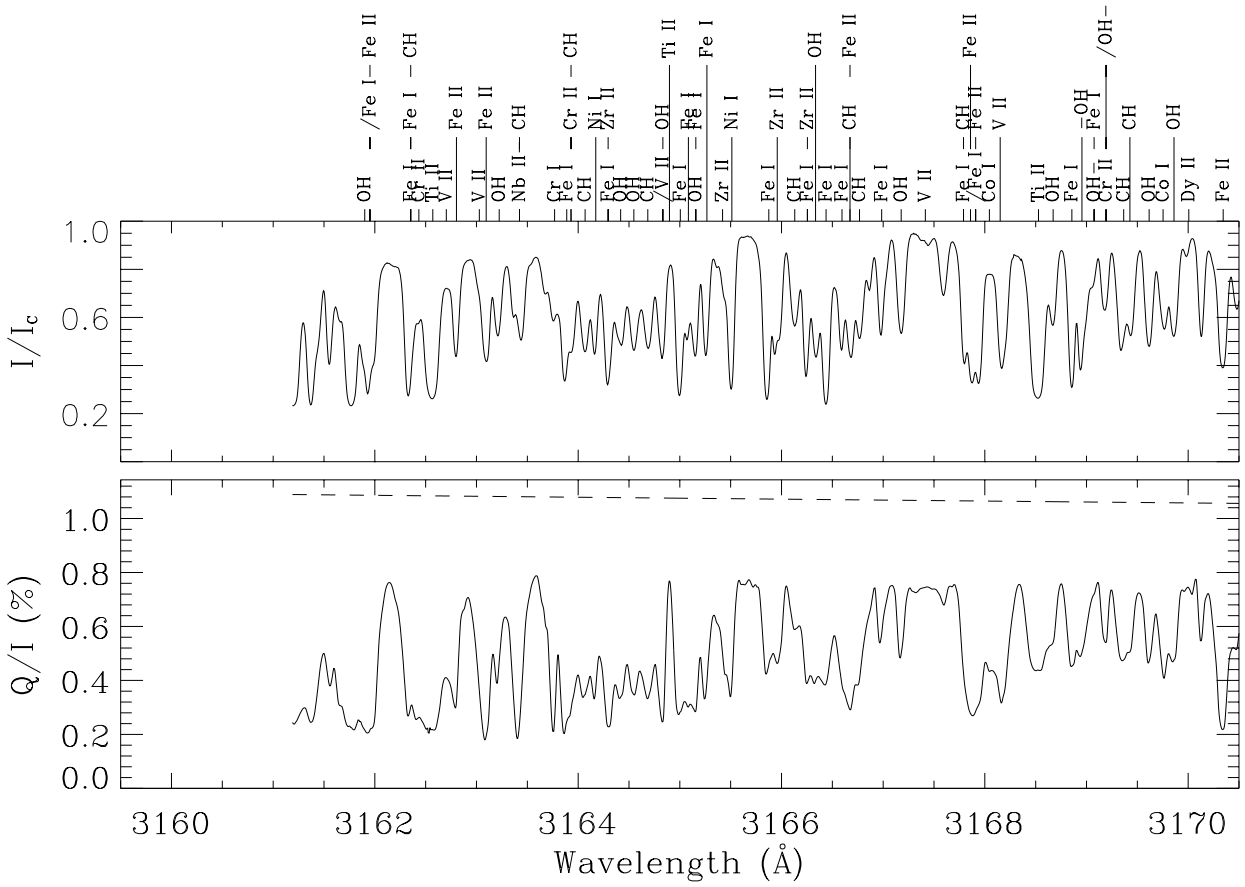
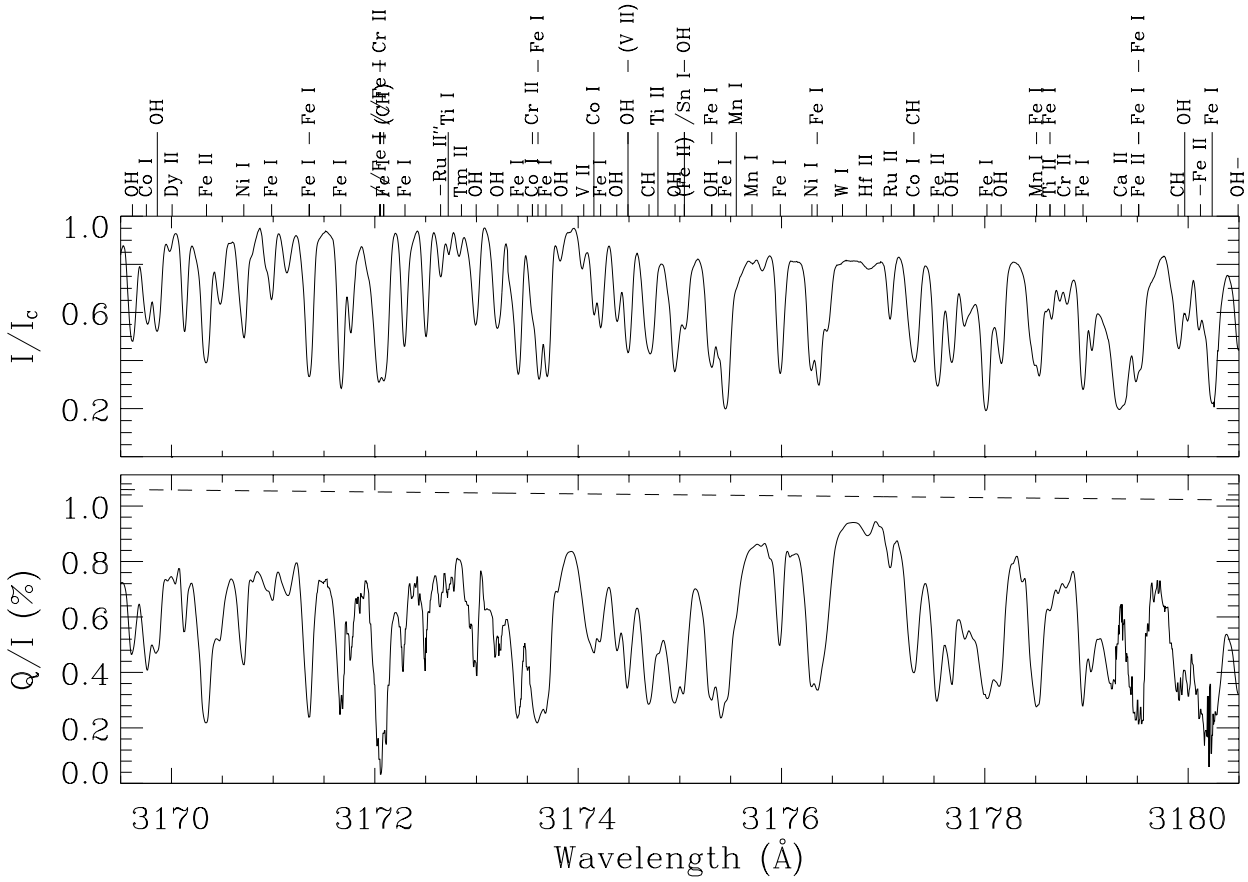
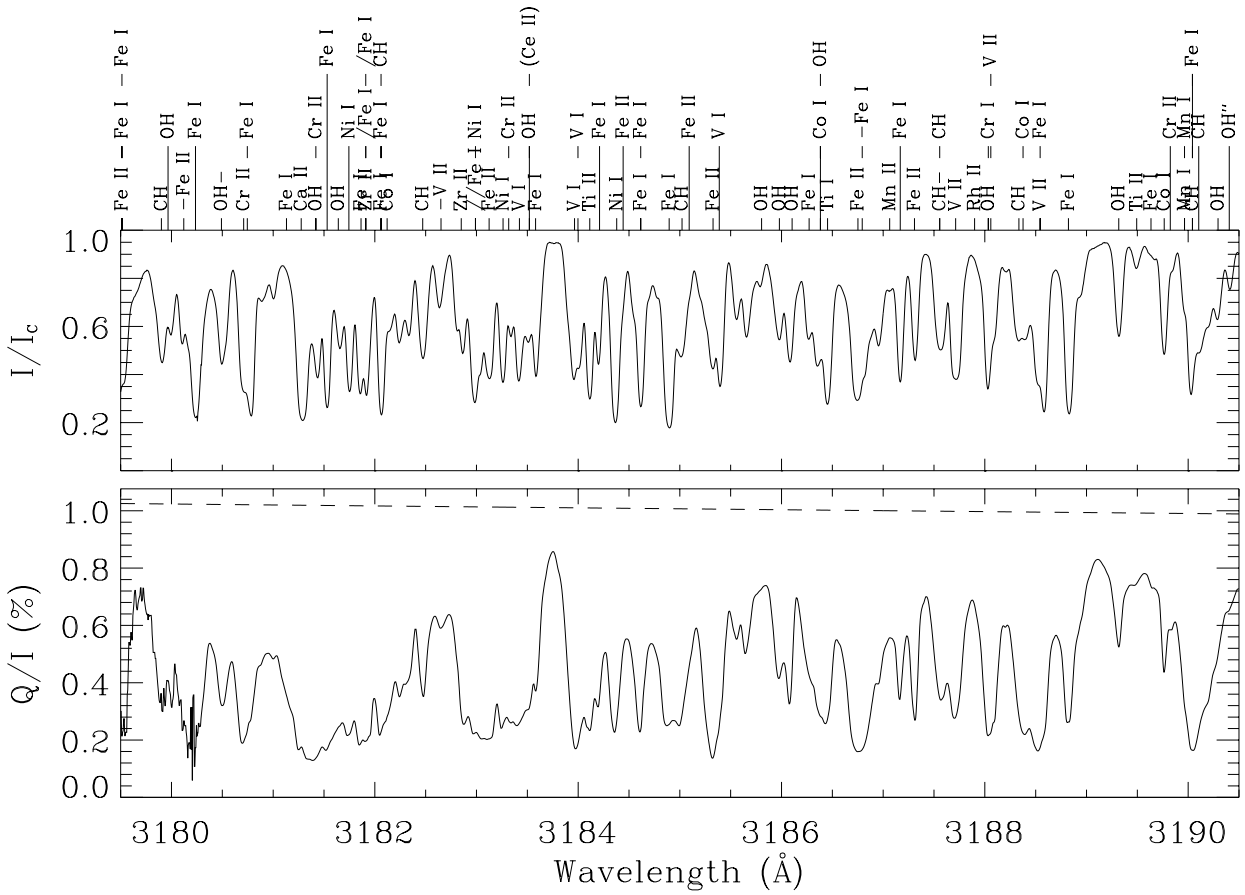
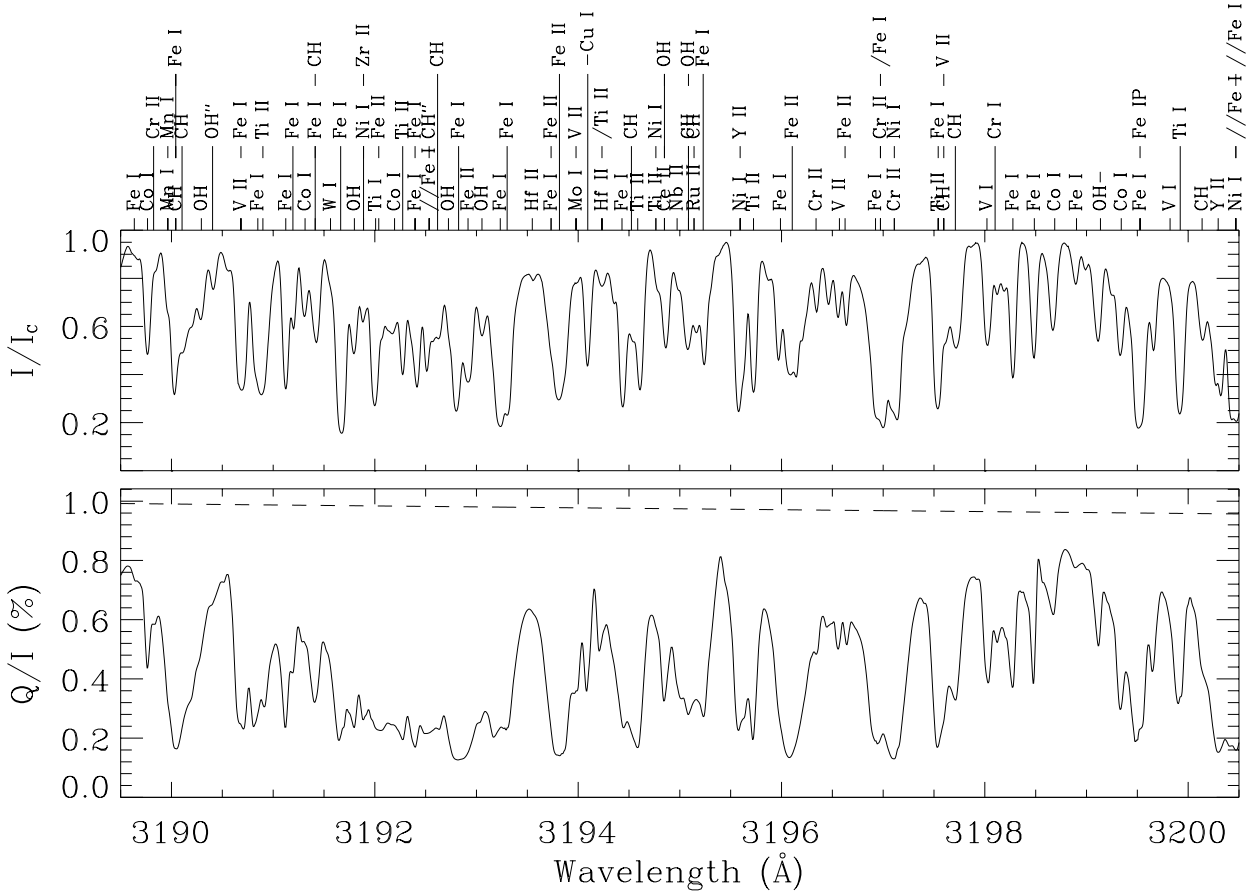
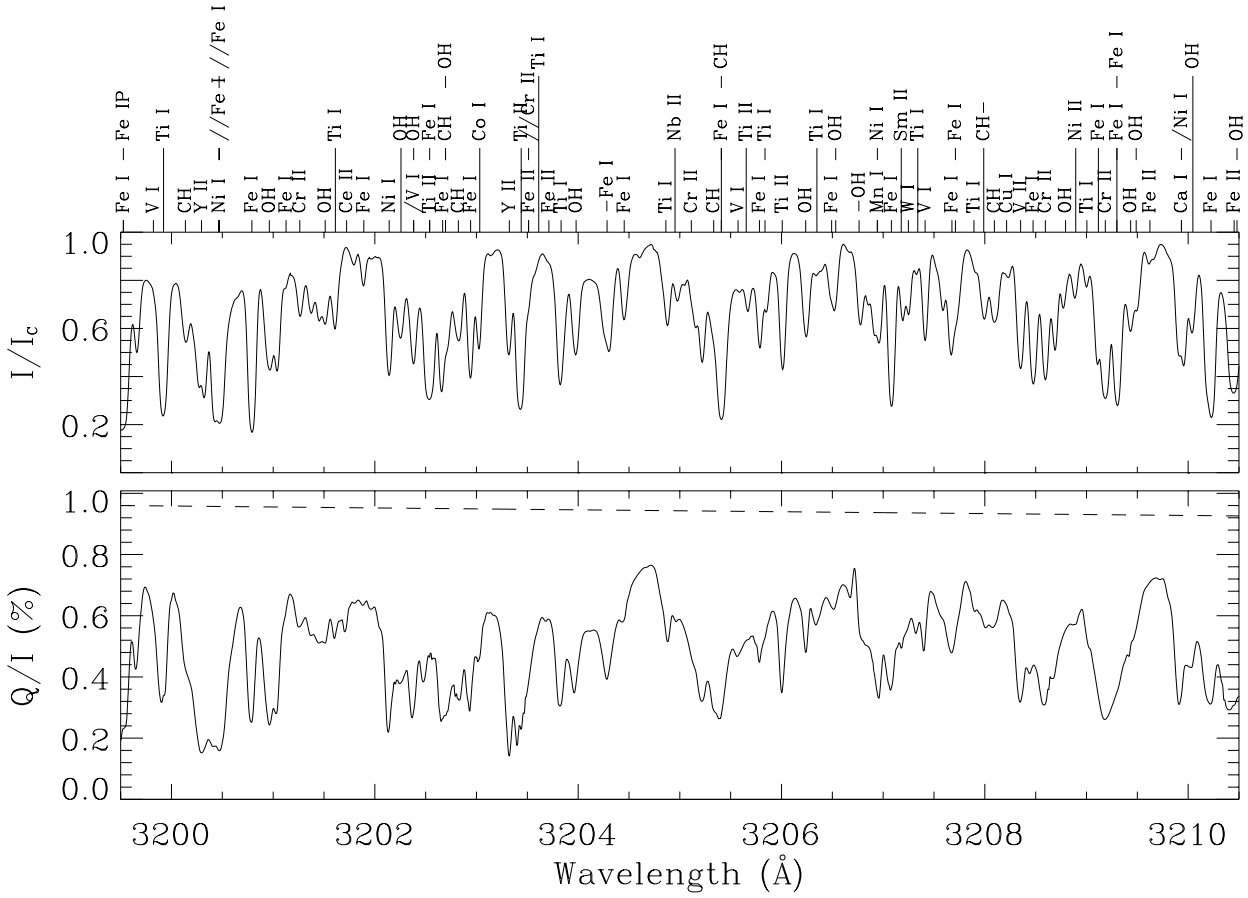
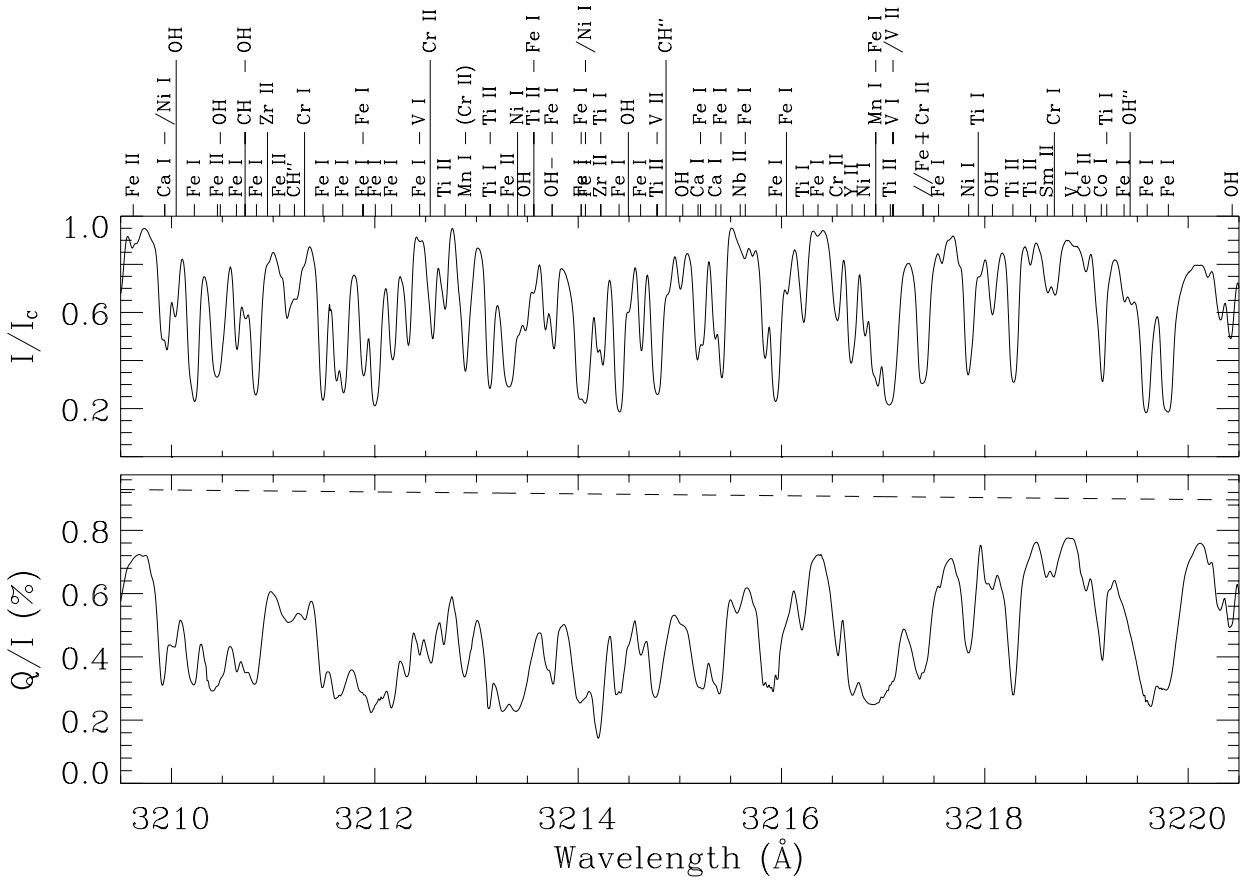

OH
/Fe I
Fe II
Fe I
CH
Fe II
V II
Fe II
OH
Nb II
CH
Cr I
Fe I
Cr II
CH
CH
Fe I
Zr II
Ni I
OH
OH
OH
V II
Ti II
OH
Fe I
Fe I
Fe I
OH
Fe I
Zr II
Ni I
Fe I
Zr II
CH
Fe I
Zr II
OH
Fe I
Fe I
CH
Fe II
Fe I
OH
V II
Fe I
CH
Fe II
Co I
Fe II
V II
Ti II
OH
Fe I
OH
Fe I
/OH
Cr II
CH
CH
OH
Co I
OH
Dy II
Fe II
I/I_c
1.0
0.6
0.2
Q/I (%)
1.0
0.8
0.6
0.4
0.2
0.0
3160
3162
3164
3166
3168
3170
Wavelength (Å)

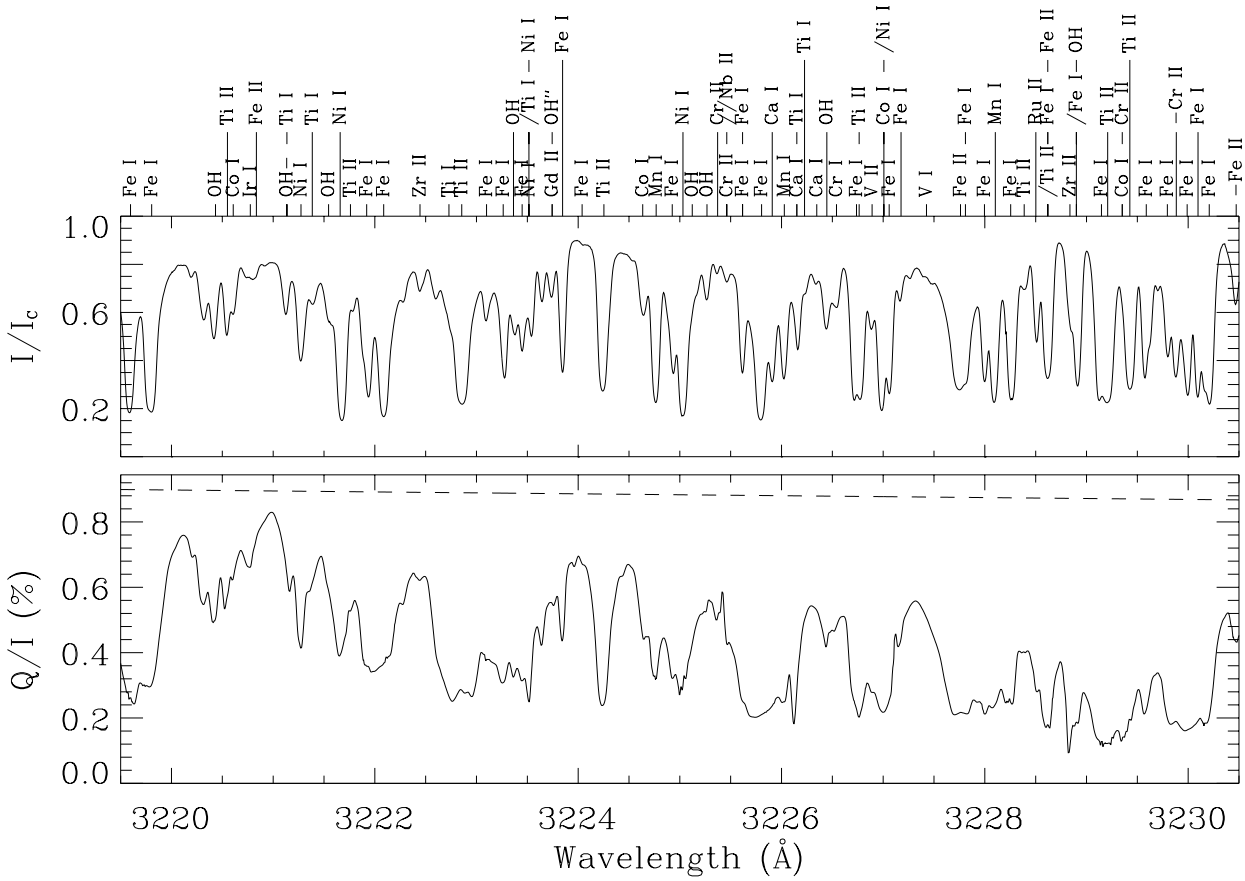

OH
Co I
OH
Dy II
Fe II
Ni I
Fe I
Fe I – Fe I
Fe I
Fe I + Cr II
Fe I
– Ru II
Ti I
Tm II
OH
OH
Fe I
Co I
Fe I
OH
Cr II – Fe I
V II
Co I
Fe I
OH
– (V II)
CH
Ti II
OH
(Fe II) /Sn I– OH
OH
Fe I
Mn I
Mn I
Fe I
Ni I – Fe I
W I
Hf II
Ru II
Co I – CH
Fe II
OH
Fe I
OH
Mn I – Fe I
Ti II
Cr II
Fe I
Ca II
Fe II – Fe I – Fe I
CH
OH
–Fe II
Fe I
OH–
1.0
0.6
0.2
I/I$_c$
1.0
0.8
0.6
0.4
0.2
0.0
Q/I (%)
3170
3172
3174
3176
3178
3180
Wavelength (Å)

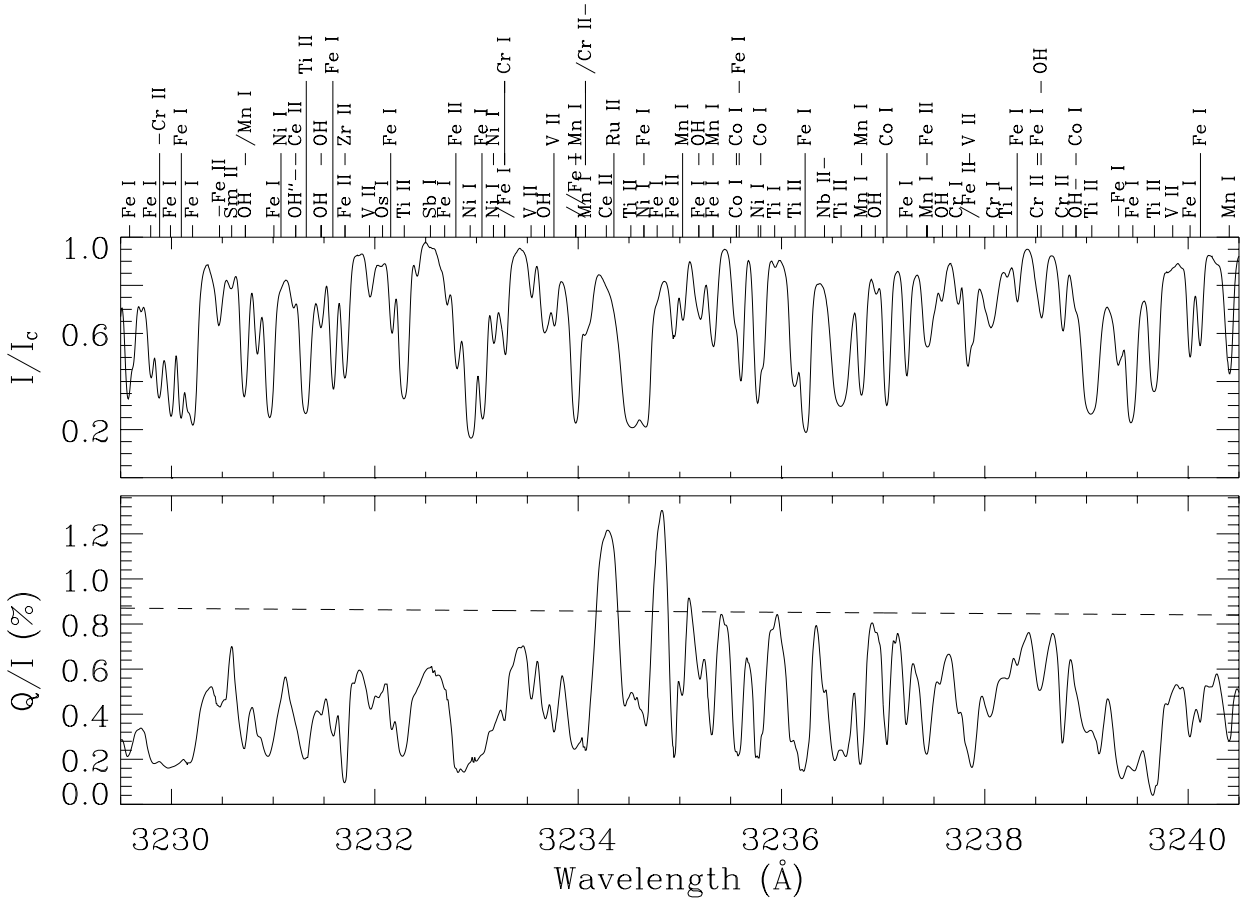

I/I_c
Q/I (%)
Wavelength (Å)
3180
3182
3184
3186
3188
3190

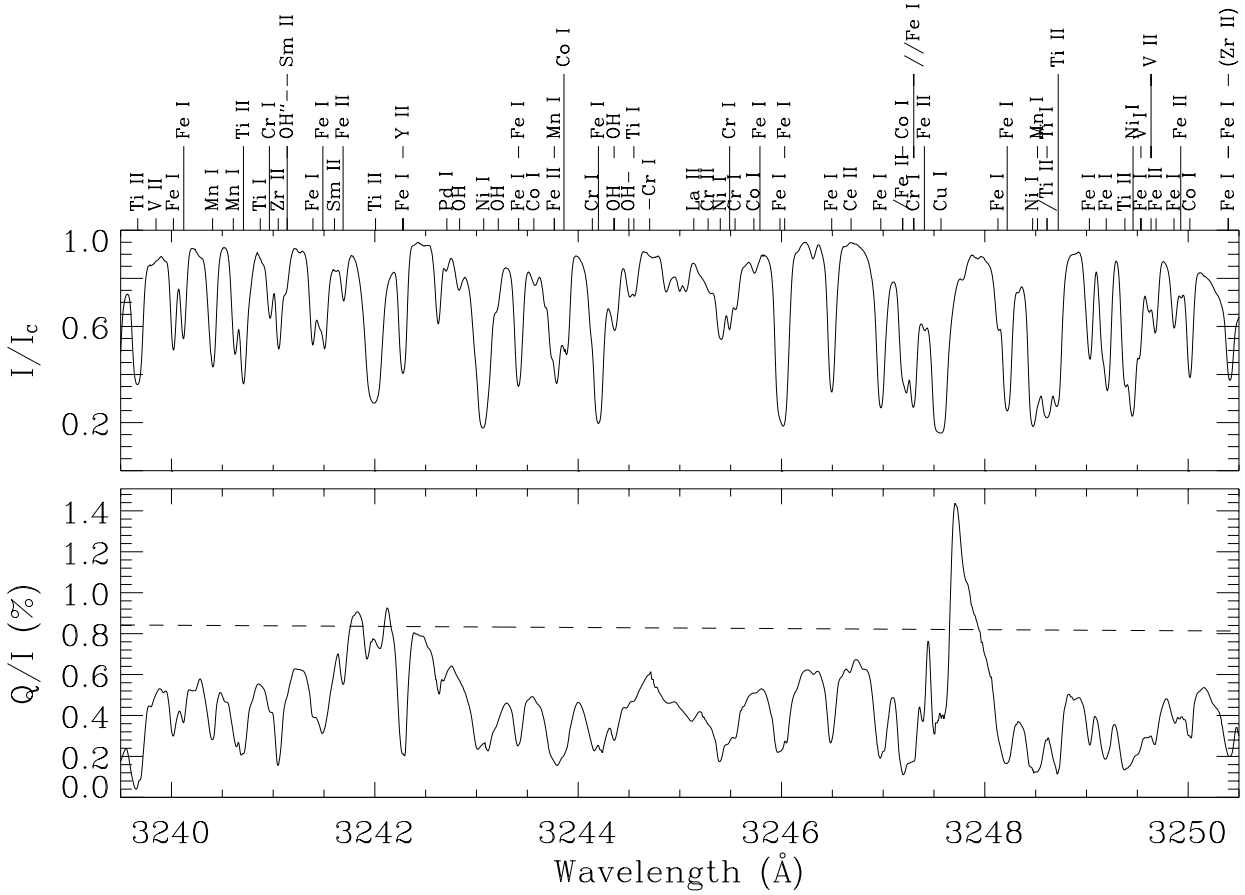

I/I_c
Q/I (%)
Wavelength (Å)
3190
3192
3194
3196
3198
3200

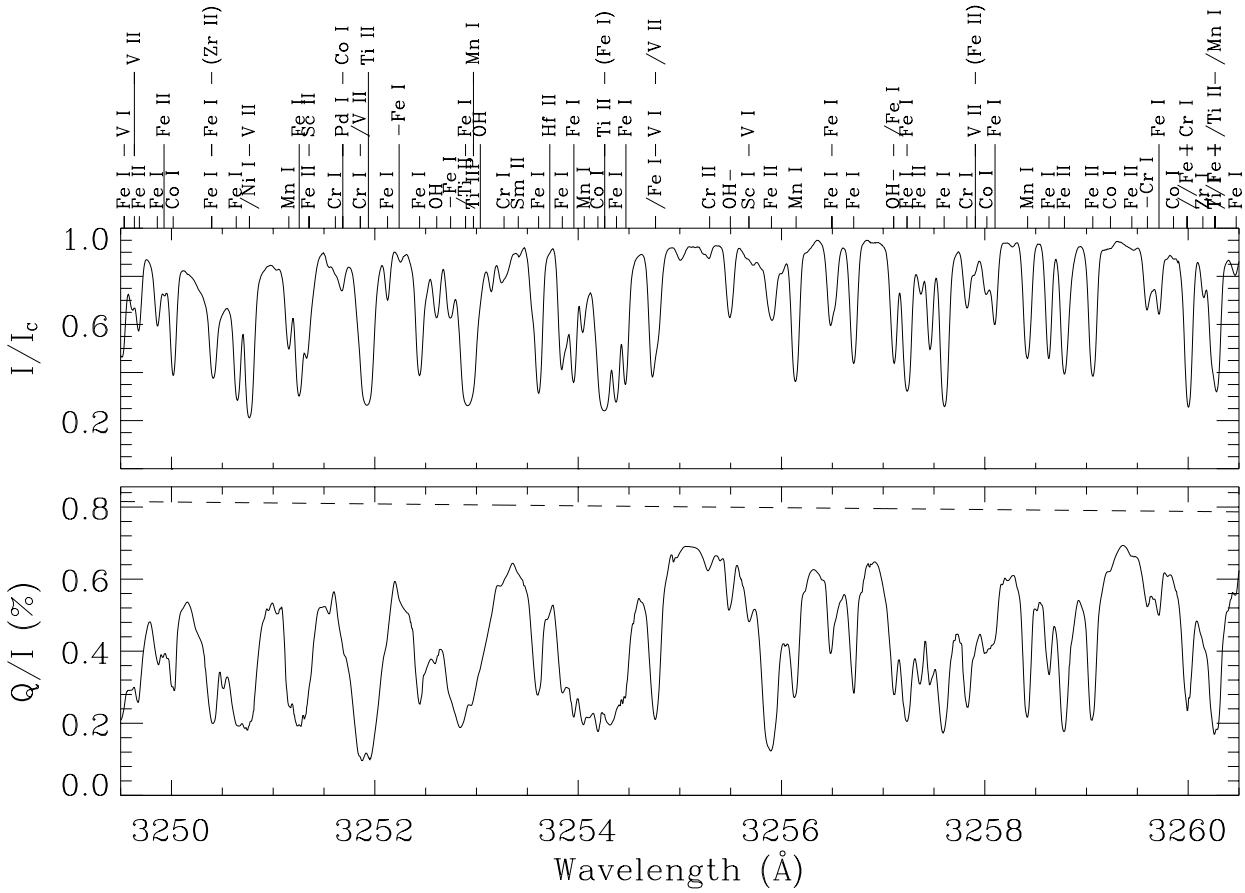

Fe I – Fe IP
V I
Ti I
CH
Y II
Ni I – //Fe I – //Fe I
Fe I
OH
Fe I
Cr II
OH
Ti I
Ce II
Fe I
Ni I
OH
OH
/V I – Fe I
Ti II – CH – OH
Fe I
CH
Fe I
Co I
Y II
Fe II – Ti/Cr II
Ti I
Fe II
Ti I
OH
–Fe I
Fe I
Ti I
Nb II
Cr II
CH
Fe I – CH
V I
Ti II
Fe I – Ti I
Ti II
OH
Ti I
Fe I – OH
–OH
Mn I – Ni I
Fe I
Sm II
W I
Ti I
V I
Fe I – Fe I
Ti I
CH–
CH I
Cu I
Y II
Fe I
Cr II
OH
Ni II
Ti I
Fe I
Cr II – Fe I
OH – OH
Fe II
Ca I – /Ni I
OH
Fe I
Fe II – OH
I/I$_c$
1.0
0.6
0.2
Q/I (%)
1.0
0.8
0.6
0.4
0.2
0.0
3200
3202
3204
3206
3208
3210
Wavelength (Å)

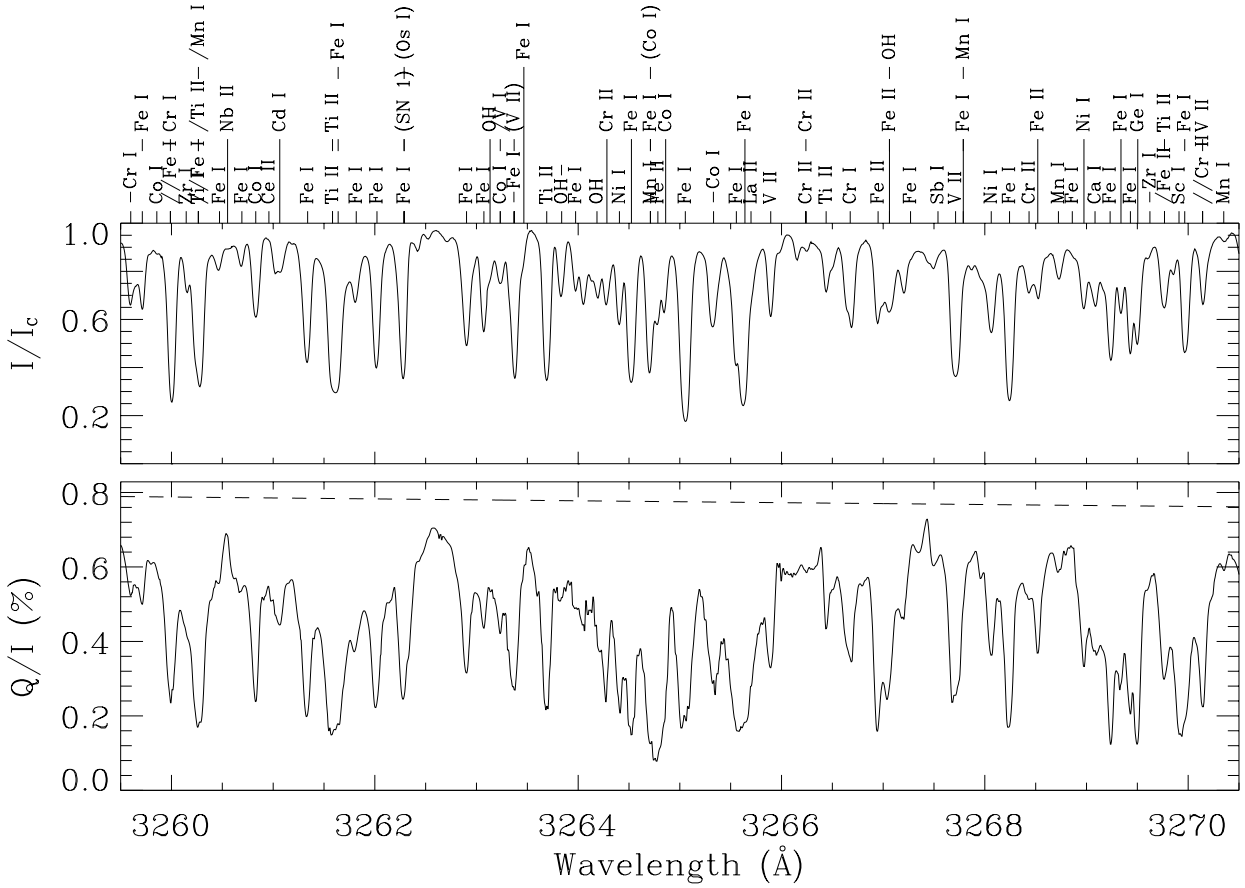

Fe II
Ca I
/Ni I
OH
Fe I
Fe II
OH
Fe I
CH
OH
Fe I
Zr II
Fe II
CH''
Cr I
Fe I
Fe I
Fe I
Fe I
Fe I
Fe I
V I
Cr II
Ti II
Mn I
(Cr II)
Ti I
Ti II
Fe II
OH
Ni I
Fe I
Ti II
OH
Fe I
Fe I
Fe I
/Ni I
Zr II
Ti I
Fe I
OH
Fe I
Ti II
V II
CH''
OH
Ca I
Fe I
Ca I
Fe I
Nb II
Fe I
Fe I
Fe I
Ti I
Fe I
Cr II
Y II
Ni I
Mn I
Fe I
Ti II
V I
/V II
/Fe I
Cr II
Fe I
Ni I
Ti I
OH
Ti II
Ti II
Sm II
Cr I
Y I
Ce II
Co I
Ti I
Fe I
OH''
Fe I
Fe I
OH
1.0
0.6
0.2
I/I_c
0.8
0.6
0.4
0.2
0.0
Q/I (%)
3210
3212
3214
3216
3218
3220
Wavelength (Å)

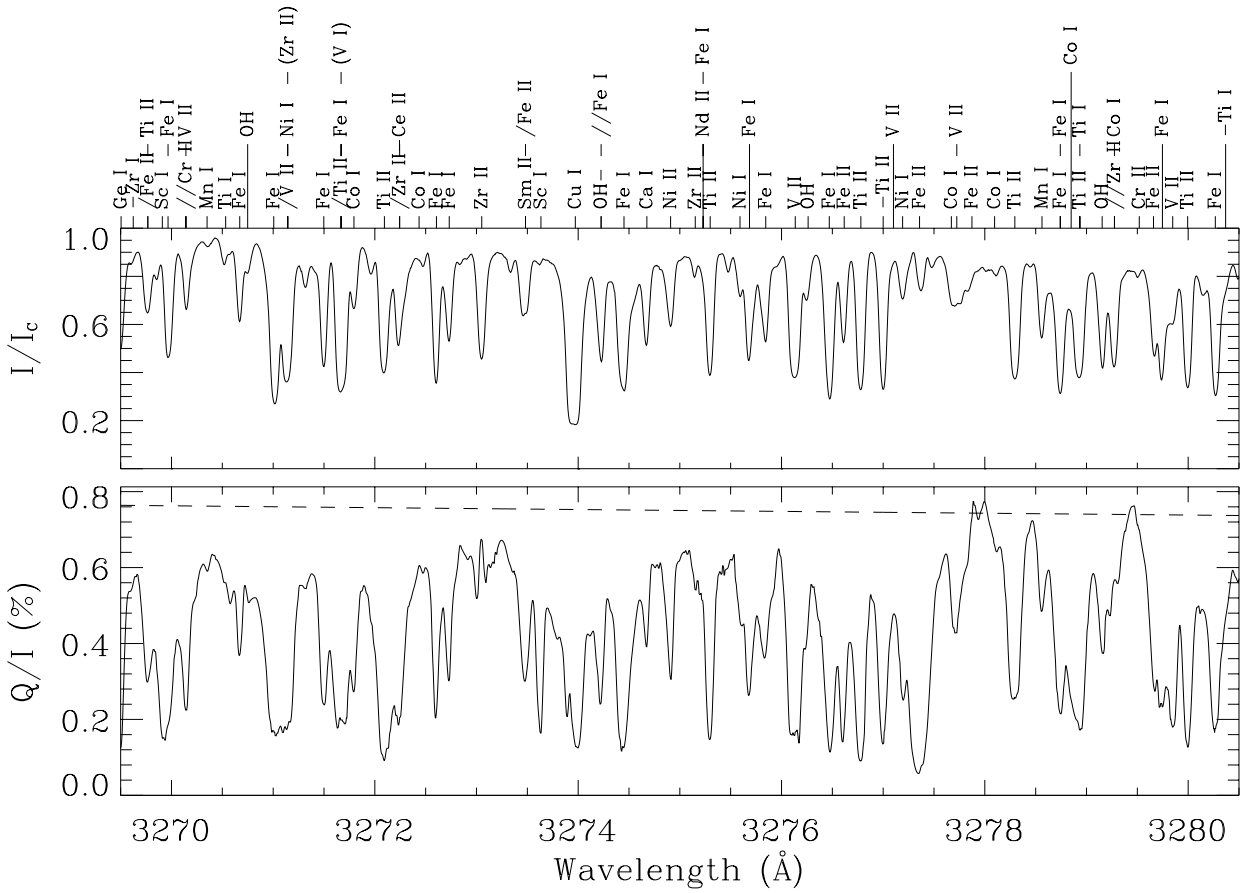

Fe I
Fe I
OH
Co I
Ir I
Ti II
Fe II
OH
Ni I
Ti I
Ti I
OH
Ni I
Ti II
Fe I
Fe I
Zr II
Ti I
Ti II
Fe I
Fe I
OH
Fe I
Ni I
Gd II
OH
Fe I
Fe I
Ti II
Co I
Mn I
Fe I
Ni I
OH
OH
Cr II
Nb II
Fe I
Fe I
Ca I
Mn I
Ca I
Ti I
Ti I
Ca I
OH
Cr I
Fe I
Ti II
V II
Co I
Ni I
Fe I
V I
Fe II
Fe I
Fe I
Mn I
Fe I
Ti II
Ru II
Fe II
Fe I
Zr II
OH
Fe I
Ti II
Co I
Cr II
Ti II
Fe I
Fe I
Cr II
Fe I
Fe I
Fe II
1.0
0.6
0.2
I/I_c
0.8
0.6
0.4
0.2
0.0
Q/I (%)
3220
3222
3224
3226
3228
3230
Wavelength (Å)

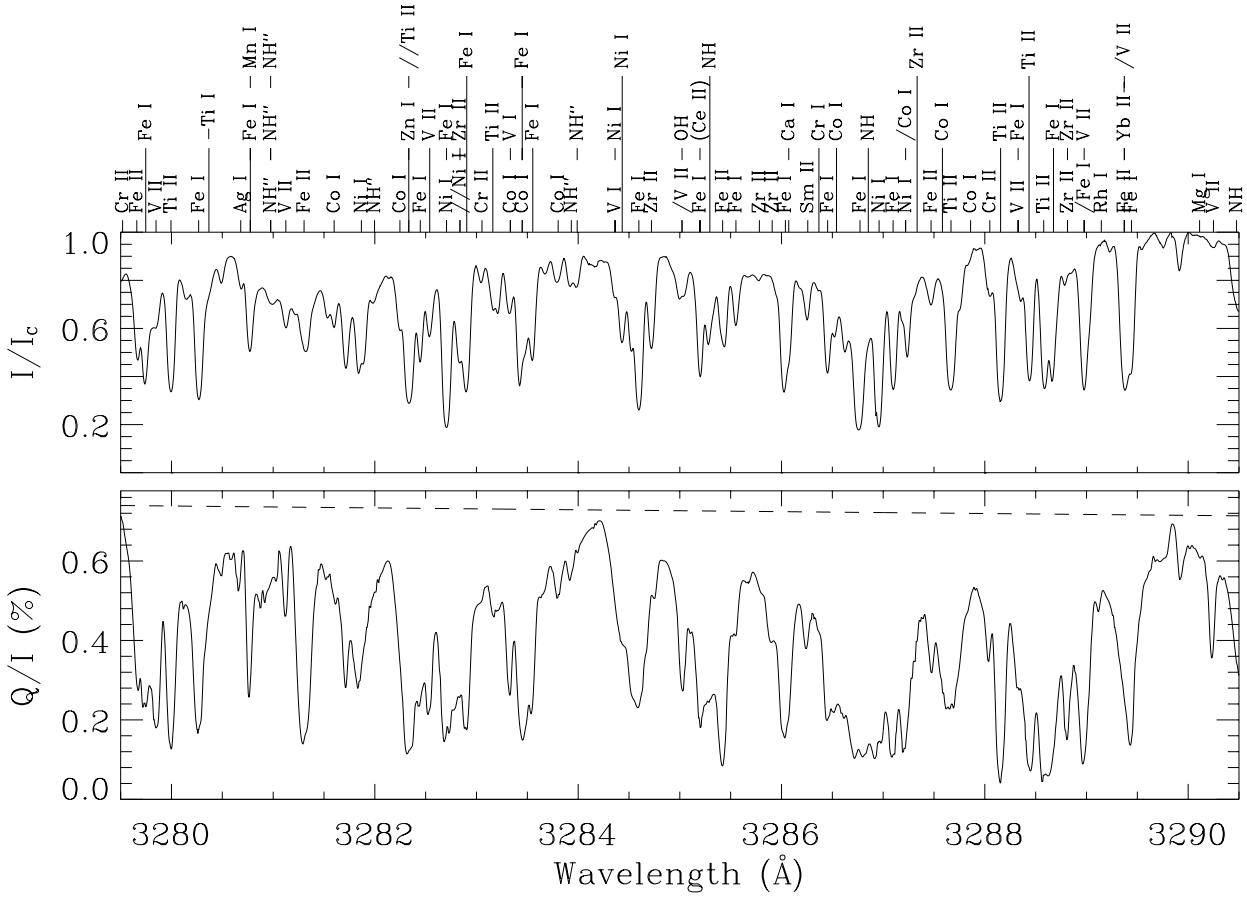

Fe I
Fe I
Cr II
Fe I
Fe I
Fe II
Sm II
OH
Mn I
Fe I
Ni I
OH
Ce II
Ti II
OH
OH
Fe II
Zr II
Fe I
V II
Os I
Fe I
Ti II
Sb I
Fe I
Fe II
Ni I
Fe I
Ni I
Fe I
Cr I
V II
OH
Mn I
Cr II
Ce II
Ru II
Ti II
Ni I
Fe I
Fe II
Fe I
Mn I
OH
Fe I
Mn I
Co I
Fe I
Co I
Ni I
Co I
Ti I
Ti II
Fe I
Nb II
Ti II
Mn I
OH
Mn I
Co I
Fe I
Mn I
Fe II
OH
Cr I
Fe II
V II
Cr I
Ti I
Fe I
Cr II
Fe I
OH
Cr II
OH
Co I
Ti II
Fe I
Fe I
Ti II
V II
Fe I
Mn I
I/I$_c$
1.0
0.6
0.2
Q/I (%)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
3230
3232
3234
3236
3238
3240
Wavelength (Å)

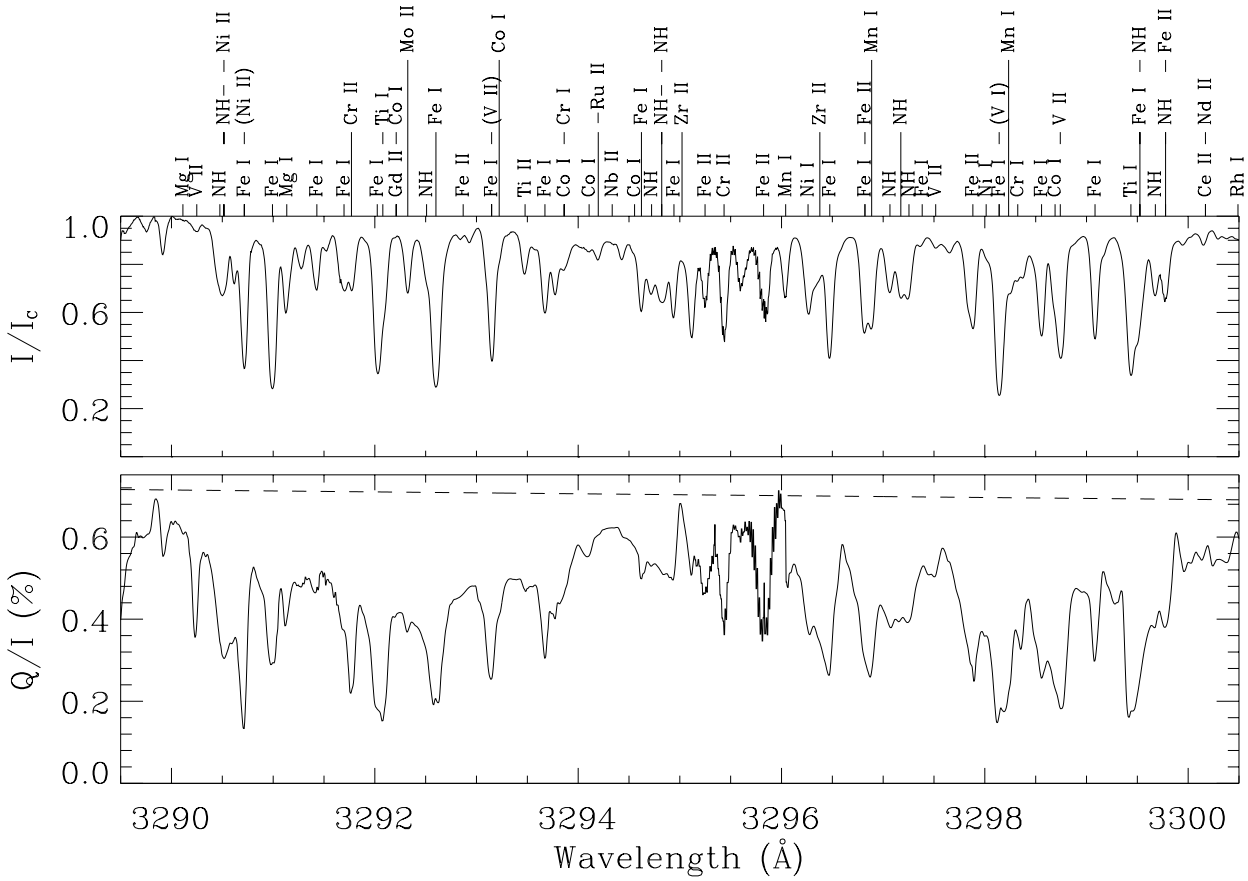

Ti II
V II
Fe I
Fe I
Mn I
Mn I
Ti II
Ti I
Cr I
Zr II
OH
Sm II
Fe I
Fe I
Sm II
Fe II
Ti II
Fe I
Y II
Pd I
OH
Ni I
OH
Fe I
Co I
Fe II
Mn I
Co I
Cr I
Fe I
OH
OH
Ti I
Cr I
La II
Cr II
Ni I
Cr I
Co I
Fe I
Fe I
Fe I
Ce II
Fe I
Fe II
Co I
Cr I
Fe II
Cu I
Fe I
Fe I
Ni I
Mn I
Ti II
Ti II
Fe I
Fe I
Ti II
Fe II
Ni I
V II
Fe II
Fe I
Co I
Fe I
Fe I
(Zr II)
1.0
0.6
0.2
I/I_c
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Q/I (%)
3240
3242
3244
3246
3248
3250
Wavelength (Å)

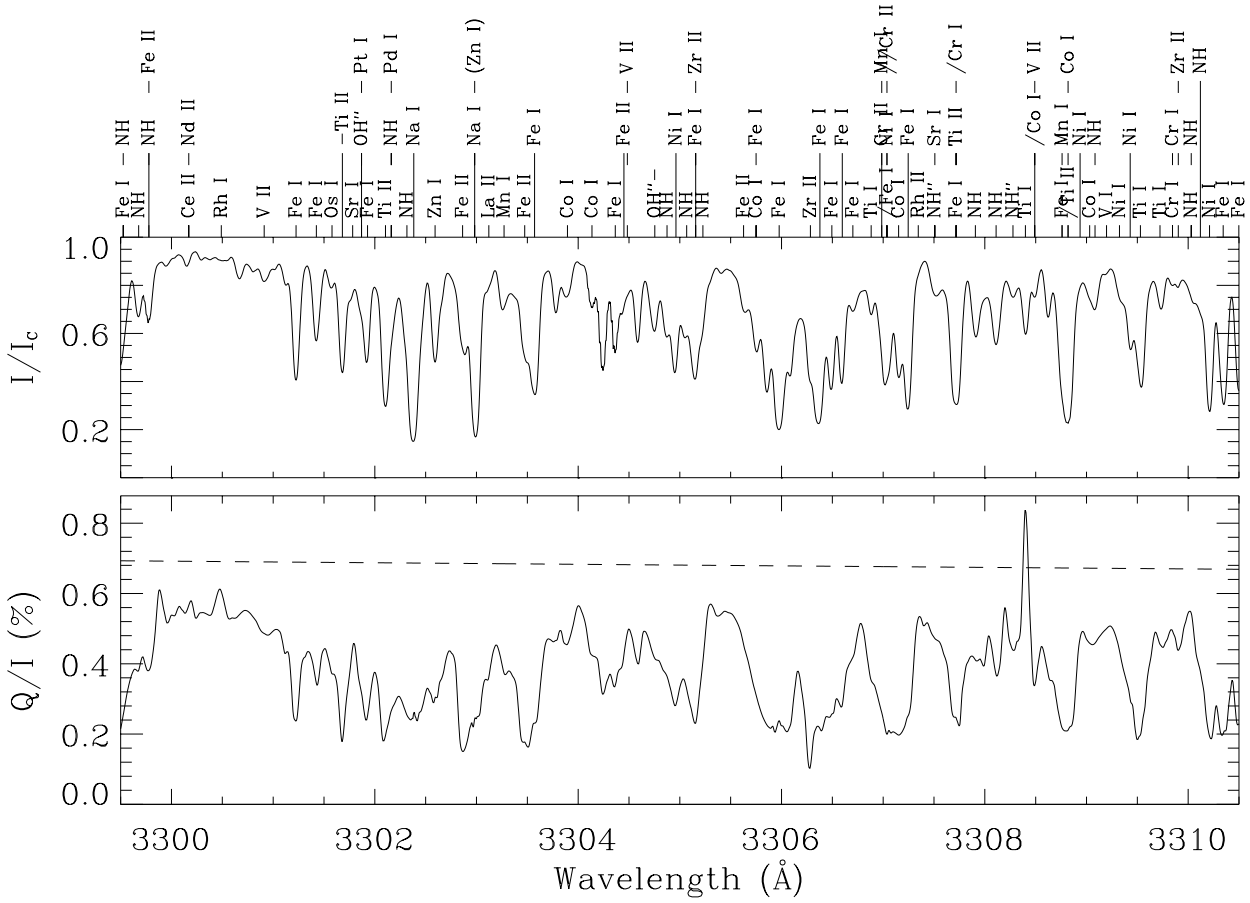

I/I_c
Q/I (%)
Wavelength (Å)
3250
3252
3254
3256
3258
3260

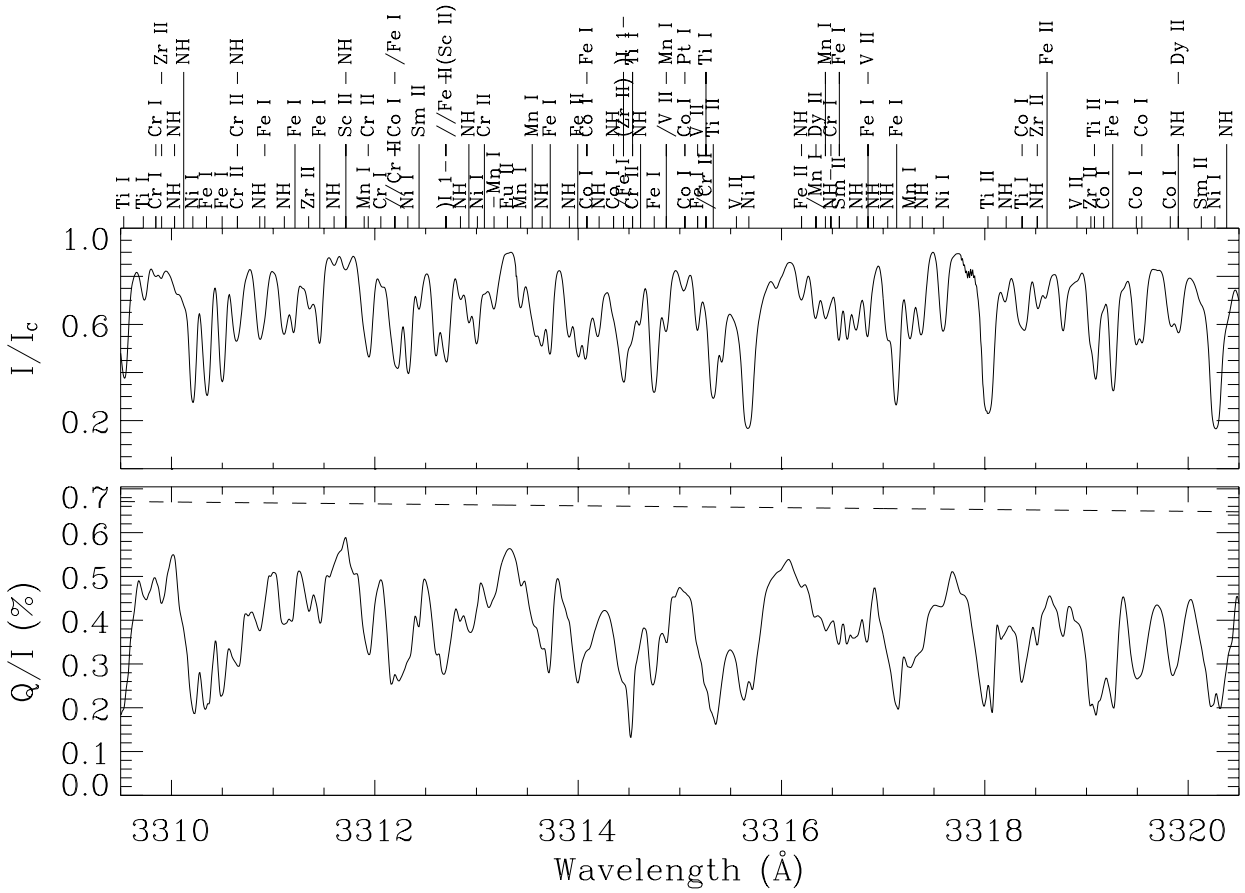

Cr I
Fe I
Co I
Fe I
Cr I
Fe I
Ti II
Mn I
Fe I
Nb II
Fe I
Co I
Ce II
Cd I
Fe I
Ti II
Fe I
Fe I
Fe I
(SN 1)
(Os I)
Fe I
Fe I
OH I
Co I
Fe I
(V II)
Fe I
Ti II
OH I
Fe I
OH
Cr II
Ni I
Fe I
Mn I
Fe I
(Co I)
Co I
Fe I
Co I
Fe I
Fe I
La II
V II
Cr II
Cr II
Ti II
Cr I
Fe II
Fe II
OH
Fe I
Sb I
V II
Fe I
Mn I
Ni I
Fe I
Cr II
Fe II
Mn I
Fe I
Ca I
Fe I
Fe I
Ge I
Zr I
Fe II
Ti II
Sc I
Fe I
Cr I
V II
Mn I
I/I_c
1.0
0.6
0.2
Q/I (%)
0.8
0.6
0.4
0.2
0.0
3260
3262
3264
3266
3268
3270
Wavelength (Å)

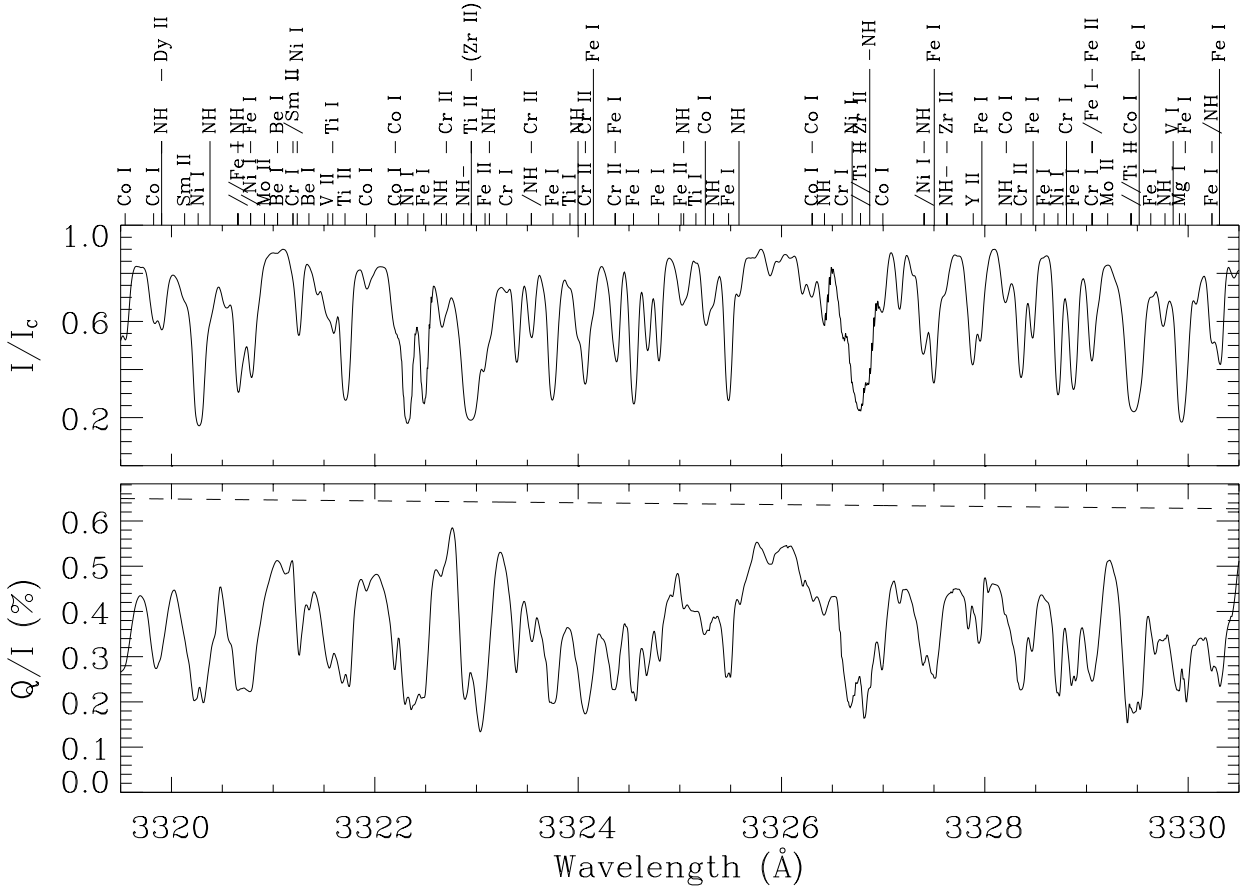

Ge I
Zr I
Fe II
Ti II
Sc I
Fe I
Cr I
V II
Mn I
Ti I
Fe I
OH
Fe I
V II
Ni I
(Zr II)
Fe I
Ti II
Fe I
(V I)
Co I
Ti II
Zr II
Ce II
Co I
Fe I
Fe I
Zr II
Sm II
Fe II
Sc I
Cu I
OH
Fe I
Fe I
Ca I
Ni II
Zr II
Ti II
Nd II
Fe I
Ni I
Fe I
V II
OH
Fe I
Fe II
Ti II
Ti II
V II
Ni I
Fe II
Co I
V II
Fe II
Co I
Ti II
Mn I
Fe I
Fe I
Ti II
Ti I
Co I
OH
Zr II
Co I
Cr II
Fe II
Fe I
V II
Ti II
Fe I
Ti I
1.0
0.6
0.2
I/I$_c$
0.8
0.6
0.4
0.2
0.0
Q/I (%)
3270
3272
3274
3276
3278
3280
Wavelength (Å)

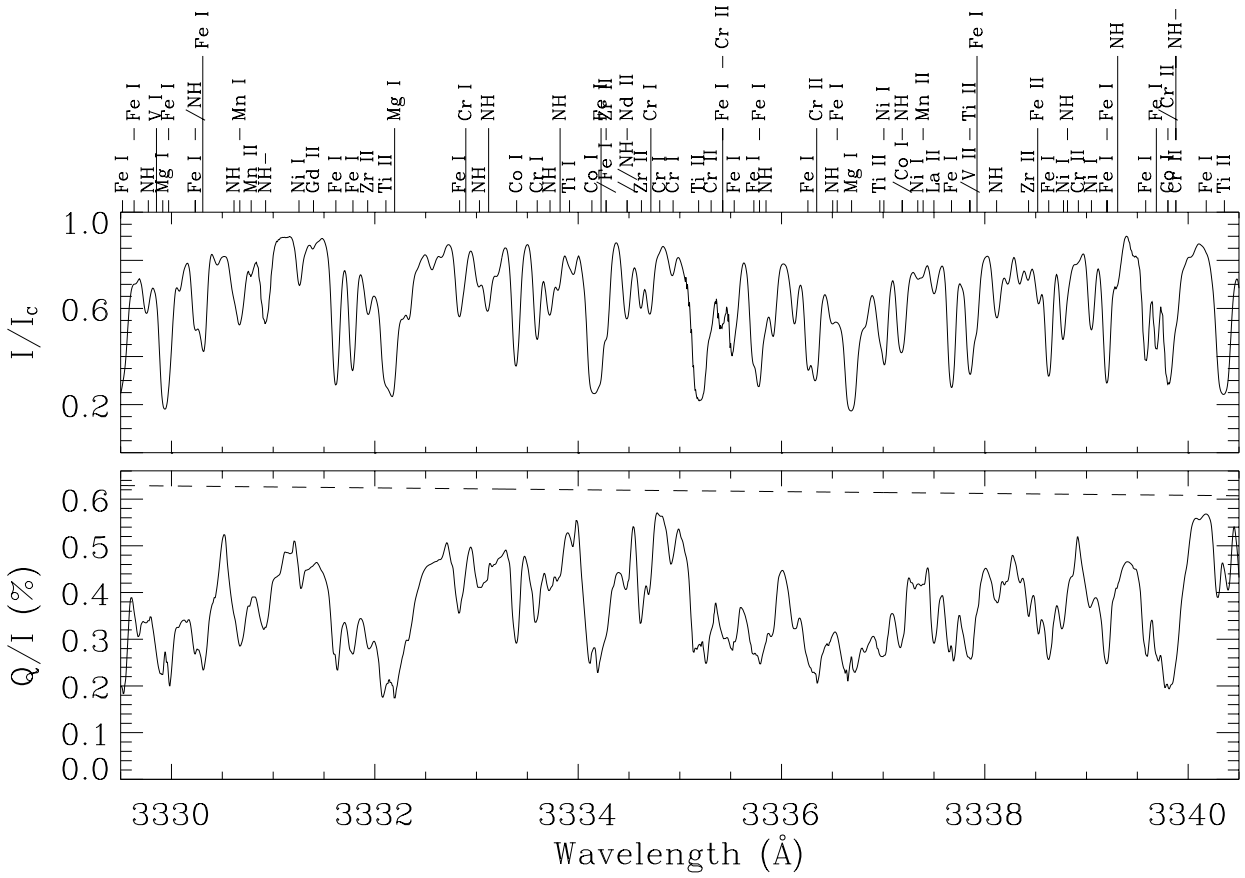

I/I_c
Q/I (%)
Wavelength (Å)
3280
3282
3284
3286
3288
3290

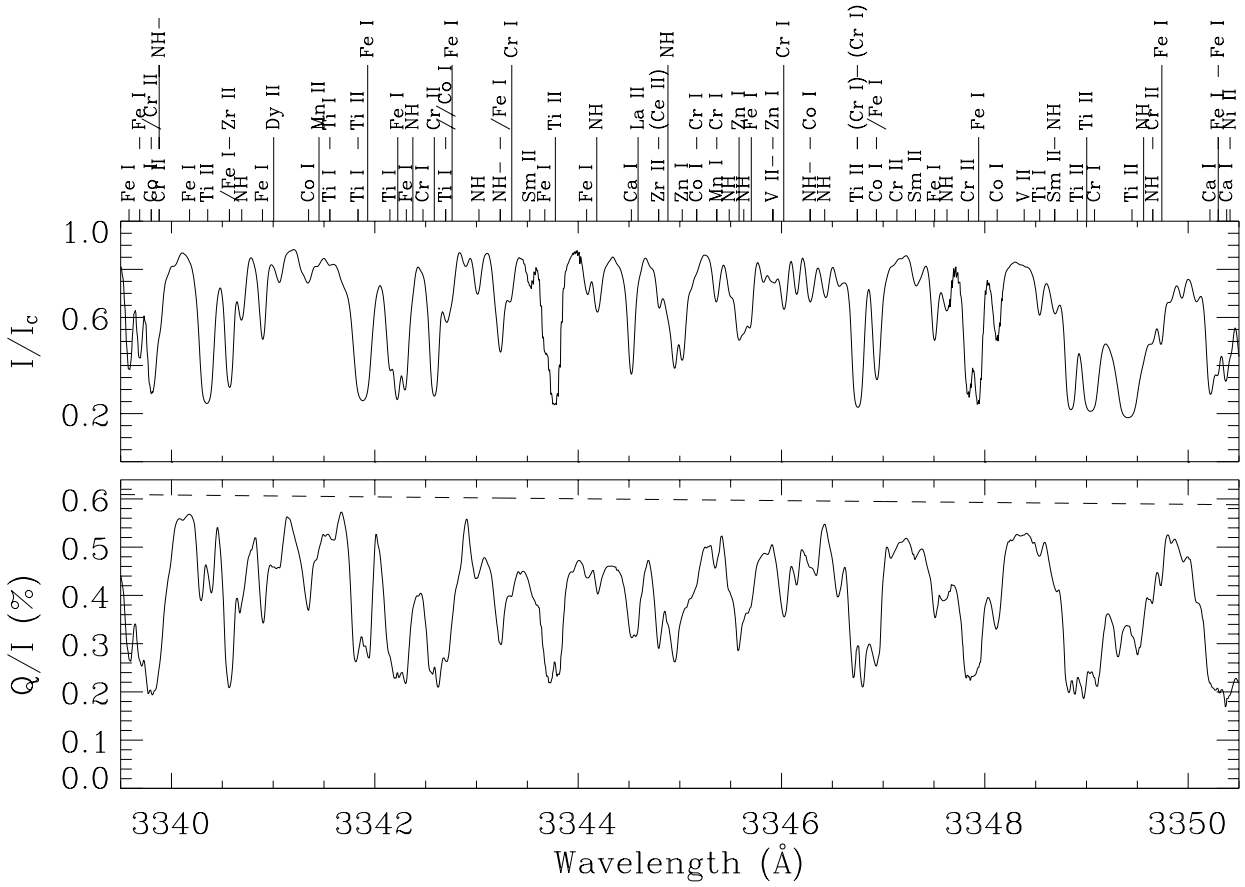

Mg I
V II
NH
Fe I
(Ni II)
Ni II
Fe I
Mg I
Fe I
Fe I
Cr II
Fe I
Ti I
Gd II
Co I
Mo II
NH
Fe I
Fe II
Fe I
(V II)
Co I
Ti II
Fe I
Co I
Cr I
Co I
Ru II
Nb II
Co I
Fe I
NH
NH
Zr II
Fe I
Fe II
Cr II
Fe II
Mn I
Ni I
Zr II
Fe I
Fe I
Fe II
Mn I
NH
NH
NH
Fe I
V II
Fe II
Ni I
Fe I
(V I)
Mn I
Cr I
Fe I
Co I
V II
Fe I
Ti I
Fe I
NH
NH
Fe II
Ce II
Nd II
Rh I
1.0
0.6
0.2
I/I_c
0.6
0.4
0.2
0.0
Q/I (%)
3290
3292
3294
3296
3298
3300
Wavelength (Å)

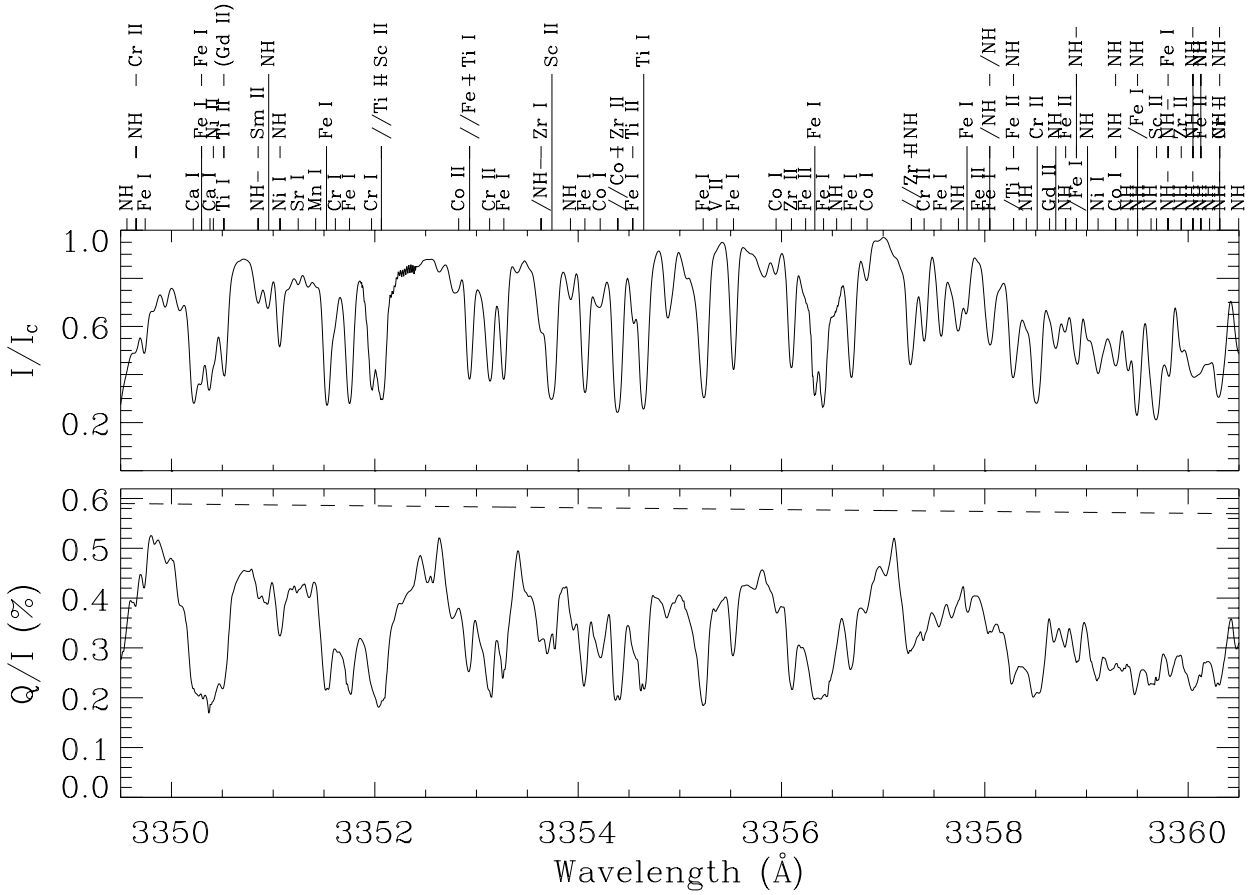

Fe I – NH
NH
– Fe II
Ce II – Nd II
Rh I
V II
Fe I
Fe I
Os I
–Ti II
Sr I
OH'' – Pt I
Fe I
Ti II – NH
– Pd I
NH
Na I
Zn I
Fe II
Na I – (Zn I)
La II
Mn I
Fe II
Fe I
Co I
Co I
Fe I
Fe II – V II
OH''–
NH
Ni I
NH
Fe I – Zr II
NH
Fe II
Co I – Fe I
Fe I
Zr II
Fe I
Fe I
Fe I
Ti I
Fe I
Co I
Rh II
NH'' – Sr I
Fe I – Ti II – /Cr I
NH
NH
NH''
Ti I
/Co I – V II
Fe I
Mn I – Co I
Co I
Ni I
V I
Ni I
Ni I
Ti I
Ti I
Cr I
NH
Cr I – Zr II
NH
NH
Ni I
Fe I
Fe I
1.0
0.6
0.2
I/I$_c$
0.8
0.6
0.4
0.2
0.0
Q/I (%)
3300
3302
3304
3306
3308
3310
Wavelength (Å)

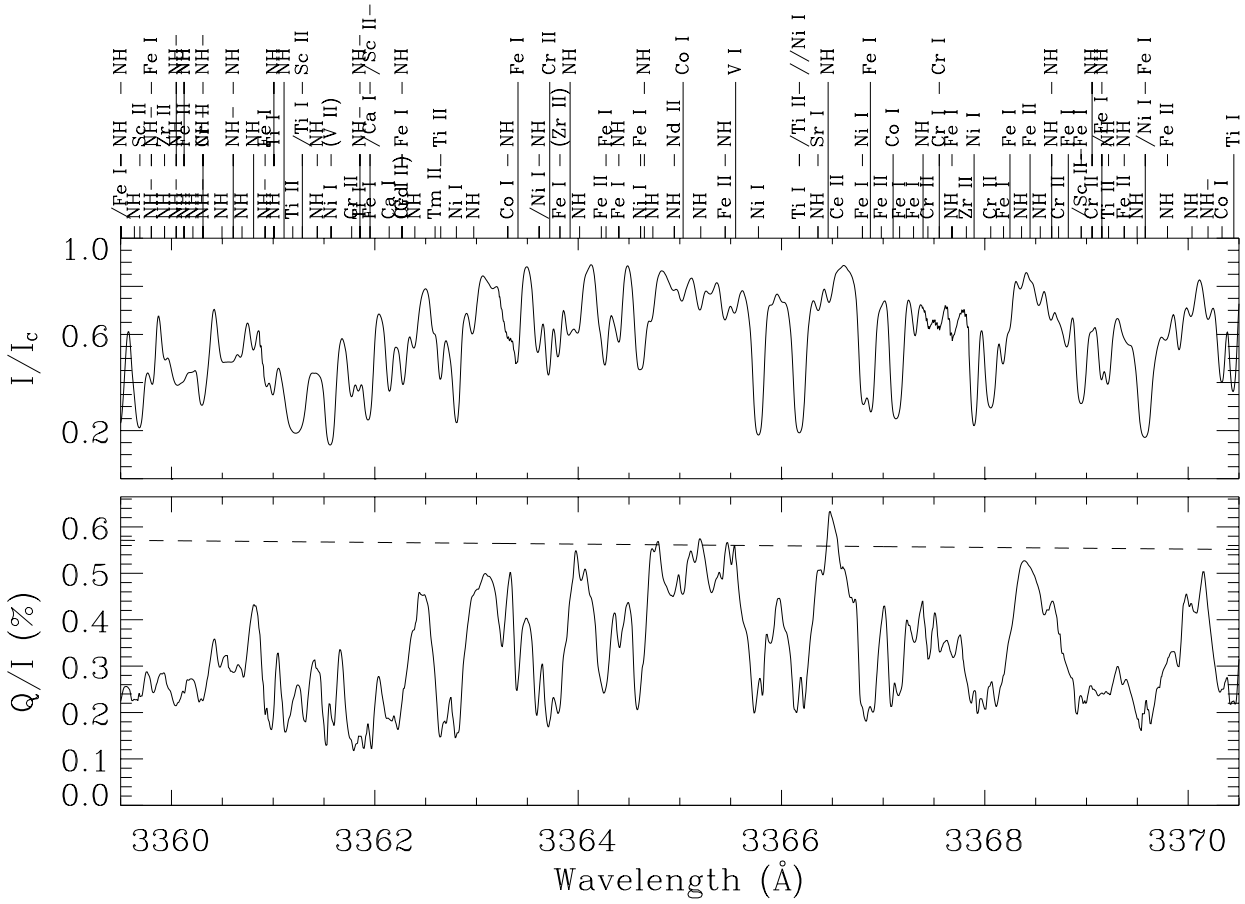

I/I_c
Q/I (%)
Wavelength (Å)
3310
3312
3314
3316
3318
3320

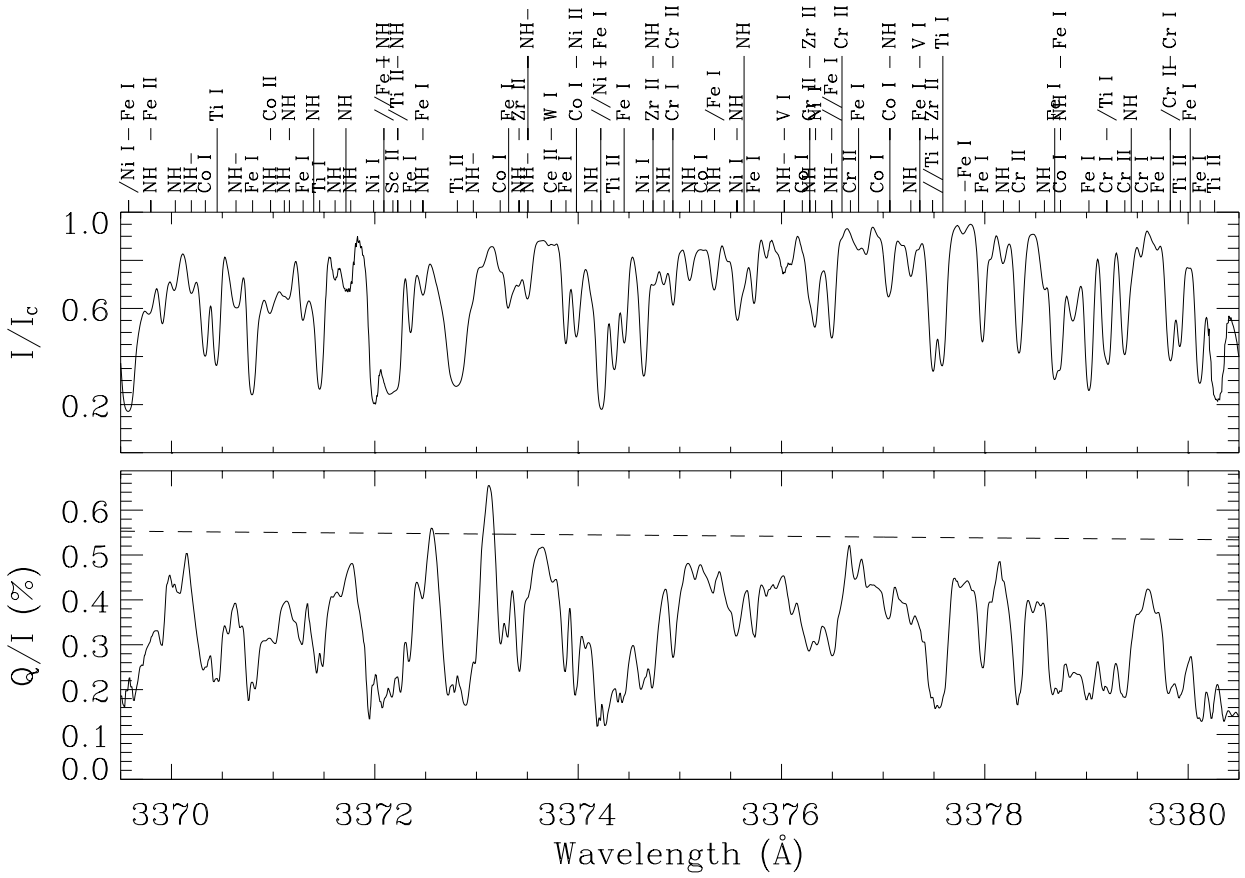

I/I_c
Q/I (%)
Wavelength (Å)
3320
3322
3324
3326
3328
3330

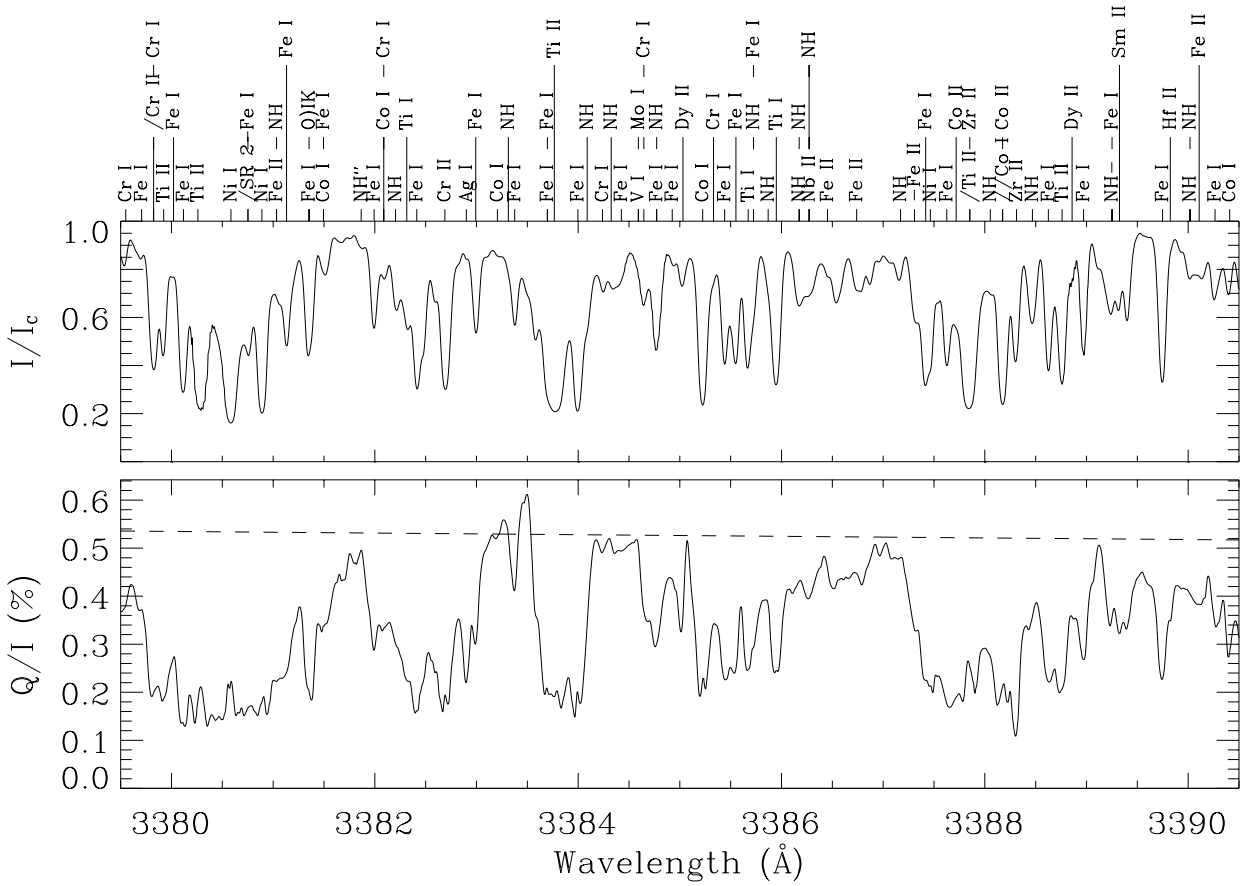

I/I_c
Q/I (%)
Wavelength (Å)
3330
3332
3334
3336
3338
3340

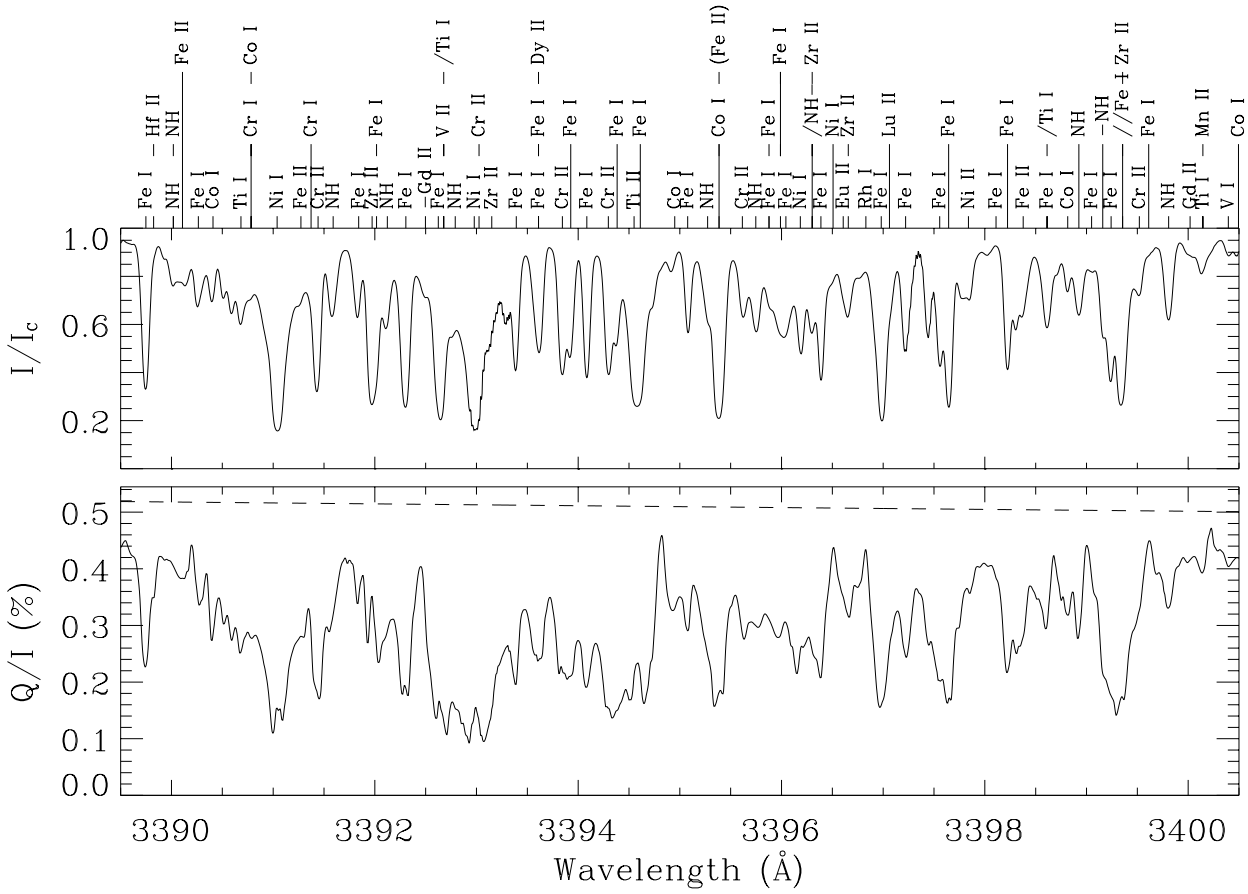

I/I_c
Q/I (%)
Wavelength (Å)
3340
3342
3344
3346
3348
3350

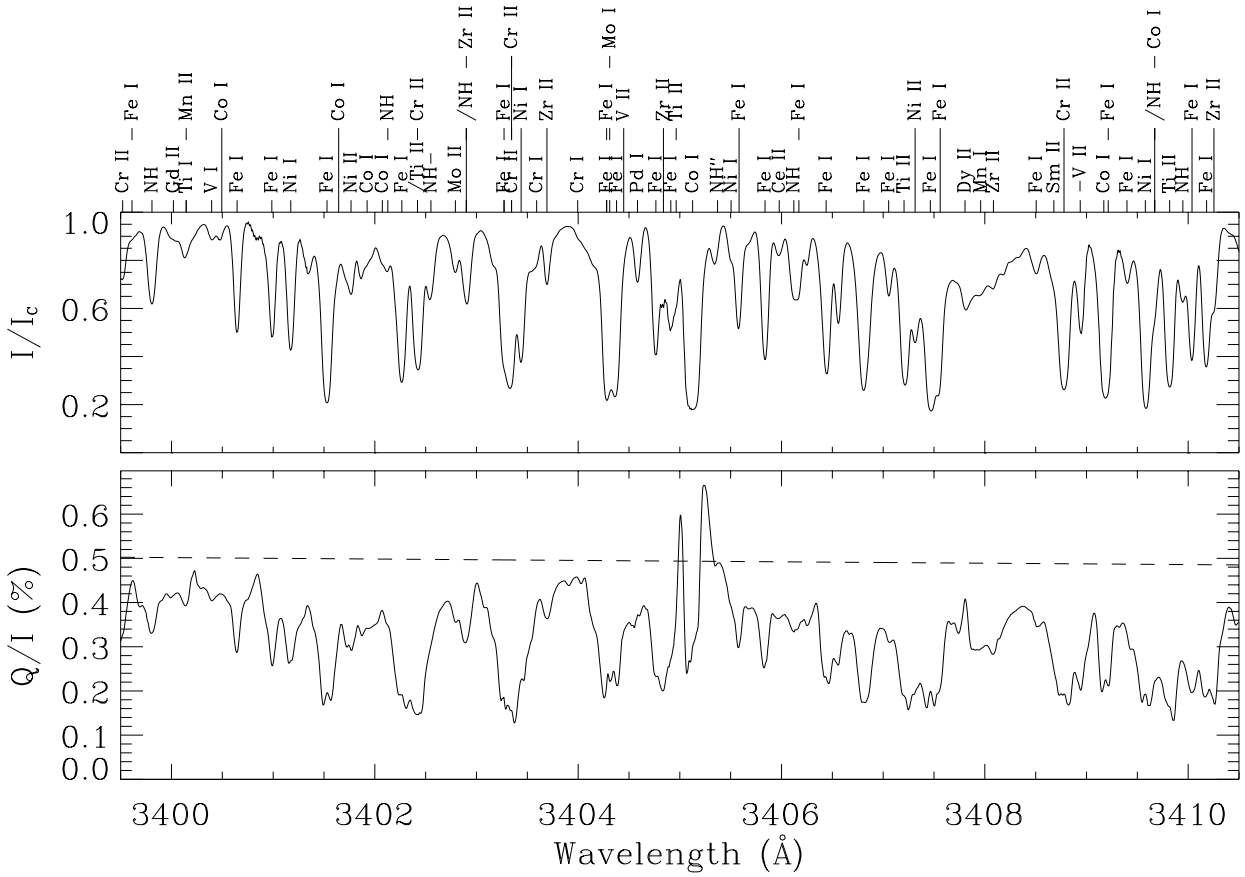

I/I_c
Q/I (%)
Wavelength (Å)
3350
3352
3354
3356
3358
3360

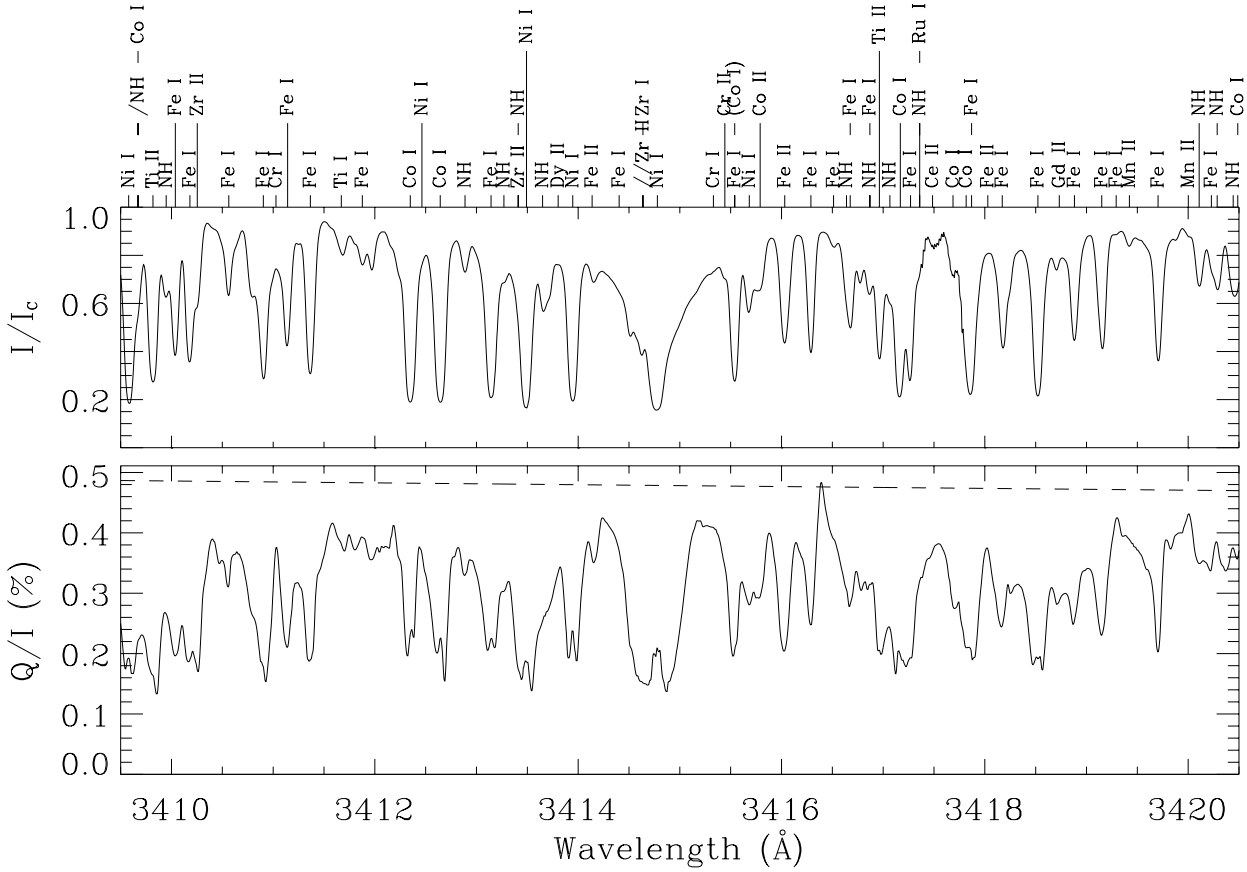

I/I_c
Q/I (%)
Wavelength (Å)
3360
3362
3364
3366
3368
3370

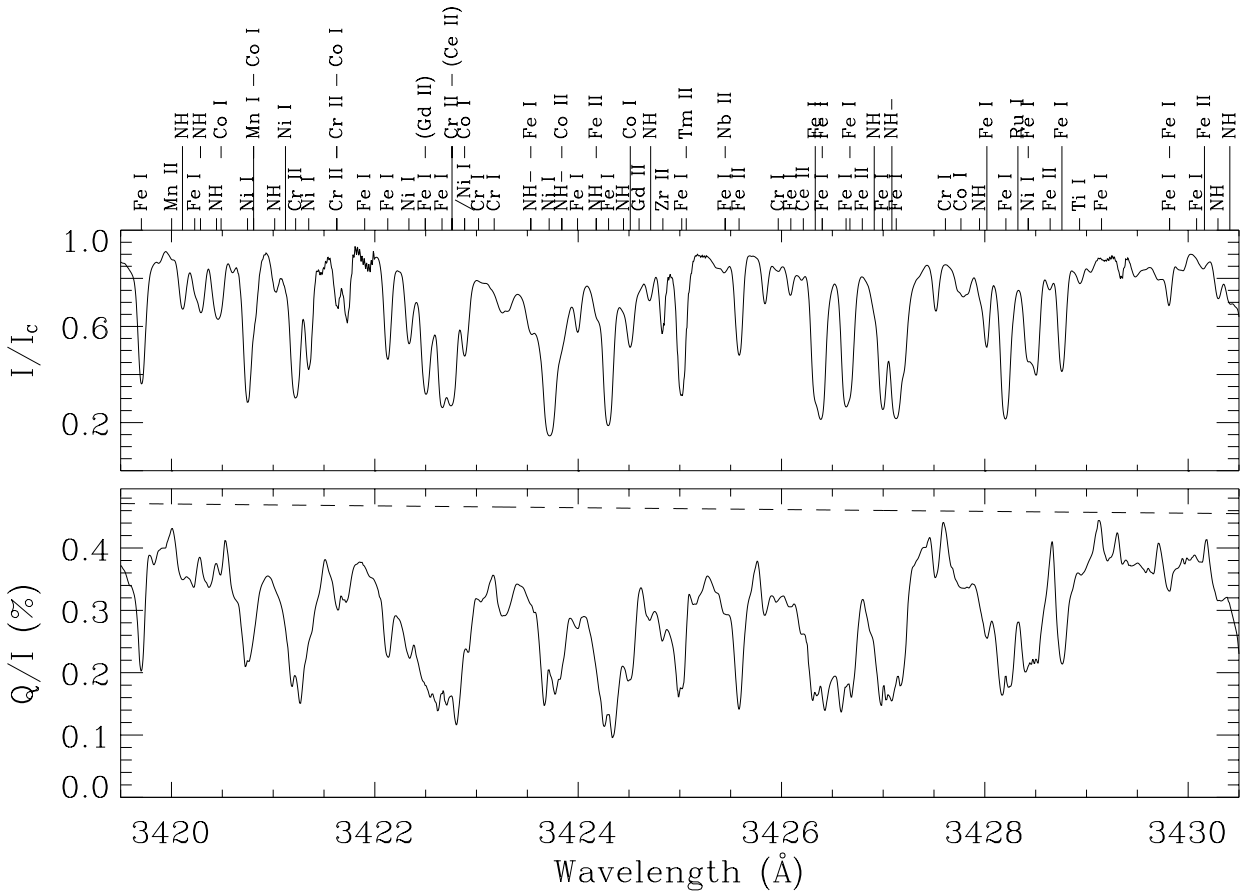

I/I_c
Q/I (%)
Wavelength (Å)
3370
3372
3374
3376
3378
3380

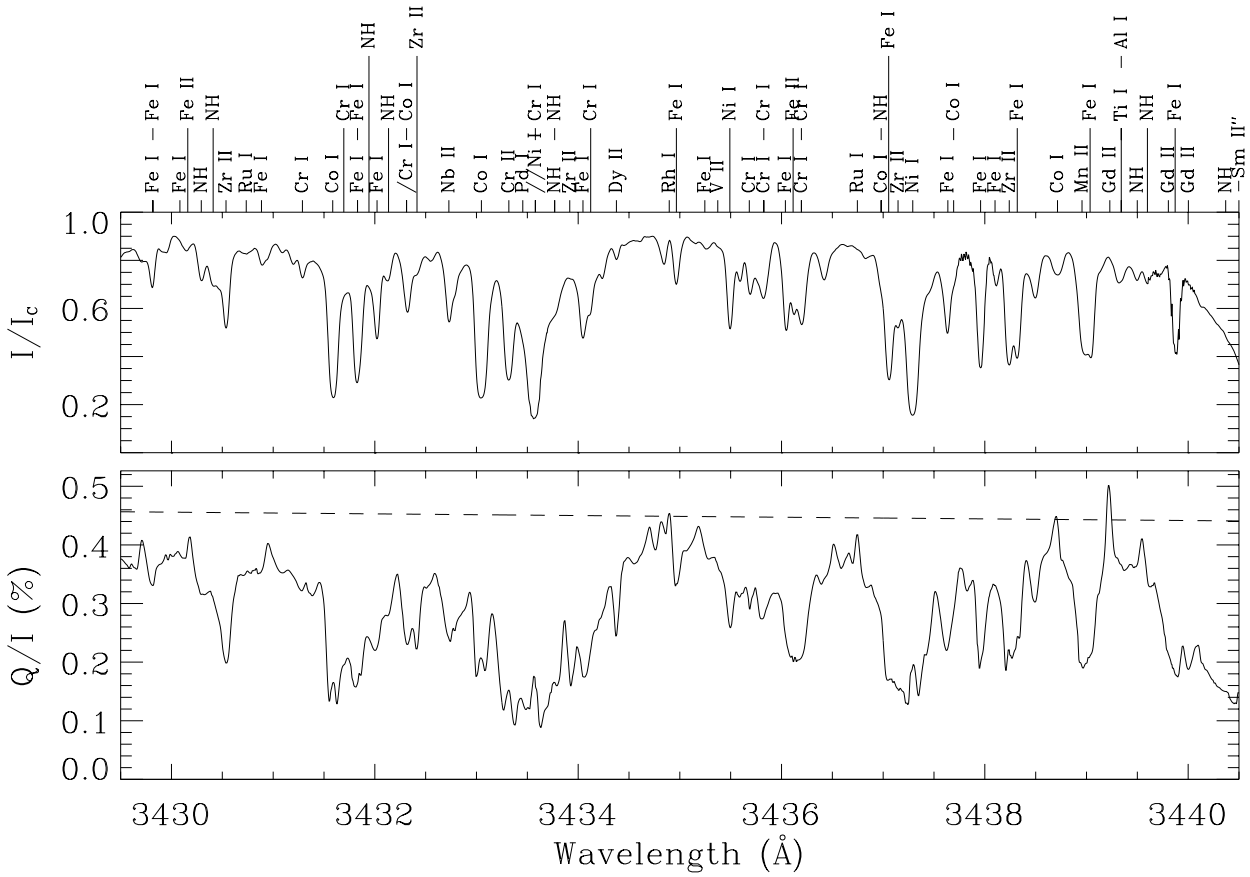

I/I_c
Q/I (%)
Wavelength (Å)
3380
3382
3384
3386
3388
3390

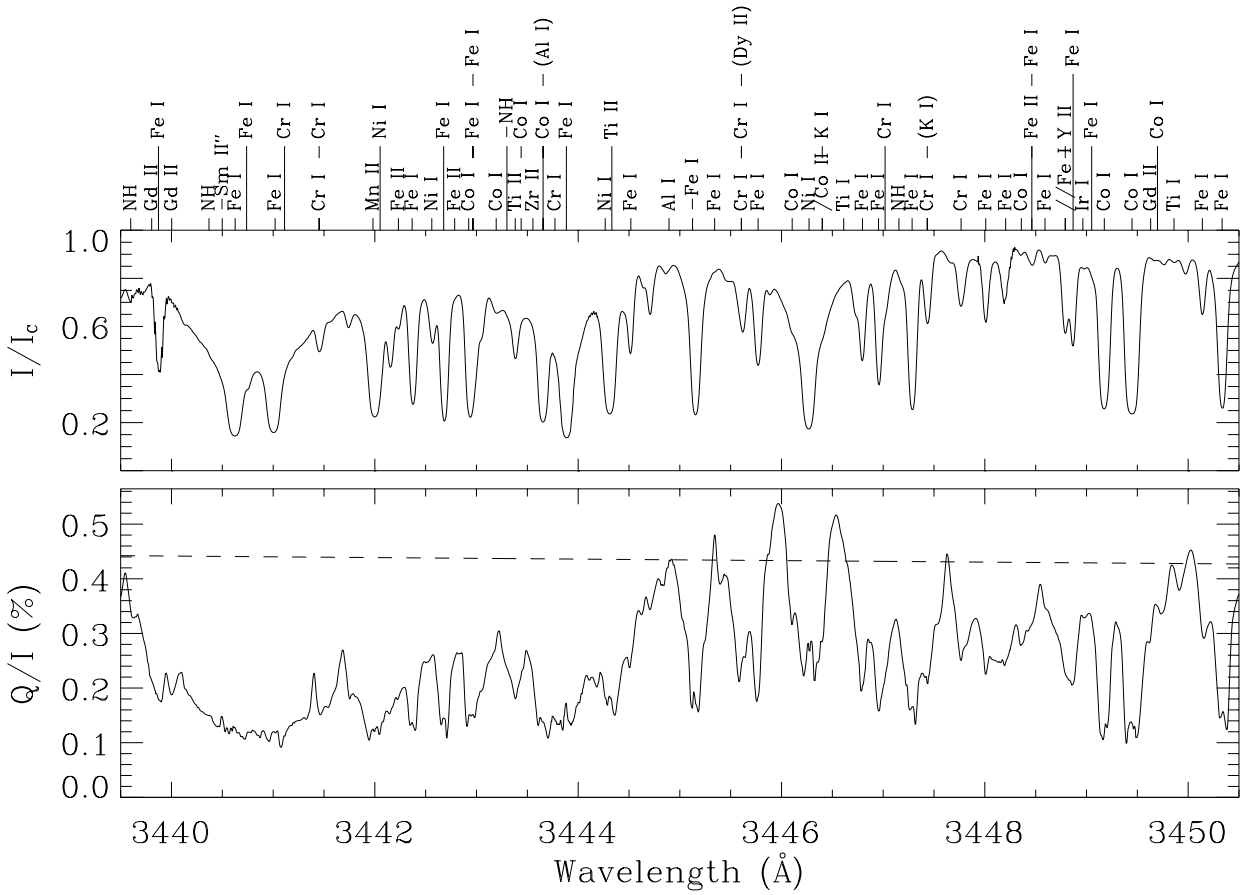

Fe I
Hf II
NH
Fe II
Fe I
Co I
Ti I
Cr I
Co I
Ni I
Fe II
Cr II
NH
Cr I
Fe I
Zr II
NH
Fe I
Gd II
Fe I
V II
/Ti I
NH
Ni I
Zr II
Cr II
Fe I
Fe I
Dy II
Cr II
Fe I
Fe I
Cr II
Ti II
Fe I
Co I
Fe I
NH
Co I
(Fe II)
Cr II
NH
Fe I
Fe I
Ni I
Fe I
Fe I
/NH
Zr II
Ni I
Eu II
Zr II
Rh I
Fe I
Lu II
Fe I
Fe I
Ni II
Fe I
Fe II
Fe I
/Ti I
Co I
NH
Fe I
NH
Fe I
//Fe + Zr II
Cr II
Fe I
NH
Gd II
Ti I
Mn II
V I
Co I
1.0
0.6
0.2
I/I$_c$
0.5
0.4
0.3
0.2
0.1
0.0
Q/I (%)
3390
3392
3394
3396
3398
3400
Wavelength (Å)

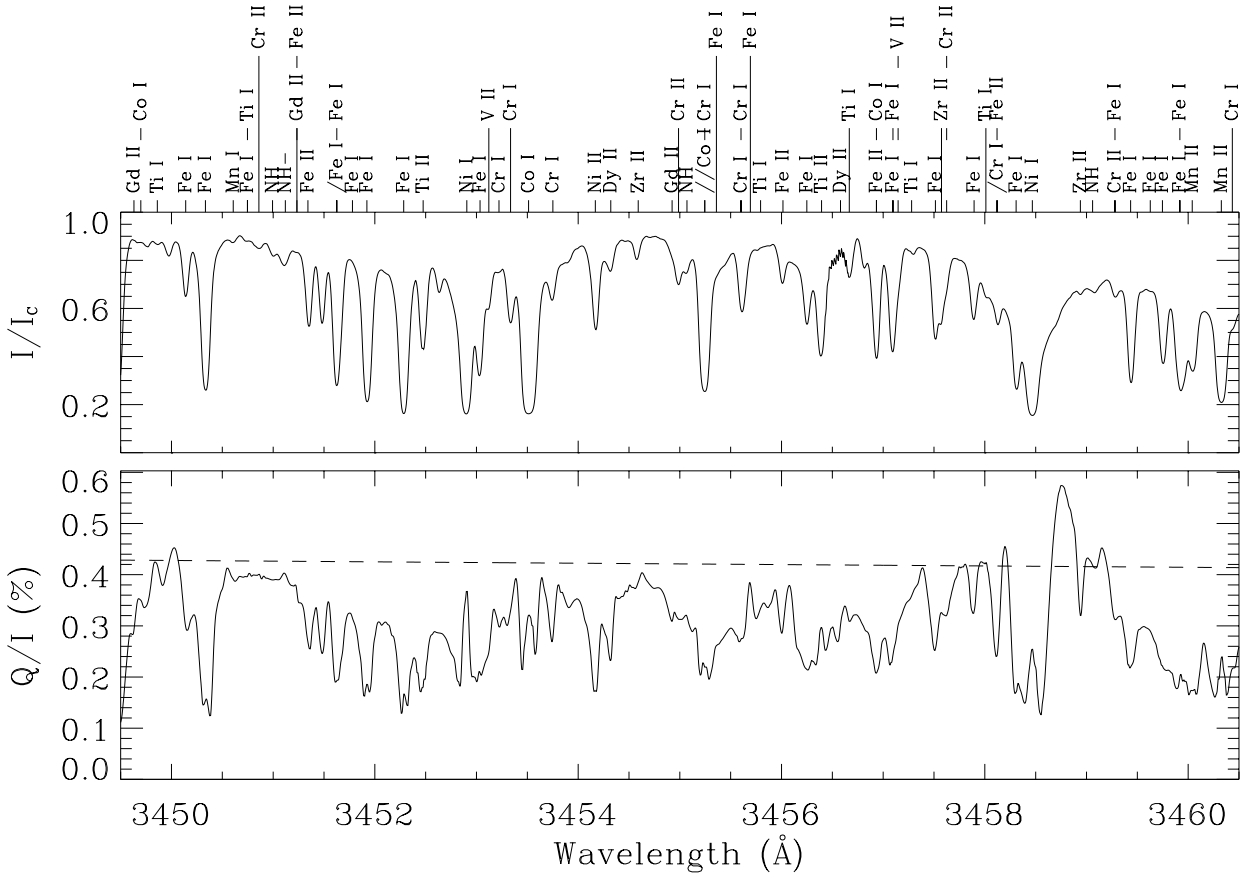

Cr II
Fe I
NH
Gd II
Ti I
Mn II
V I
Co I
Fe I
Fe I
Ni I
Fe I
Co I
Ni II
Co I
NH
Fe I
Ti II
Cr II
NH
Mo II
NH
Zr II
Fe I
Cr II
Ni I
Zr II
Cr I
Cr I
Fe I
Mo I
V II
Pd I
Fe I
Zr II
Ti II
Co I
NH
Ni I
Fe I
Fe I
Ce II
NH
Fe I
Fe I
Fe I
Ti II
Ni II
Fe I
Dy II
Mn I
Zr II
Fe I
Sm II
Cr II
V II
Co I
Fe I
Fe I
Ni I
NH
Co I
Ti II
NH
Fe I
Zr II
1.0
0.6
0.2
I/I_c
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Q/I (%)
3400
3402
3404
3406
3408
3410
Wavelength (Å)

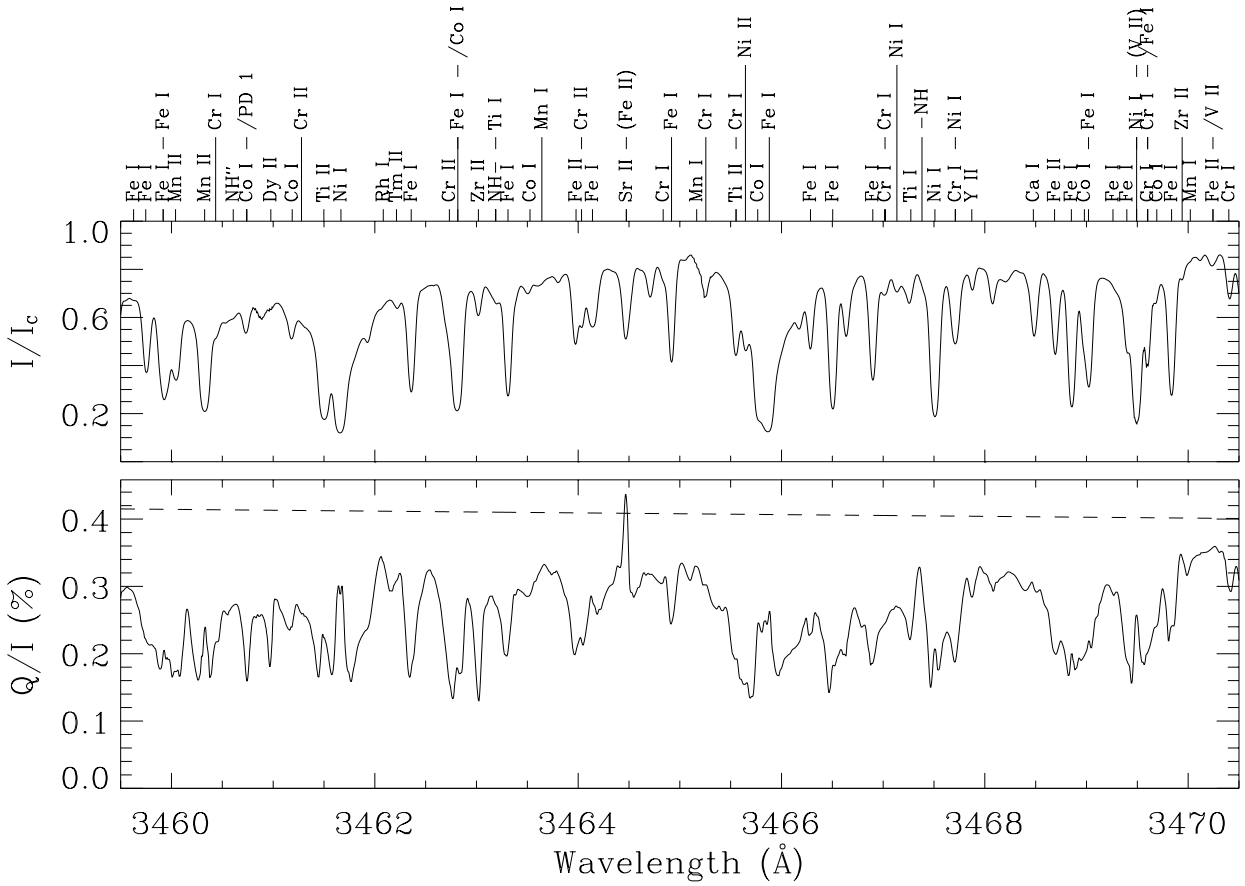

Ni I
Co I
/NH
Ti II
NH
Fe I
Zr II
Fe I
Fe I
Fe I
Cr I
Fe I
Ti I
Fe I
Co I
Ni I
Co I
NH
Fe I
NH
Zr II
NH
Ni I
NH
Dy II
Ni I
Fe II
Fe I
/Zr H
Zr I
Ni I
Cr I
Cr II
Fe I
(Co I)
Ni I
Co II
Fe II
Fe I
Fe I
NH
Fe I
NH
NH
Ti II
Co I
Fe I
NH
Ru I
Ce II
Co I
Co I
Fe II
Fe I
Fe I
Gd II
Fe I
Fe I
Fe I
Mn II
Fe I
Mn II
NH
Fe I
NH
NH
Co I
I/I$_c$
1.0
0.6
0.2
Q/I (%)
0.5
0.4
0.3
0.2
0.1
0.0
3410
3412
3414
3416
3418
3420
Wavelength (Å)

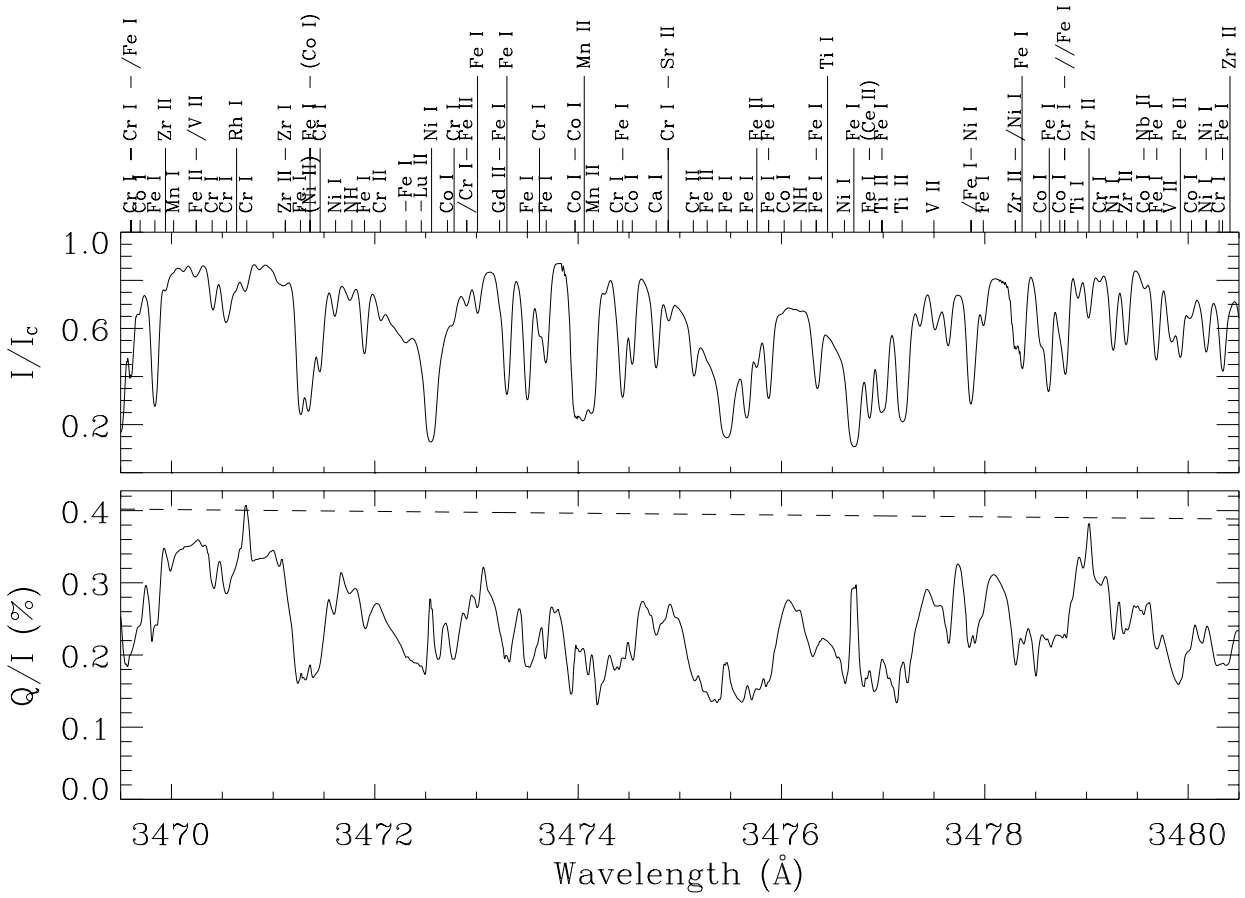

I/I_c
Q/I (%)
Wavelength (Å)
3420
3422
3424
3426
3428
3430

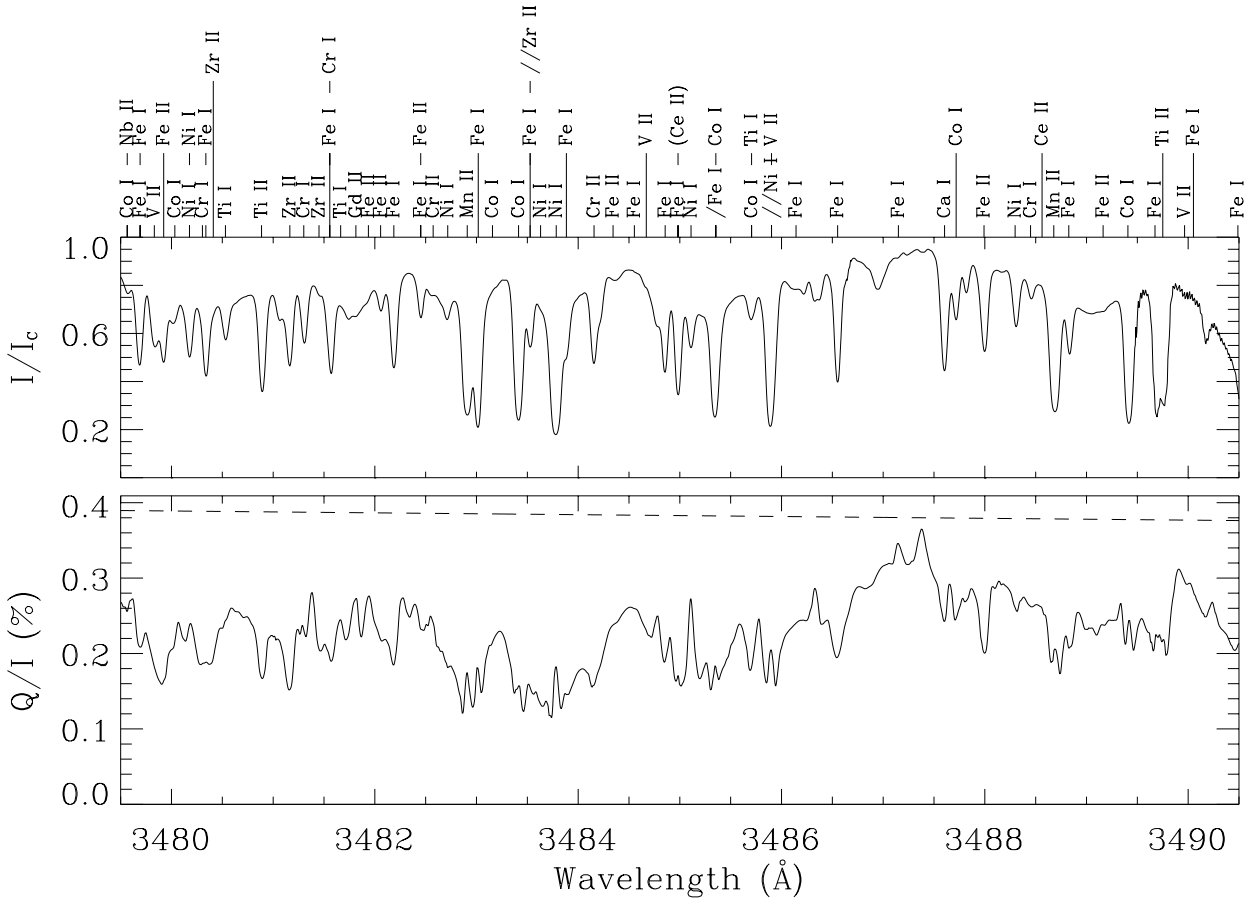

Fe I
Fe I
Fe II
NH
Zr II
Ru I
Fe I
Cr I
Co I
Cr I
Fe I
Fe I
NH
NH
Co I
Zr II
Nb II
Co I
Cr II
Pd I
Ni I
Cr I
NH
Zr II
Fe I
Cr I
Dy II
Rh I
Fe I
Fe I
V II
Ni I
Cr I
Cr I
Fe I
Fe II
Cr I
Ru I
Co I
NH
Fe I
Zr II
Ni I
Fe I
Co I
Fe I
Fe I
Zr II
Fe I
Co I
Mn II
Fe I
Gd II
Ti I
Al I
NH
NH
Gd II
Fe I
Gd II
NH
Sm II
1.0
0.6
0.2
I/I_c
0.5
0.4
0.3
0.2
0.1
0.0
Q/I (%)
3430
3432
3434
3436
3438
3440
Wavelength (Å)

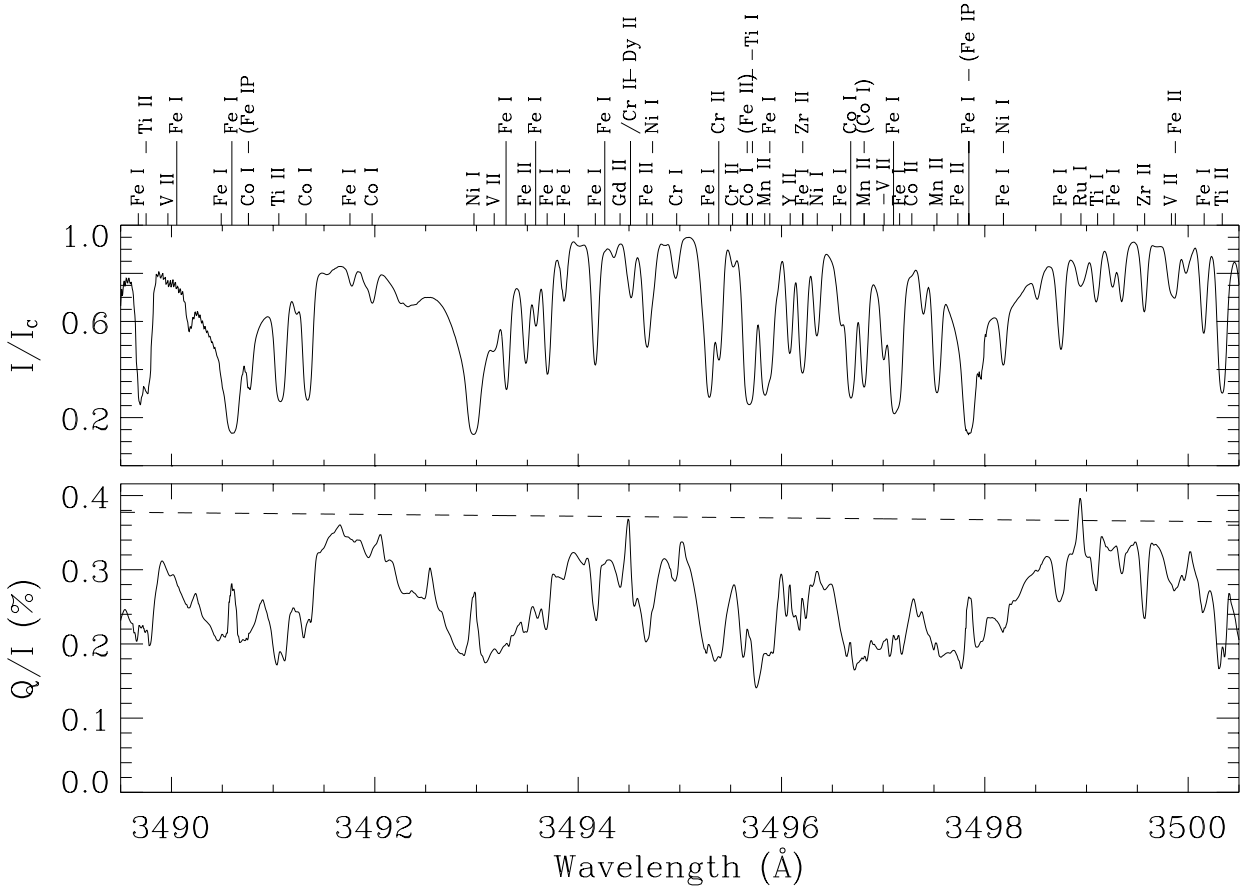

NH
Gd II
Gd II
Fe I
NH
Sm II"
Fe I
Fe I
Fe I
Cr I
Cr I
Cr I
Mn II
Ni I
Fe I
Fe I
Fe I
Ni I
Fe I
Fe I
Co I
Co I
NH
Ti II
Co I
Zr II
Co I
(Al I)
Cr I
Fe I
Ni I
Ti II
Fe I
Al I
Fe I
Fe I
Cr I
(Dy II)
Fe I
Co I
Ni I
Co II
K I
Ti I
Fe I
Fe I
Cr I
NH
Fe I
Cr I
(K I)
Cr I
Fe I
Fe I
Co I
Fe II
Fe I
Fe I
Y II
Ir I
Fe I
Co I
Co I
Gd II
Co I
Ti I
Fe I
Fe I
1.0
0.6
0.2
I/I$_c$
0.5
0.4
0.3
0.2
0.1
0.0
Q/I (%)
3440
3442
3444
3446
3448
3450
Wavelength (Å)

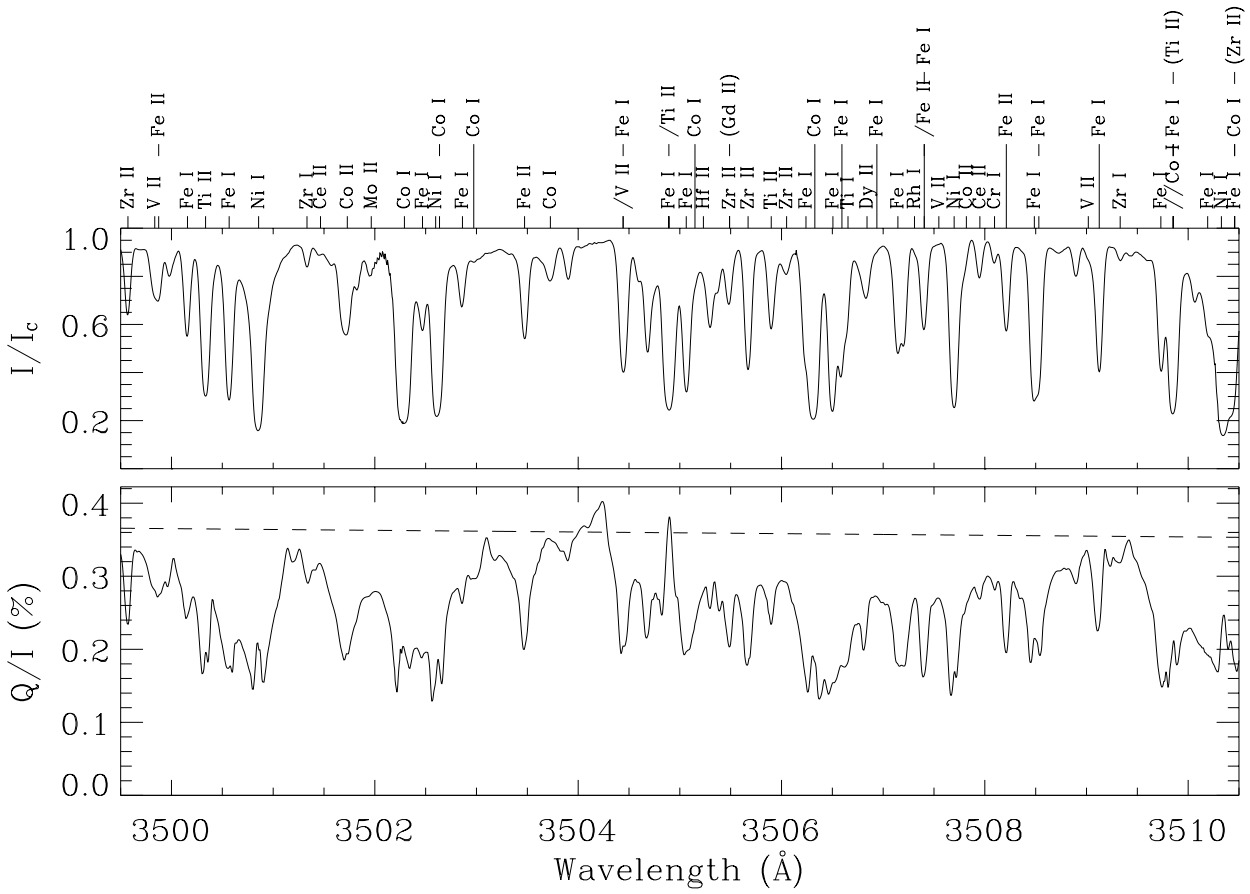

Gd II
Co I
Ti I
Fe I
Fe I
Mn I
Fe I
Ti I
Cr II
NH
NH
Gd II
Fe II
Fe I
Fe I
Fe I
Fe I
Fe I
Ti II
Ni I
Fe I
V II
Cr I
Cr I
Co I
Cr I
Ni II
Dy II
Zr II
Gd II
Cr II
NH
Co I
Cr I
Fe I
Cr I
Cr I
Ti I
Fe II
Fe I
Ti II
Dy II
Ti I
Fe II
Co I
Fe I
V II
Ti I
Fe I
Zr II
Cr II
Fe I
Cr I
Ti I
Fe II
Fe I
Ni I
Zr II
NH
Cr II
Fe I
Fe I
Fe I
Fe I
Fe I
Mn II
Mn II
Cr I
1.0
0.6
0.2
I/I_c
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Q/I (%)
3450
3452
3454
3456
3458
3460
Wavelength (Å)

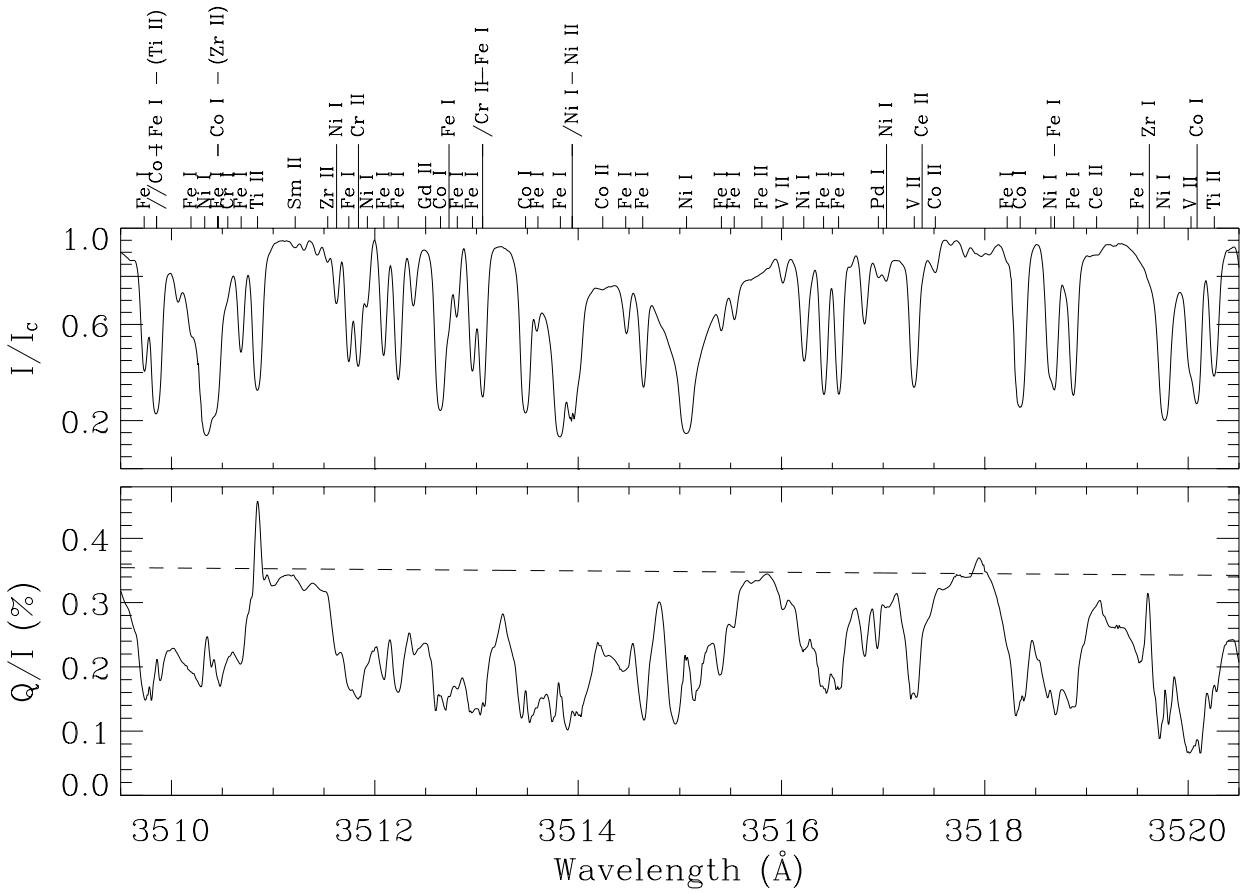

Fe I
Fe I
Mn II
Fe I
Mn II
Cr I
NH''
Co I
/PD 1
Dy II
Co I
Cr II
Ti II
Ni I
Rh I
Tm II
Fe I
Cr II
Fe I
/Co I
Zr II
NH
Fe I
Ti I
Co I
Mn I
Fe II
Fe I
Cr II
Sr II
(Fe II)
Cr I
Fe I
Mn I
Cr I
Ti II
Cr I
Ni II
Co I
Fe I
Fe I
Fe I
Fe I
Cr I
Cr I
Ni I
Ti I
NH
Ni I
Cr I
Y II
Ca I
Fe II
Fe I
Co I
Fe I
Fe I
Ni I
(Y II)
Cr I
Co I
Fe I
Fe I
Mn I
Zr II
Fe II
/V II
Cr I
1.0
0.6
0.2
I/I$_c$
0.4
0.3
0.2
0.1
0.0
Q/I (%)
3460
3462
3464
3466
3468
3470
Wavelength (Å)

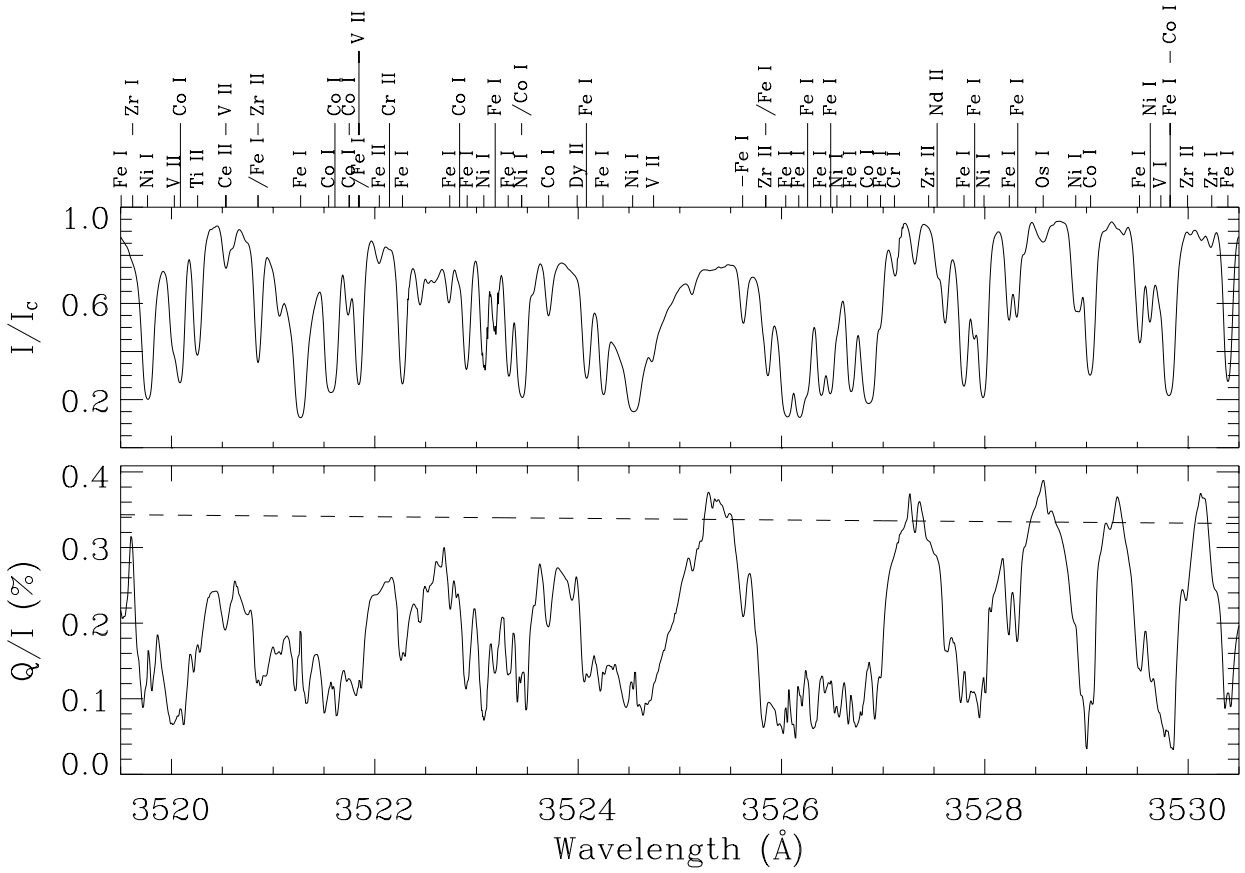

I/I_c
Q/I (%)
Wavelength (Å)
3470
3472
3474
3476
3478
3480

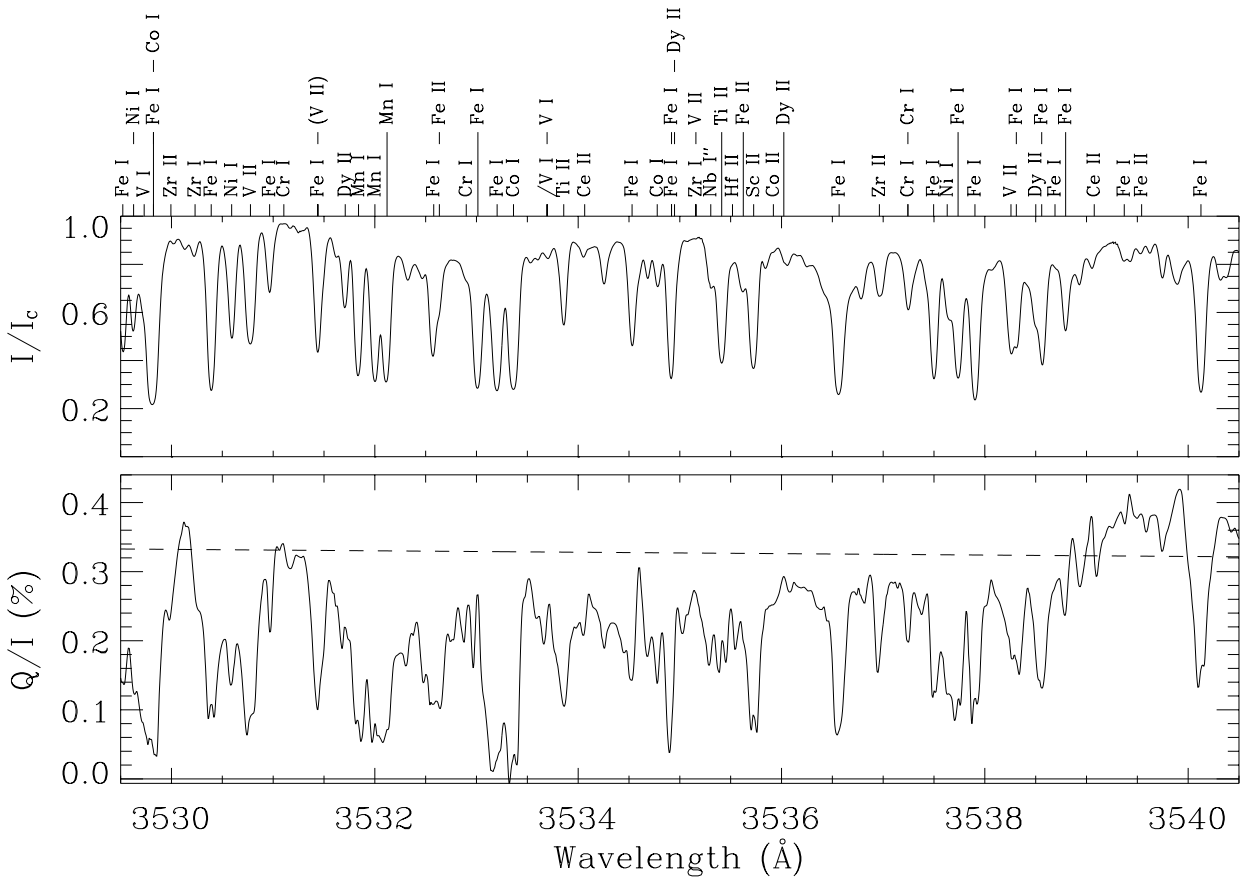

Co I – Nb II
Fe I – Fe I
V II
Fe II
Co I
Ni I – Ni I
Cr I – Fe I
Zr II
Ti I
Ti II
Zr II
Cr I
Zr II
Fe I – Cr I
Ti I
Gd II
Fe II
Fe I
Fe I – Fe II
Cr I
Ni I
Mn II
Fe I
Co I
Co I
Fe I – //Zr II
Ni I
Ni I
Fe I
Cr II
Fe II
Fe I
V II
Fe I – (Ce II)
Ni I
/Fe I – Co I
Co I – Ti I
//Ni + V II
Fe I
Fe I
Fe I
Ca I
Co I
Fe II
Ni I
Cr I
Ce II
Mn II
Fe I
Fe II
Co I
Fe I
Ti II
V II
Fe I
Fe I
1.0
0.6
0.2
I/I$_c$
0.4
0.3
0.2
0.1
0.0
Q/I (%)
3480
3482
3484
3486
3488
3490
Wavelength (Å)

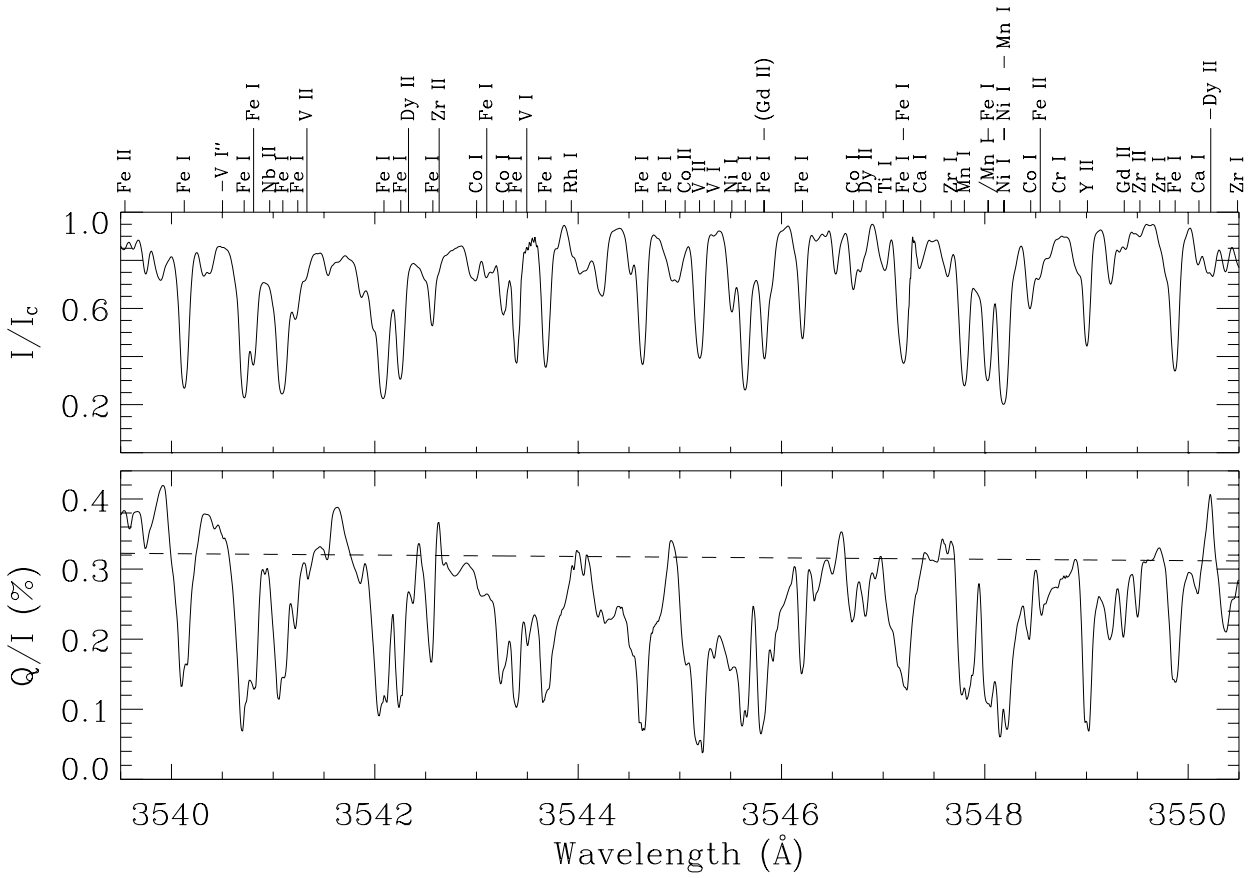

Fe I
Ti II
V II
Fe I
Fe I
(Fe IP
Fe I
Co I
Ti II
Co I
Fe I
Co I
Ni I
V II
Fe I
Fe II
Fe I
Fe I
Fe I
Gd II
/Cr II
Dy II
Fe II
Ni I
Cr I
Fe I
Cr II
Cr II
(Fe II)
Co I
Ti I
Mn II
Fe I
Y II
Fe I
Zr II
Ni I
Fe I
Co I
(Co I)
Mn II
V II
Fe I
Fe I
Co II
Mn II
Fe II
Fe I
(Fe IP
Fe I
Ni I
Fe I
Ru I
Ti I
Fe I
Zr II
V II
Fe II
Fe I
Ti II
1.0
0.6
0.2
I/I$_c$
0.4
0.3
0.2
0.1
0.0
Q/I (%)
3490
3492
3494
3496
3498
3500
Wavelength (Å)

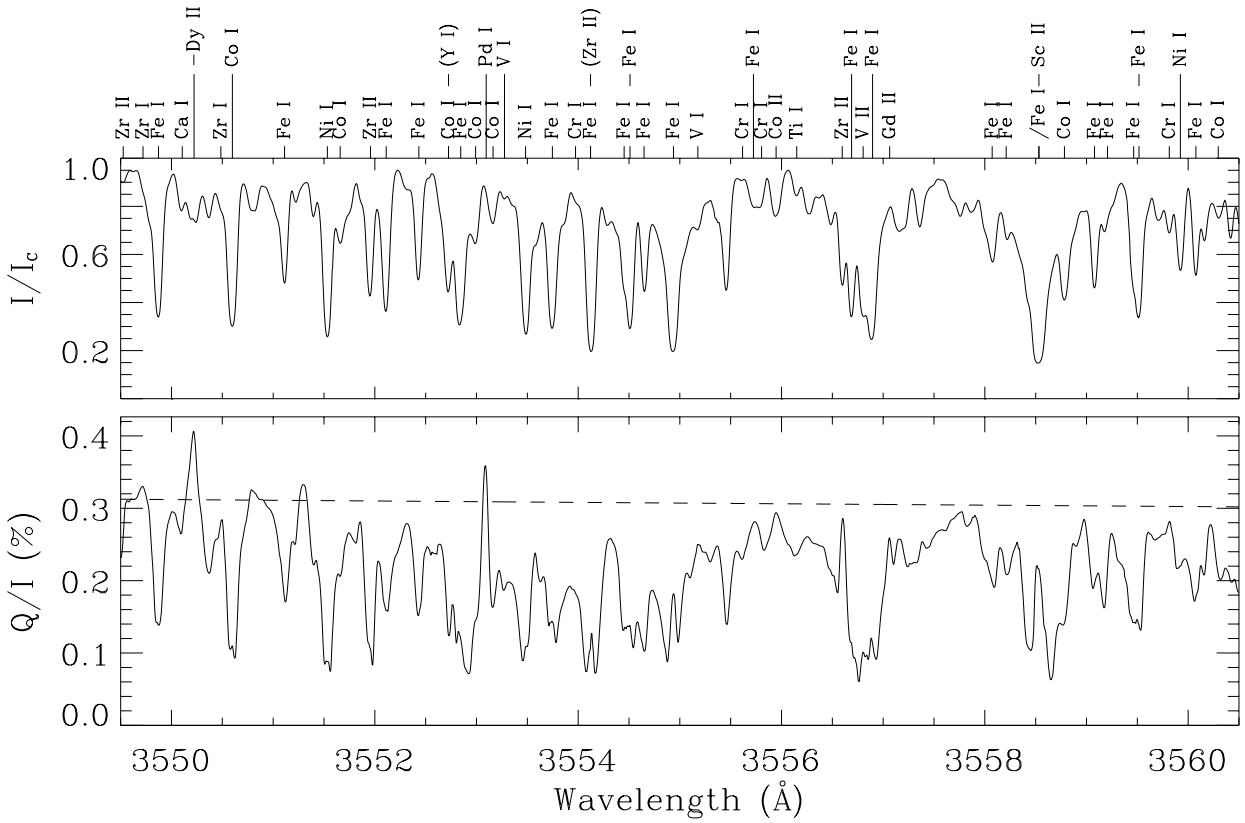

Zr II
V II – Fe II
Fe I
Ti II
Fe I
Ni I
Zr I
Ce II
Co II
Mo II
Co I
Fe I
Ni I – Co I
Fe I
Co I
Fe II
Co I
/V II – Fe I
Fe I – /Ti II
Fe I
Hf II
Co I
Zr II – (Gd II)
Zr II
Ti II
Zr II
Co I
Fe I
Fe I
Ti I
Dy II
Fe I
Fe I
Rh I
/Fe II – Fe I
V II
Ni I
Ce II
Cr I
Fe II
Fe I – Fe I
V II
Fe I
Zr I
Fe I
/Co I – Fe I – (Ti II)
Fe I
Ni I
Fe I – Co I – (Zr II)
1.0
0.6
0.2
I/I$_c$
0.4
0.3
0.2
0.1
0.0
Q/I (%)
3500
3502
3504
3506
3508
3510
Wavelength (Å)

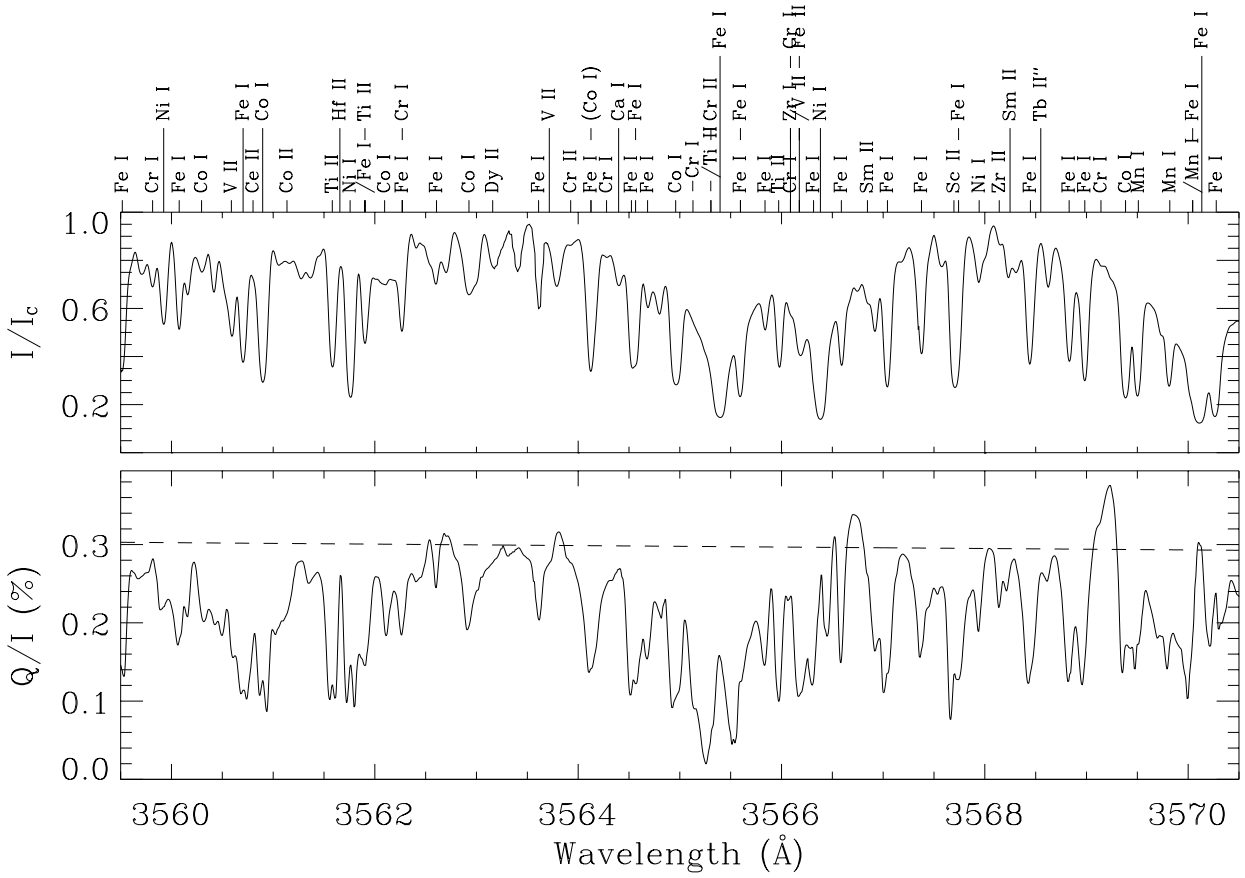

Fe I
Co I – Fe I – (Ti II)
Fe I
Ni I – Co I – (Zr II)
Fe I
Cr I
Fe I
Ti II
Sm II
Zr II
Ni I
Fe I
Cr II
Ni I
Fe I
Fe I
Gd II
Co I
Fe I
Fe I
Fe I
/Cr II – Fe I
Co I
Fe I
Fe I
/Ni I – Ni II
Co II
Fe I
Fe I
Ni I
Fe I
Fe I
Fe II
V II
Ni I
Fe I
Fe I
Pd I
Ni I
V II
Ce II
Co II
Fe I
Co I
Ni I – Fe I
Fe I
Ce II
Fe I
Zr I
Ni I
V II
Co I
Ti II
1.0
0.6
0.2
I/I_c
0.4
0.3
0.2
0.1
0.0
Q/I (%)
3510
3512
3514
3516
3518
3520
Wavelength (Å)

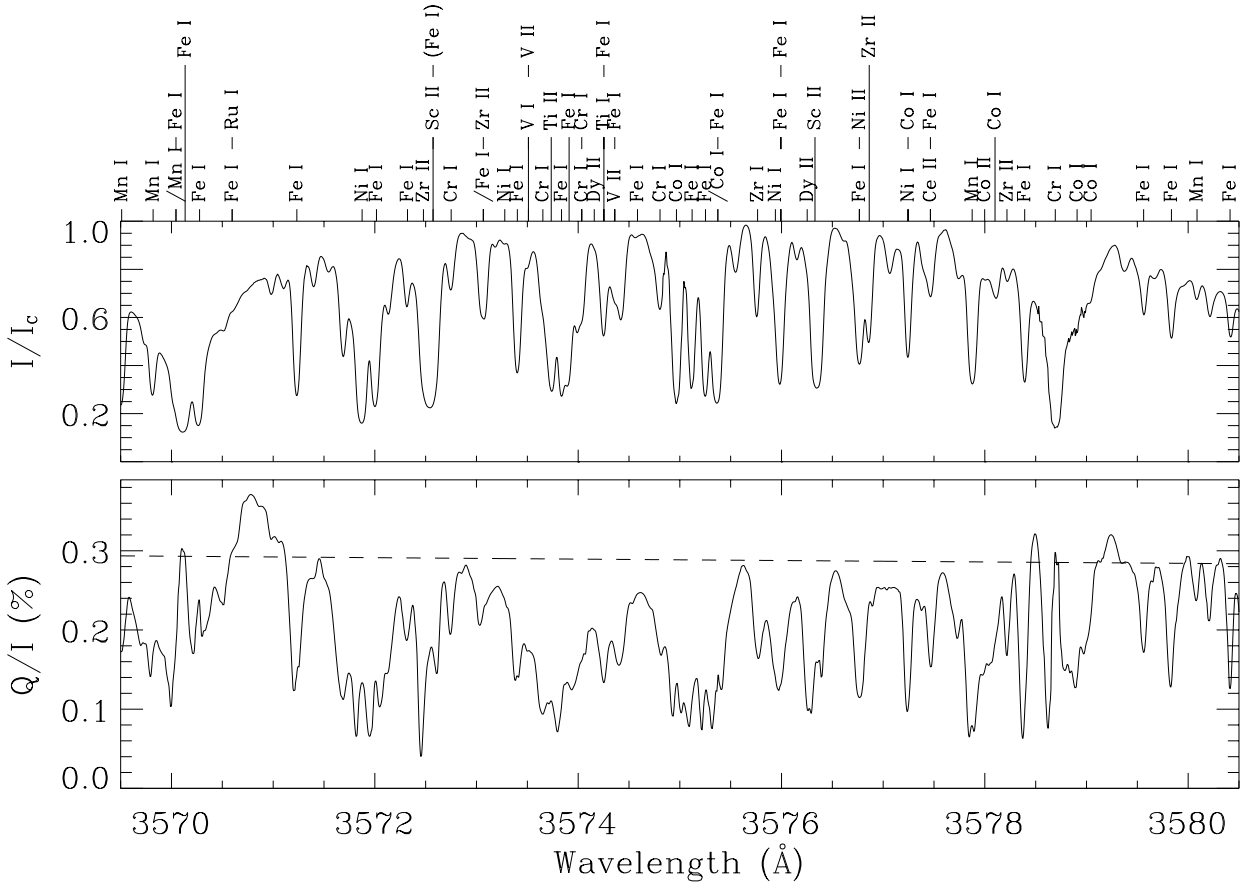

Fe I
Ni I
V II
Ti II
Ce II
Fe I
Co I
Fe II
Cr II
Dy II
Ni I
V II
Zr II
Cr I
Nd II
Os I
V I
Zr I
I/I_c
Q/I (%)
3520
3522
3524
3526
3528
3530
Wavelength (Å)

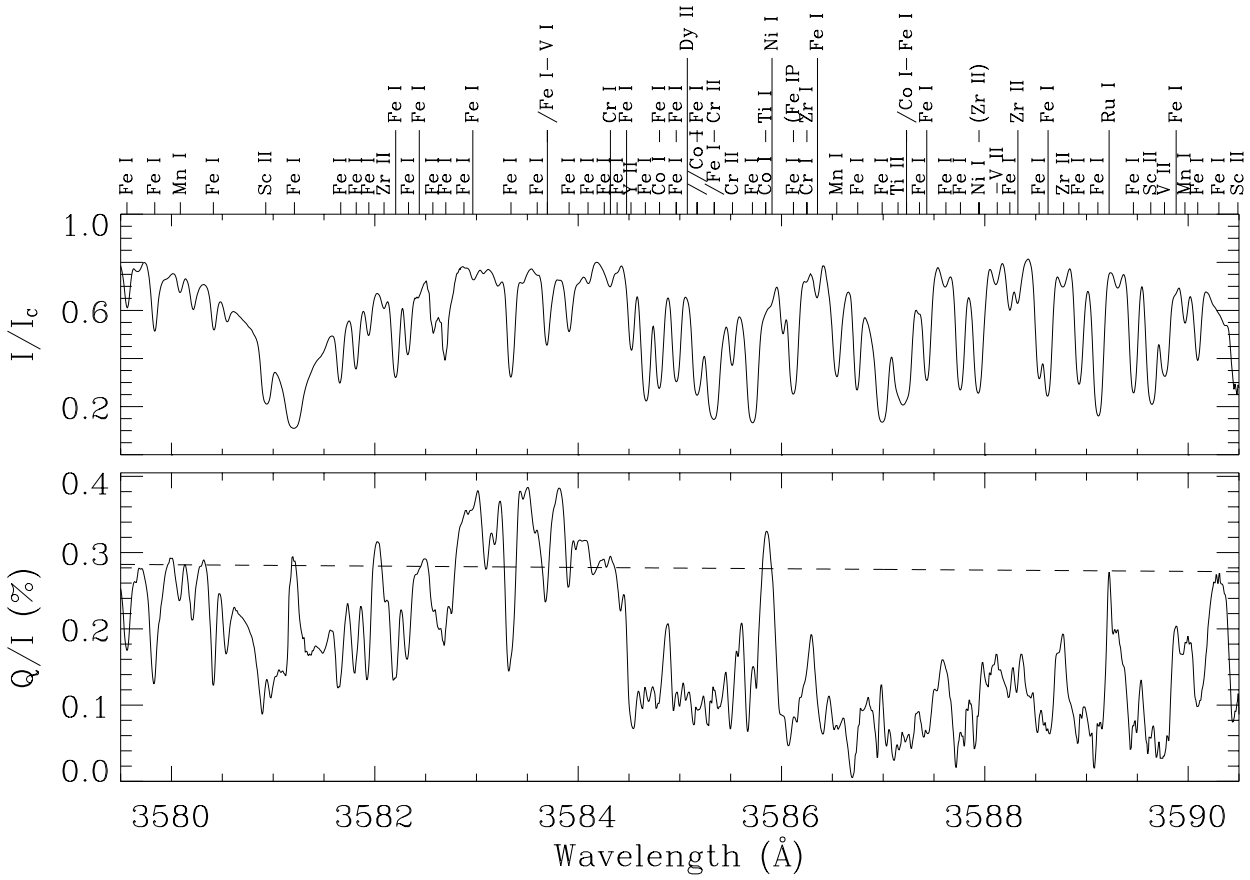

Fe I – Ni I
V I
Fe I – Co I
Zr II
Zr I
Fe I
Ni I
V II
Fe I
Cr I
Fe I – (V II)
Dy II
Mn I
Mn I
Mn I
Fe I – Fe II
Cr I
Fe I
Co I
/V I – V I
Ti II
Ce II
Fe I
Co I
Fe I = Fe I – Dy II
Zr I – V II
Nb I''
Ti II
Hf II
Fe II
Sc II
Co II
Dy II
Fe I
Zr II
Cr I – Cr I
Fe I
Ni I
Fe I
V II – Fe I
Dy II – Fe I
Fe I
Fe I
Ce II
Fe I
Fe II
Fe I
1.0
0.6
0.2
I/I_c
0.4
0.3
0.2
0.1
0.0
Q/I (%)
3530
3532
3534
3536
3538
3540
Wavelength (Å)

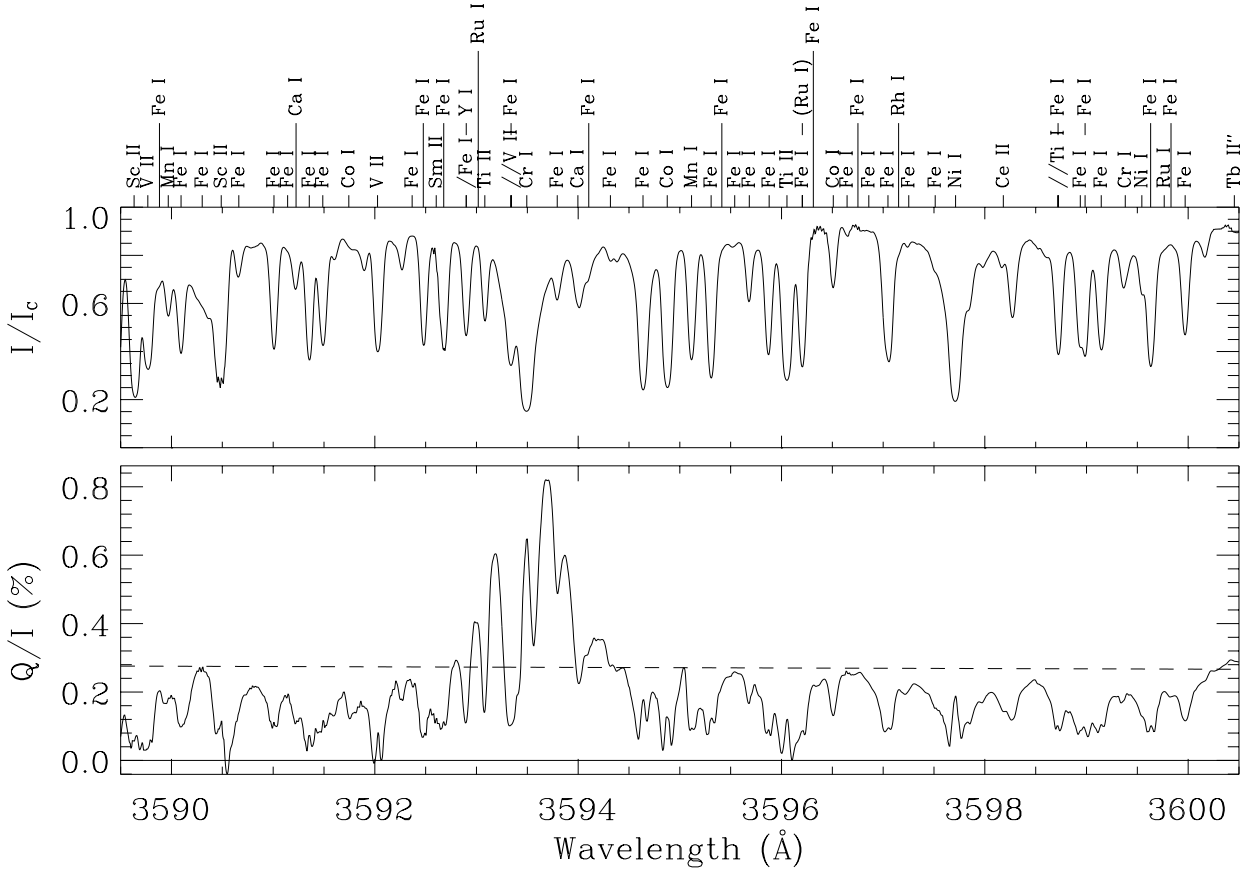

Fe II
Fe I
V I"
Fe I
Nb II
Fe I
Fe I
V II
Fe I
Fe I
Dy II
Fe I
Zr II
Co I
Co I
Fe I
V I
Fe I
Rh I
Fe I
Fe I
Co II
V II
V I
Ni I
Fe I
Fe I
(Gd II)
Fe I
Co I
Dy II
Ti I
Fe I
Fe I
Ca I
Zr I
Mn I
Mn I
Fe I
Ni I
Mn I
Co I
Fe II
Cr I
Y II
Gd II
Zr II
Zr I
Fe I
Ca I
Dy II
Zr I
1.0
0.6
0.2
I/I_c
0.4
0.3
0.2
0.1
0.0
Q/I (%)
3540
3542
3544
3546
3548
3550
Wavelength (Å)

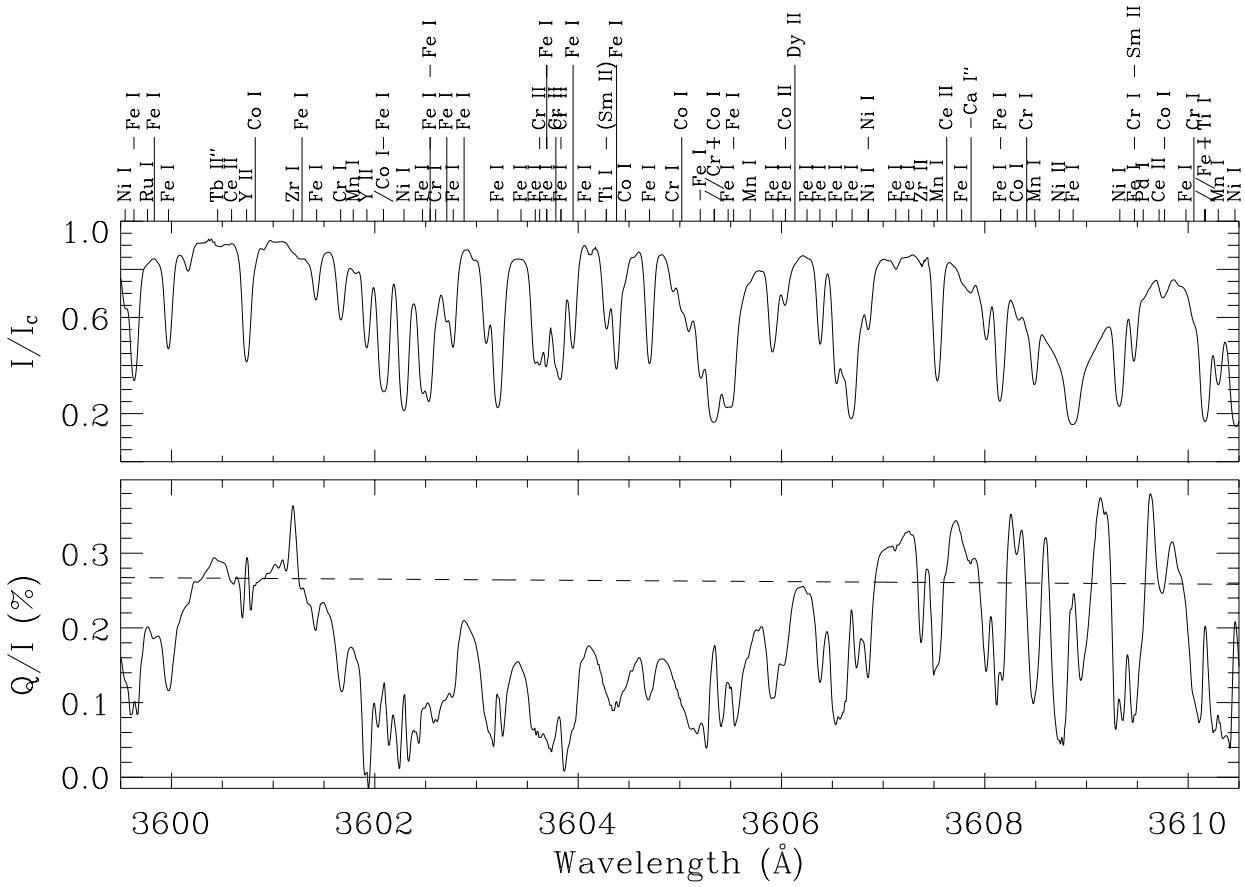

Zr II
Zr I
Fe I
Ca I
Dy II
Zr I
Co I
Fe I
Ni I
Co I
Zr II
Fe I
Fe I
Co I
Fe I
Co I
Co I
Pd I
V I
(Y I)
Ni I
Fe I
Cr I
Fe I
(Zr II)
Fe I
Fe I
Fe I
Fe I
V I
Cr I
Cr I
Co II
Ti I
Fe I
Zr II
V II
Fe I
Gd II
Fe I
Fe I
Fe I
Sc II
Co I
Fe I
Fe I
Fe I
Fe I
Cr I
Ni I
Fe I
Co I
1.0
0.6
0.2
I/I$_c$
0.4
0.3
0.2
0.1
0.0
Q/I (%)
3550
3552
3554
3556
3558
3560
Wavelength (Å)

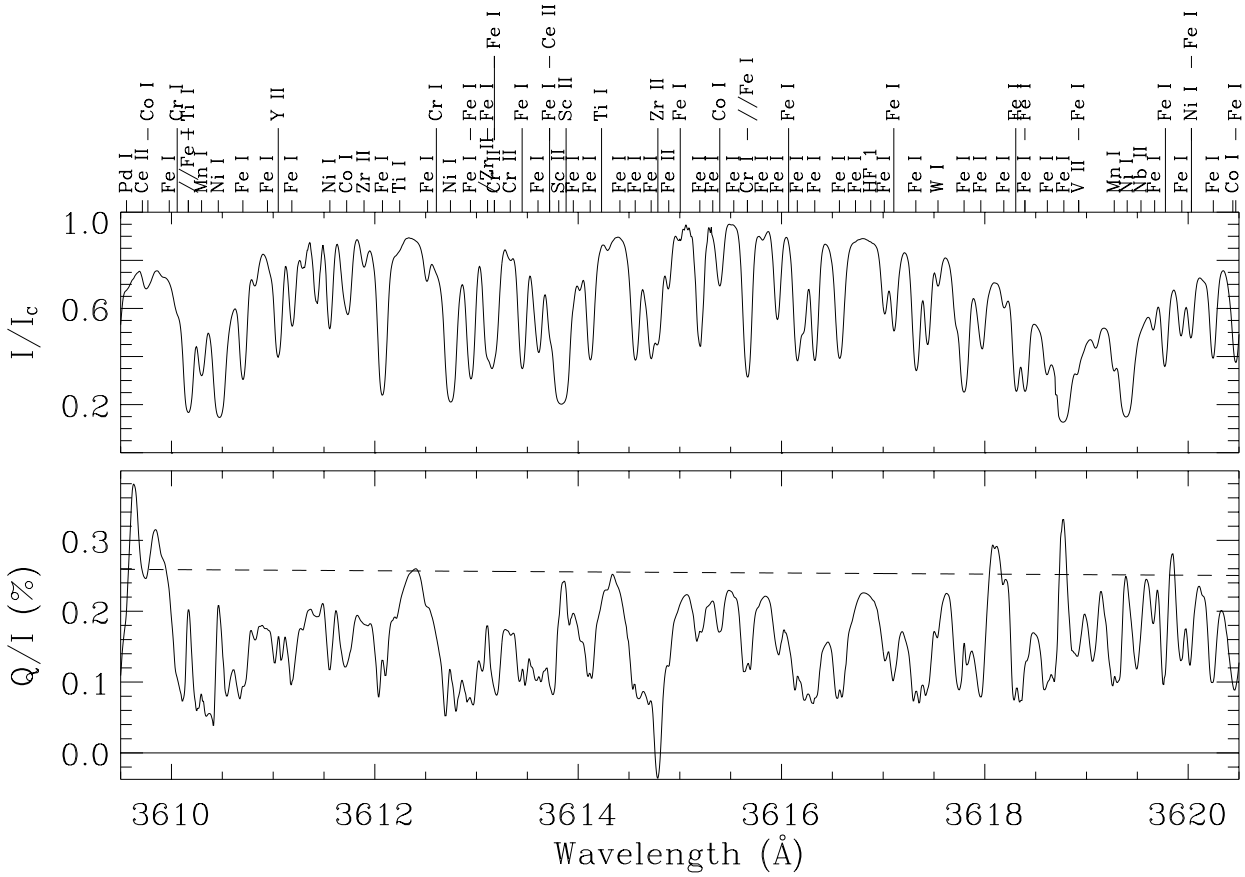

Fe I
Cr I
Ni I
Fe I
Co I
V II
Fe I
Ce II
Co I
Co II
Ti II
Hf II
Ni I
Fe I
Ti II
Co I
Fe I
Cr I
Fe I
Co I
Dy II
Fe I
V II
Cr II
Fe I
(Co I)
Cr I
Ca I
Fe I
Fe I
Co I
Cr I
Ti H
Cr II
Fe I
Fe I
Fe I
Ti II
Cr I
Zr I
V II
Fe I
Fe II
Fe I
Ni I
Fe I
Sm II
Fe I
Fe I
Sc II
Fe I
Ni I
Zr II
Sm II
Fe I
Tb II''
Fe I
Fe I
Cr I
Co I
Mn I
Mn I
Mn I
Fe I
Fe I
1.0
0.6
0.2
I/I$_c$
0.3
0.2
0.1
0.0
Q/I (%)
3560
3562
3564
3566
3568
3570
Wavelength (Å)

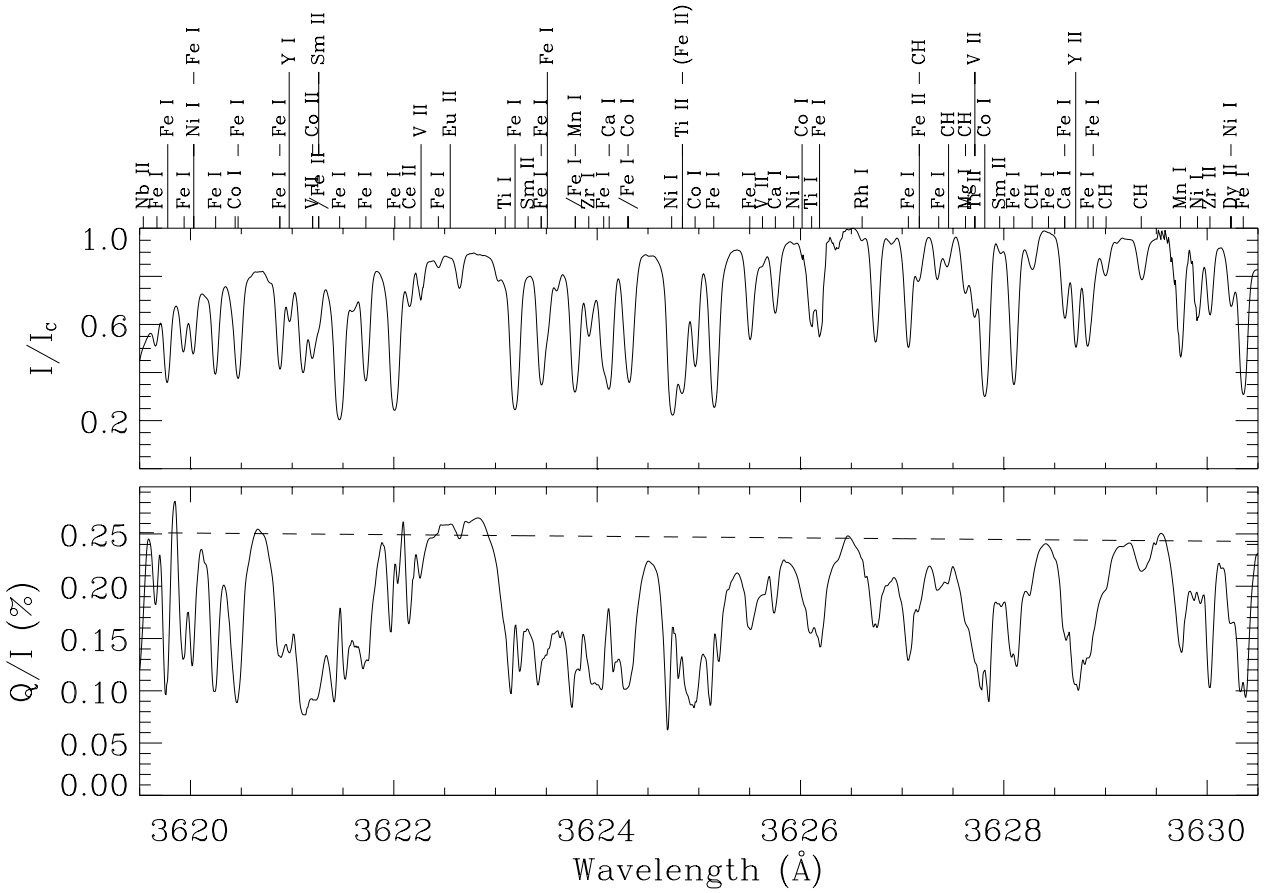

Mn I
Mn I
/Mn I
Fe I
Fe I
Fe I
Fe I
Ru I
Fe I
Ni I
Fe I
Fe I
Zr II
Sc II
(Fe I)
Cr I
/Fe I
Zr II
Ni I
Fe I
V I
V II
Cr I
Ti II
Fe I
Fe I
Cr I
Cr I
Dy II
Ti I
Fe I
V II
Fe I
Fe I
Cr I
Co I
Fe I
Fe I
/Co I
Fe I
Zr I
Ni I
Fe I
Dy II
Sc II
Fe I
Ni II
Zr II
Ni I
Co I
Ce II
Fe I
Mn I
Co II
Co I
Zr II
Fe I
Cr I
Co I
Co I
Fe I
Fe I
Mn I
Fe I
1.0
0.6
0.2
I/I$_c$
0.3
0.2
0.1
0.0
Q/I (%)
3570
3572
3574
3576
3578
3580
Wavelength (Å)

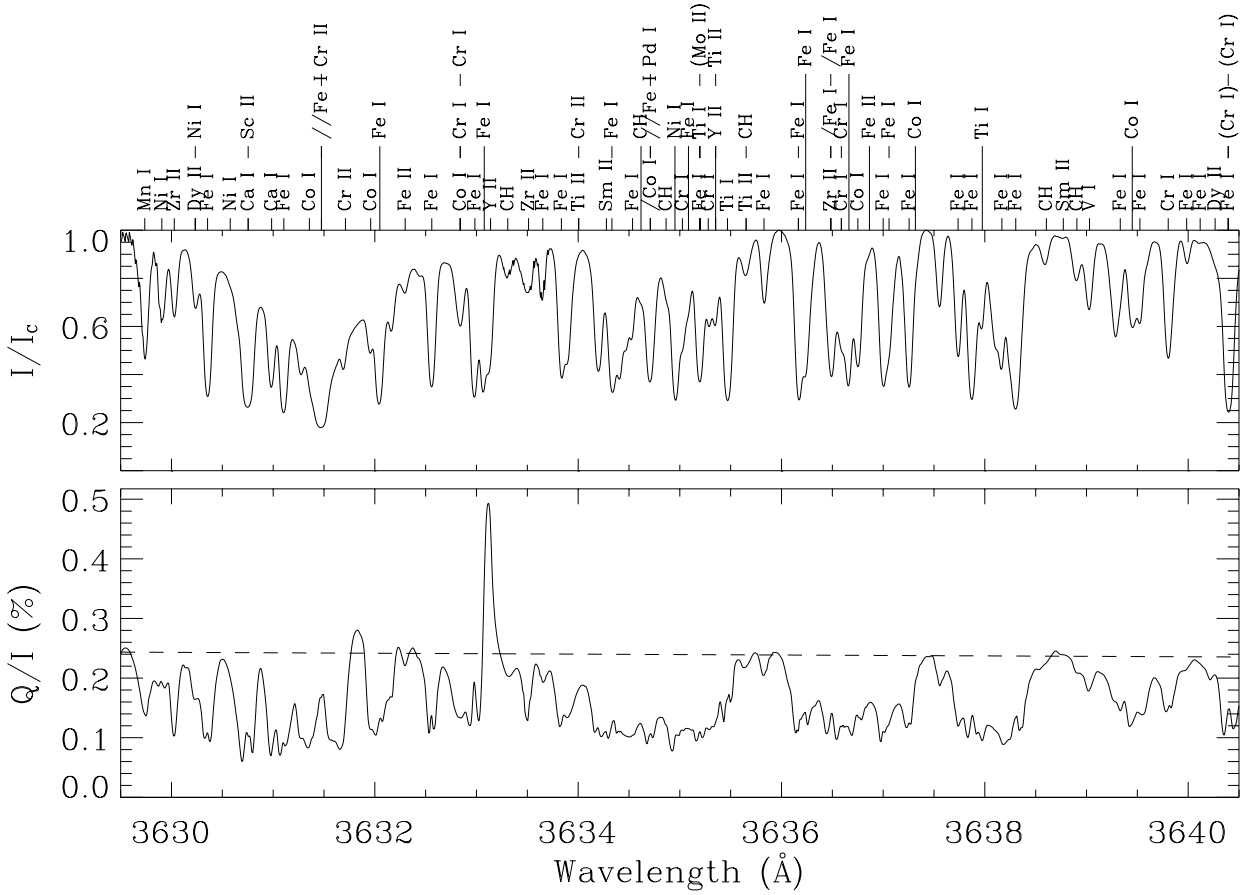

Fe I
Fe I
Mn I
Fe I
Sc II
Fe I
Fe I
Fe I
Fe I
Zr II
Fe I
Fe I
Fe I
Fe I
Fe I
/Fe I – V I
Fe I
Fe I
Fe I
Cr I
Fe I
Y II
Fe I
Co I – Fe I
Fe I – Dy II
/Co I – Fe I
/Fe I – Cr II
Cr II
Fe I
Co I – Ti I
Ni I
Fe I – (Fe IP
Cr I – Zr I
Fe I
Mn I
Fe I
Fe I
Ti II
/Co I – Fe I
Fe I
Fe I
Fe I
Ni I – (Zr II)
V II
Fe I
Zr II
Fe I
Fe I
Zr II
Fe I
Fe I
Ru I
Fe I
Sc II
V II
Mn I
Fe I
Fe I
Sc II
1.0
0.6
0.2
I/I_c
0.4
0.3
0.2
0.1
0.0
Q/I (%)
3580
3582
3584
3586
3588
3590
Wavelength (Å)

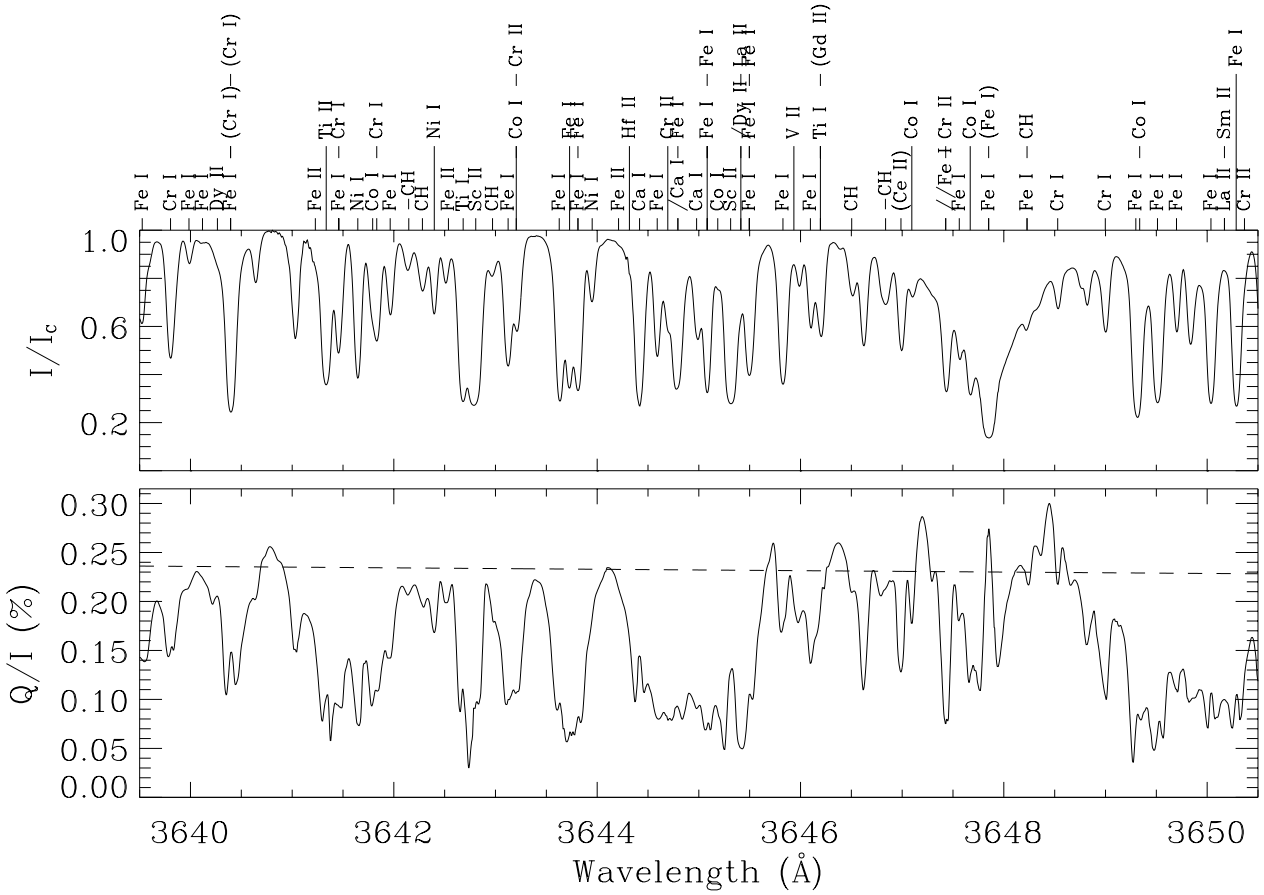

Sc II
V II
Fe I
Mn I
Fe I
Fe I
Sc II
Fe I
Fe I
Fe I
Ca I
Fe I
Fe I
Co I
V II
Fe I
Fe I
Sm II
Fe I
Fe I
Y I
Ru I
Ti II
Fe I
V II
Cr I
Fe I
Fe I
Ca I
Fe I
Fe I
Co I
Mn I
Fe I
Fe I
Fe I
Fe I
Ti II
Fe I
(Ru I)
Fe I
Co I
Fe I
Fe I
Fe I
Rh I
Fe I
Fe I
Ni I
Ce II
Ti II
Fe I
Fe I
Fe I
Fe I
Cr I
Ni I
Fe I
Ru I
Fe I
Tb II
1.0
0.6
0.2
I/I_c
0.8
0.6
0.4
0.2
0.0
Q/I (%)
3590
3592
3594
3596
3598
3600
Wavelength (Å)

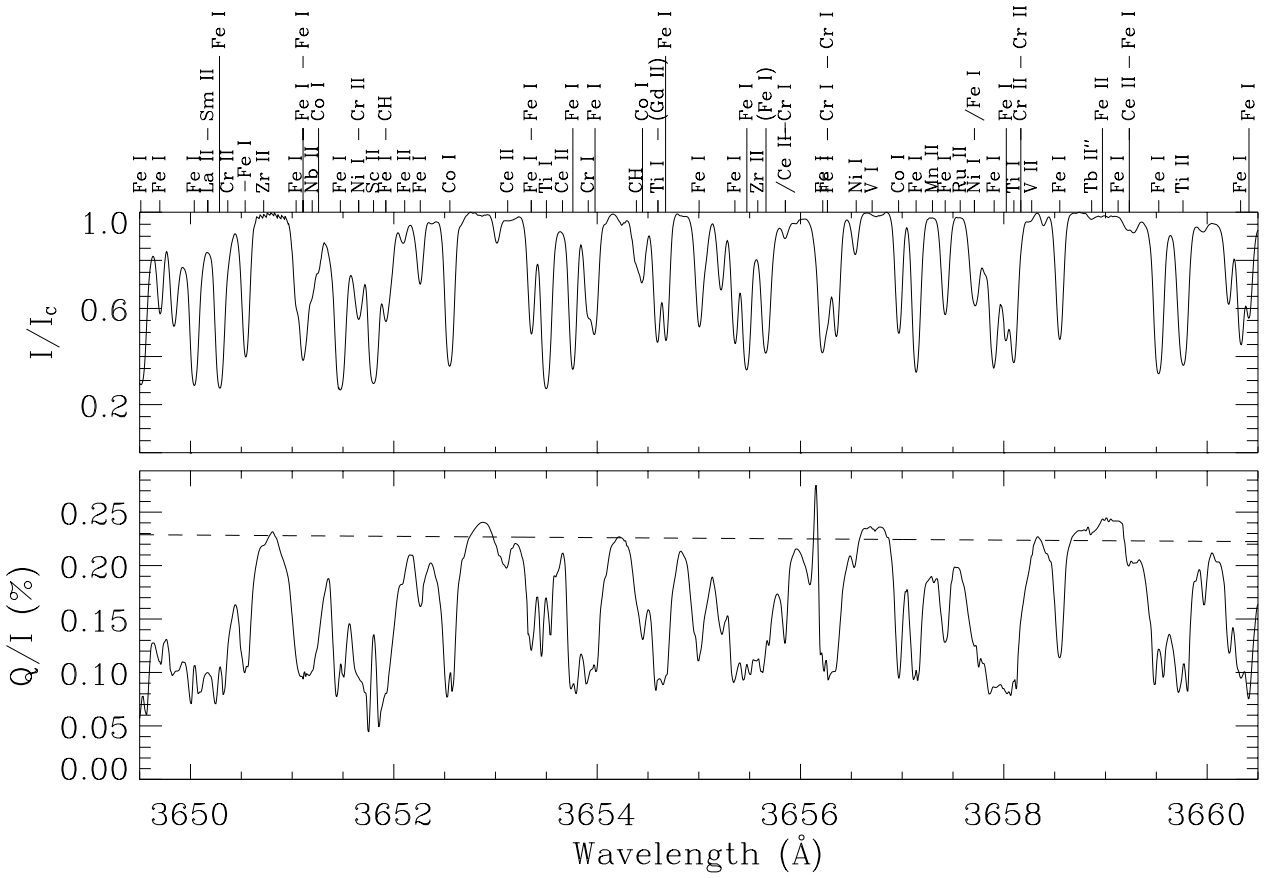

Ni I
Fe I
Ru I
Fe I
Tb II''
Ce II
Y II
Co I
Zr I
Fe I
Cr I
Mn I
Y II
Co I
Fe I
Ni I
Fe I
Cr I
Fe I
Fe I
Fe I
Cr II
Fe I
Cr II
Fe I
Fe I
Ti I
(Sm II)
Fe I
Co I
Fe I
Cr I
Co I
Fe I
Cr I
Fe I
Mn I
Fe I
Co II
Dy II
Fe I
Fe I
Fe I
Fe I
Ni I
Ni I
Fe I
Fe I
Zr II
Mn I
Ce II
Ca I''
Fe I
Fe I
Co I
Cr I
Mn I
Ni II
Fe I
Ni I
Fe I
Cr I
Sm II
Ce II
Co I
Fe I
Cr I
Fe I
Ti I
Mn I
Ni I
1.0
0.6
0.2
I/I_c
0.3
0.2
0.1
0.0
Q/I (%)
3600
3602
3604
3606
3608
3610
Wavelength (Å)

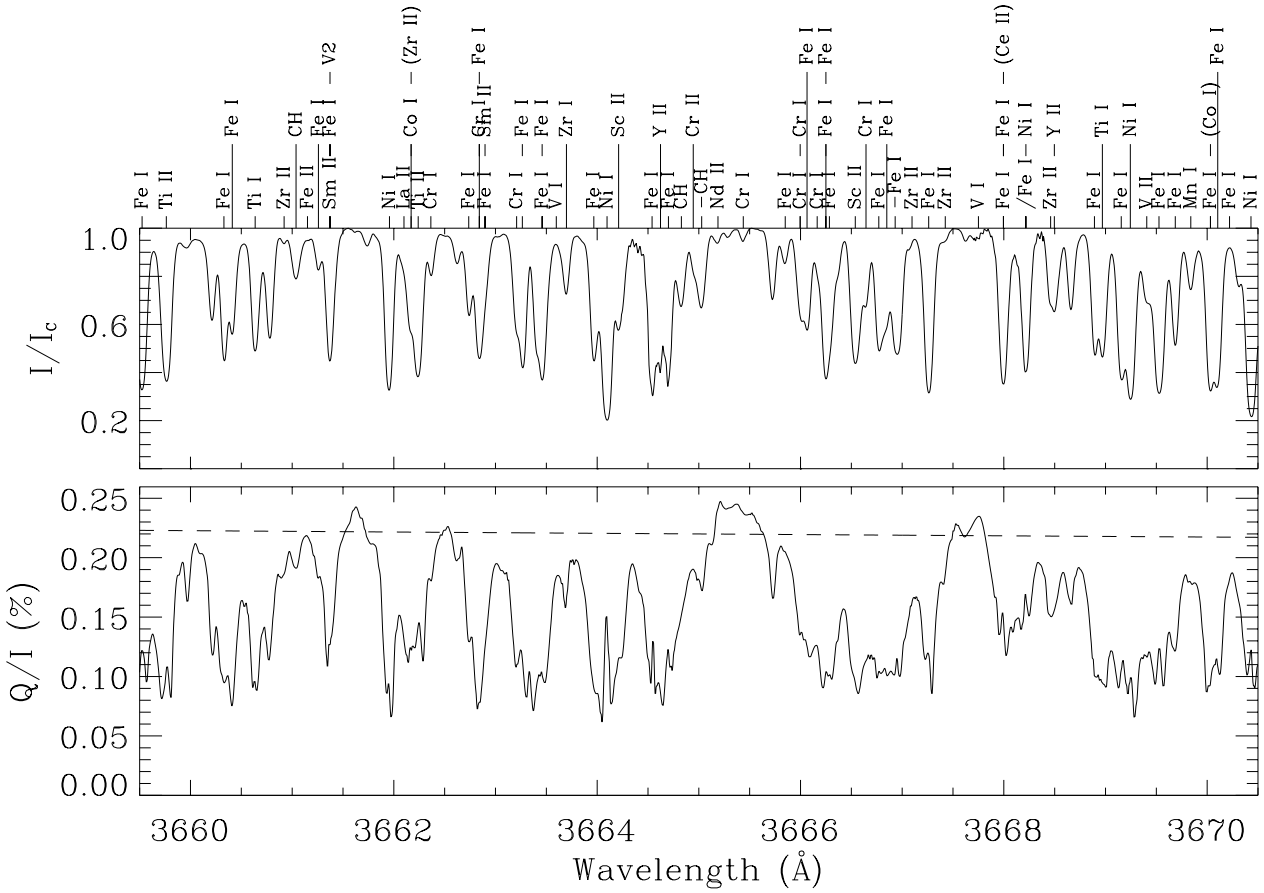

I/I_c
Q/I (%)
Wavelength (Å)
3610
3612
3614
3616
3618
3620

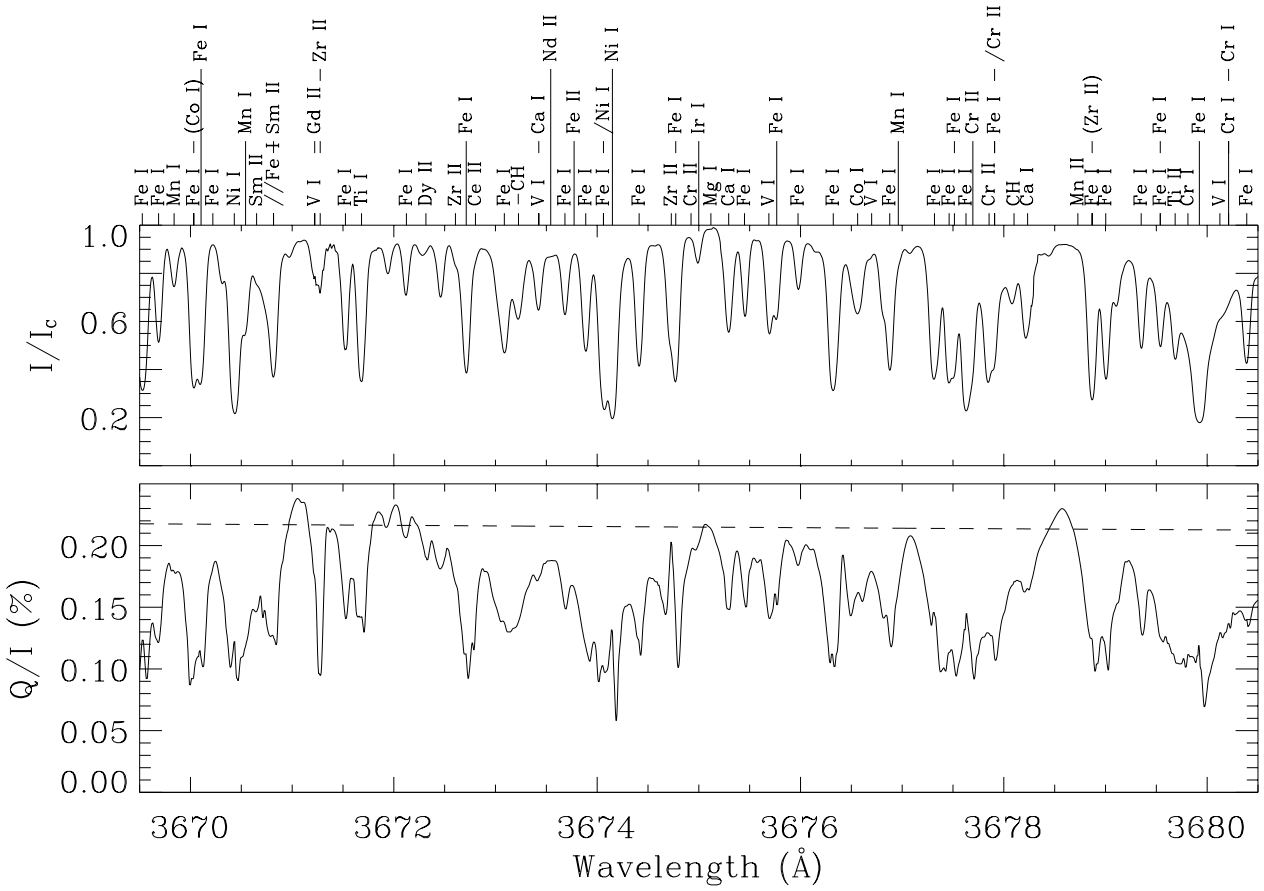

Nb II
Fe I
Fe I
Ni I – Fe I
Fe I
Co I – Fe I
Fe I – Fe I
Y I
Y II
Co II
Sm II
Fe I
Fe I
Fe I
Fe I
Ce II
V II
Fe I
Eu II
Ti I
Fe I
Sm II
Fe I – Fe I
Fe I
Fe I – Mn I
Zr I
Fe I – Ca I
Fe I – Co I
Ni I
Ti II – (Fe II)
Co I
Fe I
Fe I
Ti II
Ca I
Ni I
Co I
Ti I
Fe I
Rh I
Fe I
Fe II – CH
Fe I
CH
Mg I
CH
Ti II
V II
Co I
Sm II
Fe I
CH
Fe I
Ca I – Fe I
Y II
Fe I – Fe I
CH
CH
Mn I
Ni I
Zr II
Dy II – Ni I
Fe I
1.0
0.6
0.2
I/I_c
0.25
0.20
0.15
0.10
0.05
0.00
Q/I (%)
3620
3622
3624
3626
3628
3630
Wavelength (Å)

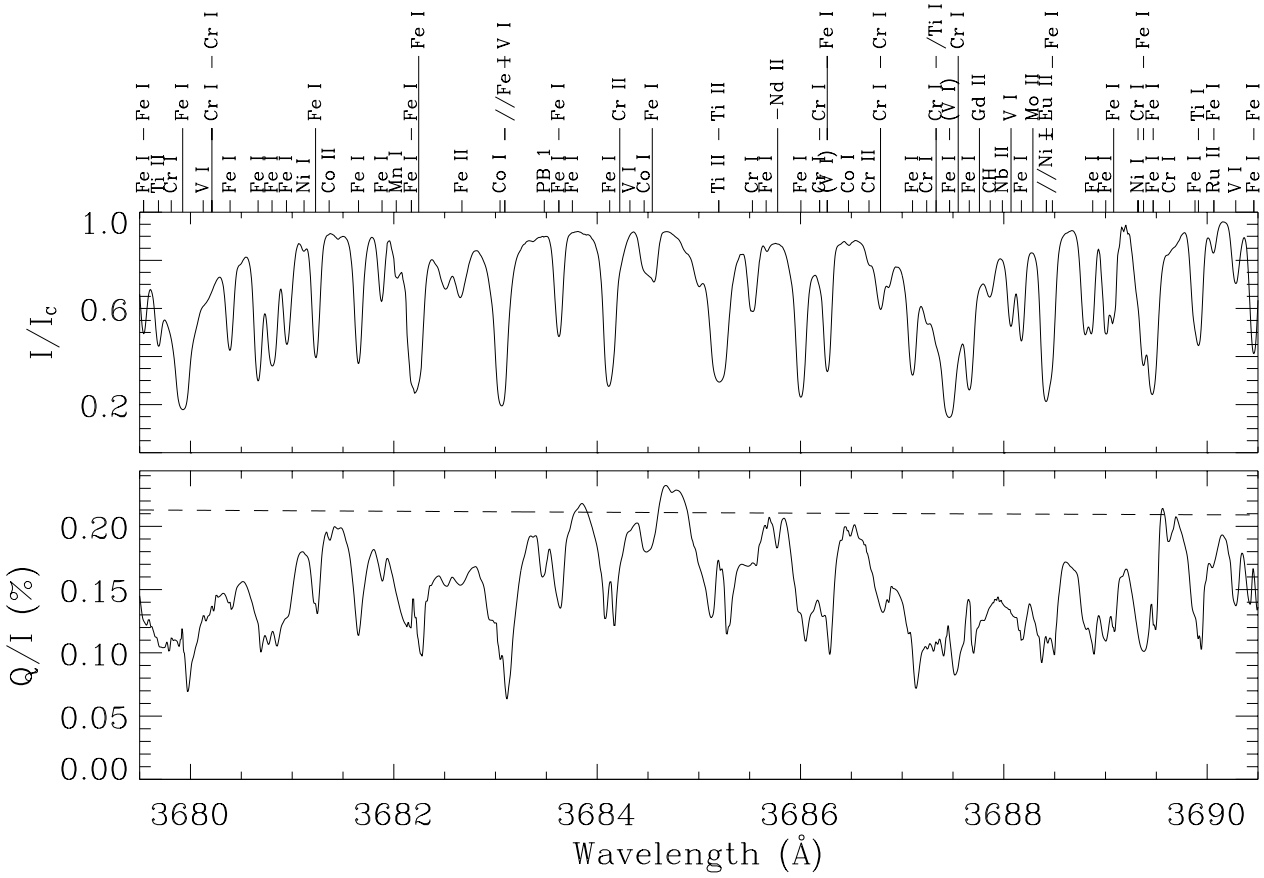

Mn I
Ni I
Zr II
Dy II – Ni I
Fe I
Ni I
Ca I – Sc II
Ca I
Fe I
Co I
//Fe I + Cr II
Cr II
Co I
Fe I
Fe II
Fe I
Co I – Cr I – Cr I
Fe I
Y II
Fe I
CH
Zr II
Fe I
Fe I
Ti II – Cr II
Sm II
Fe I
Fe I
/Co I
CH
//Fe I + Pd I
Ni I
Cr I
Fe I – (Mo II)
Cr I
Y II
Ti II
Ti I
Ti II – CH
Fe I
Fe I – Fe I
Fe I
Zr II – /Fe I
Cr I
Fe I
Co I
Fe I – Fe II
Fe I
Fe I – Co I
Fe I
Fe I
Fe I
Ti I
Fe I
Fe I
CH
Sm II
CH
V I
Fe I
Co I
Fe I
Cr I
Fe I
Fe I
Dy II
Fe I – (Cr I) – (Cr I)
1.0
0.6
0.2
I/I_c
0.5
0.4
0.3
0.2
0.1
0.0
Q/I (%)
3630
3632
3634
3636
3638
3640
Wavelength (Å)

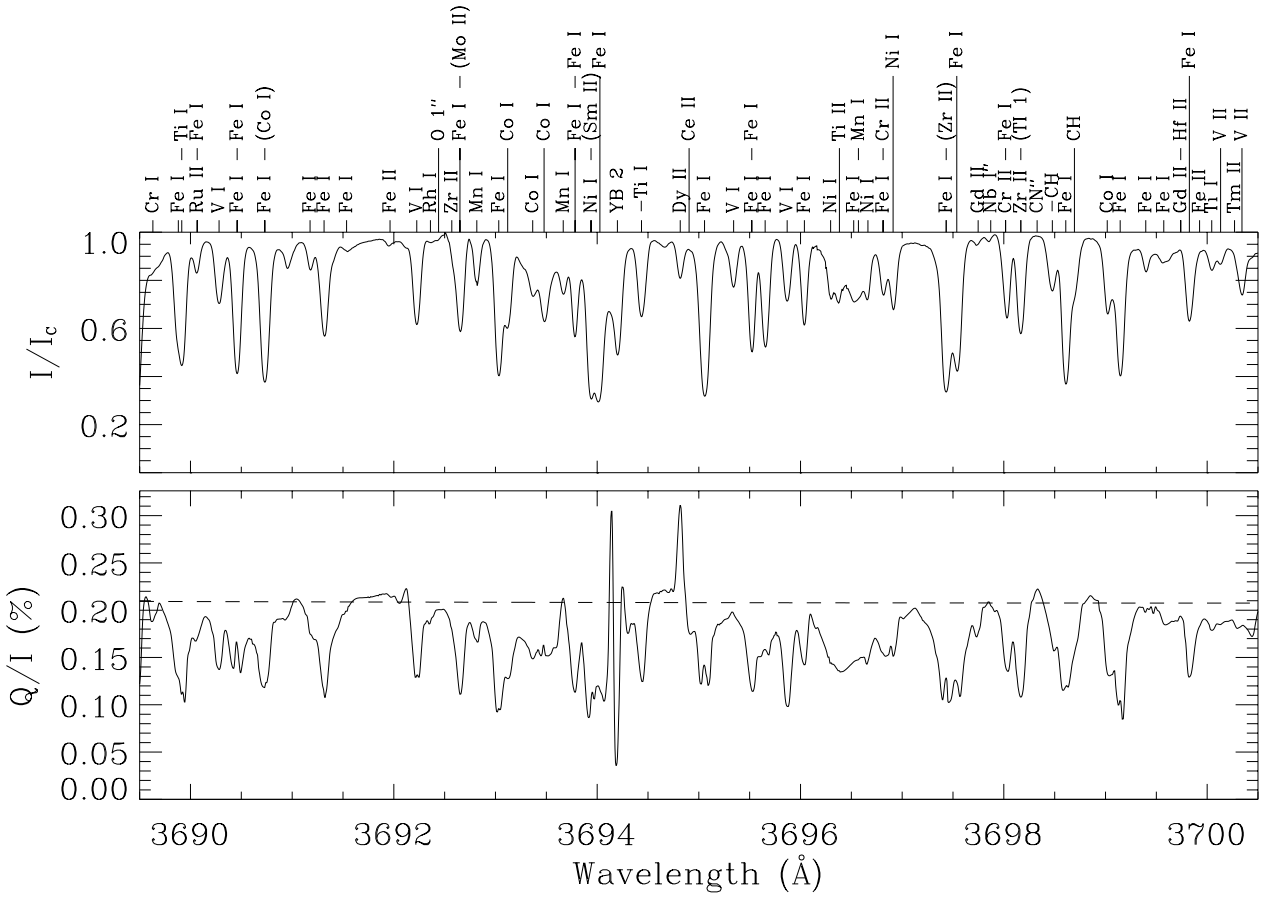

Fe I
Cr I
Fe I
Fe I
Dy II
Fe I – (Cr I)
– (Cr I)
Fe II
Ti II
Fe I – Cr I
Ni I
Co I – Cr I
Fe I
CH
CH
Ni I
Fe II
Ti I
Sc II
CH
Fe I
Co I – Cr II
Fe I
Fe I
Ni I
Fe II
Hf II
Ca I
Fe I
Cr II
Ca I
Fe I
Ca I – Fe I
Co I
Sc II
Dy II
Fe I – Fe II
Fe I
V II
Fe I
Ti I – (Gd II)
CH
CH
(Ce II)
Co I
Fe I
Cr II
Fe I
Co I
(Fe I)
Fe I – CH
Cr I
Cr I
Fe I – Co I
Fe I
Fe I
Fe I
La II – Sm II
Fe I
Cr II
1.0
0.6
0.2
I/I_c
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Q/I (%)
3640
3642
3644
3646
3648
3650
Wavelength (Å)

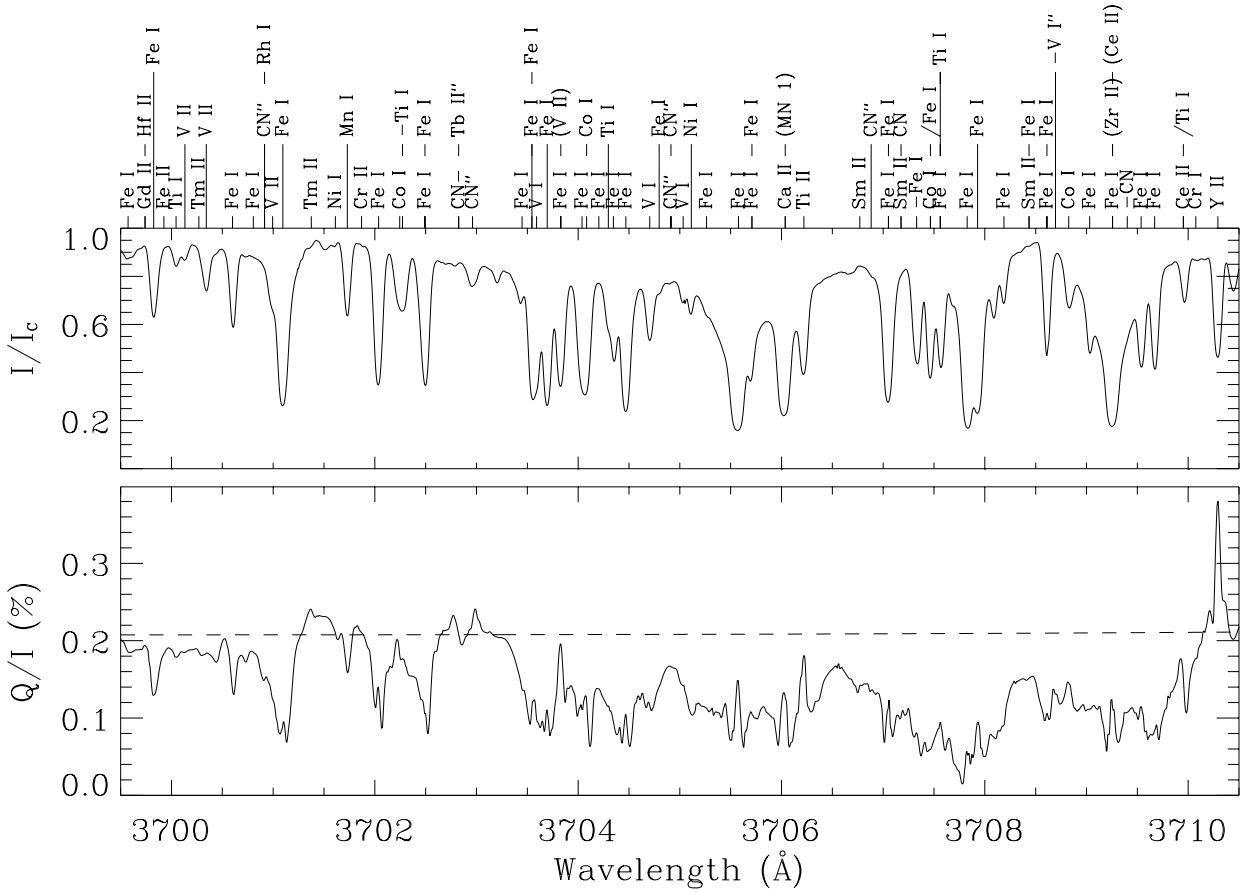

Fe I
Fe I
Fe I
La II – Sm II
Fe I
Cr II
Fe I
Zr II
Fe I
Fe I – Fe I
Nb II
Co I
Fe I
Ni I – Cr II
Sc II
Fe I – CH
Fe II
Fe I
Co I
Ce II
Fe I – Fe I
Ti I
Ce II
Fe I
Cr I
Fe I
CH
Co I
Ti I – (Gd II)
Fe I
Fe I
Fe I
Zr II
(Fe I)
/Ce II – Cr I
Fe I – Cr I – Cr I
Ni I
V I
Co I
Fe I
Mn I
Fe I
Ru I
Ni I – /Fe I
Fe I
Fe I
Ti I
Cr II – Cr II
V II
Fe I
Tb II''
Fe II
Fe I
Ce II – Fe I
Fe I
Ti II
Fe I
1.0
0.6
0.2
I/I$_c$
0.25
0.20
0.15
0.10
0.05
0.00
Q/I (%)
3650
3652
3654
3656
3658
3660
Wavelength (Å)

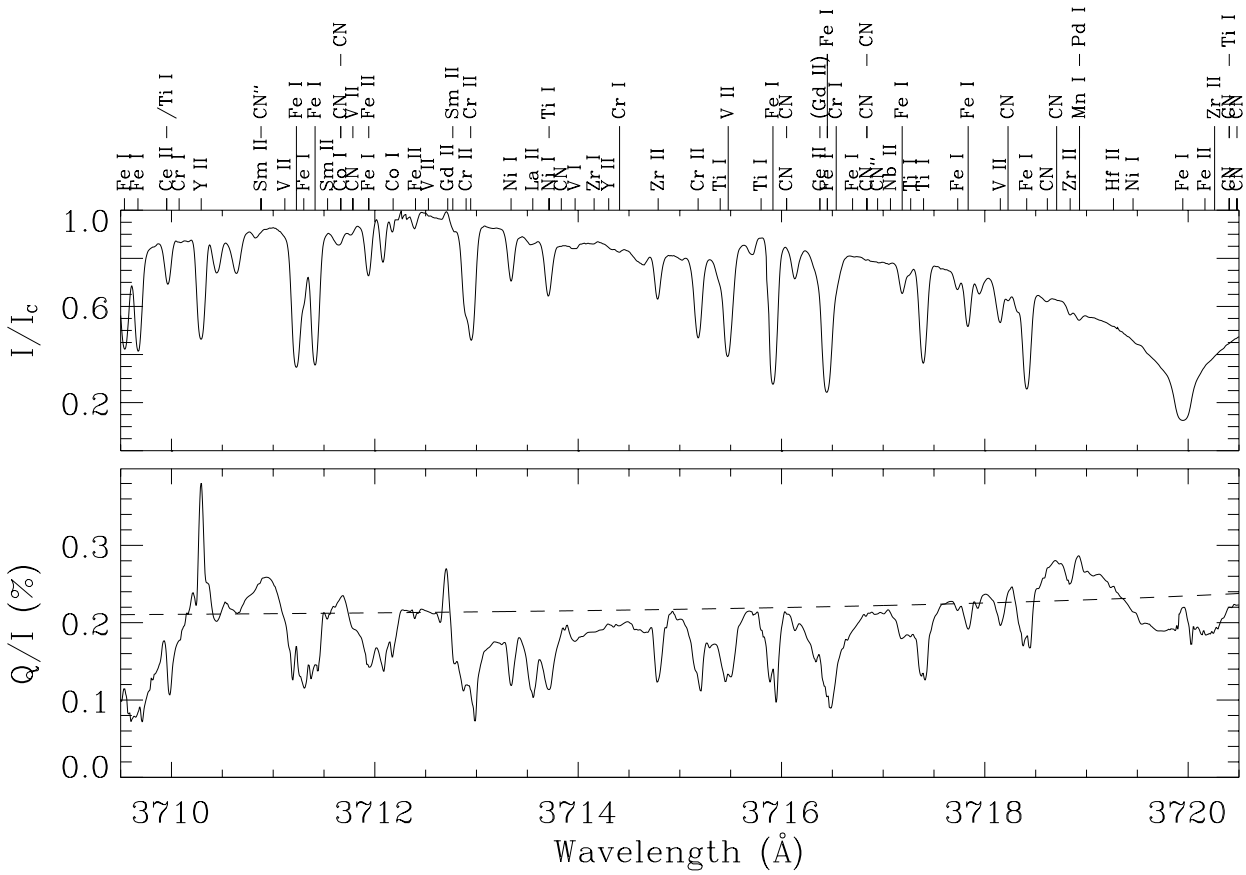

Fe I
Ti II
Fe I
Fe I
Ti I
Zr II
CH
Fe II
Fe I
Sm II
V2
Ni I
Co I
(Zr II)
Cr I
Fe I
Sm II
Fe I
Cr I
Fe I
Fe I
V I
Zr I
Fe I
Ni I
Sc II
Fe I
Y II
Fe I
CH
Cr II
CH
Nd II
Cr I
Fe I
Cr I
Cr I
Fe I
Fe I
Sc II
Cr I
Fe I
Fe I
Zr II
Fe I
Zr II
V I
Fe I
(Ce II)
Fe I
Ni I
Zr II
Y II
Fe I
Ti I
Fe I
Ni I
Y II
Fe I
Fe I
Mn I
Fe I
(Co I)
Fe I
Fe I
Ni I
1.0
0.6
0.2
I/I_c
0.25
0.20
0.15
0.10
0.05
0.00
Q/I (%)
3660
3662
3664
3666
3668
3670
Wavelength (Å)

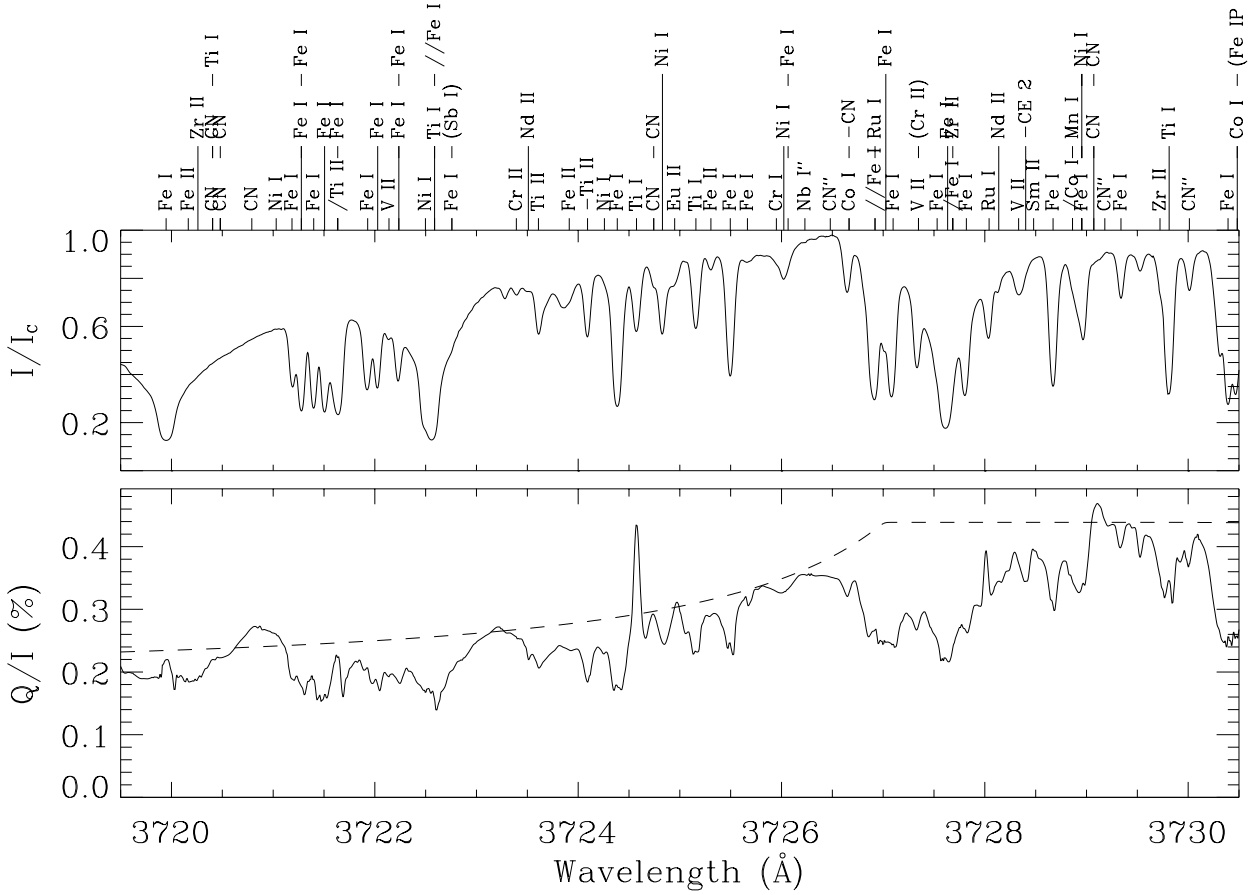

Fe I
Fe I
Mn I
Fe I – (Co I)
Fe I
Ni I
Mn I
Sm II
//Fe I Sm II
V I = Gd II – Zr II
Fe I
Ti I
Fe I
Dy II
Zr II
Ce II
Fe I
Fe I
–CH
V I – Ca I
Nd II
Fe I
Fe II
Fe I
Fe I – /Ni I
Ni I
Fe I
Zr II – Fe I
Cr II
Ir I
Mg I
Ca I
Fe I
V I
Fe I
Fe I
Co I
V I
Fe I
Mn I
Fe I
Fe I – Fe I
Cr II
Cr II – Fe I – /Cr II
CH
Ca I
Mn II
Fe I – (Zr II)
Fe I
Fe I – Fe I
Fe I
Ti II
Cr I
Fe I
V I
Cr I – Cr I
Fe I
I/I_c
1.0
0.6
0.2
Q/I (%)
0.20
0.15
0.10
0.05
0.00
3670
3672
3674
3676
3678
3680
Wavelength (Å)

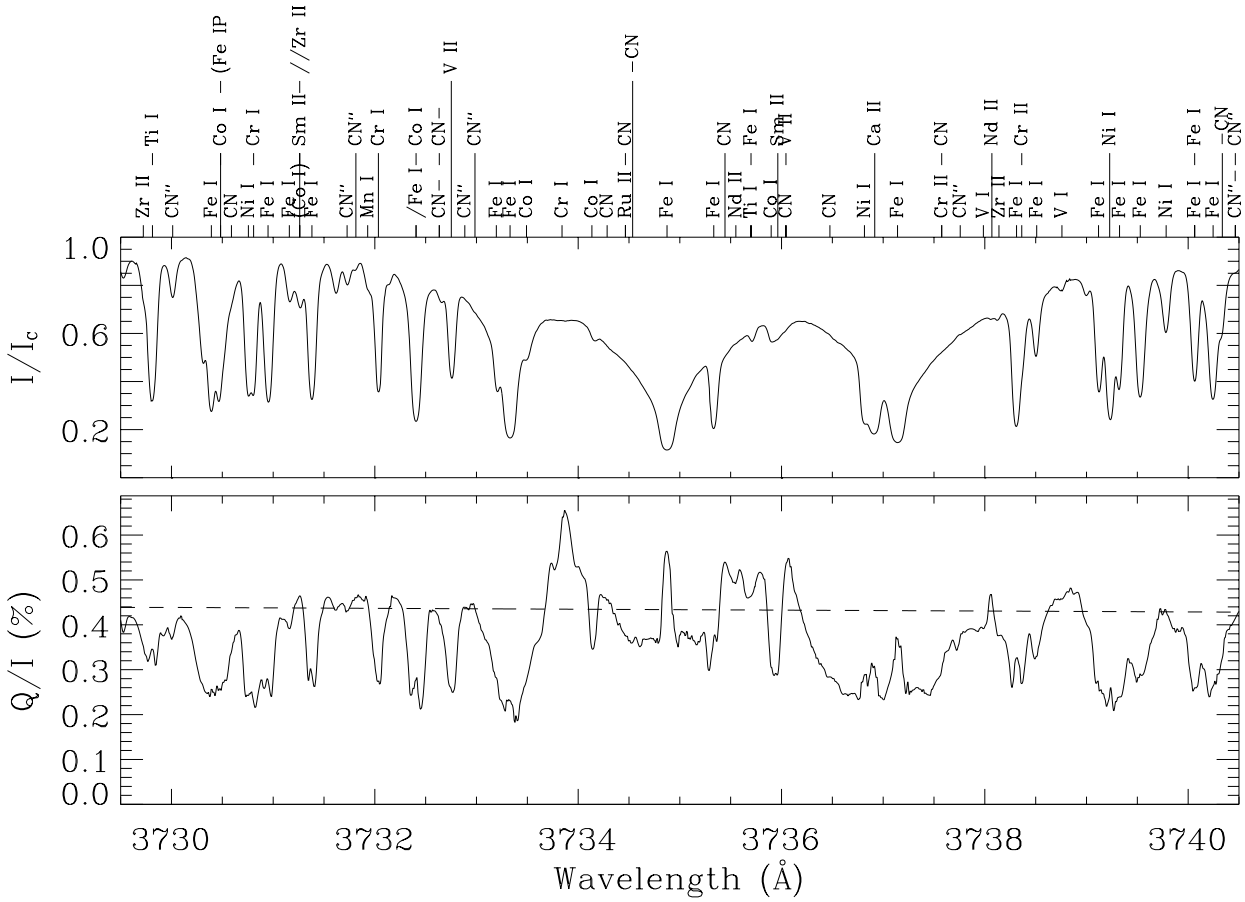

Fe I
Ti II
Cr I
Fe I
V I
Cr I
Cr I
Fe I
Fe I
Fe I
Fe I
Ni I
Fe I
Co II
Fe I
Fe I
Mn I
Fe I
Fe I
Fe II
Co I
//Fe I
V I
PB 1
Fe I
Fe I
Fe I
Cr II
V I
Co I
Fe I
Ti II
Ti II
Cr I
Fe I
Nd II
Fe I
Cr I
Fe I
Co I
Cr II
Cr I
Cr I
Cr I
Ti I
Fe I
Cr I
Gd II
CH
Nb II
V I
Fe I
Mo II
//Ni I
Eu II
Fe I
Fe I
Fe I
Ni I
Cr I
Fe I
Fe I
Cr I
Fe I
Ti I
Ru II
Fe I
V I
Fe I
1.0
0.6
0.2
I/I_c
0.20
0.15
0.10
0.05
0.00
Q/I (%)
3680
3682
3684
3686
3688
3690
Wavelength (Å)

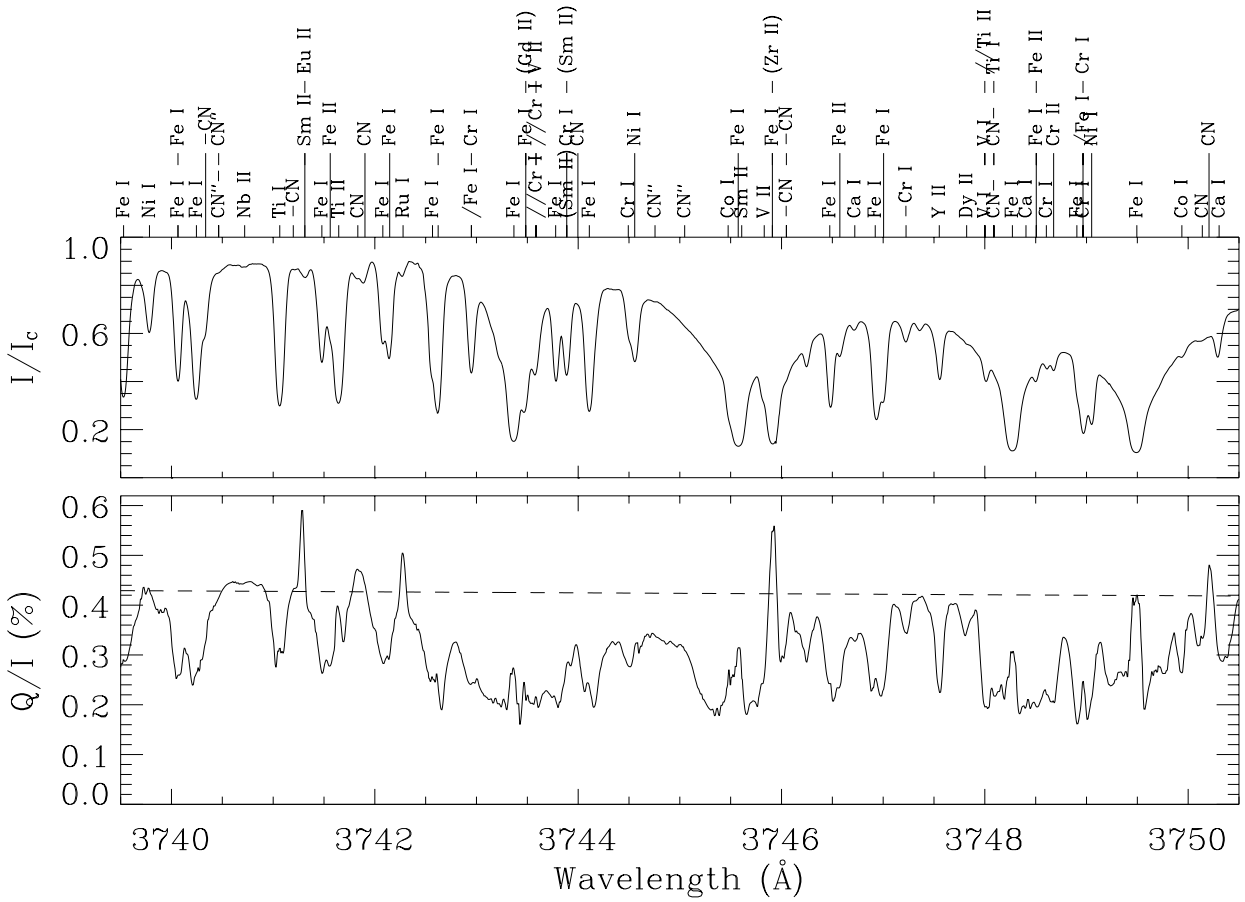

Cr I
Fe I – Ti I
Ru II – Fe I
V I
Fe I – Fe I
Fe I – (Co I)
Fe I
Fe I
Fe I
Fe II
V I
Rh I
O 1''
Zr II – (Mo II)
Mn I
Fe I
Co I
Co I
Co I
Mn I
Fe I – Fe I
Ni I – (Sm II)
Fe I
YB 2
Ti I
Dy II
Ce II
Fe I
V I
Fe I – Fe I
Fe I
V I
Fe I
Ni I
Ti II
Fe I – Mn I
Ni I
Fe I – Cr II
Ni I
Fe I – (Zr II)
Fe I
Gd II
Nb I
Cr II – Fe I
Zr II – (Ti I)
CN''
CH
Fe I
CH
Co I
Fe I
Fe I
Fe I
Gd II – Hf II
Fe I
Fe II
Ti I
V II
Tm II
V II
1.0
0.6
0.2
I/I$_c$
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Q/I (%)
3690
3692
3694
3696
3698
3700
Wavelength (Å)

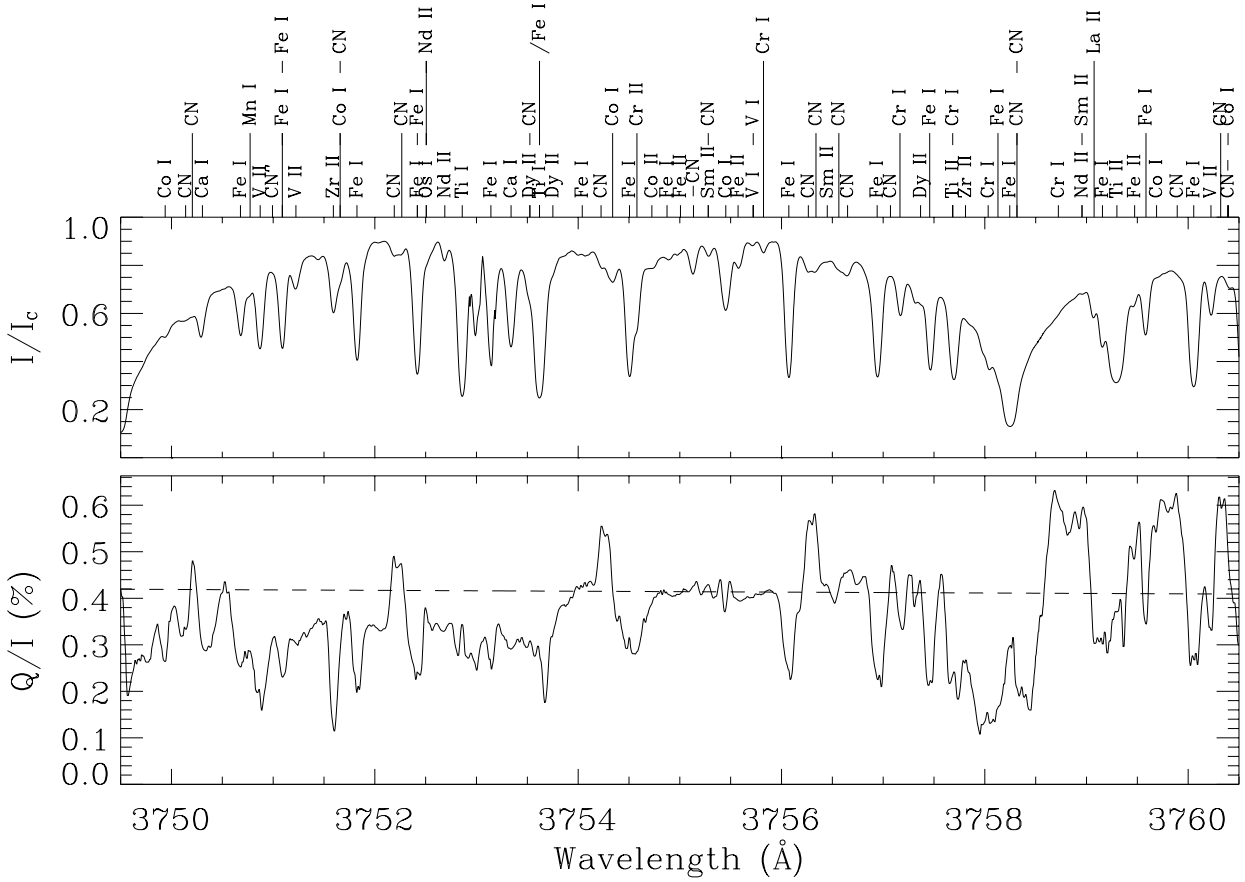

Fe I
Gd II
Hf II
Fe I
Fe II
Ti I
V II
Tm II
V II
Fe I
Fe I
CN''
Rh I
V II
Fe I
Tm II
Ni I
Mn I
Cr II
Fe I
Co I
Ti I
Fe I
CN
Tb II''
CN''
Fe I
V I
Fe I
(V II)
Fe I
Co I
Fe I
Ti I
Fe I
Fe I
V I
Fe I
CN''
V I
Ni I
Fe I
Fe I
Fe I
Ca II
(MN 1)
Ti II
Sm II
CN''
Fe I
Sm II
CN
Fe I
Co I
Fe I
Ti I
Fe I
Fe I
Fe I
Sm II
Fe I
Fe I
V I''
Co I
Fe I
Fe I
(Zr II)
(Ce II)
CN
Fe I
Fe I
Ce II
Ti I
Cr I
Y II
1.0
0.6
0.2
I/I_c
0.3
0.2
0.1
0.0
Q/I (%)
3700
3702
3704
3706
3708
3710
Wavelength (Å)

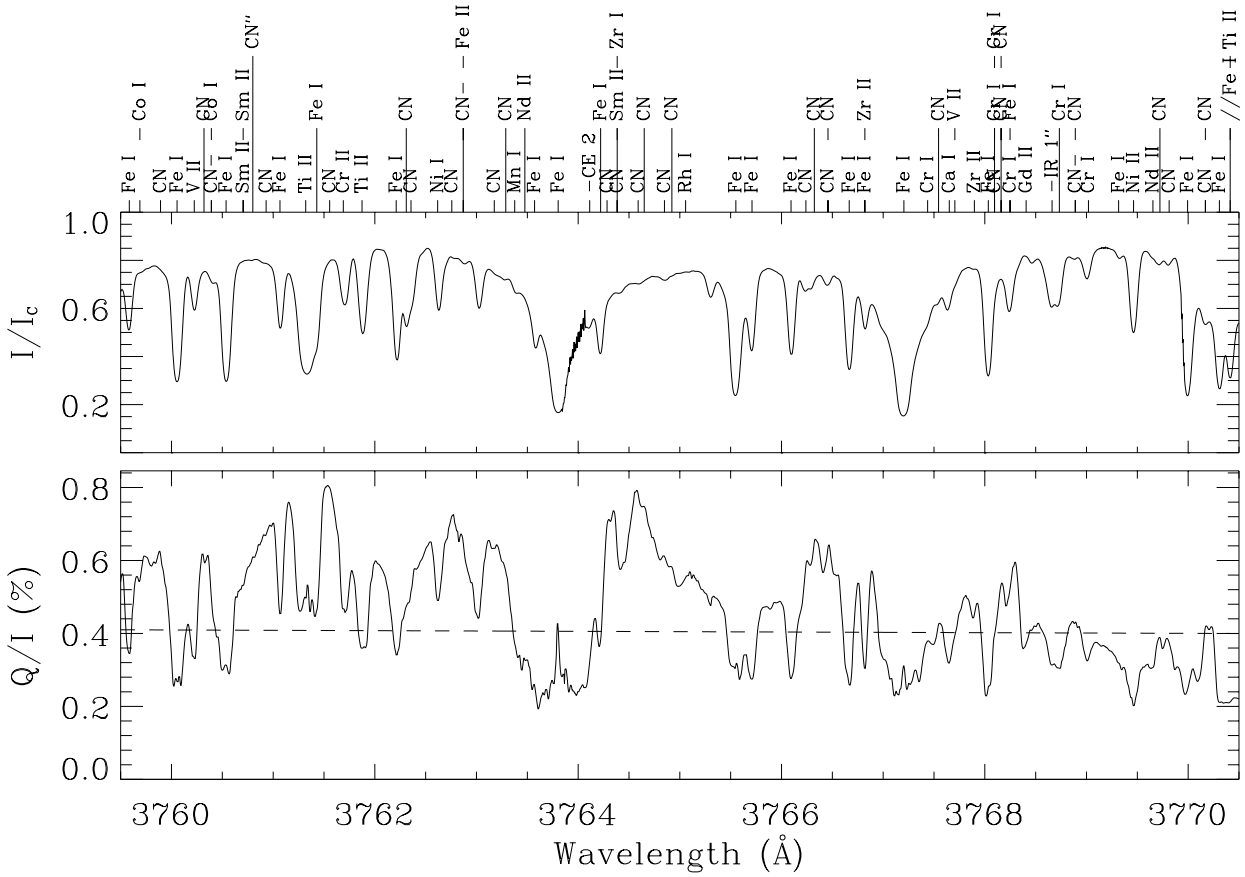

I/I_c
Q/I (%)
Wavelength (Å)
3710
3712
3714
3716
3718
3720

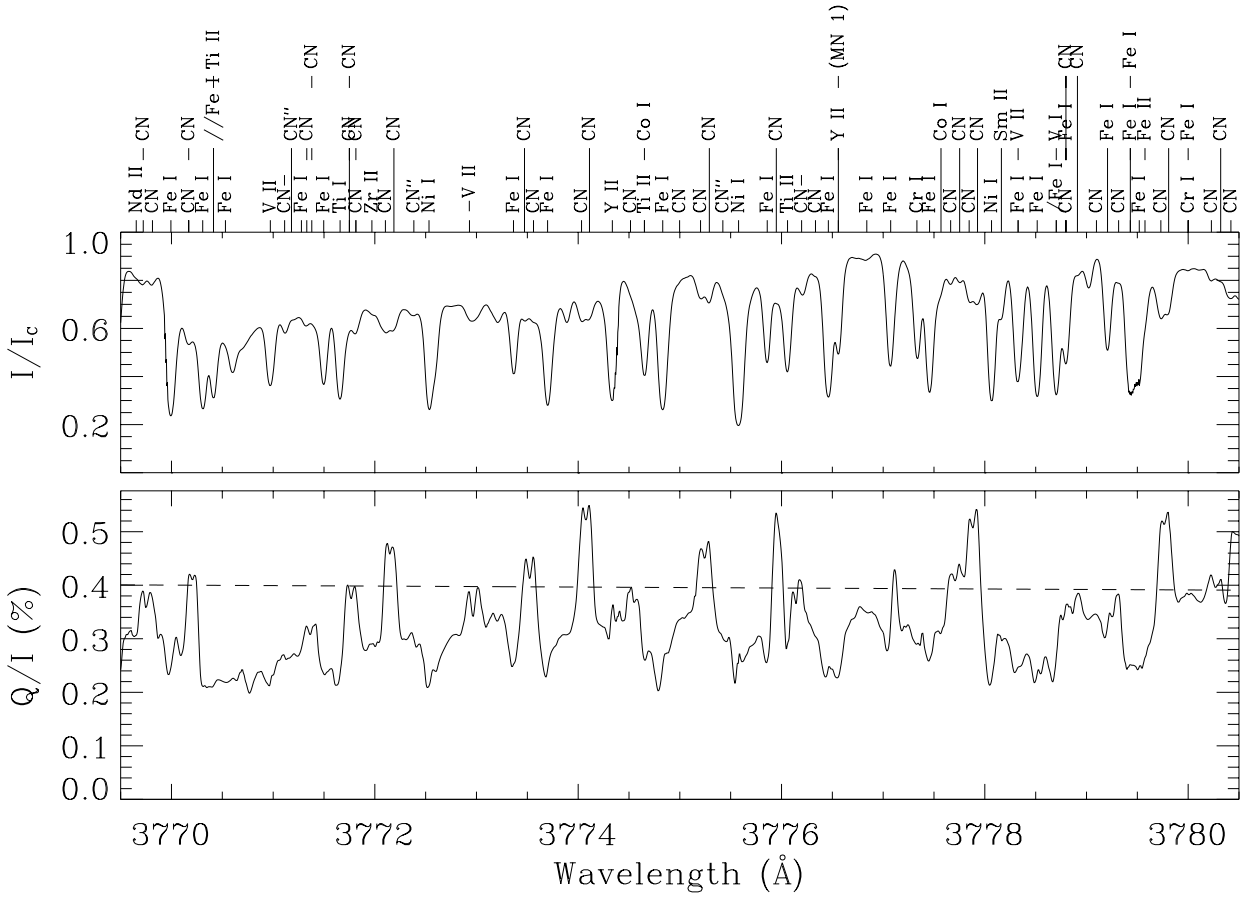

Fe I
Fe II
Zr II
Ti I
CN
CN
CN
Ni I
Fe I
Fe I
Fe I
Fe I
/Ti II
Fe I
Fe I
Fe I
V II
Fe I
Ni I
Ti I
Fe I
(Sb I)
//Fe I
Cr II
Nd II
Ti II
Fe II
Ti II
Ni I
Fe I
Ti I
CN
CN
Ni I
Eu II
Ti I
Fe II
Fe I
Fe I
Cr I
Ni I
Fe I
Nb I''
CN''
Co I
CN
CN
//Fe I
Ru I
Fe I
Fe I
V II
(Cr II)
Fe I
Fe I
Fe I
Ru I
Nd II
V II
Sm II
CE 2
Fe I
Fe I
Co I
Mn I
Ni I
CN
CN
CN''
Fe I
Zr II
Ti I
CN''
Fe I
Co I
(Fe IP
I/I$_c$
1.0
0.6
0.2
Q/I (%)
0.4
0.3
0.2
0.1
0.0
3720
3722
3724
3726
3728
3730
Wavelength (Å)

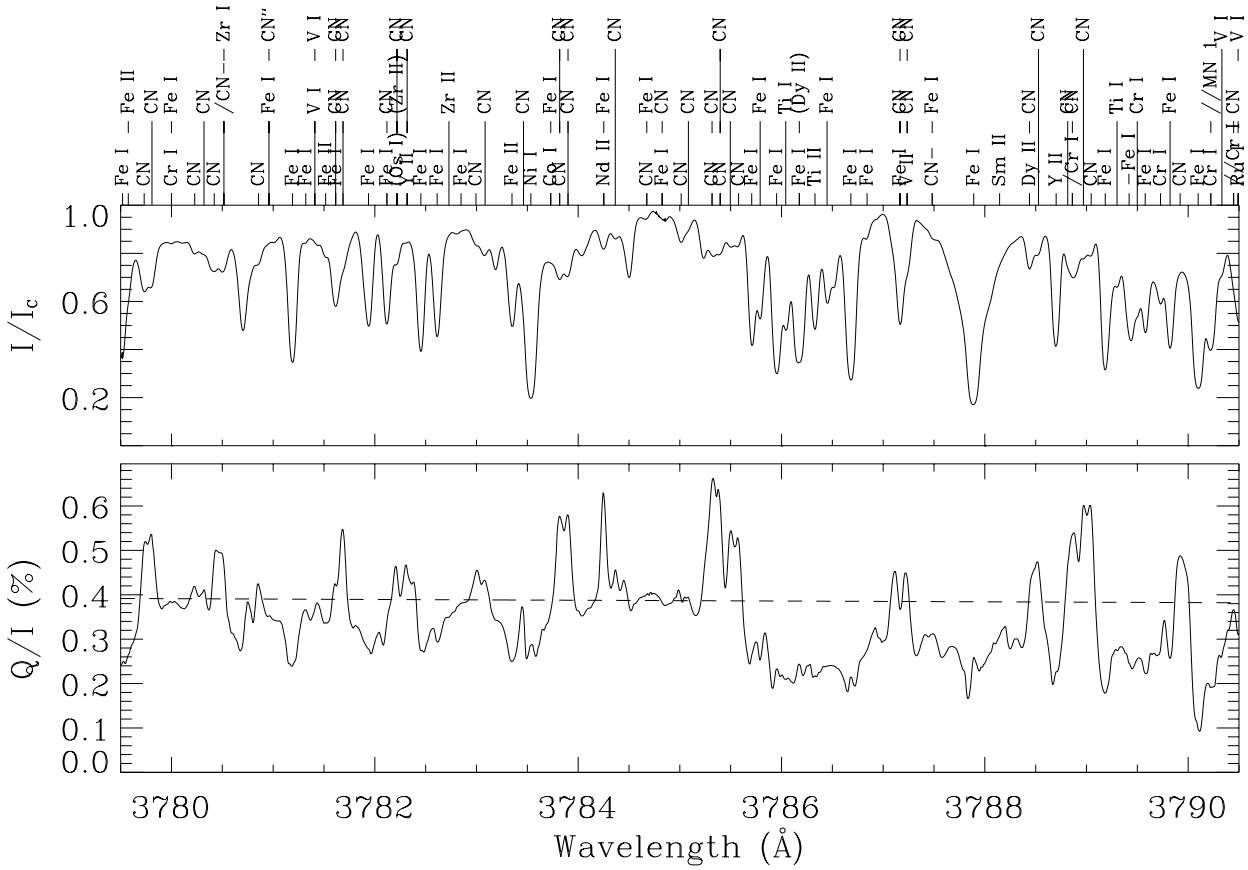

Zr II – Ti I
CN''
Fe I
Co I – (Fe IP
CN
Ni I – Cr I
Fe I
Fe I
Sm II– //Zr II
Fe I
CN''
Mn I
Cr I
/Fe I– Co I
CN– – CN–
V II
CN''
Fe I
Fe I
Co I
Cr I
Co I
CN
Ru II – CN
–CN
Fe I
Fe I
CN
Nd II
Ti I – Fe I
Co I
Sm II
CN
Ti I
CN
Ni I
Ca II
Fe I
Cr II – CN
CN''
V I
Nd II
Zr II
Fe I – Cr II
Fe I
V I
Fe I
Ni I
Fe I
Fe I
Ni I
Fe I – Fe I
Fe I
CN
CN''– CN''
1.0
0.6
0.2
I/I_c
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Q/I (%)
3730
3732
3734
3736
3738
3740
Wavelength (Å)

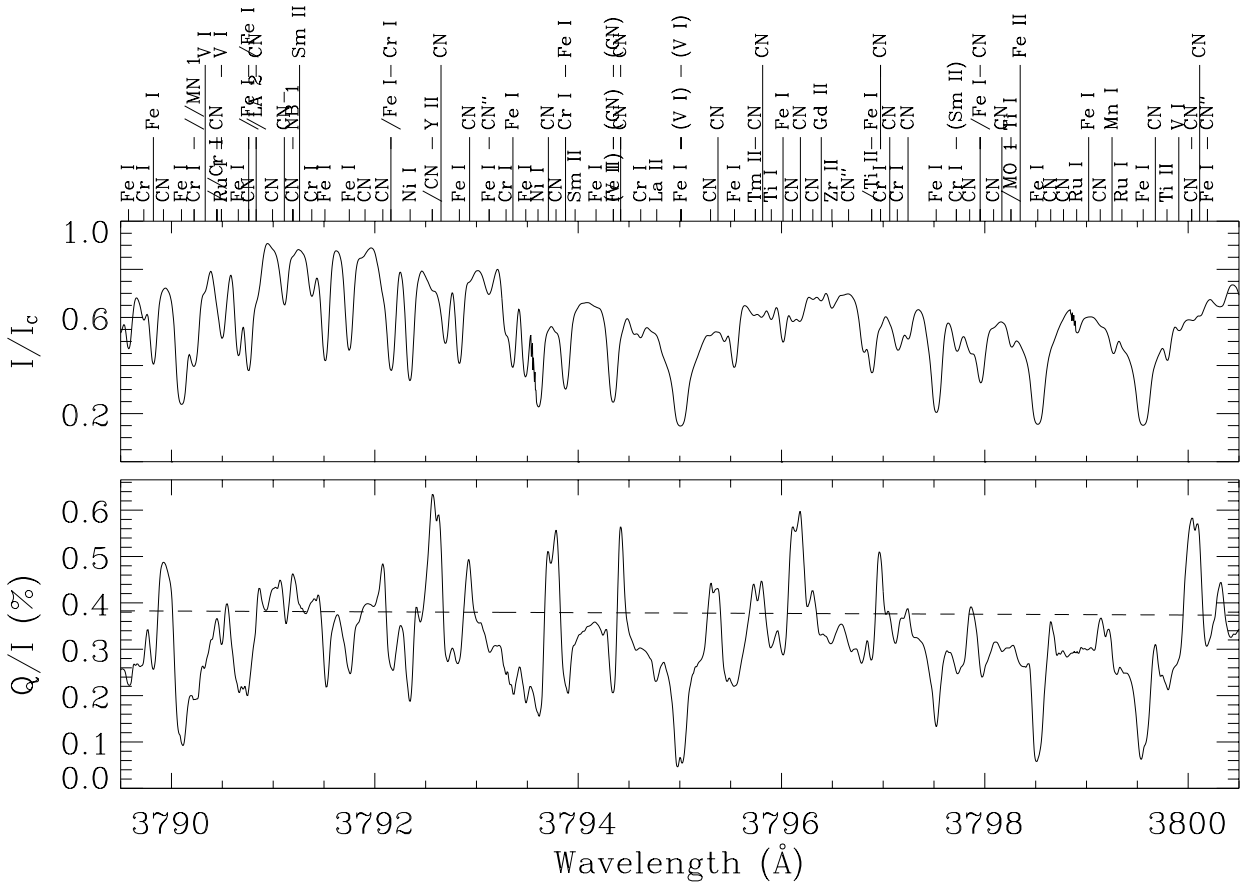

Fe I
Ni I
Fe I
Fe I
CN
CN
CN
Nb II
Ti I
CN
Sm II
Eu II
Fe I
Fe II
Ti II
CN
Fe I
Fe I
Ru I
Fe I
Fe I
Cr I
Fe I
Fe I
Cr I
Ga II
Fe I
Cr I
Sm II
Fe I
CN
Fe I
Cr I
Ni I
CN
CN
Co I
Fe I
Sm II
V II
Fe I
Zr II
CN
CN
Fe I
Fe II
Ca I
Fe I
Fe I
Cr I
Y II
Dy II
V I
CN
Ti I
Ti II
Fe I
Ca I
Fe I
Fe II
Cr I
Cr II
Fe I
Ni I
Cr I
Fe I
Co I
CN
CN
Ca I
1.0
0.6
0.2
I/I_c
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Q/I (%)
3740
3742
3744
3746
3748
3750
Wavelength (Å)

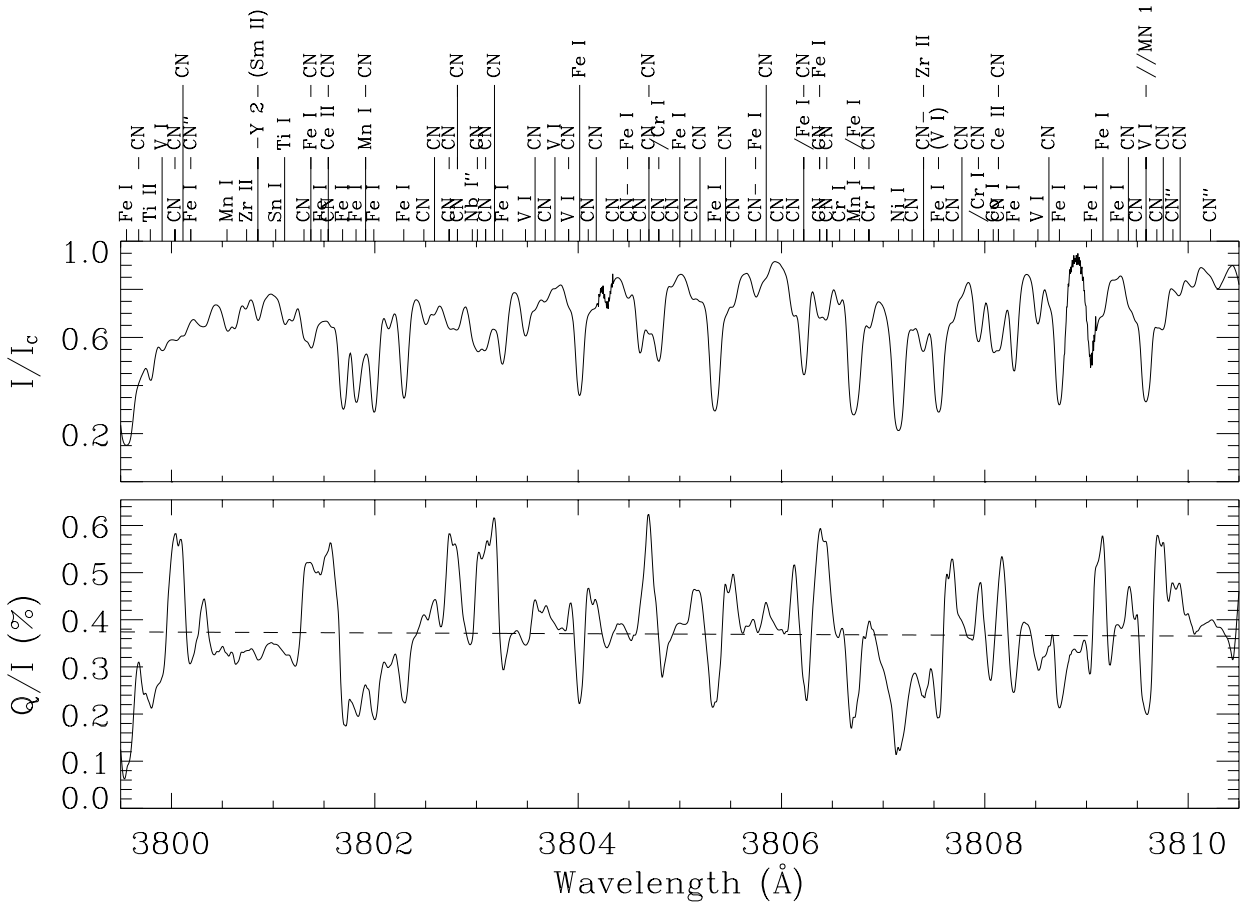

I/I_c
Q/I (%)
Wavelength (Å)
3750
3752
3754
3756
3758
3760

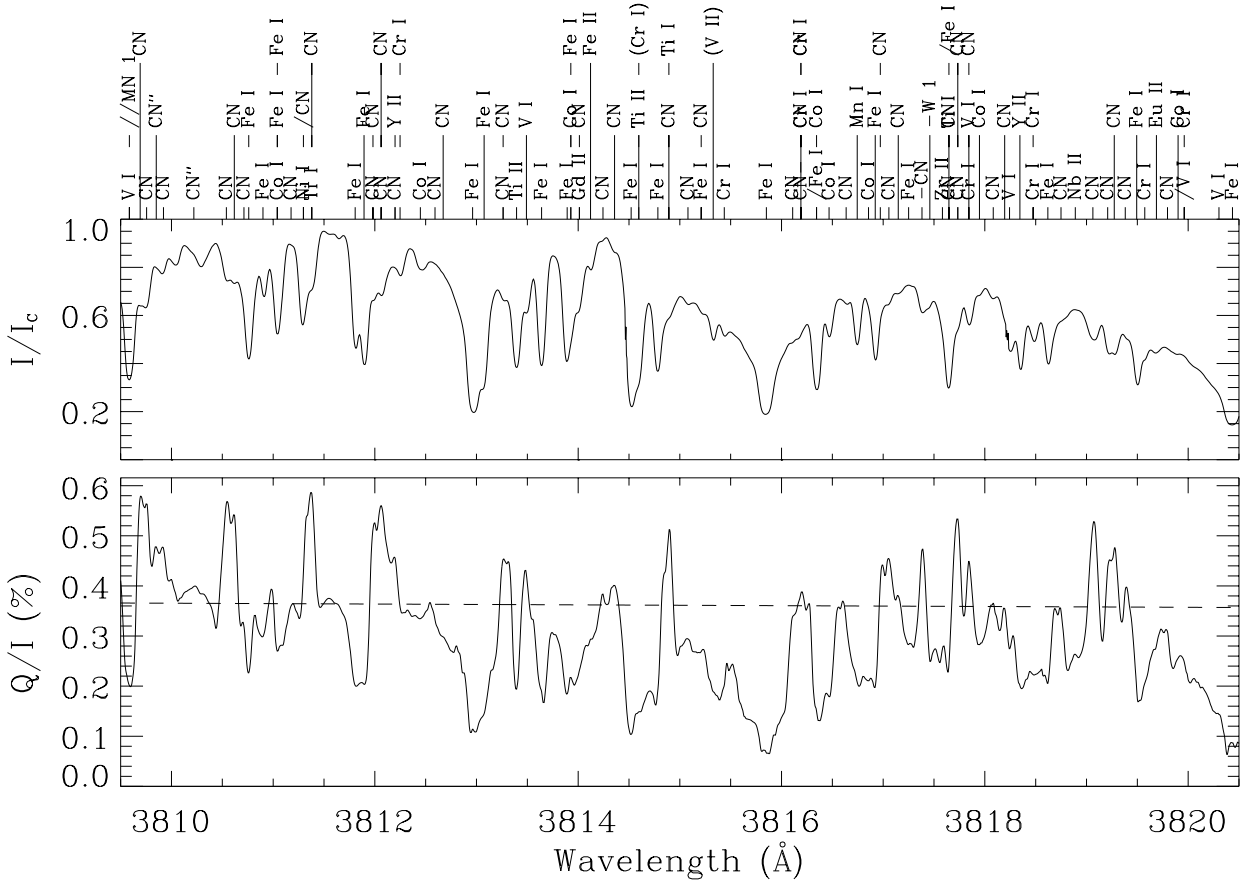

Fe I
Co I
CN
Fe I
V II
CN
Co I
CN
Fe I
Sm II
Sm II
CN''
CN
Fe I
Ti II
Fe I
CN
Cr II
Ti II
Fe I
CN
Ni I
CN
CN
Fe II
CN
Mn I
Nd II
Fe I
Fe I
CE 2
Fe I
CN
Sm II
Zr I
CN
CN
CN
Rh I
Fe I
Fe I
Fe I
CN
CN
CN
Fe I
Zr II
CN
Cr I
Ca I
V II
Zr II
Fe I
Cr I
Gd II
IR 1''
Cr I
CN
CN
Cr I
Fe I
Ni II
Nd II
CN
CN
Fe I
CN
Fe I
//Fe + Ti II
1.0
0.6
0.2
I/I_c
0.8
0.6
0.4
0.2
0.0
Q/I (%)
3760
3762
3764
3766
3768
3770
Wavelength (Å)

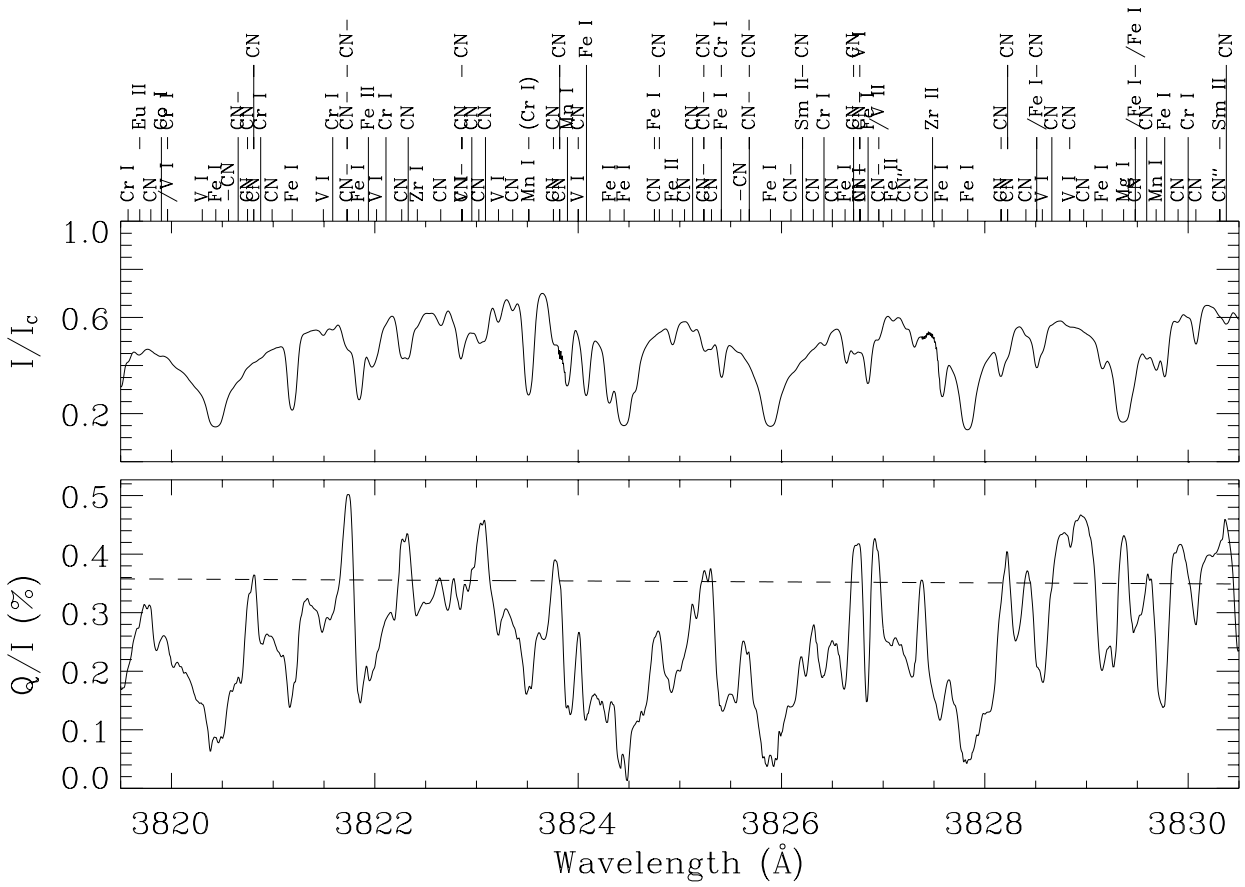

Nd II – CN
CN
Fe I
CN – CN
Fe I
//Fe + Ti II
Fe I
V II
CN''
CN
Fe I
Ti I
CN
CN
K II
CN
CN
CN''
Ni I
– V II
Fe I
CN
CN
Fe I
CN
Y II
CN
Ti II – Co I
Fe I
CN
CN
CN''
Ni I
Fe I
CN
Ti II
CN
CN
Fe I
Y II – (MN 1)
Fe I
Fe I
Cr I
Fe I
Co I
CN
CN
CN
Ni I
Sm II
V II
Fe I – Y I
Fe I
Fe I
CN
CN
CN
Fe I
CN
CN
Fe I – Fe I
Fe II
CN
Cr I – Fe I
CN
CN
I/I$_c$
Q/I (%)
Wavelength (Å)

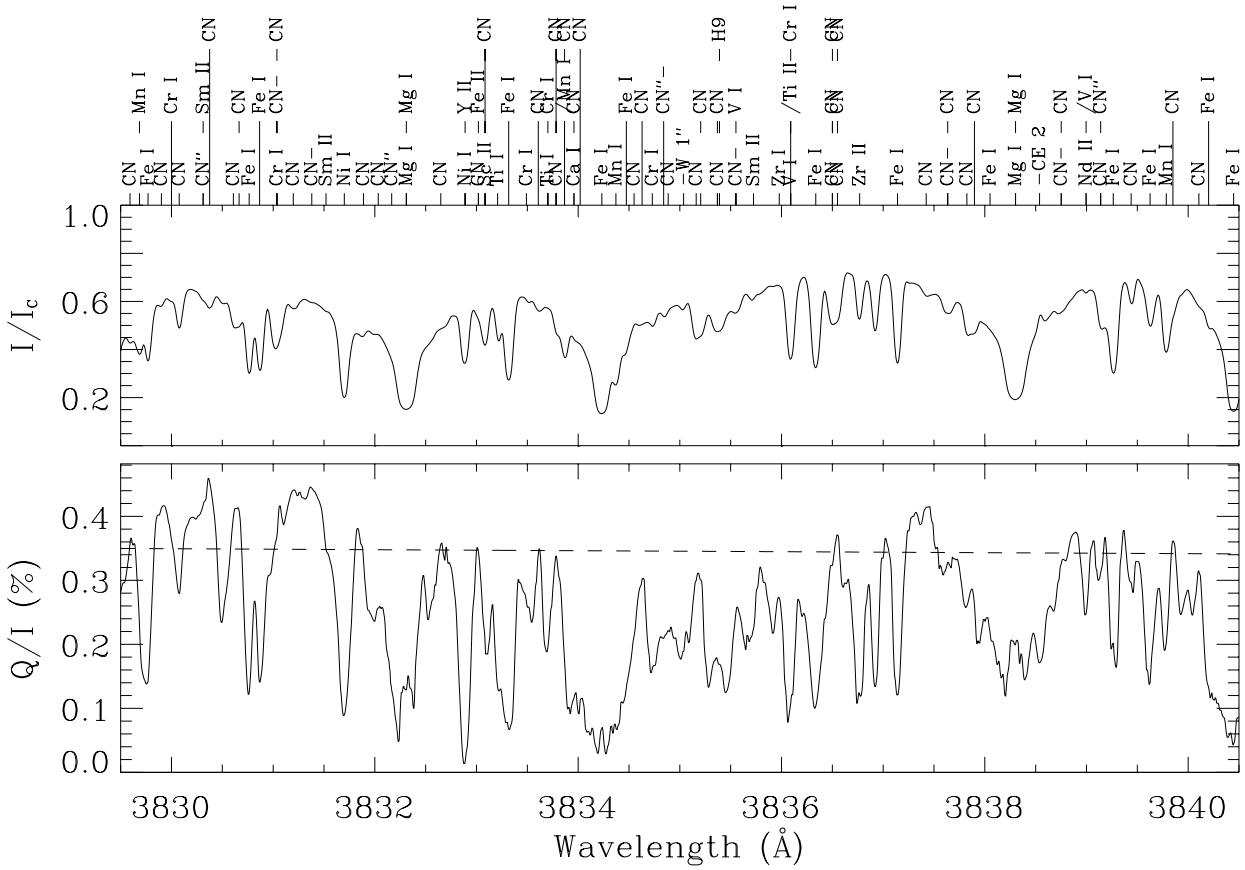

I/I_c
Q/I (%)
Wavelength (Å)
3780
3782
3784
3786
3788
3790

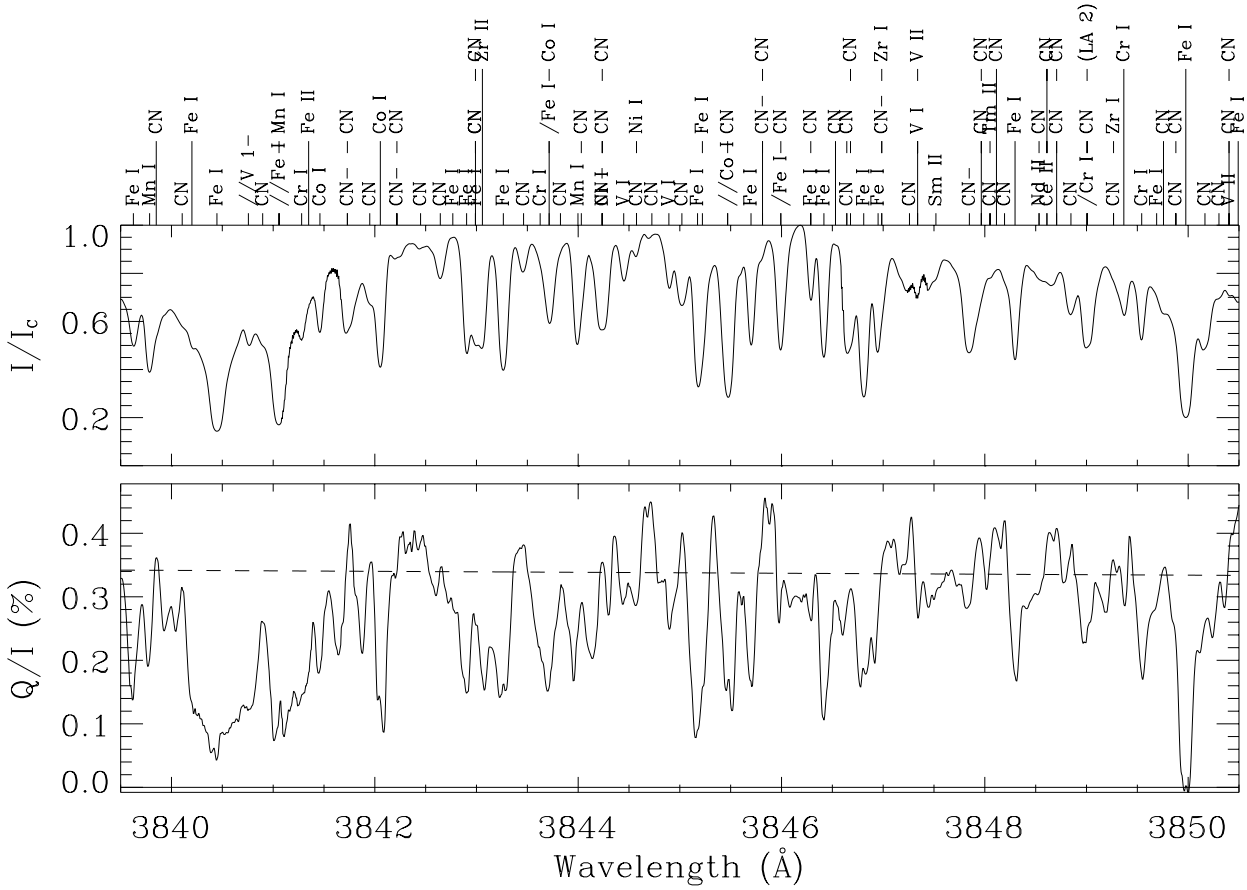

I/I_c
Q/I (%)
Wavelength (Å)
3790
3792
3794
3796
3798
3800

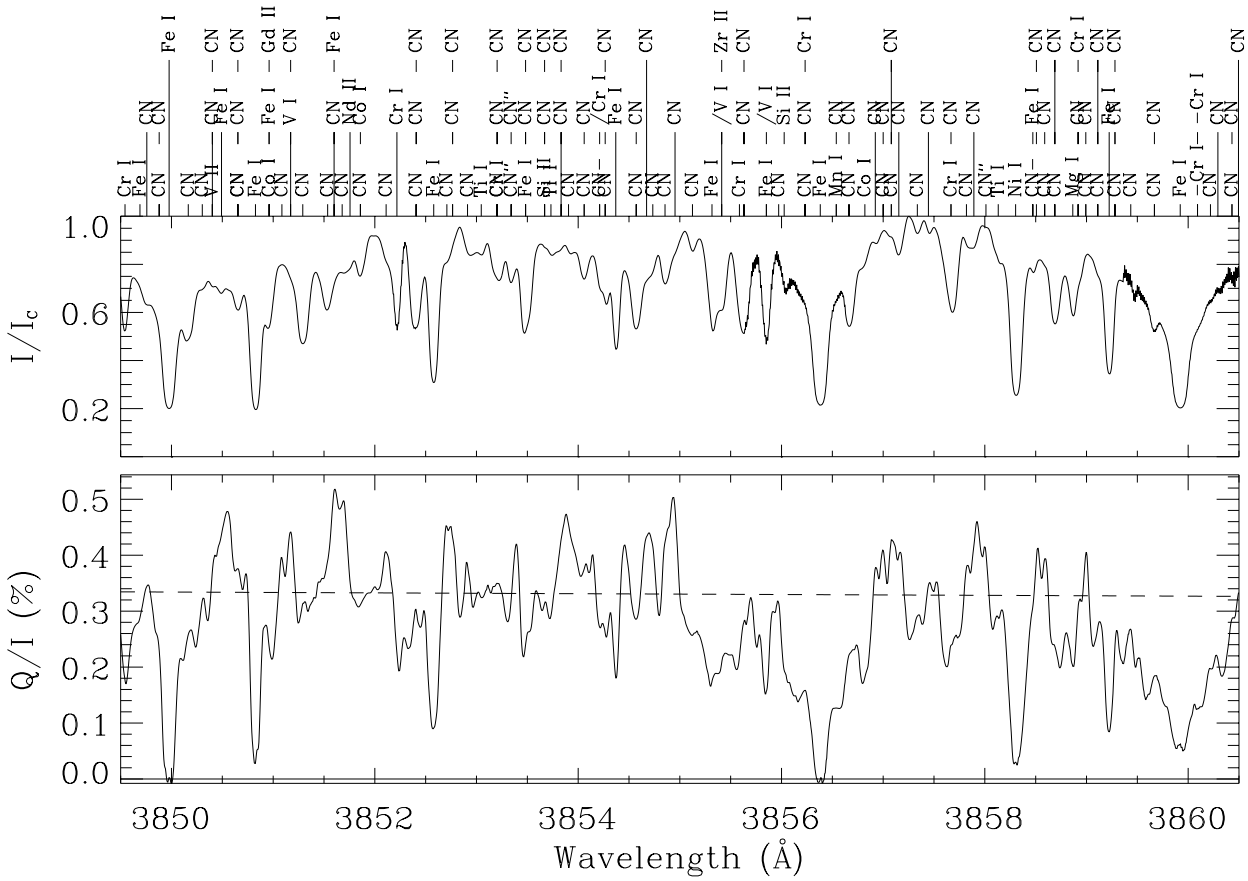

I/I_c
Q/I (%)
Wavelength (Å)
3800
3802
3804
3806
3808
3810

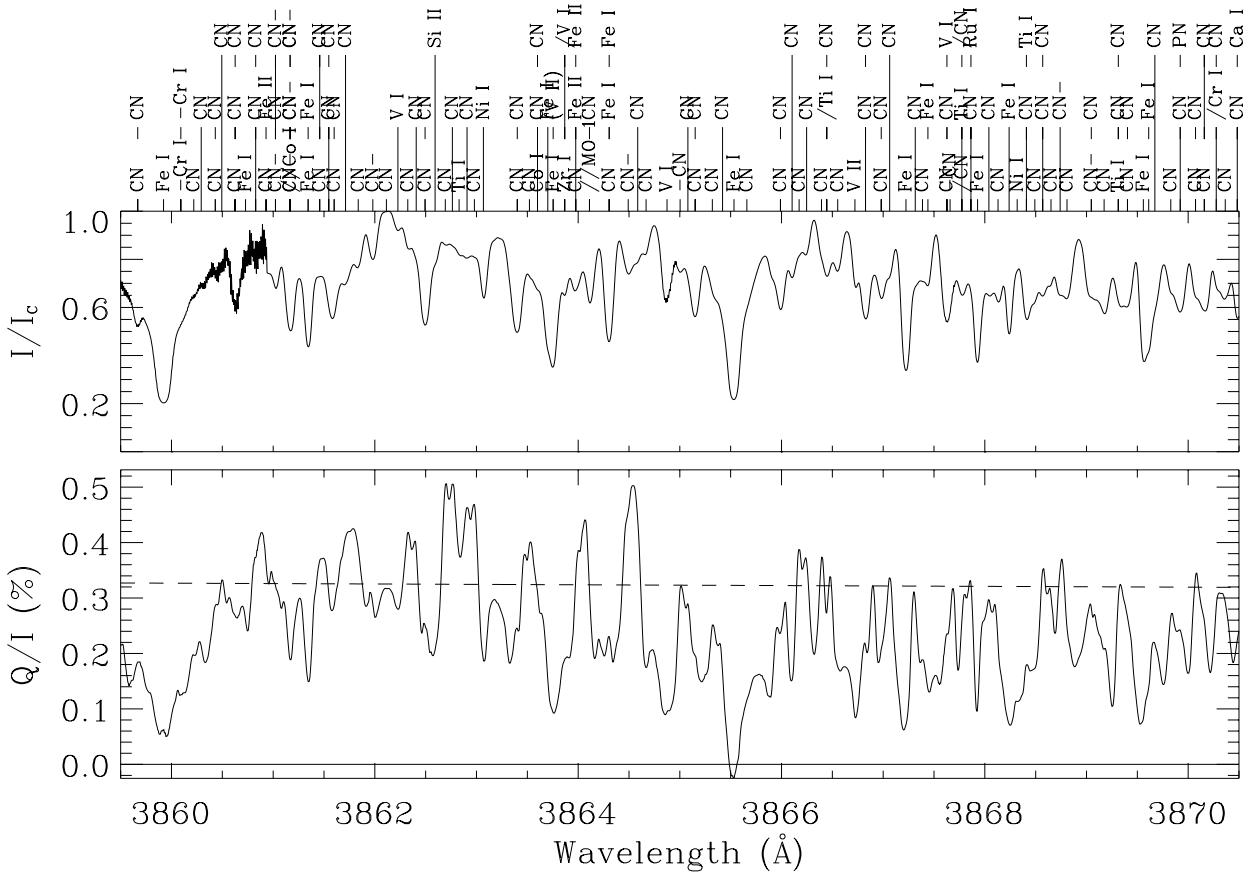

I/I_c
Q/I (%)
Wavelength (Å)
3810
3812
3814
3816
3818
3820

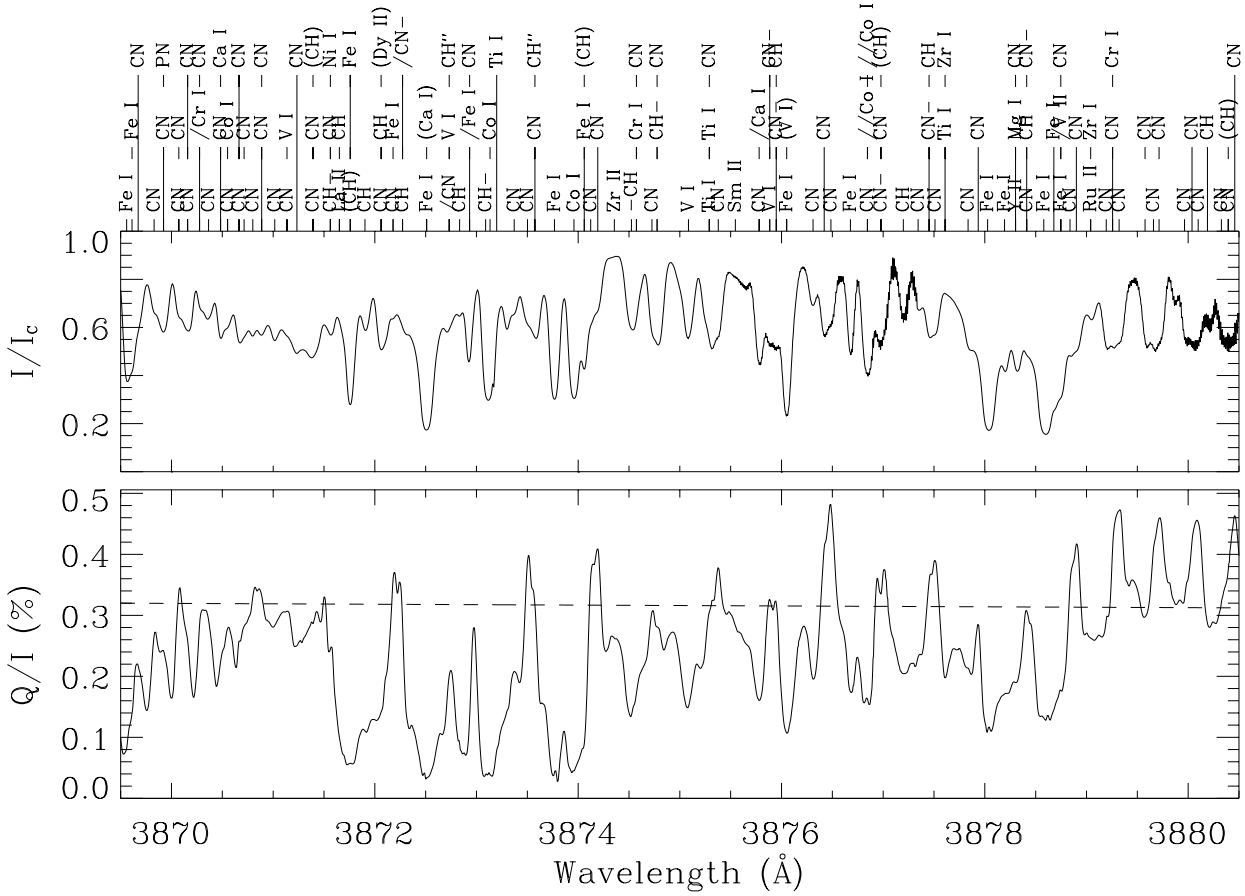

I/I_c
Q/I (%)
Wavelength (Å)
3820
3822
3824
3826
3828
3830

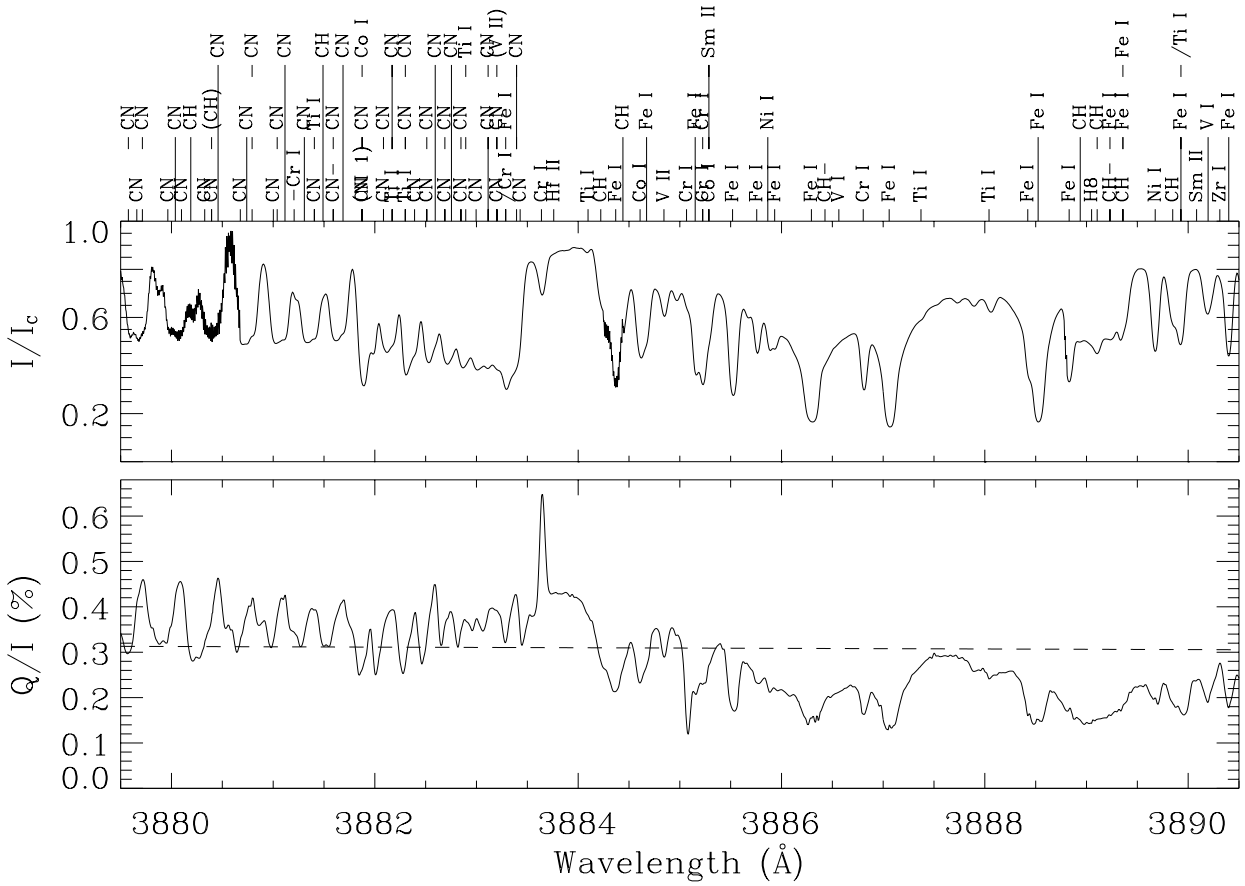

I/I_c
Q/I (%)
Wavelength (Å)
3830
3832
3834
3836
3838
3840

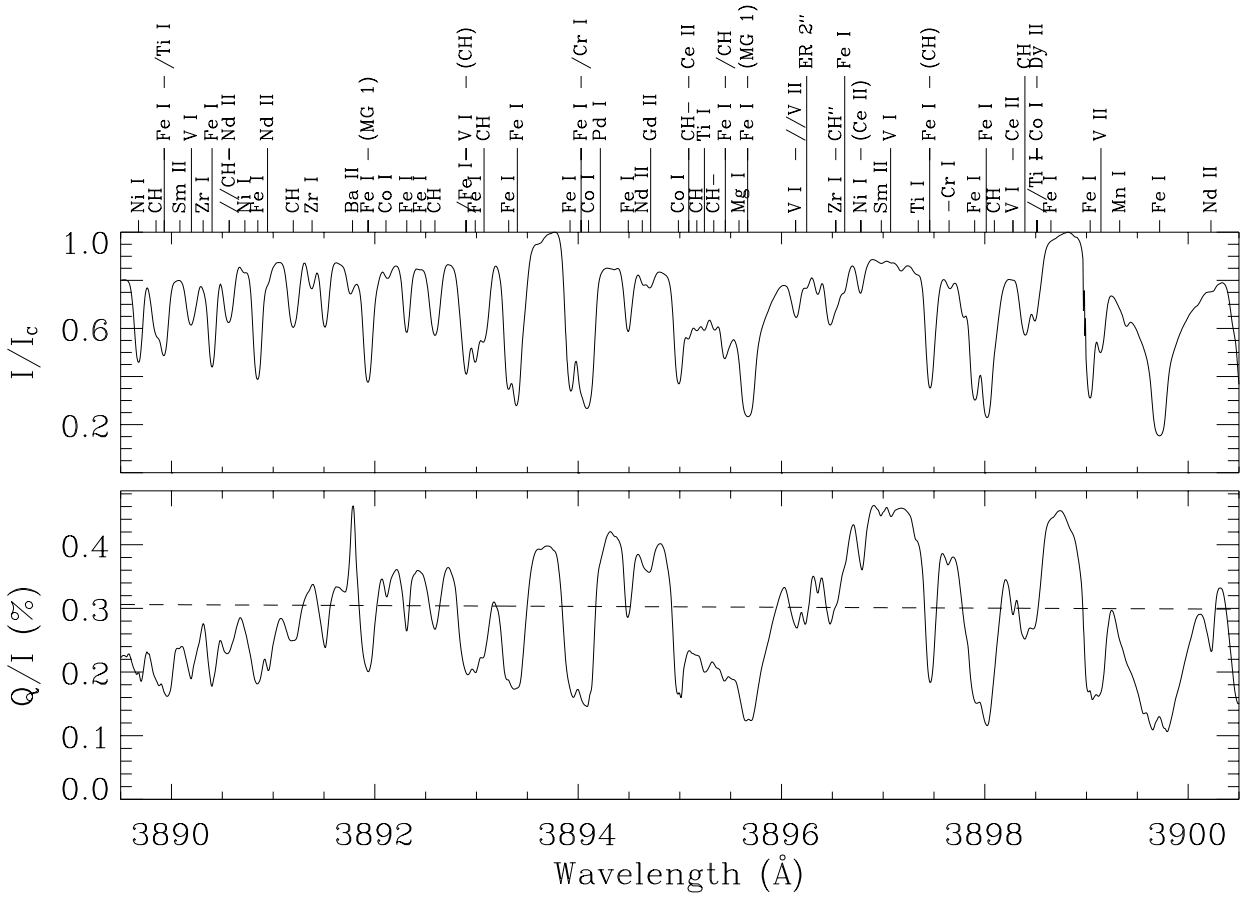

I/I_c
Q/I (%)
Wavelength (Å)
3840
3842
3844
3846
3848
3850

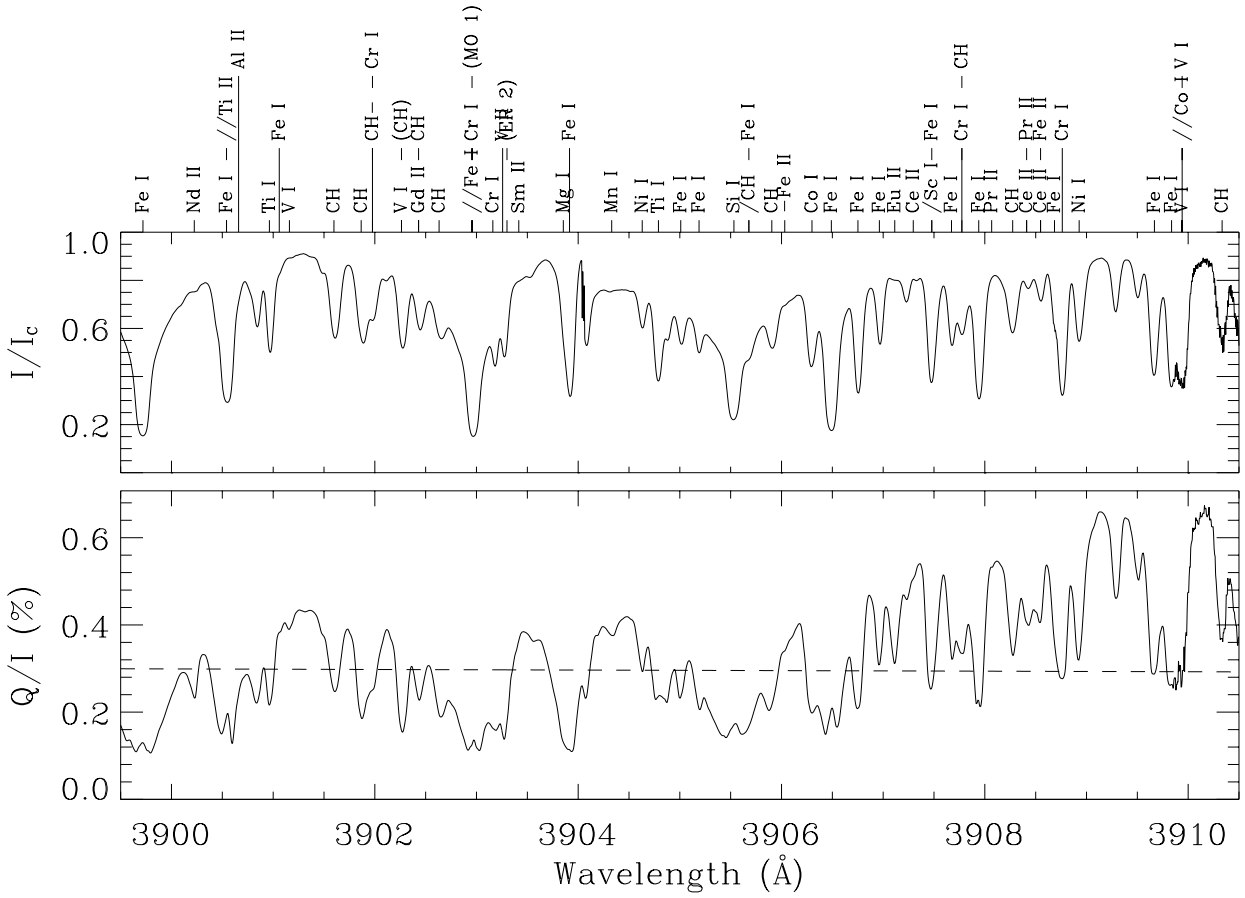

I/I_c
Q/I (%)
Wavelength (Å)
3850
3852
3854
3856
3858
3860

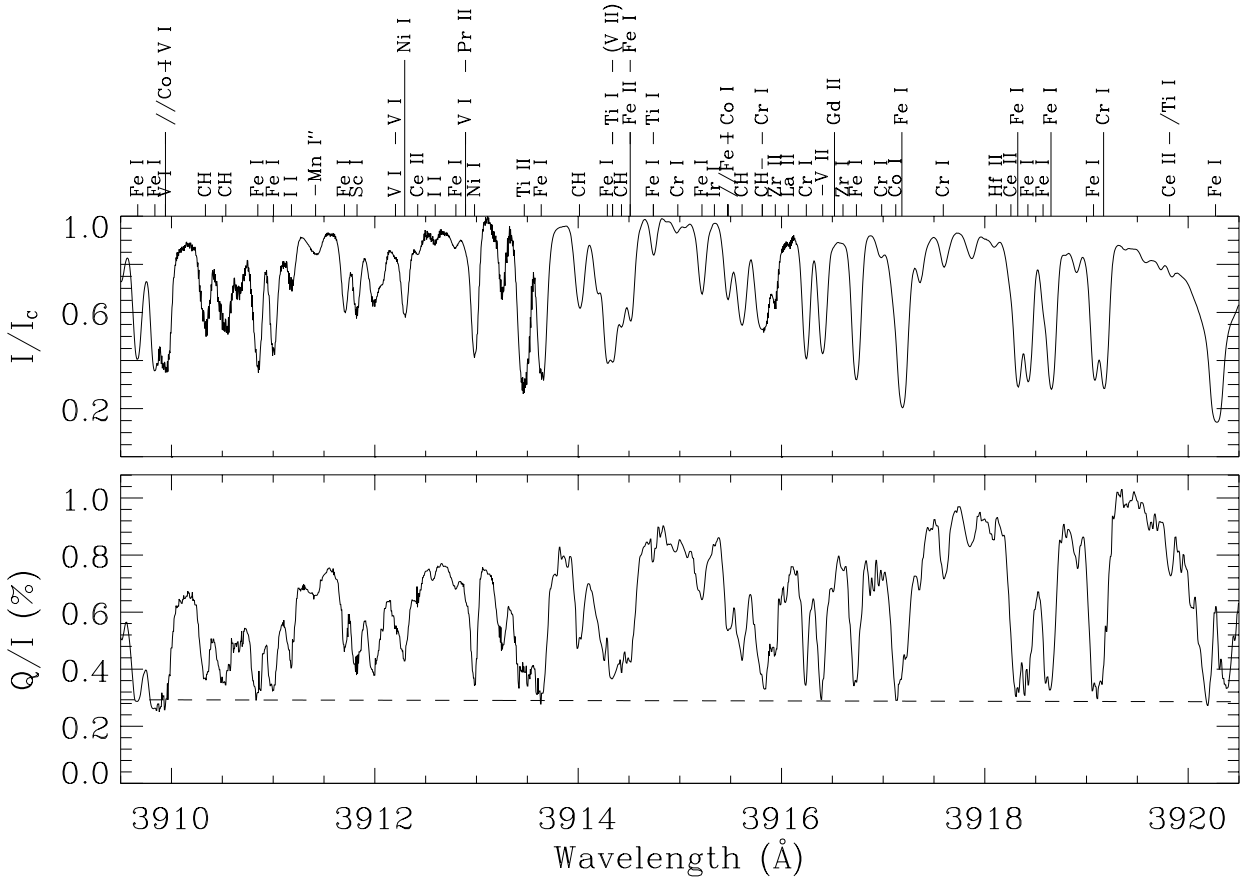

I/I_c
Q/I (%)
Wavelength (Å)
3860
3862
3864
3866
3868
3870

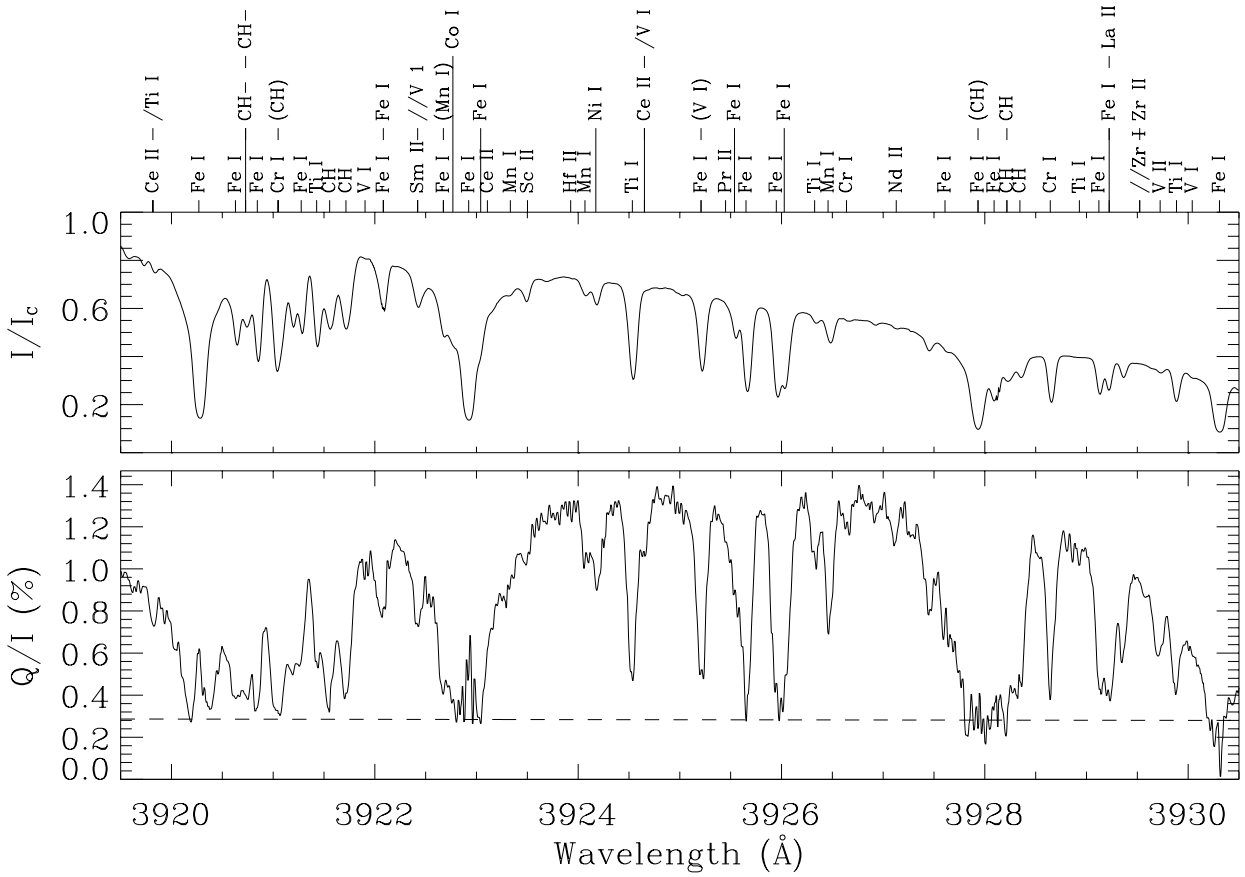

I/I_c
Q/I (%)
Wavelength (Å)
3870
3872
3874
3876
3878
3880

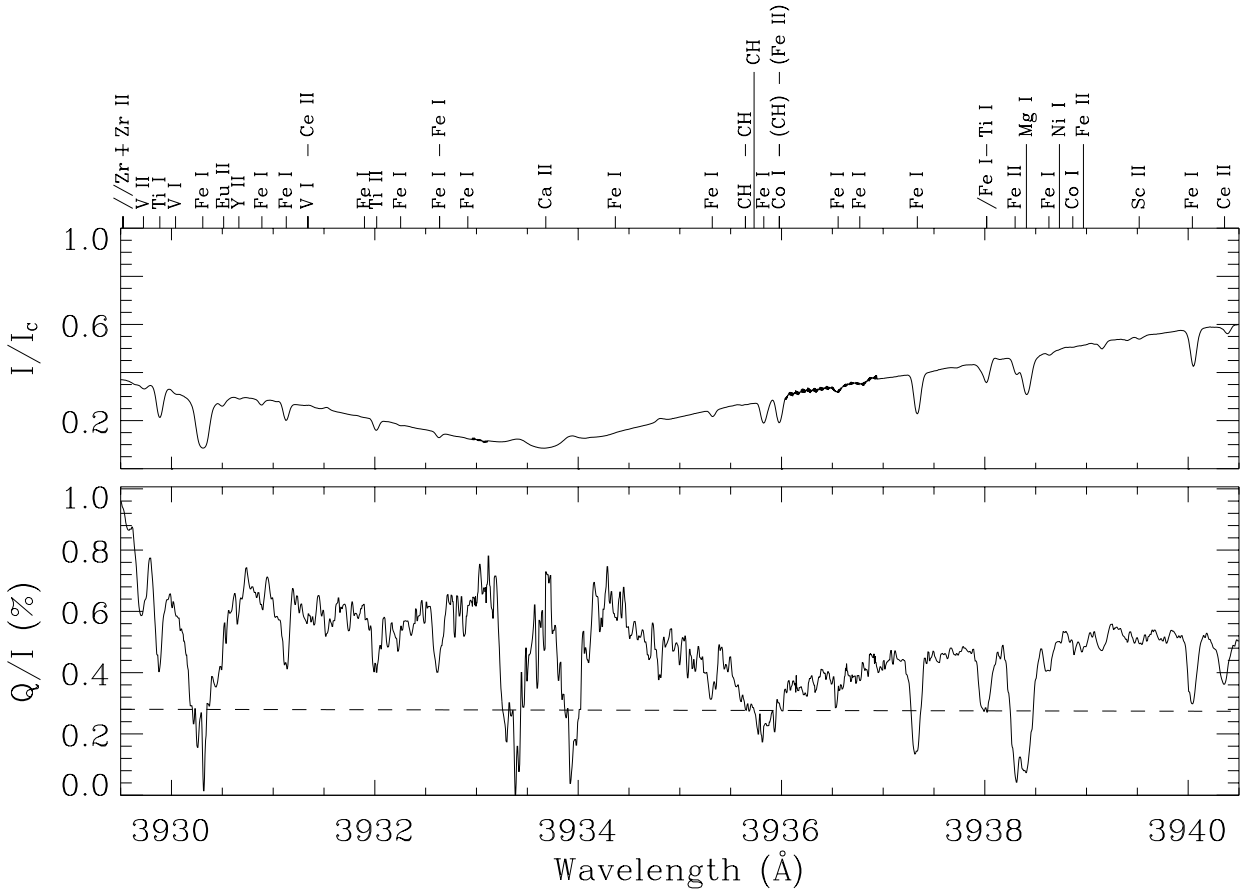

I/I_c
Q/I (%)
Wavelength (Å)
3880
3882
3884
3886
3888
3890

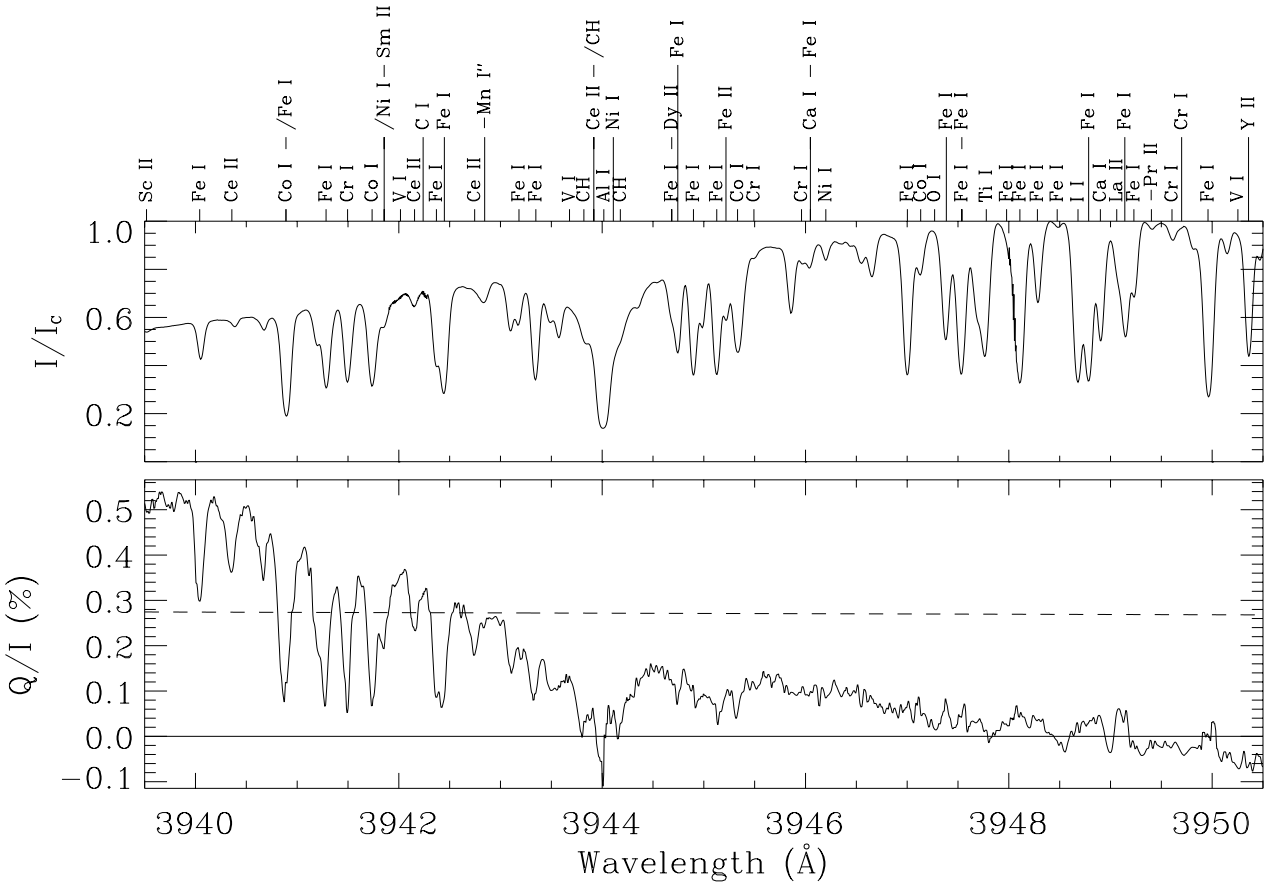

Ni I
CH
Fe I
/Ti I
Sm II
V I
Zr I
Fe I
/CH
Nd II
Ni I
Fe I
Nd II
CH
Zr I
Ba II
Fe I
(MG 1)
Co I
Fe I
Fe I
CH
Fe I
V I
(CH)
CH
Fe I
Fe I
Fe I
/Cr I
Co I
Pd I
Fe I
Nd II
Gd II
Co I
CH
Ce II
CH
Ti I
CH
Fe I
/CH
Mg I
Fe I
(MG 1)
V I
/V II
ER 2''
Zr I
CH''
Fe I
Ni I
(Ce II)
Sm II
V I
Ti I
Fe I
(CH)
Cr I
Fe I
Fe I
CH
V I
Ce II
/Ti I
Co I
CH
Dy II
Fe I
Fe I
V II
Mn I
Fe I
Nd II
1.0
0.6
0.2
I/I$_c$
0.4
0.3
0.2
0.1
0.0
Q/I (%)
3890
3892
3894
3896
3898
3900
Wavelength (Å)

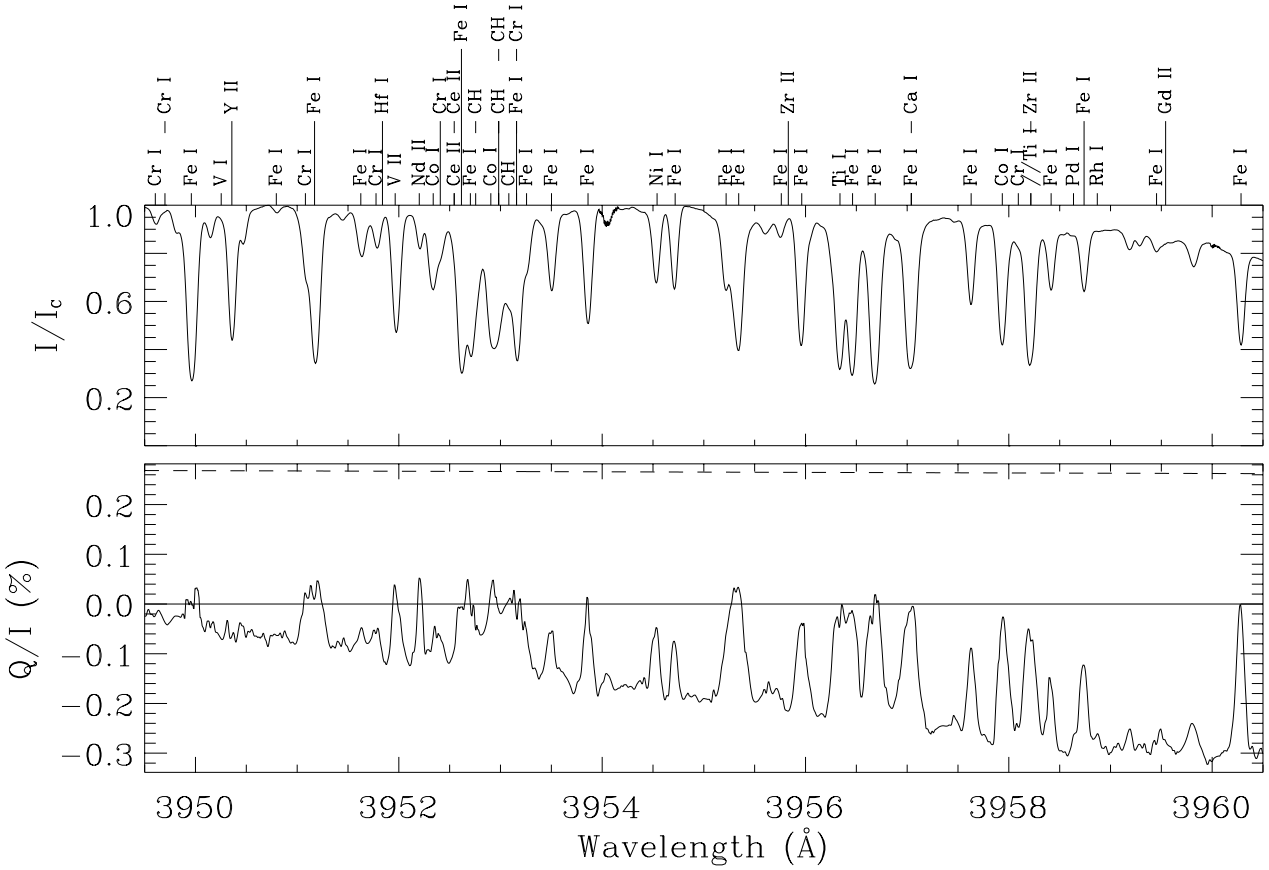

Fe I
Nd II
Fe I – //Ti II
Al II
Ti I
Fe I
V I
CH
CH
CH– – Cr I
V I – (CH)
Gd II – CH
CH
//Fe + Cr I – (MO 1)
Cr I
Sm II
Mg I
Fe I
Mn I
Ni I
Ti I
Fe I
Fe I
Si I
/CH – Fe I
CH
Fe II
Co I
Fe I
Fe I
Fe I
Eu II
Ce II
/Sc I – Fe I
Fe I
Cr I – CH
Fe I
Pr II
CH
Ce II – Pr II
Ce II – Fe II
Fe I
Cr I
Ni I
Fe I
Fe I
V I
//Co + V I
CH
1.0
0.6
0.2
I/I$_c$
0.6
0.4
0.2
0.0
Q/I (%)
3900
3902
3904
3906
3908
3910
Wavelength (Å)

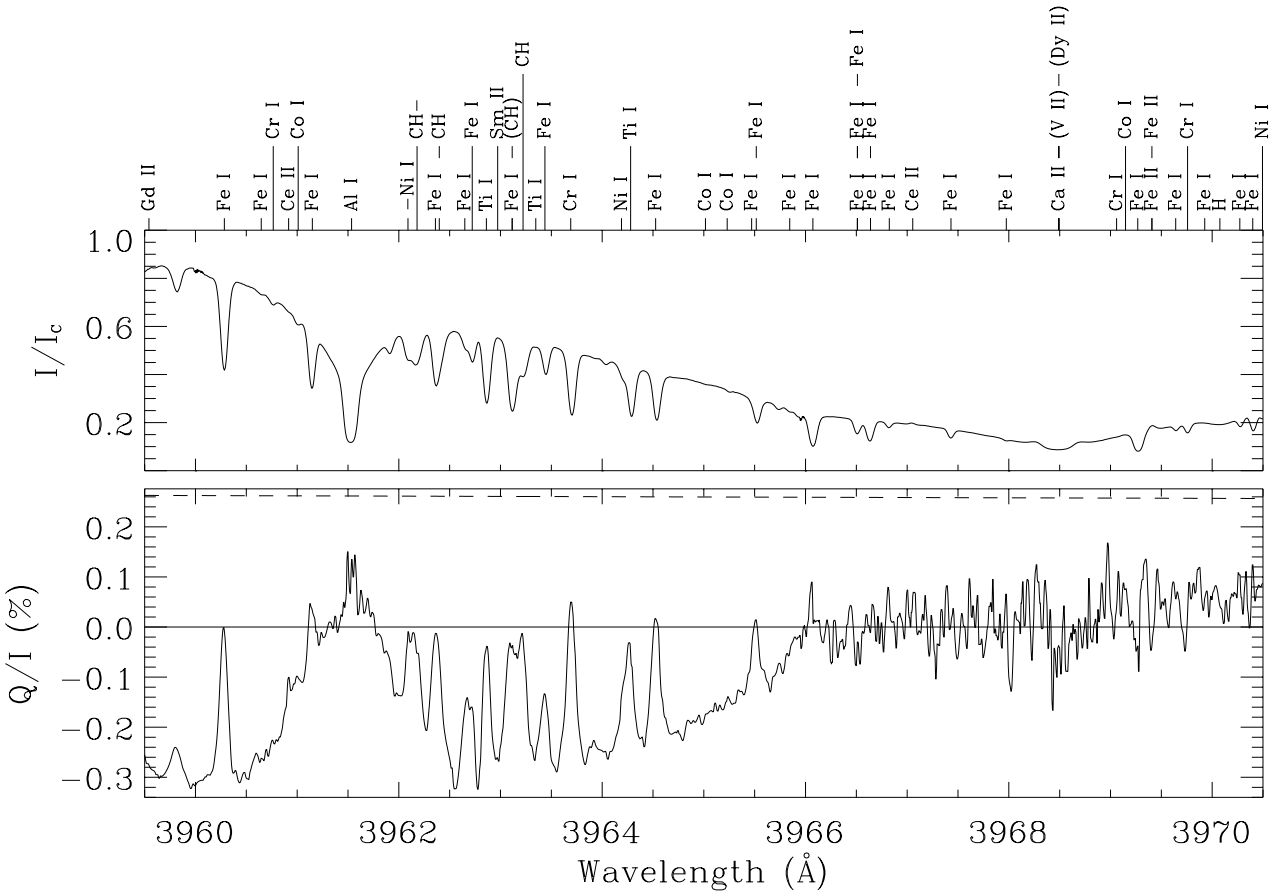

Fe I
Fe I
V I
//Co + V I
CH
CH
Fe I
Fe I
I I
Mn I''
Fe I
Sc I
V I
V I
Ni I
Ce II
I I
Fe I
Ni I
V I
Pr II
Ti II
Fe I
CH
Fe I
Ti I
(V II)
CH
Fe II
Fe I
Fe I
Ti I
Cr I
Fe I
Ir I
Fe + Co I
CH
CH
Cr I
Zr II
La II
Cr I
V II
Gd II
Zr I
Fe I
Cr I
Co I
Fe I
Cr I
Hf II
Ce II
Fe I
Fe I
Fe I
Fe I
Cr I
Ce II
Ti I
Fe I
1.0
0.6
0.2
I/I$_c$
1.0
0.8
0.6
0.4
0.2
0.0
Q/I (%)
3910
3912
3914
3916
3918
3920
Wavelength (Å)

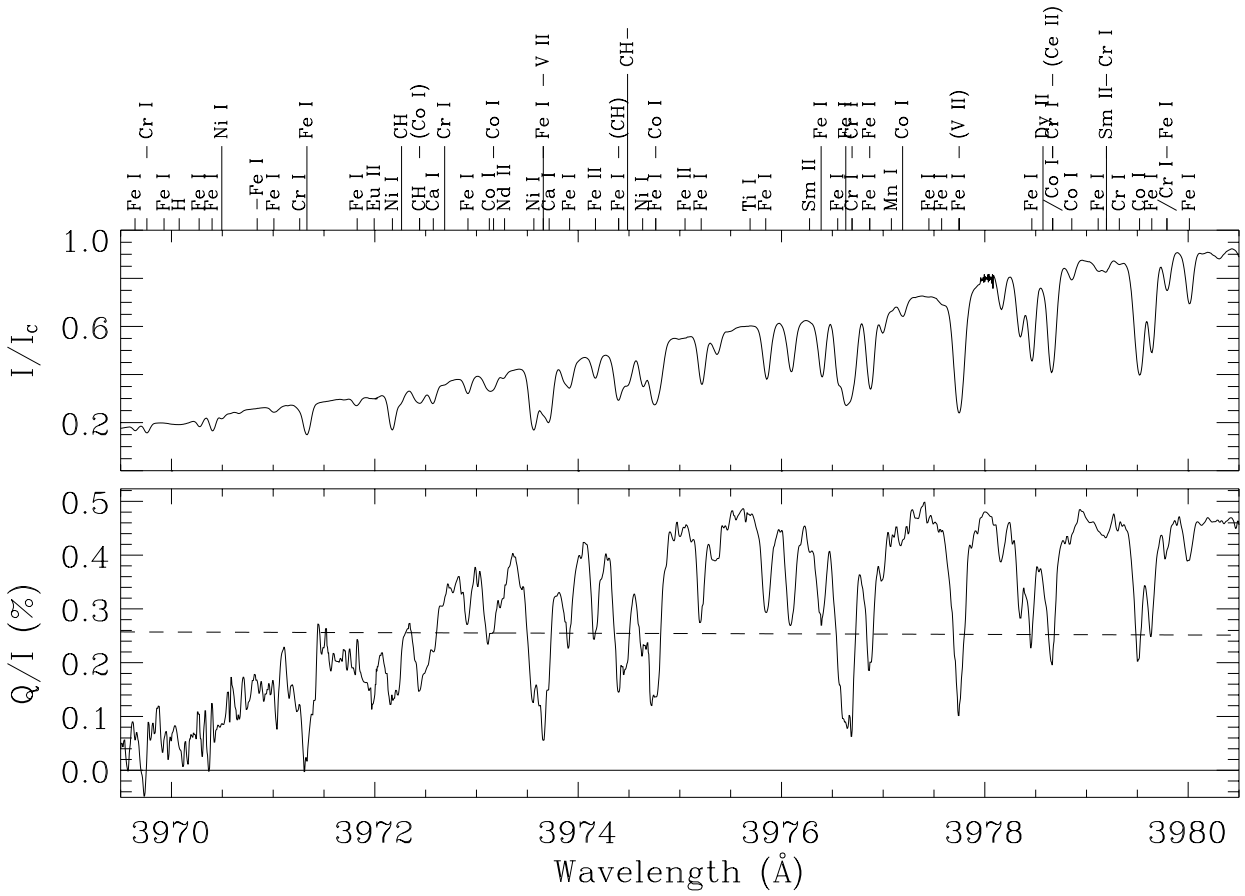

Ce II – /Ti I
Fe I
Fe I
CH– – CH–
Fe I
Cr I – (CH)
Fe I
Ti I
CH
CH
V I
Fe I – Fe I
Sm II– //V 1
Fe I – (Mn I) Co I
Fe I
Ce II
Mn I
Sc II
Hf II
Mn I
Ni I
Ti I
Ce II – /V I
Fe I – (V I)
Pr II
Fe I
Fe I
Fe I
Ti I
Mn I
Cr I
Nd II
Fe I
Fe I – (CH)
Fe I
CH
CH
CH
Cr I
Ti I
Fe I
Fe I – La II
//Zr + Zr II
V II
Ti I
V I
Fe I
I/I$_c$
1.0
0.6
0.2
Q/I (%)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
3920
3922
3924
3926
3928
3930
Wavelength (Å)

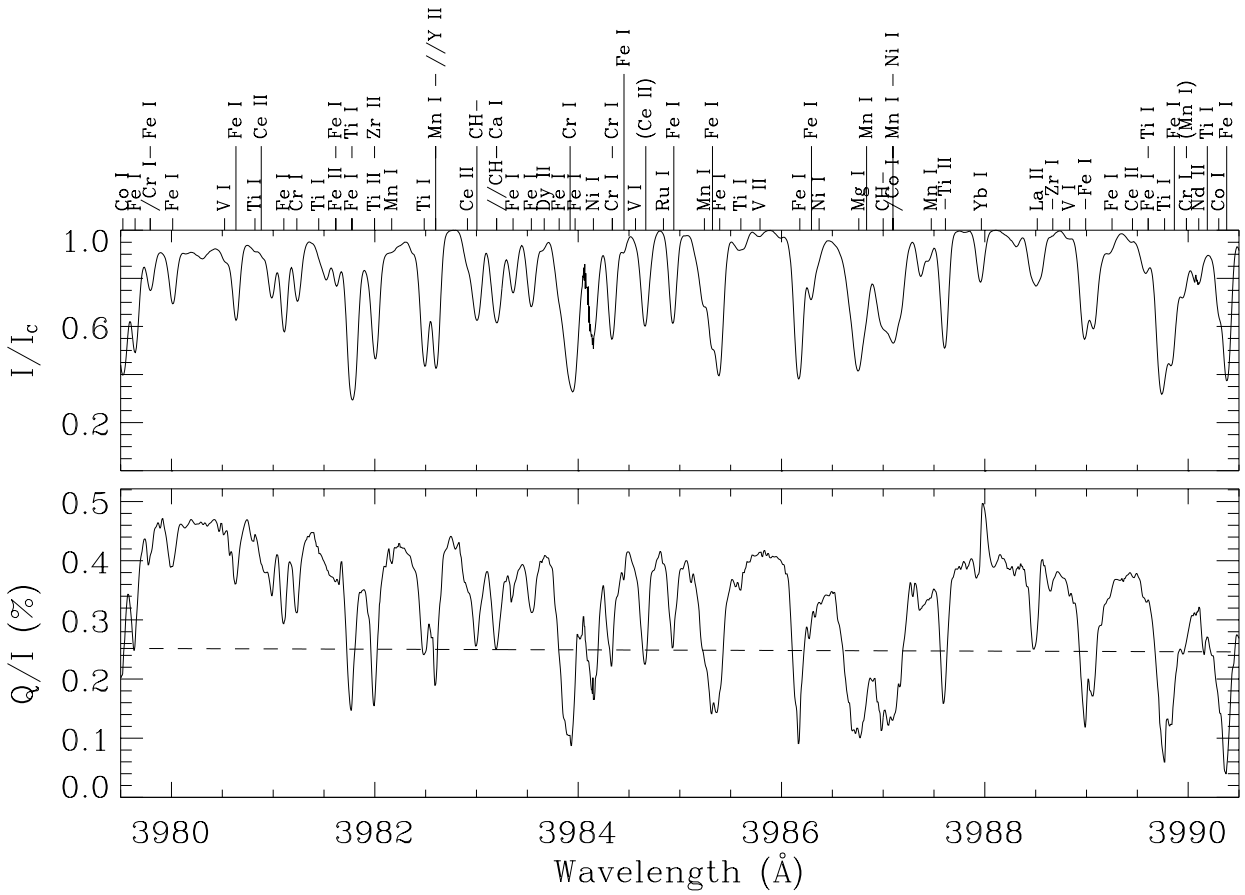

//Zr + Zr II
V II
Ti I
V I
Fe I
Eu II
Y II
Fe I
Fe I
V I
Ce II
Fe I
Ti II
Fe I
Fe I
Fe I
Ca II
Fe I
Fe I
CH
CH
CH
Fe I
Co I
(CH)
(Fe II)
Fe I
Fe I
Fe I
/Fe I
Ti I
Fe II
Mg I
Fe I
Ni I
Co I
Fe II
Sc II
Fe I
Ce II
1.0
0.6
0.2
I/I_c
1.0
0.8
0.6
0.4
0.2
0.0
Q/I (%)
3930
3932
3934
3936
3938
3940
Wavelength (Å)

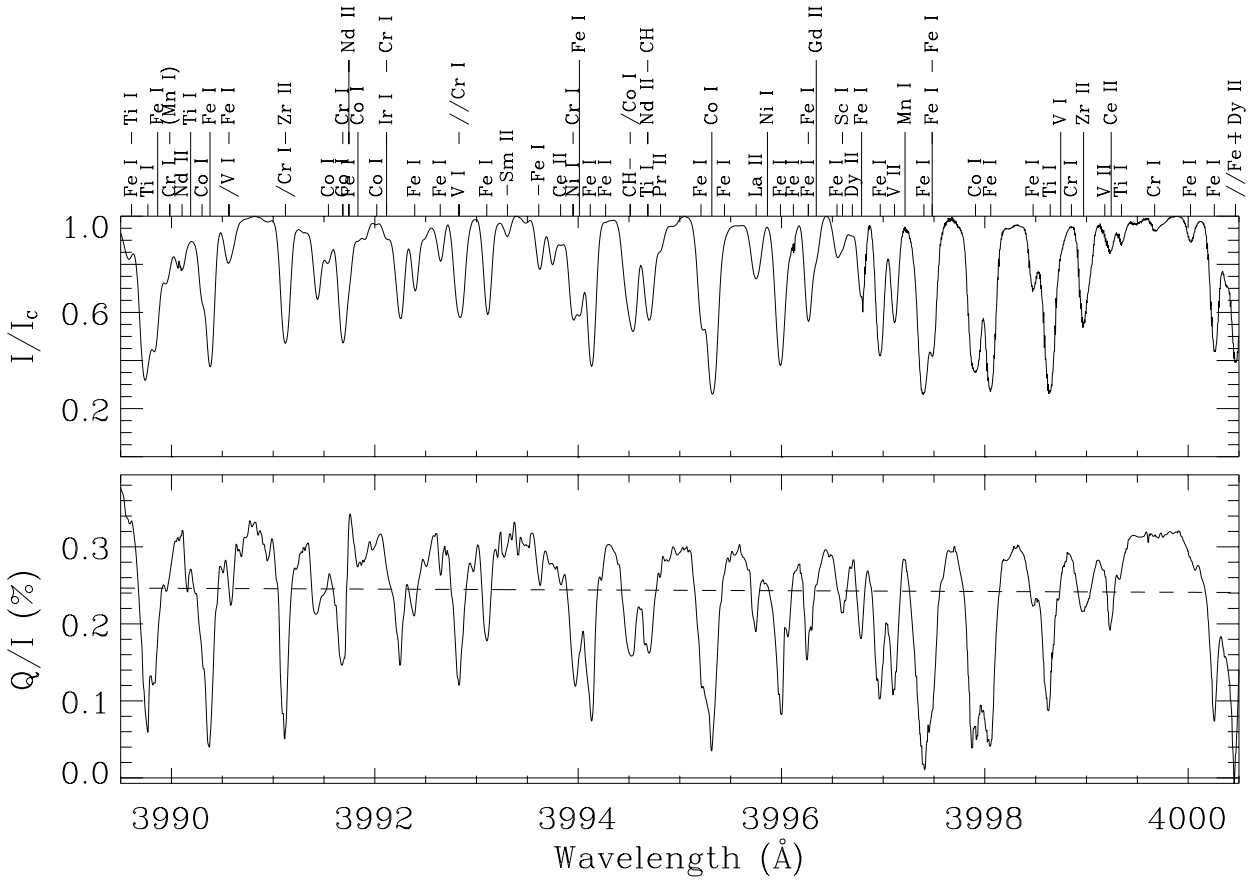

Sc II
Fe I
Ce II
Co I – /Fe I
Fe I
Cr I
Co I
/Ni I – Sm II
V I
Ce II
C I
Fe I
Fe I
Ce II – /Mn I"
Fe I
Fe I
V I
CH
Ce II – /CH
Al I
Ni I
CH
Fe I – Dy II – Fe I
Fe I
Fe I
Fe II
Co I
Cr I
Cr I
Ca I – Fe I
Ni I
Fe I
Co I
O I
Fe I
Fe I
Ti I
Fe I
Fe I
Fe I
Fe I
I I
Fe I
Ca I
La II
Fe I
Fe I
Pr II
Cr I
Cr I
Fe I
V I
Y II
1.0
0.6
0.2
I/I_c
0.5
0.4
0.3
0.2
0.1
0.0
−0.1
Q/I (%)
3940
3942
3944
3946
3948
3950
Wavelength (Å)

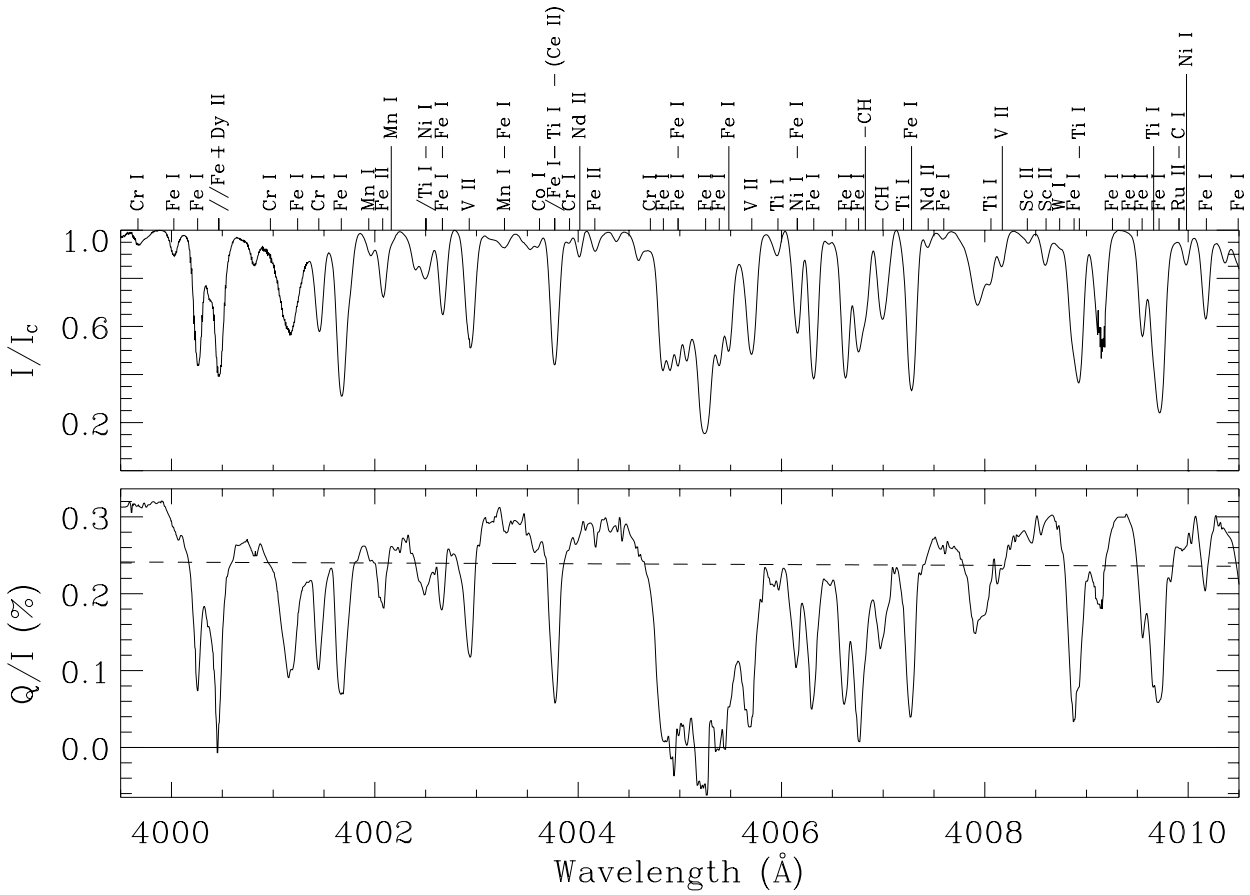

Cr I
Fe I
V I
Y II
Fe I
Cr I
Fe I
Cr I
Hf I
V II
Nd II
Co I
Cr I
Ce II
Ce II
Fe I
Fe I
CH
Co I
CH
CH
Fe I
Cr I
Fe I
Fe I
Fe I
Ni I
Fe I
Fe I
Fe I
Fe I
Zr II
Fe I
Ti I
Fe I
Fe I
Fe I
Ca I
Fe I
Co I
Cr I
Ti I
Zr II
Fe I
Pd I
Rh I
Fe I
Gd II
Fe I
1.0
0.6
0.2
I/I_c
0.2
0.1
0.0
−0.1
−0.2
−0.3
Q/I (%)
3950
3952
3954
3956
3958
3960
Wavelength (Å)

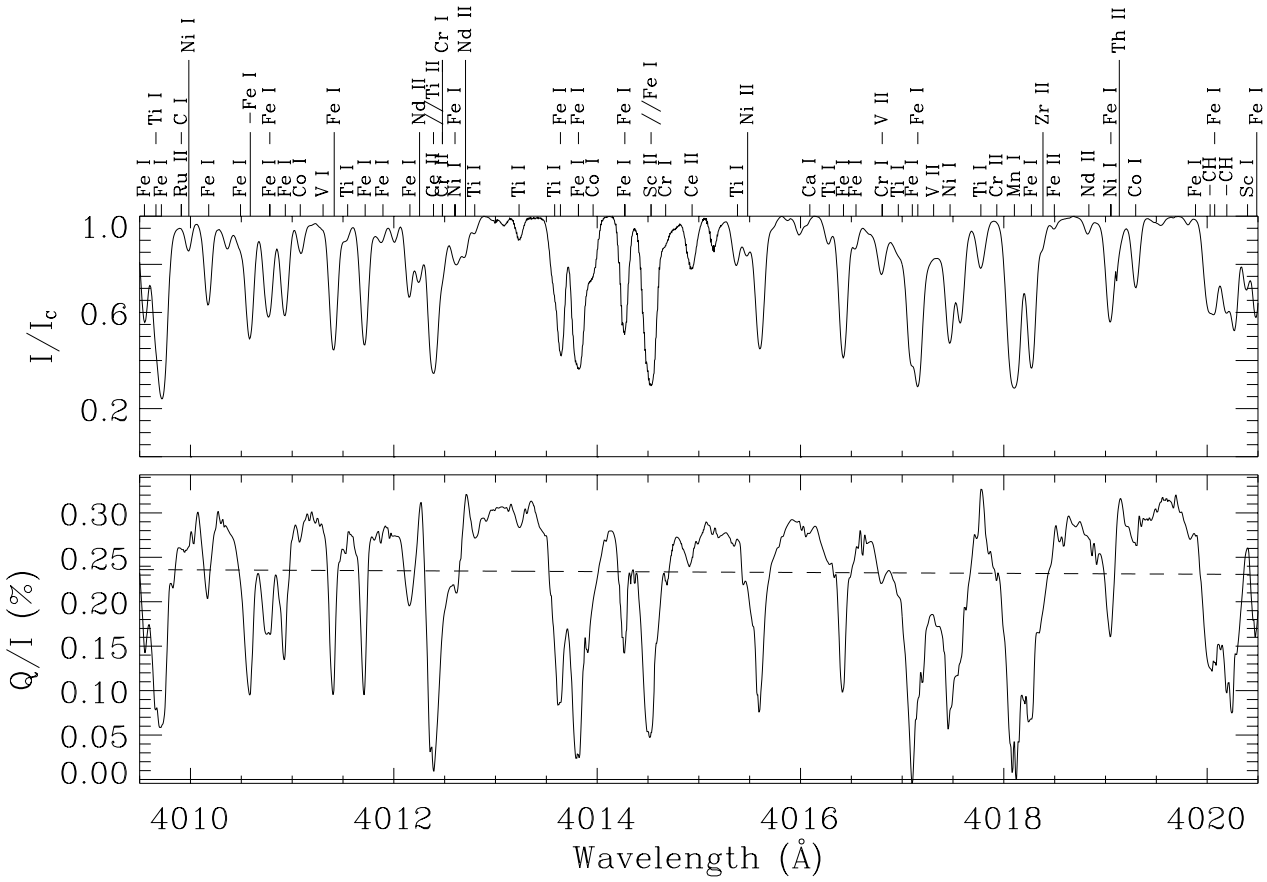

Gd II
Fe I
Fe I
Cr I
Ce II
Co I
Fe I
Al I
Ni I
CH
Fe I
CH
Fe I
Ti I
Sm II
(CH)
CH
Fe I
Ti I
Cr I
Ni I
Ti I
Fe I
Co I
Co I
Fe I
Fe I
Fe I
Fe I
Fe I
Fe I
Fe I
Fe I
Ce II
Fe I
Fe I
Ca II
(V II)
(Dy II)
Cr I
Co I
Fe I
Fe II
Fe I
Cr I
Fe I
H
Fe I
Fe I
Ni I
1.0
0.6
0.2
I/I_c
0.2
0.1
0.0
−0.1
−0.2
−0.3
Q/I (%)
3960
3962
3964
3966
3968
3970
Wavelength (Å)

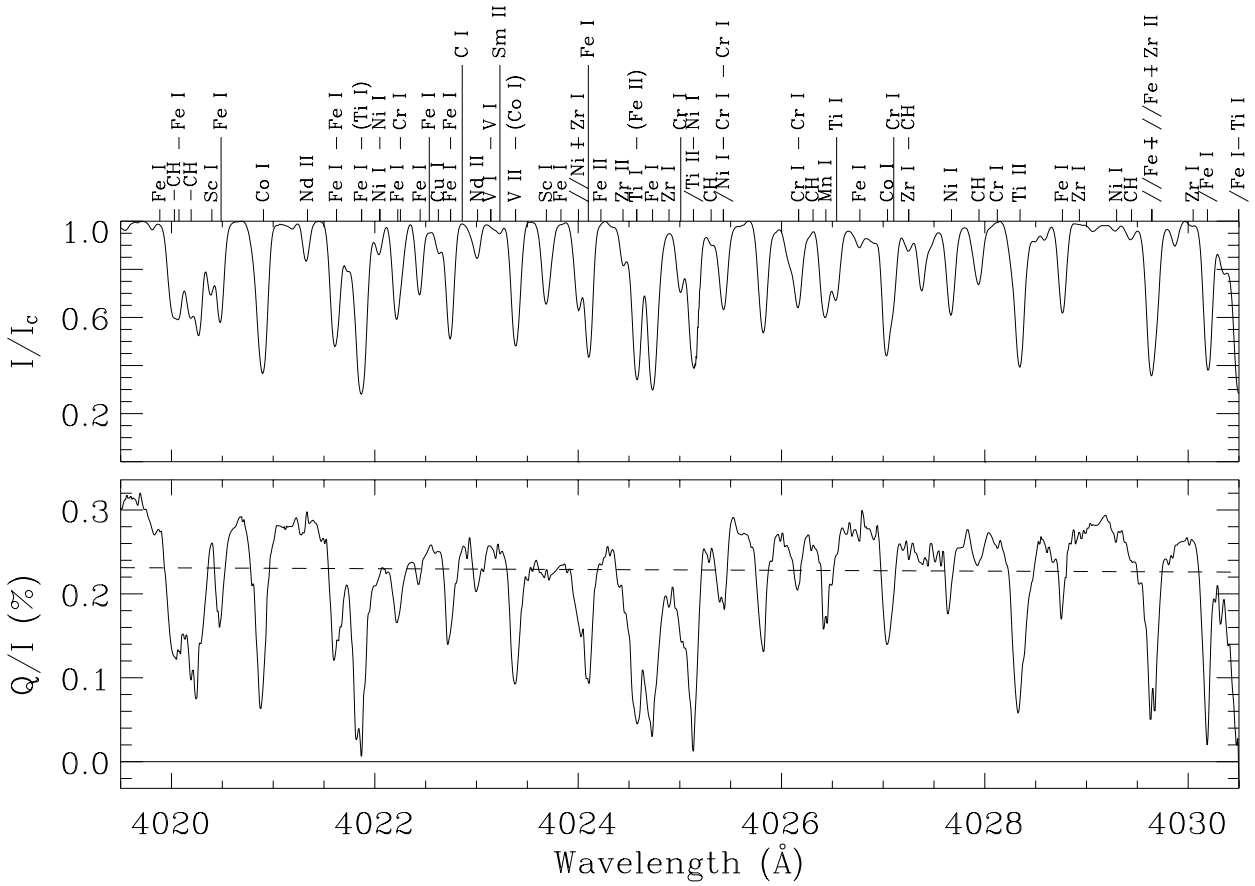

Fe I
Cr I
Fe I
H
Fe I
Fe I
Ni I
Fe I
Fe I
Cr I
Fe I
Fe I
Eu II
Ni I
CH
(Co I)
CH
Ca I
Cr I
Fe I
Co I
Co I
Nd II
Ni I
Fe I
V II
Ca I
Fe I
Fe II
Fe I
(CH)
CH
Ni I
Fe I
Co I
Fe II
Fe I
Ti I
Fe I
Sm II
Fe I
Fe I
Cr I
Fe I
Fe I
Mn I
Co I
Fe I
Fe I
Fe I
(V II)
Fe I
Dy II
(Ce II)
Co I
Co I
Fe I
Sm II
Cr I
Cr I
Co I
Fe I
Cr I
Fe I
I/I$_c$
1.0
0.6
0.2
Q/I (%)
0.5
0.4
0.3
0.2
0.1
0.0
3970
3972
3974
3976
3978
3980
Wavelength (Å)

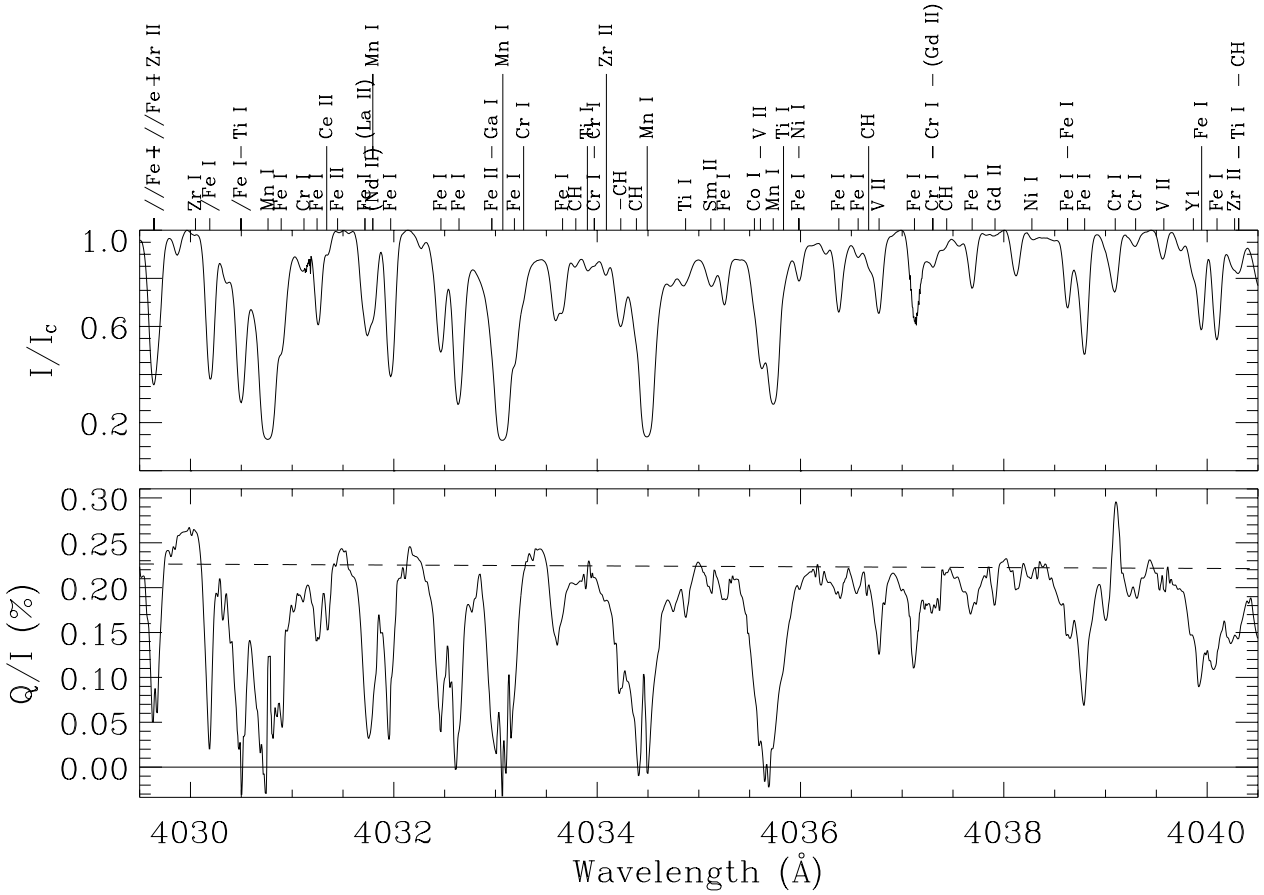

Co I
Fe I
/Cr I – Fe I
Fe I
V I
Fe I
Ti I
Ce II
Fe I
Cr I
Ti I
Fe II – Fe I
Fe I – Ti I
Ti II – Zr II
Mn I
Ti I
Mn I – //Y II
Ce II
CH–
//CH– Ca I
Fe I
Fe I
Dy II
Fe I
Fe I
Cr I
Ni I
Cr I – Cr I
Fe I
V I
(Ce II)
Ru I
Fe I
Mn I
Fe I
Fe I
Ti I
V II
Fe I
Ni I
Fe I
Mg I
Mn I
CH–
Co I – Mn I – Ni I
Mn I
–Ti II
Yb I
La II
Zr I
V I
–Fe I
Fe I
Ce II
Fe I – Ti I
Ti I
Fe I
Cr I – (Mn I)
Nd II
Ti I
Co I
Fe I
1.0
0.6
0.2
I/I$_c$
0.5
0.4
0.3
0.2
0.1
0.0
Q/I (%)
3980
3982
3984
3986
3988
3990
Wavelength (Å)

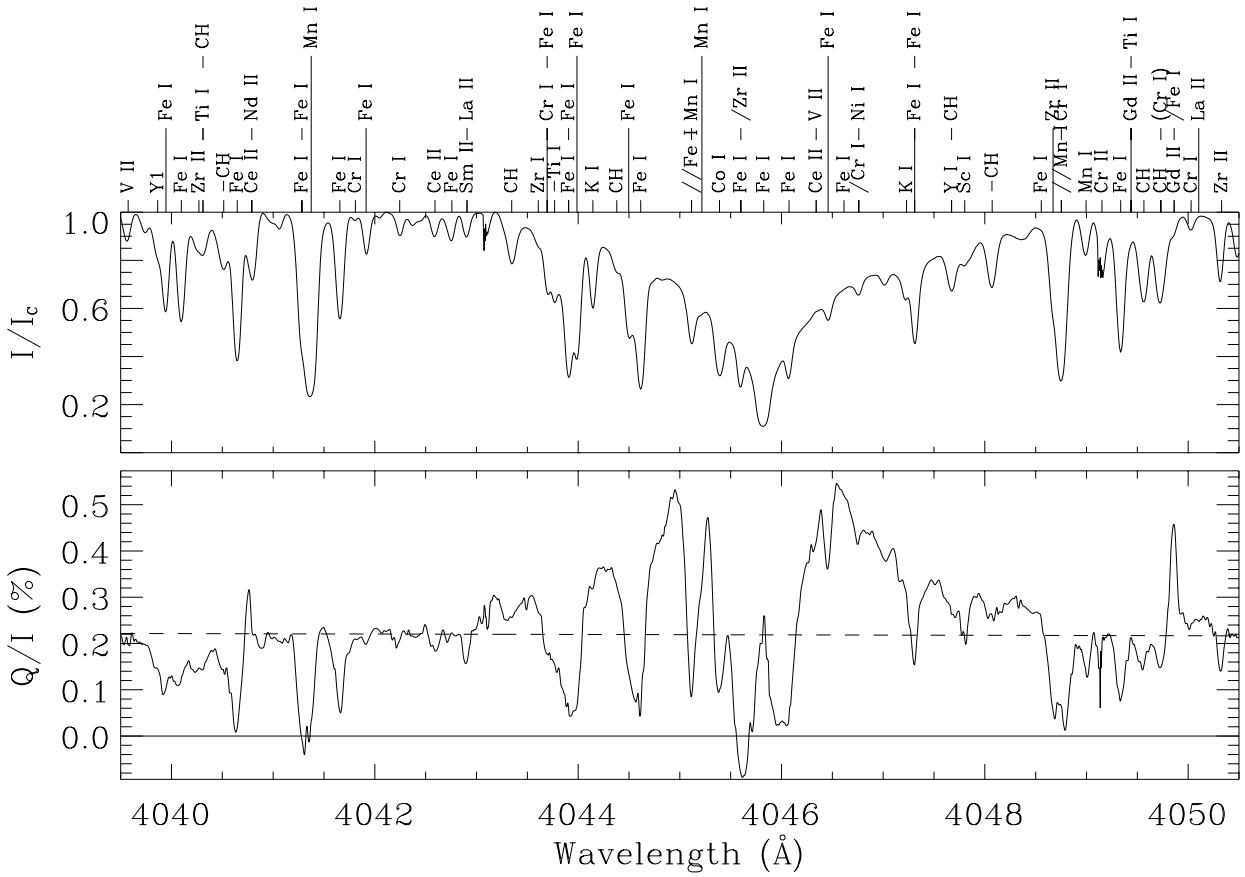

Fe I
Ti I
Cr I
(Mn I)
Nd II
Ti I
Co I
Fe I
/V I
Fe I
/Cr I
Zr II
Co I
Cr I
Nd II
Fe I
Co I
Ir I
Cr I
Fe I
Fe I
V I
//Cr I
Fe I
Sm II
Fe I
Ce II
Ni I
Cr I
Fe I
Fe I
Fe I
CH
/Co I
Ti I
Nd II
Pr II
CH
Fe I
Co I
Fe I
La II
Ni I
Fe I
Fe I
Fe I
Gd II
Fe I
Sc I
Dy II
Fe I
Fe I
V II
Mn I
Fe I
Fe I
Co I
Fe I
Fe I
Ti I
V I
Cr I
Zr II
V II
Ce II
Ti I
Cr I
Fe I
Fe I
//Fe I
Dy II
1.0
0.6
0.2
I/I_c
0.3
0.2
0.1
0.0
Q/I (%)
3990
3992
3994
3996
3998
4000
Wavelength (Å)

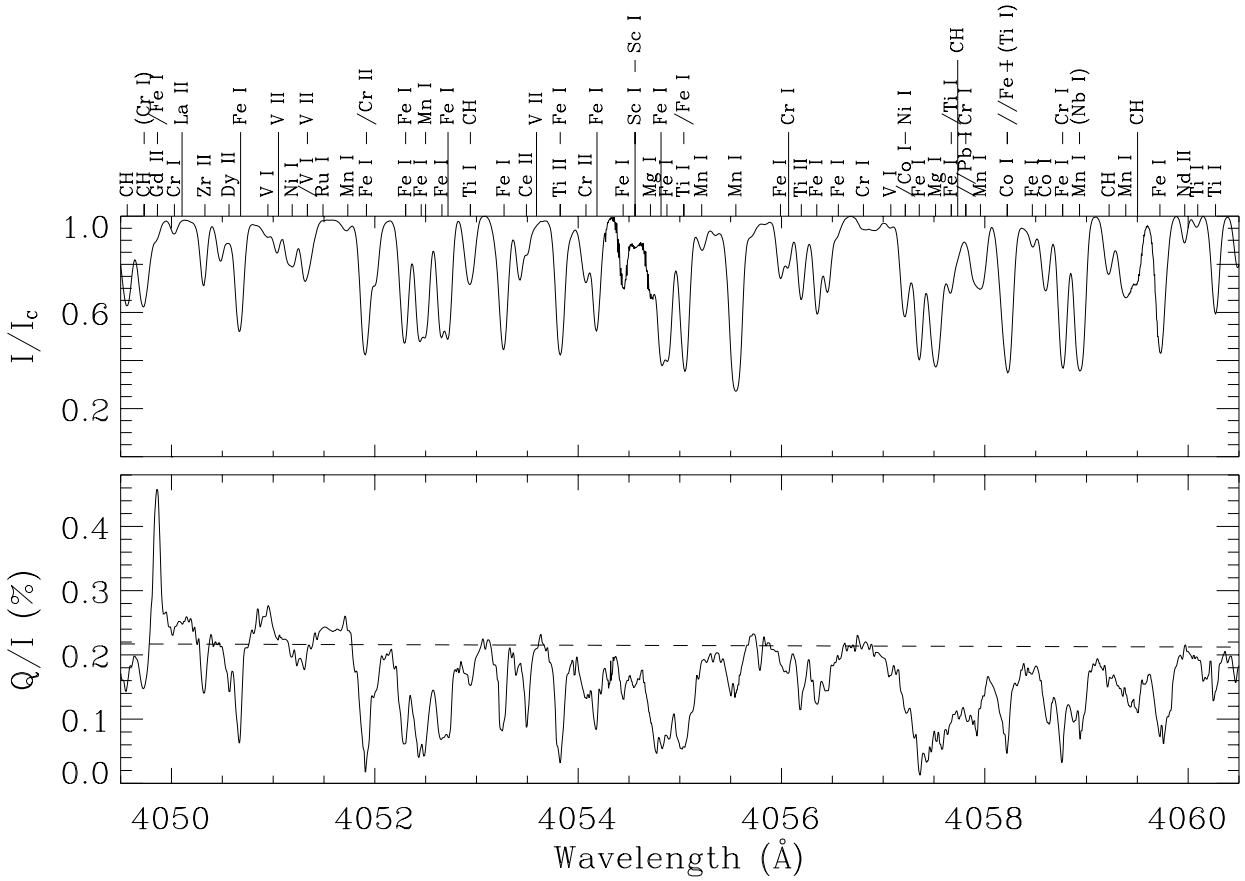

Cr I
Fe I
Fe I
Fe I + Dy II
Cr I
Fe I
Cr I
Fe I
Mn I
Fe II
Mn I
Ti I
Ni I
Fe I
V II
Mn I
Fe I
Co I
Fe I
Ti I
(Ce II)
Cr I
Nd II
Fe II
Cr I
Fe I
Fe I
Fe I
Fe I
Fe I
V II
Ti I
Ni I
Fe I
Fe I
Fe I
Fe I
CH
Ti I
Fe I
Nd II
Fe I
Ti I
V II
Sc II
Sc II
W I
Fe I
Ti I
Fe I
Fe I
Fe I
Fe I
Ti I
Ru II
C I
Ni I
Fe I
Fe I
1.0
0.6
0.2
I/I$_c$
0.3
0.2
0.1
0.0
Q/I (%)
4000
4002
4004
4006
4008
4010
Wavelength (Å)

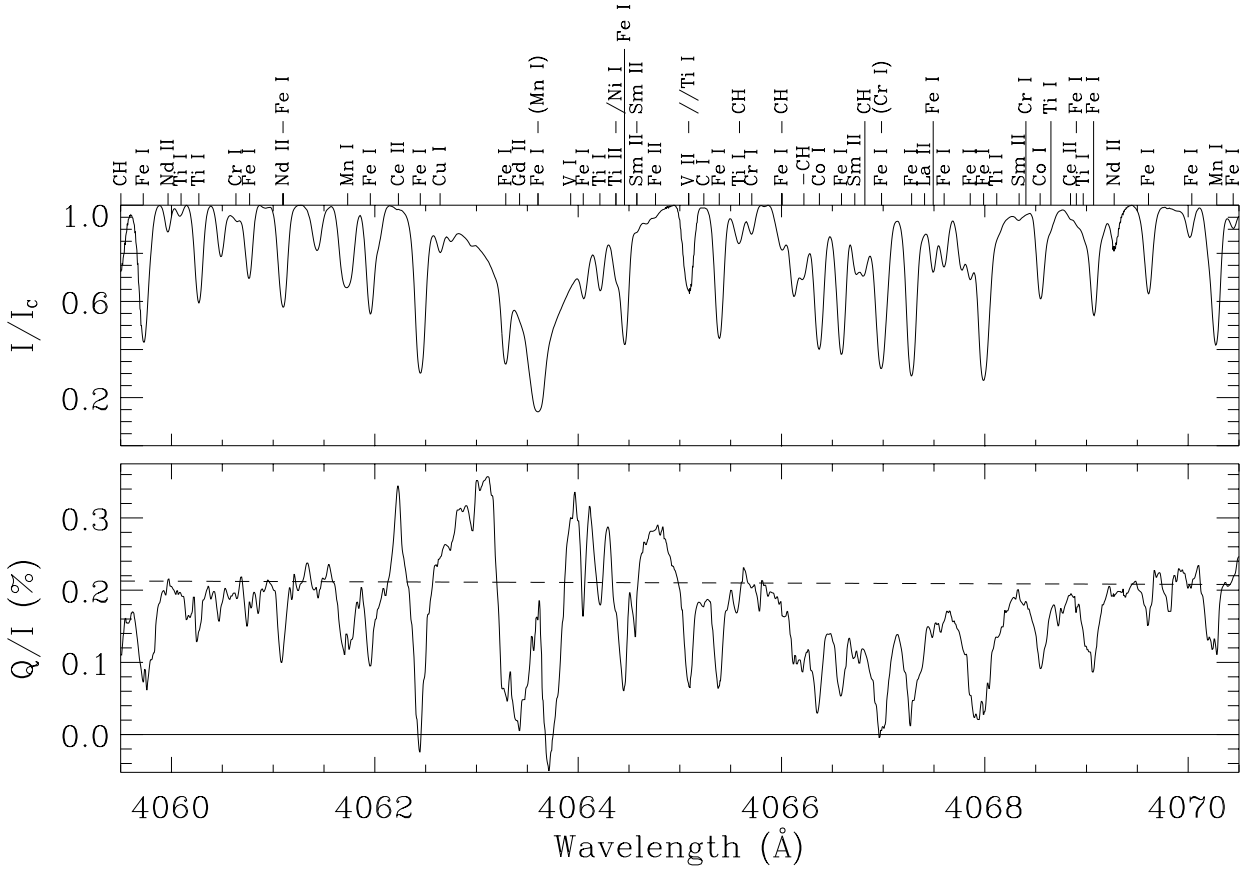

Fe I
Fe I
Ti I
Ru II
C I
Ni I
Fe I
Fe I
Fe I
Fe I
Fe I
Co I
V I
Fe I
Ti I
Fe I
Fe I
Fe I
Nd II
Ce II
Cr I
Ni I
Fe I
Nd II
Ti I
Ti I
Ti I
Fe I
Fe I
Co I
Fe I
Fe I
Sc II
Cr I
Fe I
Ce II
Ti I
Ni II
Ca I
Ti I
Fe I
Fe I
Cr I
V II
Ti I
Fe I
Fe I
V II
Ni I
Ti I
Cr II
Mn I
Fe I
Fe II
Zr II
Nd II
Ni I
Fe I
Th II
Co I
Fe I
CH
CH
Fe I
Sc I
1.0
0.6
0.2
I/I_c
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4010
4012
4014
4016
4018
4020
Wavelength (Å)

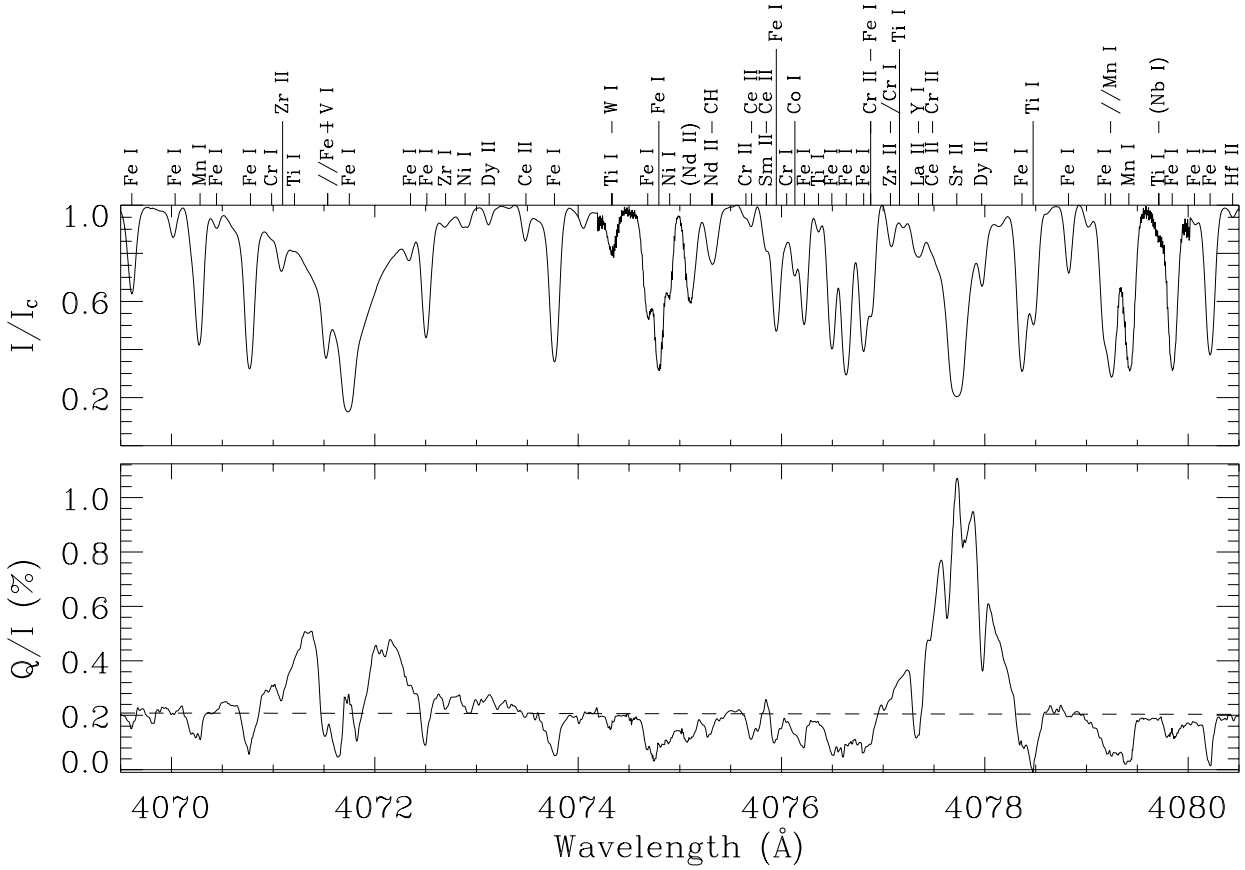

Fe I
CH
CH
Sc I
Fe I
Co I
Nd II
Fe I
Fe I
(Ti I)
Ni I
Ni I
Cr I
Fe I
Fe I
Cu I
Fe I
Fe I
C I
Nd II
V I
V I
Sm II
(Co I)
V II
Sc I
Fe I
//Ni I
Zr I
Fe I
Fe II
Zr II
Ti I
(Fe II)
Fe I
Zr I
Cr I
/Ti II
Ni I
CH
/Ni I
Cr I
Cr I
Cr I
CH
Mn I
Ti I
Fe I
Co I
Cr I
Zr I
CH
Ni I
CH
Cr I
Ti II
Fe I
Zr I
Ni I
CH
//Fe I
//Fe I
Zr II
Zr I
/Fe I
/Fe I
Ti I
1.0
0.6
0.2
I/I_c
0.3
0.2
0.1
0.0
Q/I (%)
4020
4022
4024
4026
4028
4030
Wavelength (Å)

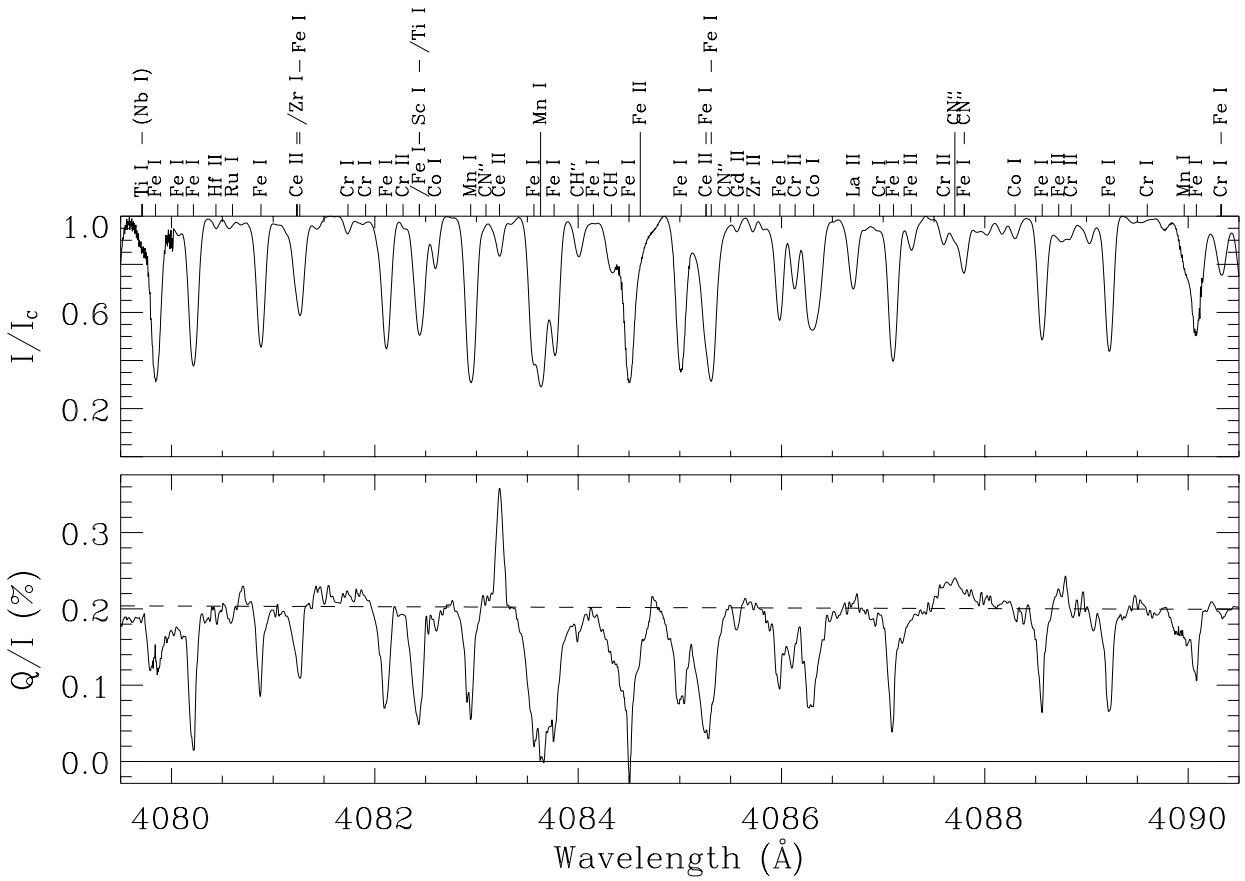

//Fe + //Fe + Zr II
Zr I
/Fe I
/Fe I – Ti I
Mn I
Fe I
Cr I
Fe I
Ce II
Fe II
Fe I
(Nd II)
(La II)
Mn I
Fe I
Fe I
Fe I
Fe II – Ga I
Mn I
Fe I
Cr I
Fe I
CH
Cr I
Ti I
Cr I
Zr II
–CH
CH
Mn I
Ti I
Sm II
Fe I
Co I – V II
Mn I
Ti I
Fe I – Ni I
Fe I
Fe I
CH
V II
Fe I
Cr I – (Gd II)
CH
Fe I
Gd II
Ni I
Fe I – Fe I
Fe I
Cr I
Cr I
V II
Y1
Fe I
Zr II – Ti I – CH
1.0
0.6
0.2
I/I_c
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4030
4032
4034
4036
4038
4040
Wavelength (Å)

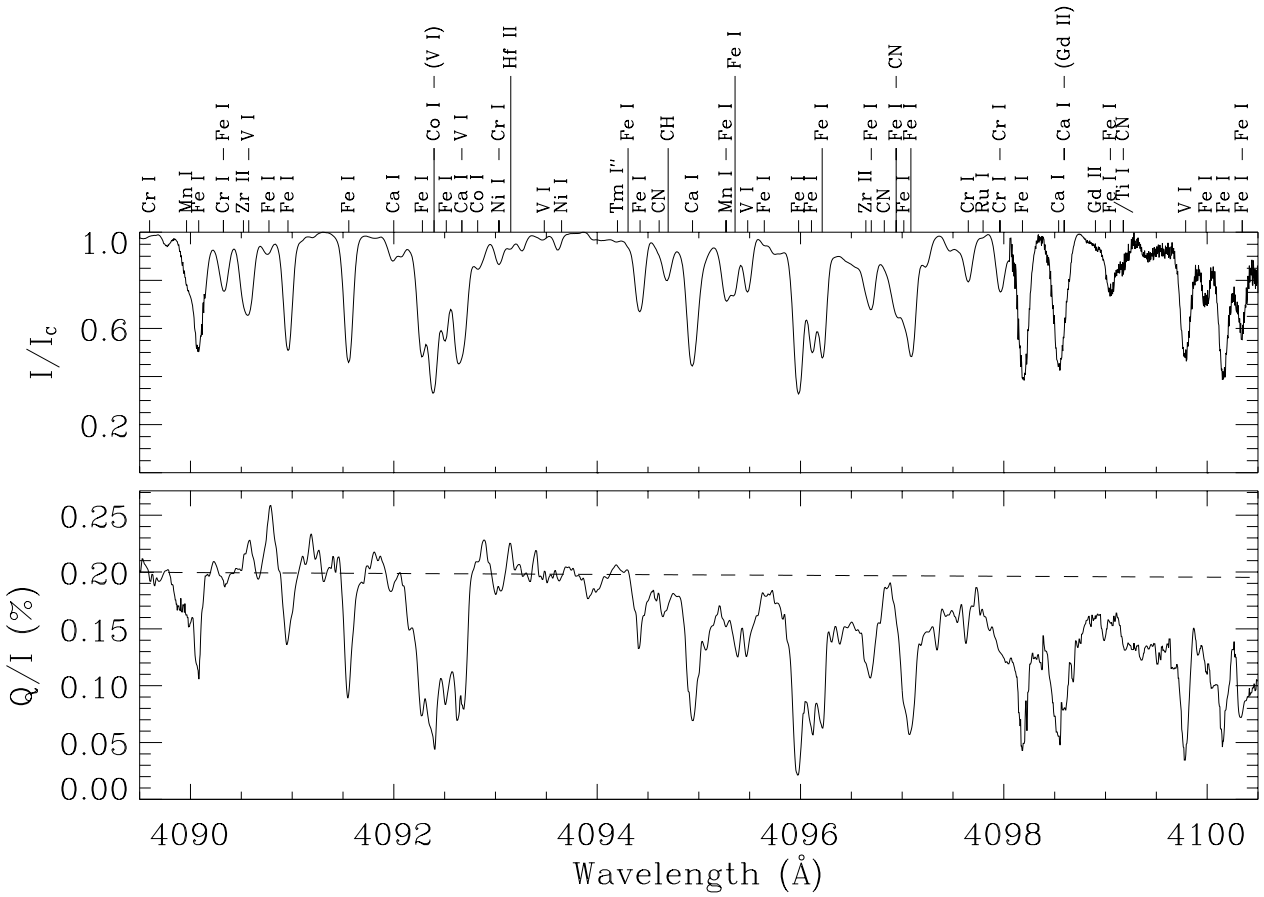

V II
Y1
Fe I
Fe I
Zr II
Ti I
CH
CH
Fe I
Ce II
Nd II
Fe I
Fe I
Mn I
Fe I
Fe I
Cr I
Cr I
Ce II
Fe I
Sm II
La II
CH
Zr I
Cr I
Ti I
Fe I
Fe I
Fe I
K I
CH
Fe I
Fe I
Mn I
Mn I
Co I
Fe I
Zr II
Fe I
Fe I
Ce II
V II
Fe I
Fe I
Cr I
Ni I
K I
Fe I
Fe I
Y I
Sc I
CH
CH
Fe I
Zr II
Mn I
Mn I
Cr II
Fe I
Gd II
Ti I
CH
CH
Gd II
Cr I
Fe I
Cr I
La II
Zr II
1.0
0.6
0.2
I/I$_c$
0.5
0.4
0.3
0.2
0.1
0.0
Q/I (%)
4040
4042
4044
4046
4048
4050
Wavelength (Å)

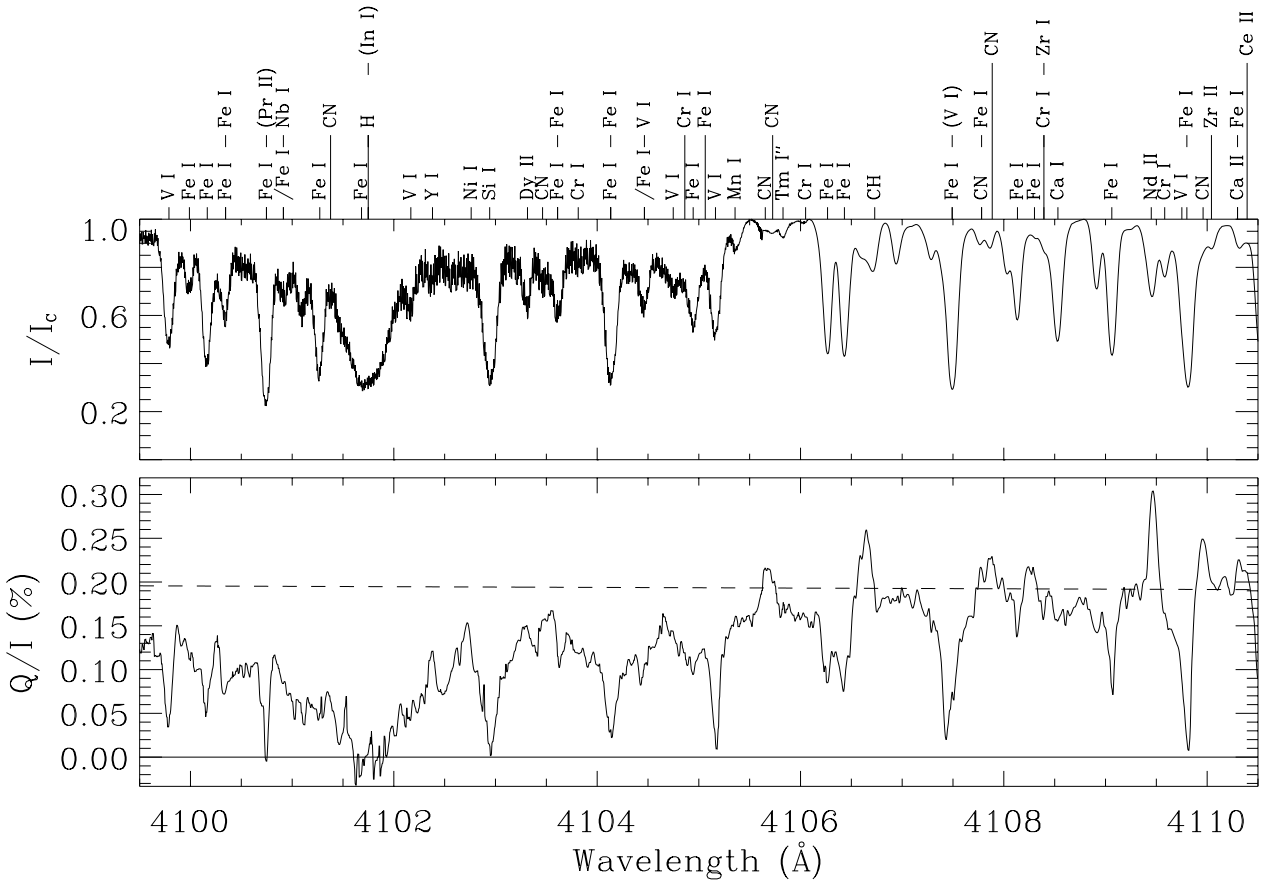

CH
CH
Gd II
Cr I
(Cr I)
Fe I
La II
Zr II
Dy II
Fe I
V I
V II
Ni I
V I
V II
Ru I
Mn I
Fe I
Cr II
Fe I
Fe I
Mn I
Fe I
Ti I
CH
Fe I
Ce II
V II
Ti II
Fe I
Cr II
Fe I
Sc I
Sc I
Mg I
Fe I
Fe I
Ti I
Fe I
Mn I
Mn I
Fe I
Cr I
Ti II
Fe I
Fe I
Cr I
V I
Co I
Ni I
Fe I
Mg I
Fe I
Ti I
CH
Pb I
Cr I
Mn I
Co I
Fe I
(Ti I)
Fe I
Co I
Fe I
Cr I
Mn I
(Nb I)
CH
Mn I
Fe I
Nd II
Ti I
Ti I
1.0
0.6
0.2
I/I$_c$
0.4
0.3
0.2
0.1
0.0
Q/I (%)
4050
4052
4054
4056
4058
4060
Wavelength (Å)

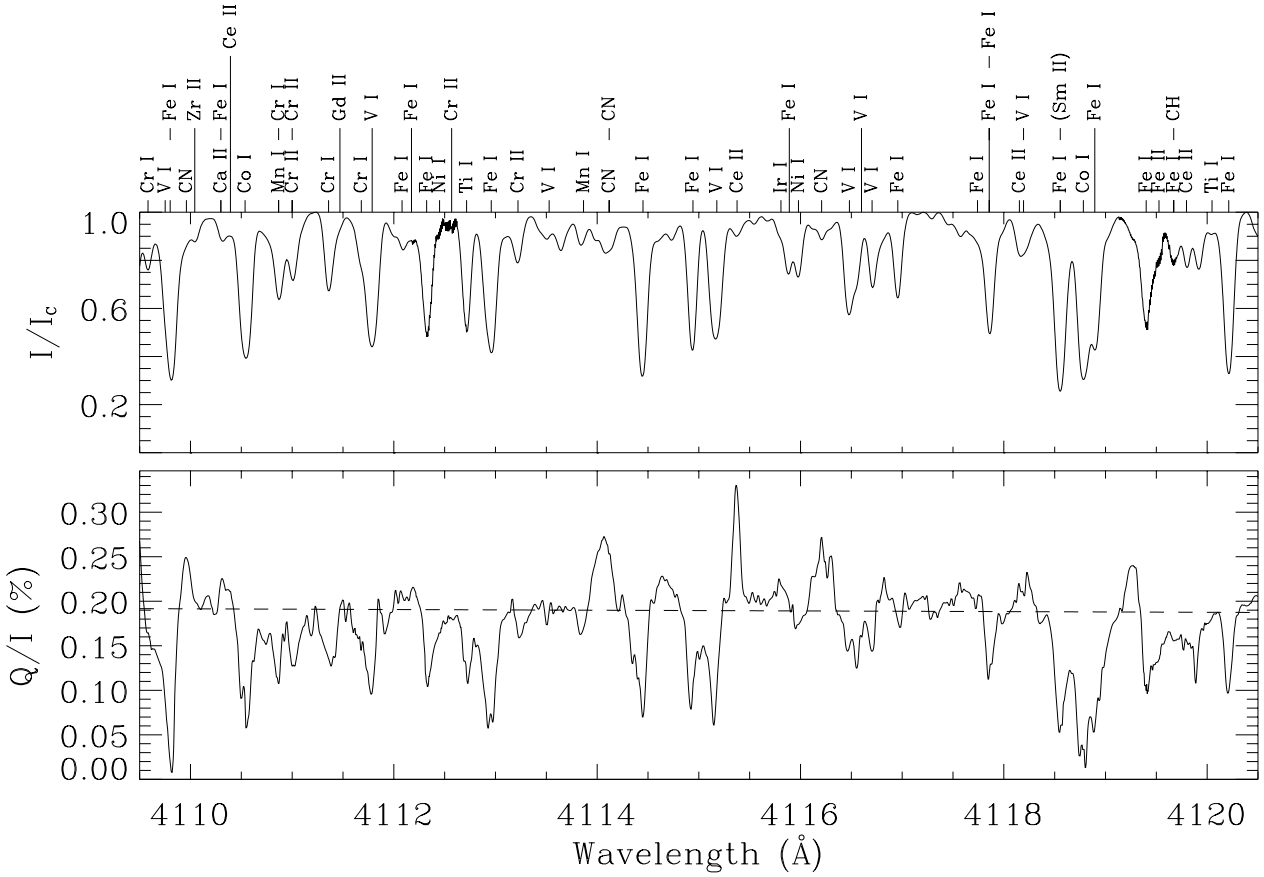

CH
Fe I
Nd II
Ti I
Ti I
Cr I
Fe I
Nd II – Fe I
Mn I
Fe I
Ce II
Fe I
Cu I
Fe I
Gd II
Fe I – (Mn I)
V I
Fe I
Ti I
Ti II – /Ni I
Fe I
Sm II– Sm II
Fe II
V II – //Ti I
C I
Fe I
Ti I – CH
Cr I
Fe I – CH
–CH
Co I
Fe I
Sm II
CH
Fe I – (Cr I)
Fe I
La II
Fe I
Fe I
Fe I
Ti I
Sm II
Cr I
Co I
Ti I
Ce II – Fe I
Ti I
Fe I
Nd II
Fe I
Fe I
Mn I
Fe I
1.0
0.6
0.2
I/I_c
0.3
0.2
0.1
0.0
Q/I (%)
4060
4062
4064
4066
4068
4070
Wavelength (Å)

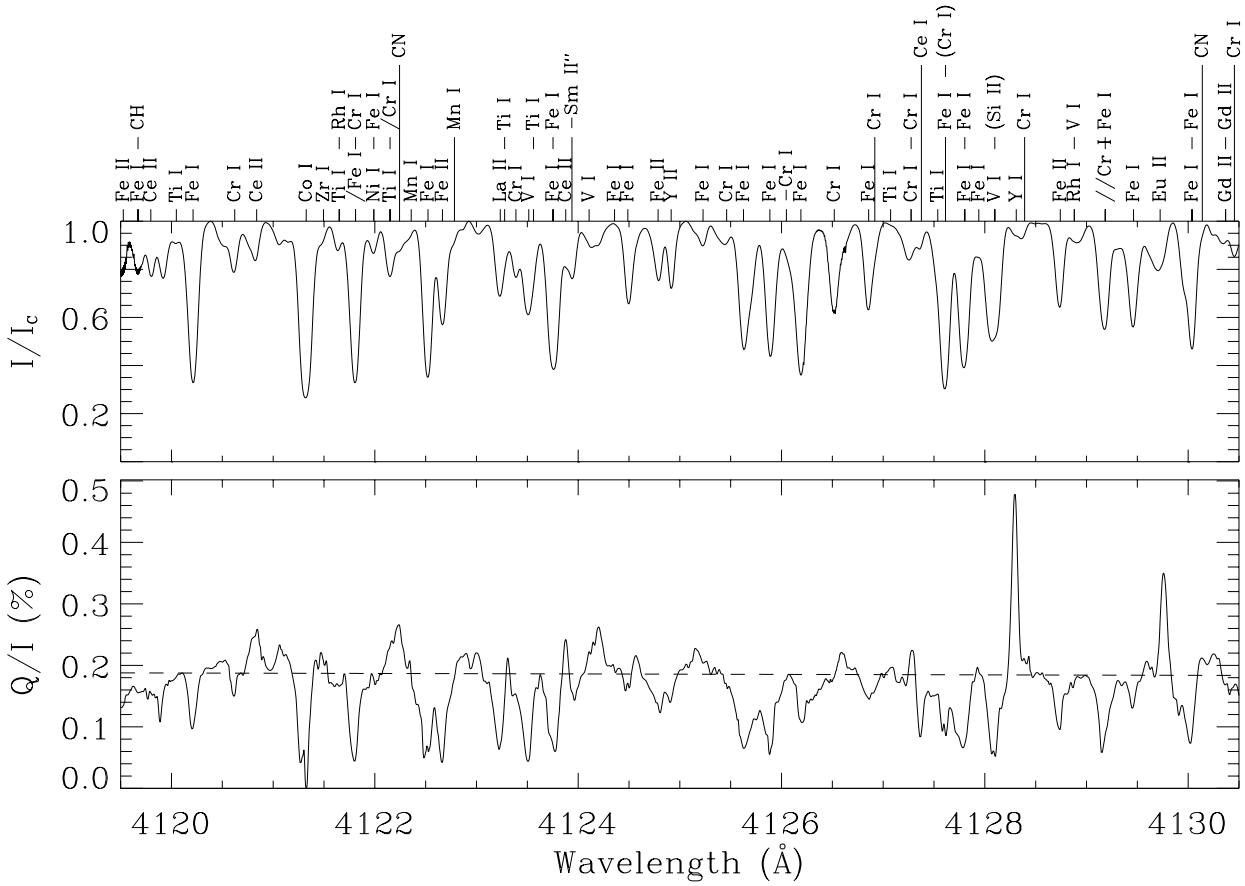

Fe I
Fe I
Mn I
Fe I
Fe I
Cr I
Zr II
Ti I
//Fe I + V I
Fe I
Fe I
Fe I
Zr I
Ni I
Dy II
Ce II
Fe I
Ti I – W I
Fe I
Ni I
(Nd II)
Nd II – CH
Cr II – Ce II
Sm II – Ce II
Fe I
Cr I
Co I
Fe I
Ti I
Fe I
Fe I
Cr II – Fe I
Zr II – /Cr I
Ti I
La II – Y I
Ce II – Cr II
Sr II
Dy II
Fe I
Ti I
Fe I
Fe I – //Mn I
Mn I
Ti I – (Nb I)
Fe I
Fe I
Fe I
Hf II
1.0
0.6
0.2
I/I_c
1.0
0.8
0.6
0.4
0.2
0.0
Q/I (%)
4070
4072
4074
4076
4078
4080
Wavelength (Å)

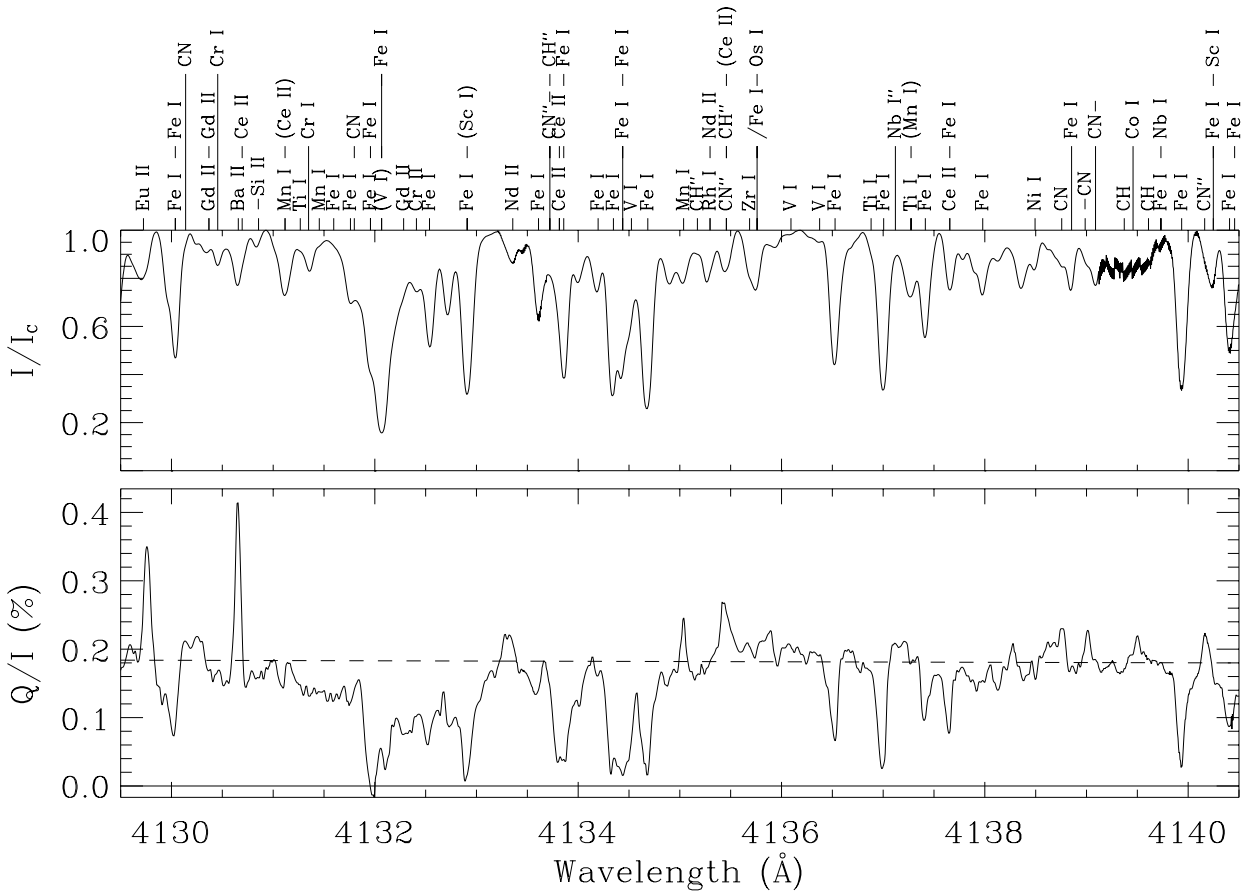

Ti I – (Nb I)
Fe I
Fe I
Fe I
Hf II
Ru I
Fe I
Ce II = /Zr I – Fe I
Cr I
Cr I
Fe I
Cr II
/Fe I – Sc I – /Ti I
Co I
Mn I
CN''
Ce II
Fe I
Mn I
Fe I
CH''
Fe I
CH
Fe I
Fe II
Fe I
Ce II = Fe I – Fe I
CN''
Gd II
Zr II
Fe I
Cr II
Co I
La II
Cr I
Fe I
Fe II
Cr II
Fe I – CN''
CN''
Co I
Fe I
Fe II
Cr II
Fe I
Cr I
Mn I
Fe I
Cr I – Fe I
1.0
0.6
0.2
I/I$_c$
0.3
0.2
0.1
0.0
Q/I (%)
4080
4082
4084
4086
4088
4090
Wavelength (Å)

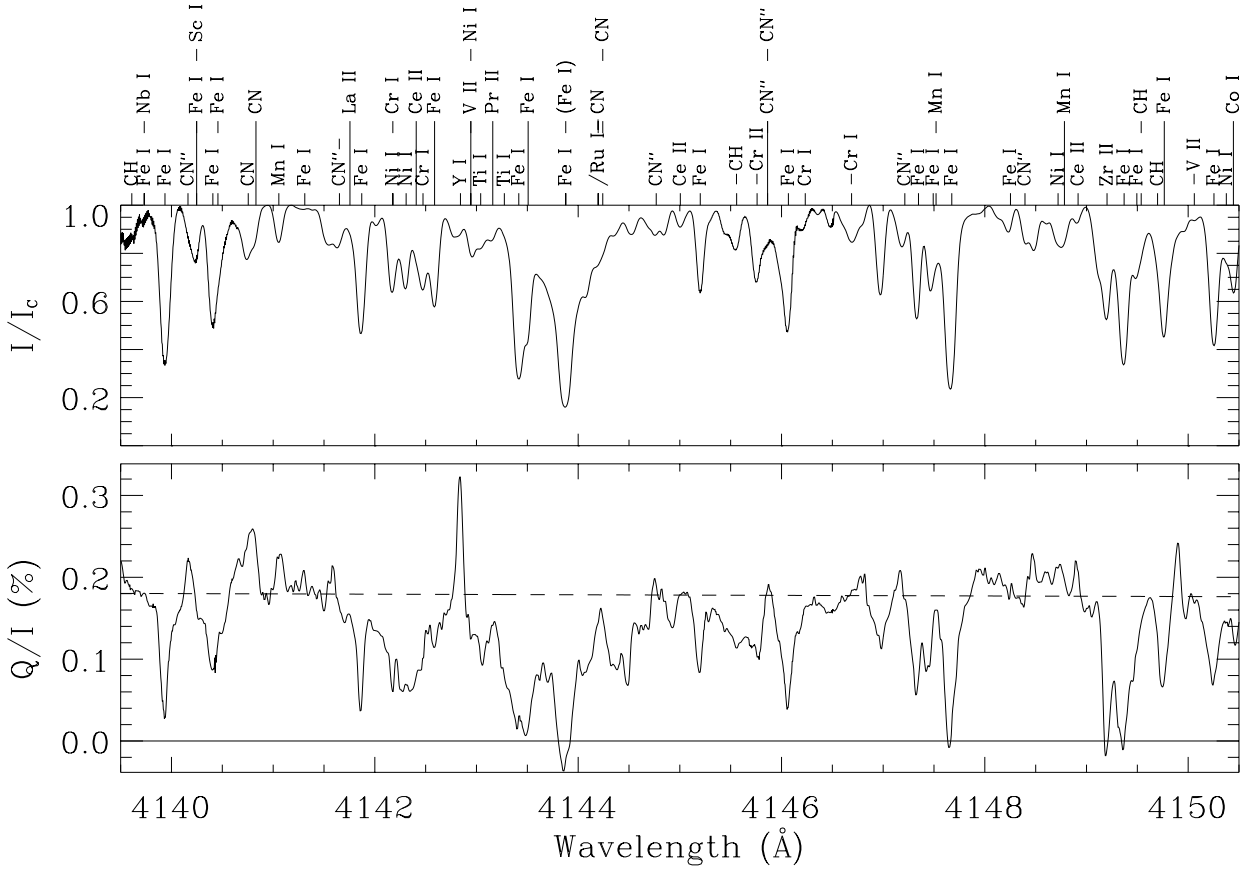

Cr I
Mn I
Fe I
Cr I – Fe I
Zr II – V I
Fe I
Fe I
Fe I
Ca I
Fe I
Co I – (V I)
Fe I
Ca I – V I
Co I
Ni I – Cr I
Hf II
V I
Ni I
Tm I''
Fe I
Fe I
CN
CH
Ca I
Mn I – Fe I
Fe I
V I
Fe I
Fe I
Fe I
Fe I
Zr II – Fe I
CN
Fe I – CN
Fe I
Cr I
Ru I
Cr I – Cr I
Fe I
Ca I – Ca I – (Gd II)
Gd II
Fe I – Fe I
Ti I – CN
V I
Fe I
Fe I
Fe I – Fe I
I/I_c
1.0
0.6
0.2
Q/I (%)
0.25
0.20
0.15
0.10
0.05
0.00
4090
4092
4094
4096
4098
4100
Wavelength (Å)

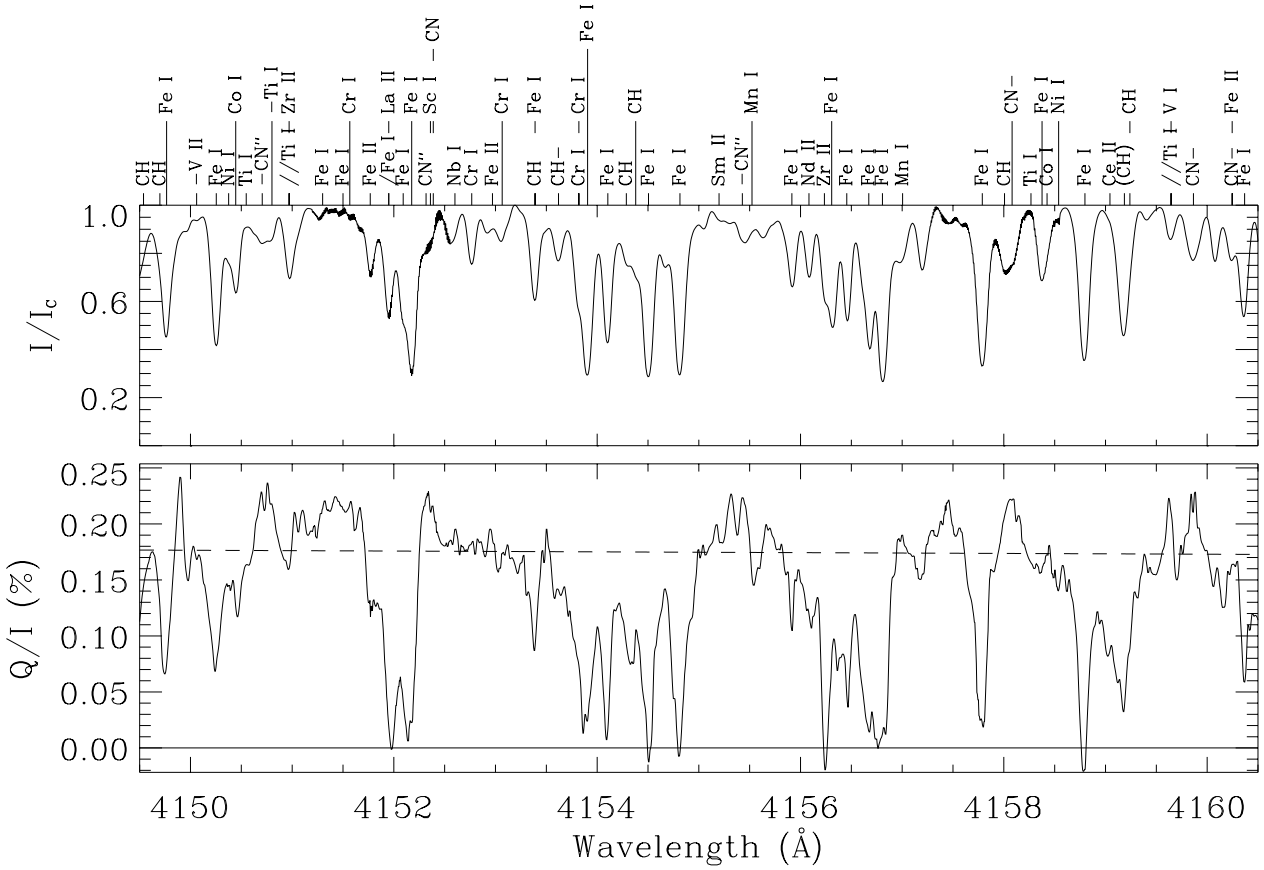

V I
Fe I
Fe I
Fe I – Fe I
Fe I – (Pr II)
/Fe I – Nb I
Fe I
CN
Fe I
H
– (In I)
V I
Y I
Ni I
Si I
Dy II
CN
Fe I – Fe I
Cr I
Fe I – Fe I
/Fe I – V I
V I
Cr I
Fe I
Fe I
V I
Mn I
CN
CN
Tm I''
Cr I
Fe I
Fe I
CH
Fe I – (V I)
CN
– Fe I
CN
Fe I
Fe I
Cr I – Zr I
Ca I
Fe I
Nd II
Cr I
V I
– Fe I
CN
Zr II
Ca II – Fe I
Ce II
1.0
0.6
0.2
I/I_c
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4100
4102
4104
4106
4108
4110
Wavelength (Å)

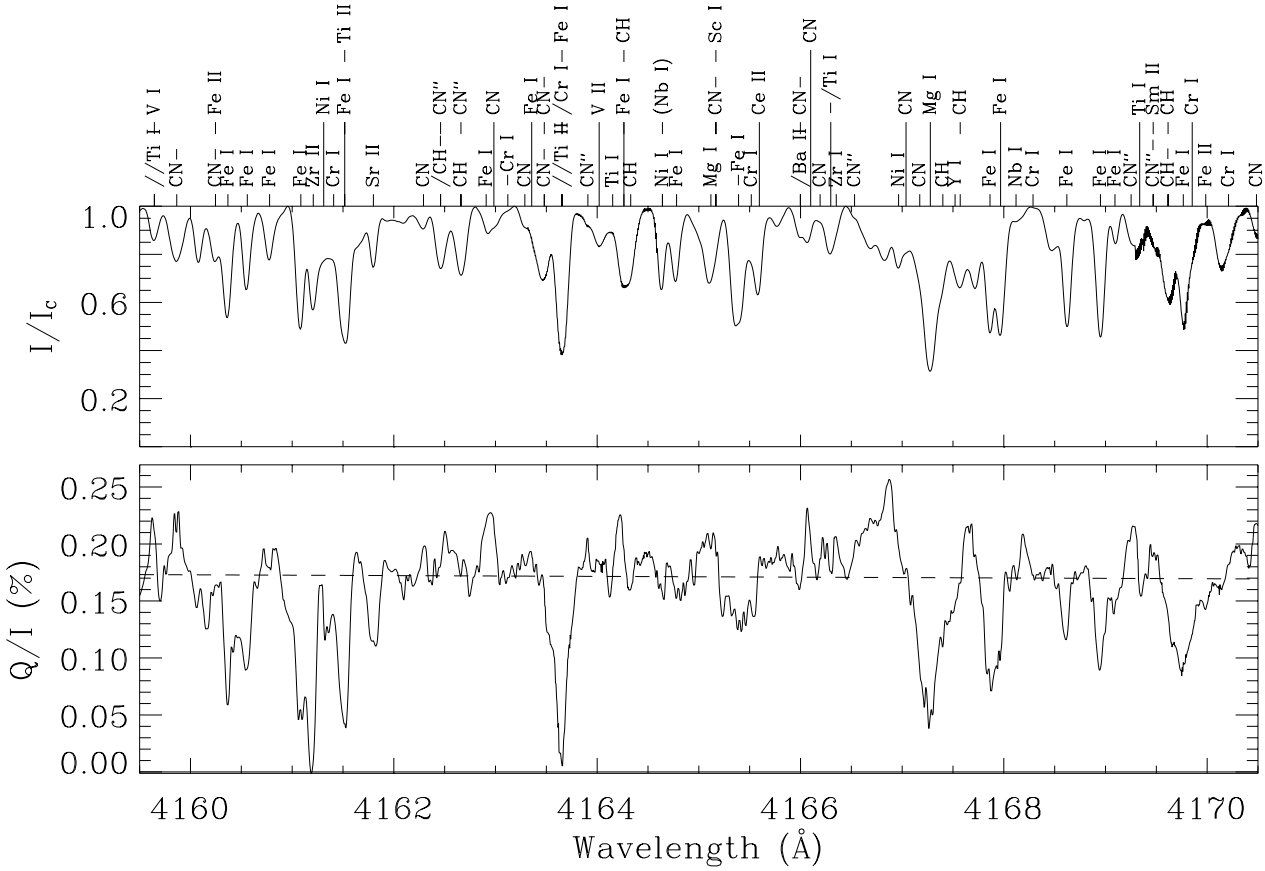

Cr I
V I
Fe I
CN
Zr II
Ca II
Fe I
Ce II
Co I
Mn I
Cr II
Cr II
Cr I
Gd II
Cr I
V I
Fe I
Fe I
Ni I
Cr II
Ti I
Fe I
Cr II
V I
Mn I
CN
CN
Fe I
Fe I
V I
Ce II
Ir I
Fe I
Ni I
CN
V I
V I
V I
Fe I
Fe I
Fe I
Ce II
V I
Fe I
(Sm II)
Co I
Fe I
Fe I
Fe II
Fe I
Ce II
CH
Ti I
Fe I
1.0
0.6
0.2
I/I_c
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4110
4112
4114
4116
4118
4120
Wavelength (Å)

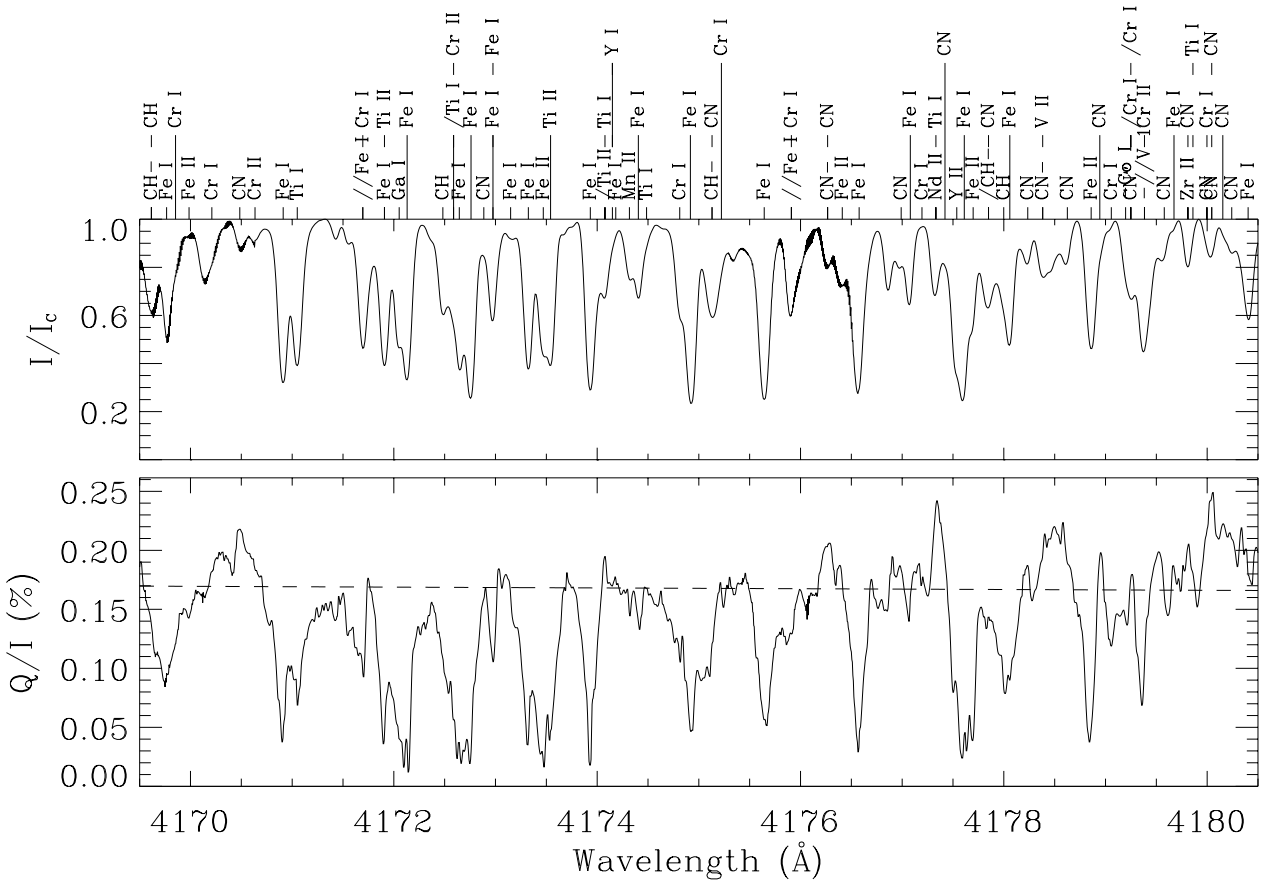

Fe II
Fe I – CH
Ce II
Ti I
Fe I
Cr I
Ce II
Co I
Zr I
Ti I – Rh I
/Fe I – Cr I
Ni I – Fe I
Ti I – /Cr I
CN
Mn I
Fe I
Fe II
Mn I
La II – Ti I
Cr I
V I – Ti I
Fe I – Fe I
Ce II – Sm II"
V I
Fe I
Fe I
Fe II
Y II
Fe I
Cr I
Fe I
Fe I
Cr I
Fe I
Cr I
Fe I – Cr I
Ti I
Cr I – Cr I
Ce I
Ti I – Fe I – (Cr I)
Fe I – Fe I
Fe I – (Si II)
V I
Y I – Cr I
Fe II
Rh I – V I
//Cr + Fe I
Fe I
Eu II
Fe I – Fe I – CN
Gd II – Gd II – Cr I
1.0
0.6
0.2
I/I$_c$
0.5
0.4
0.3
0.2
0.1
0.0
Q/I (%)
4120
4122
4124
4126
4128
4130
Wavelength (Å)

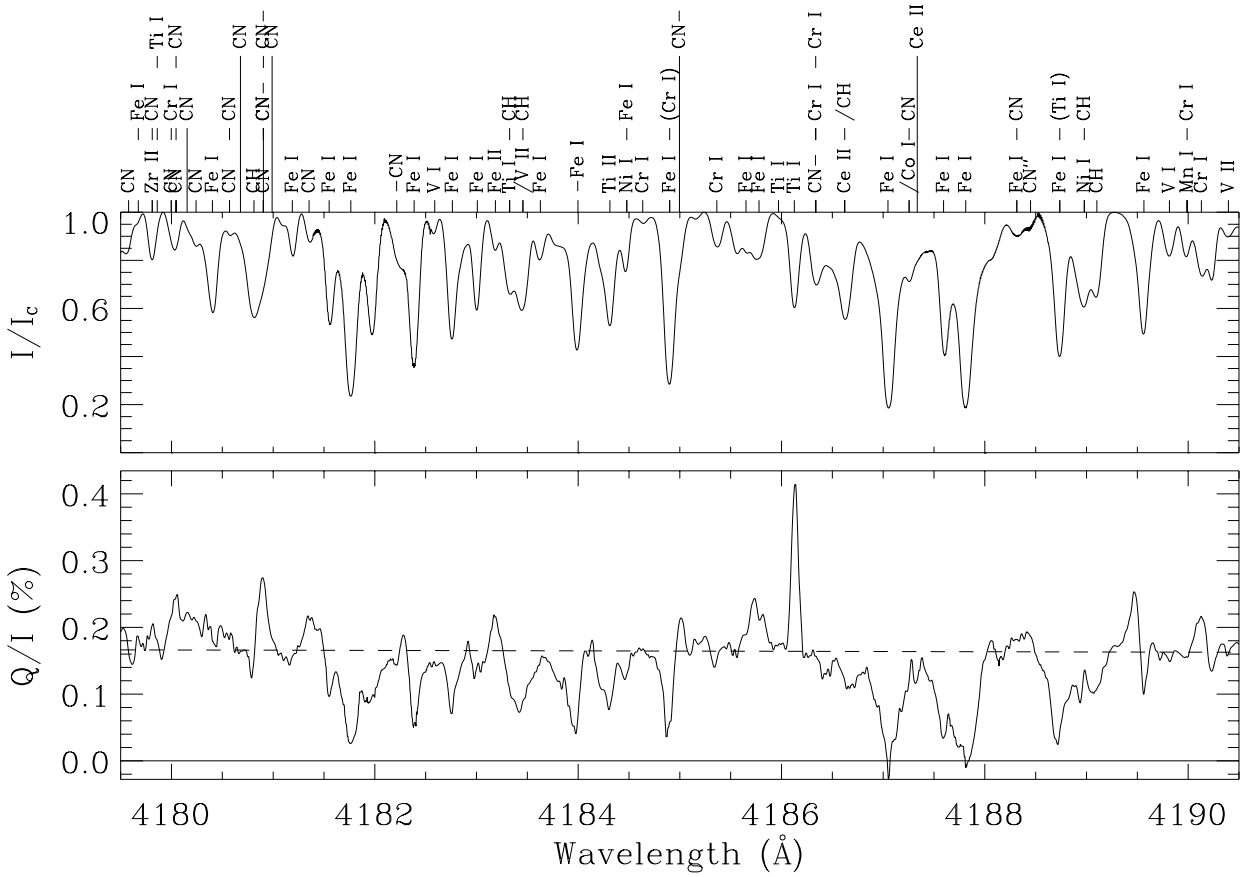

Eu II
Fe I
Fe I
CN
Gd II
Gd II
Cr I
Ba II
Ce II
Si II
Mn I
(Ce II)
Ti I
Cr I
Mn I
Fe I
Fe I
CN
Fe I
Fe I
(V I)
Gd II
Cr I
Fe I
Fe I
(Sc I)
Nd II
Fe I
CN''
CH''
Ce II
Fe I
Fe I
Fe I
Fe I
Fe I
V I
Fe I
Mn I
CH''
Rh I
Nd II
CN''
CH''
(Ce II)
Zr I
Fe I
Os I
V I
V I
Fe I
Ti I
Fe I
Nb I''
Ti I
(Mn I)
Fe I
Ce II
Fe I
Fe I
Ni I
CN
Fe I
CN
CN
CH
Co I
CH
Fe I
Nb I
Fe I
CN''
Fe I
Sc I
Fe I
Fe I
1.0
0.6
0.2
I/I$_c$
0.4
0.3
0.2
0.1
0.0
Q/I (%)
4130
4132
4134
4136
4138
4140
Wavelength (Å)

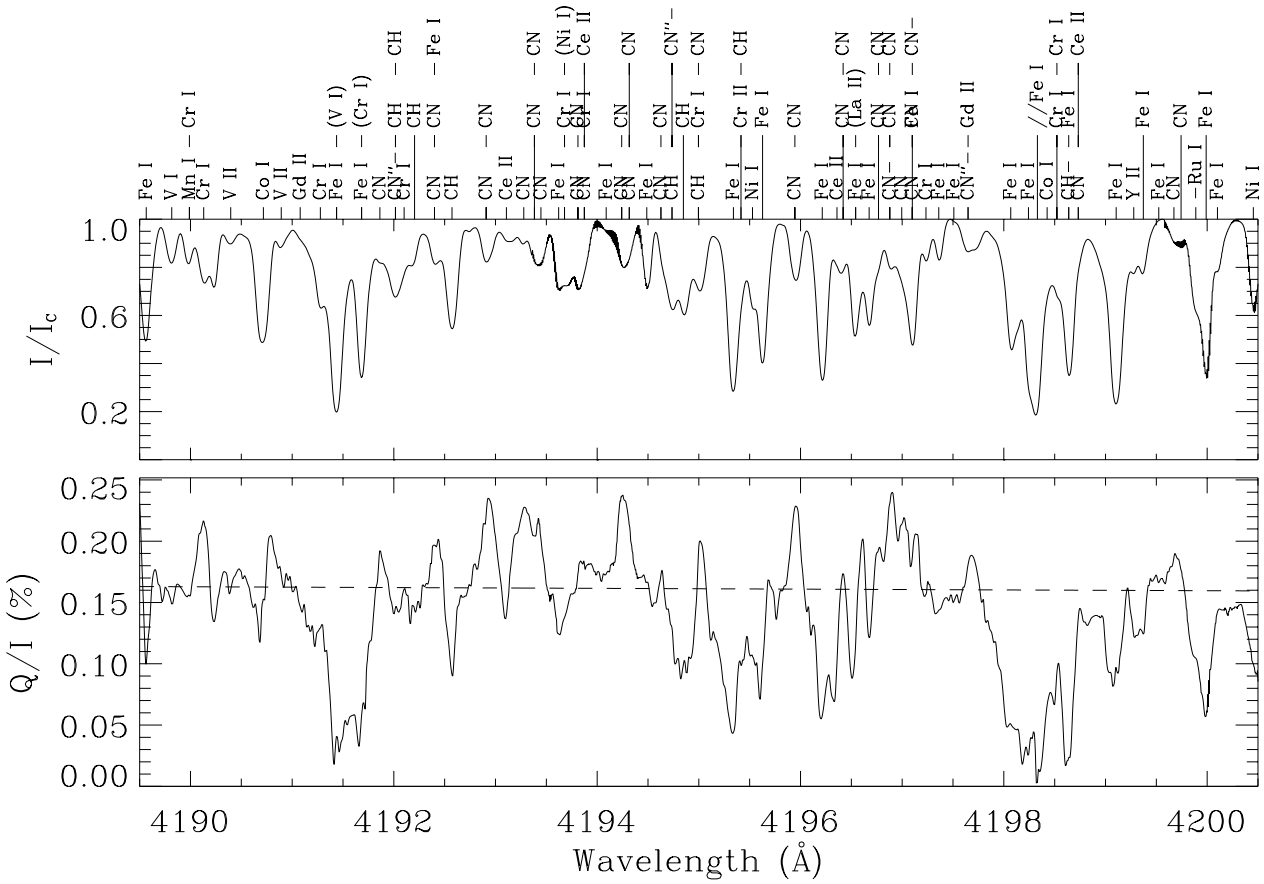

CH
Fe I
Nb I
Fe I
CN''
Fe I
Sc I
Fe I
Fe I
CN
CN
Mn I
Fe I
CN''
Fe I
La II
Ni I
Cr I
Ni I
Ce II
Cr I
Fe I
Y I
V II
Ni I
Ti I
Pr II
Ti I
Fe I
Fe I
Fe I
(Fe I)
/Ru I
CN
CN
CN''
Ce II
Fe I
CH
Cr II
CN''
CN''
Fe I
Cr I
Cr I
CN''
Fe I
Fe I
Mn I
Fe I
Fe I
CN''
Ni I
Mn I
Ce II
Zr II
Fe I
Fe I
CH
CH
Fe I
V II
Fe I
Ni I
Co I
1.0
0.6
0.2
I/I_c
0.3
0.2
0.1
0.0
Q/I (%)
4140
4142
4144
4146
4148
4150
Wavelength (Å)

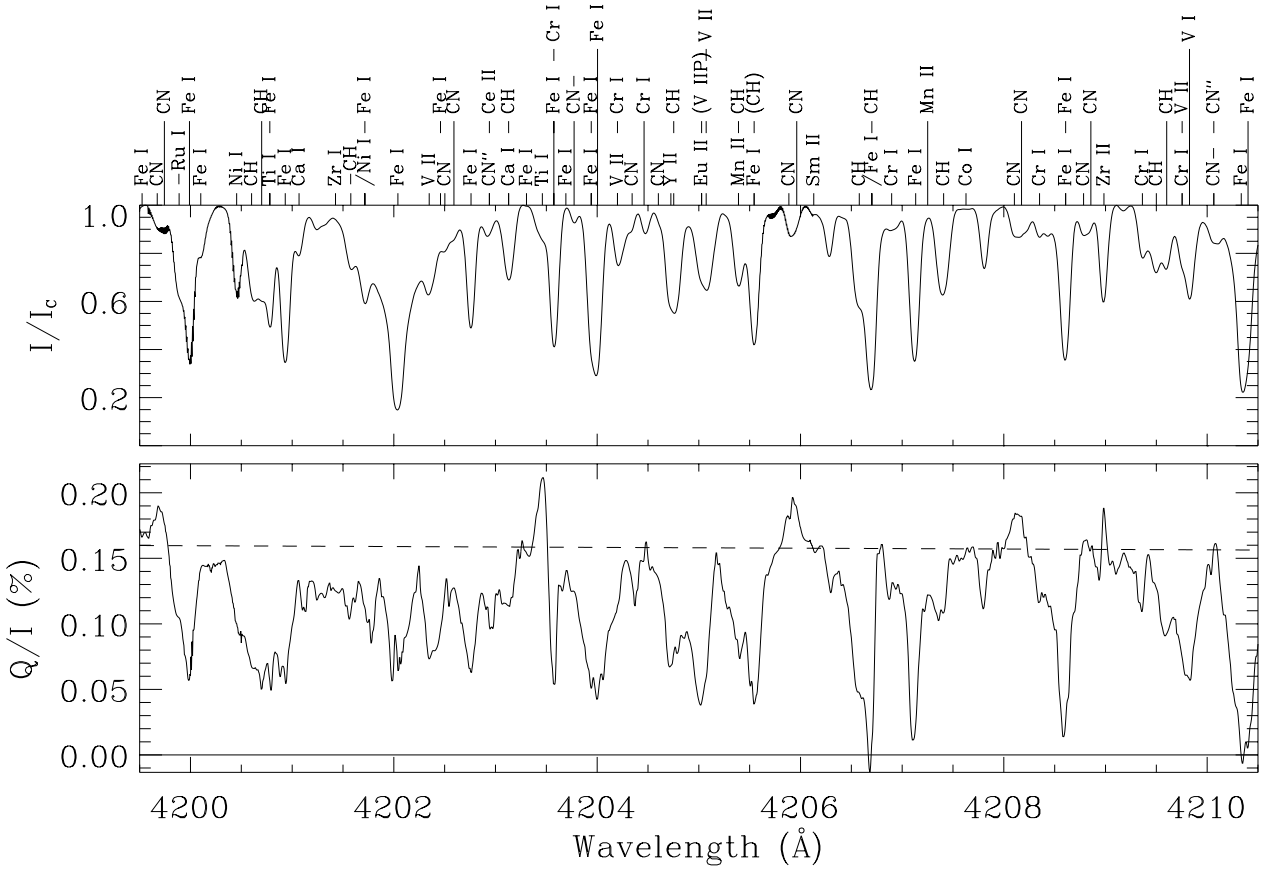

CH
CH
Fe I
V II
Fe I
Ni I
Co I
Ti I
CN''
Ti I
Zr II
Fe I
Fe I
Cr I
Fe II
Fe I
La II
Fe I
Fe I
CN''
Sc I
CN
Nb I
Cr I
Fe II
Cr I
CH
Fe I
CH
Cr I
Cr I
Fe I
CH
Fe I
Fe I
Sm II
CN''
Mn I
Fe I
Nd II
Zr II
Fe I
Fe I
Fe I
Mn I
Fe I
CH
CN
Ti I
Co I
Fe I
Ni I
Fe I
Ce II
(CH)
CH
Ti I
V I
CN
CN
Fe II
Fe I
1.0
0.6
0.2
I/I_c
0.25
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4150
4152
4154
4156
4158
4160
Wavelength (Å)

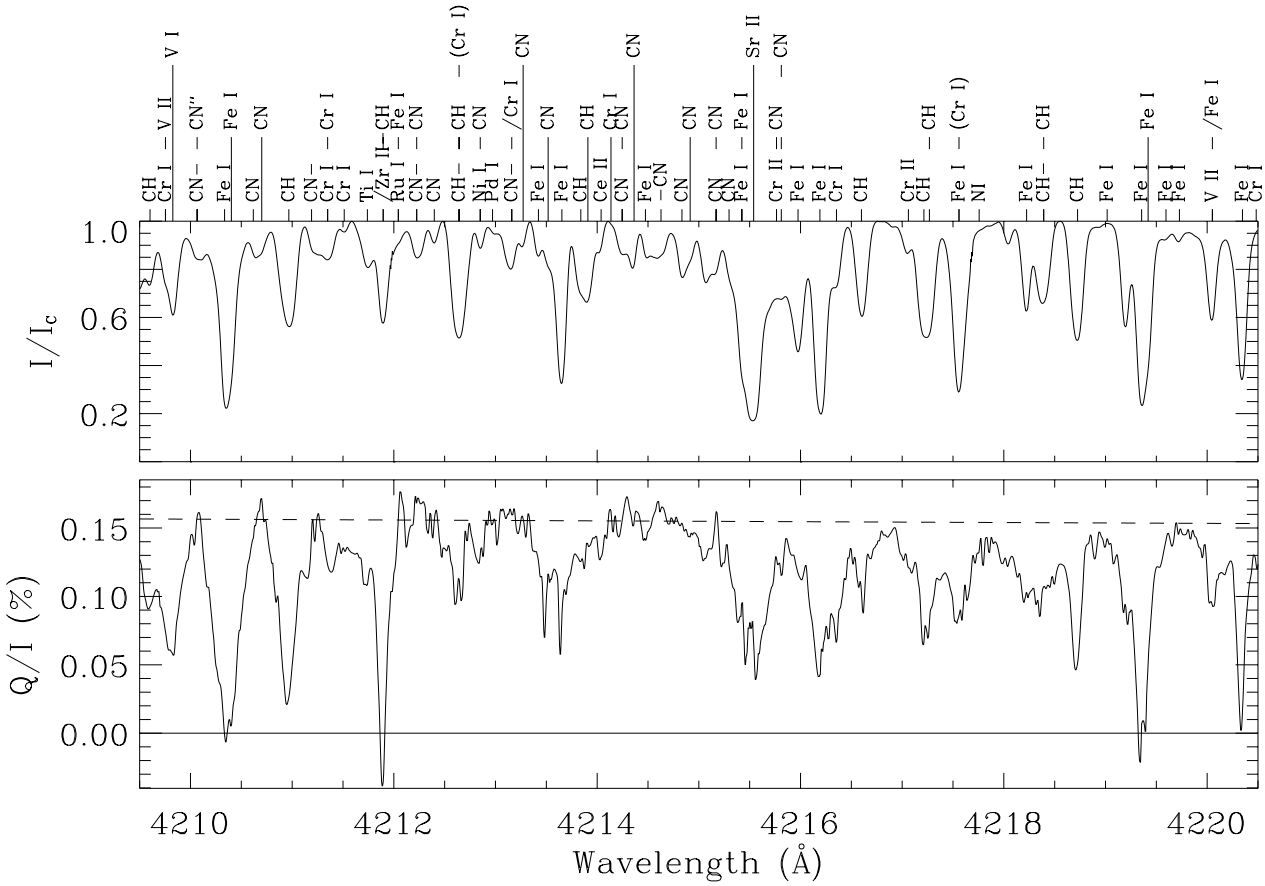

I/I_c
Q/I (%)
Wavelength (Å)
4160
4162
4164
4166
4168
4170

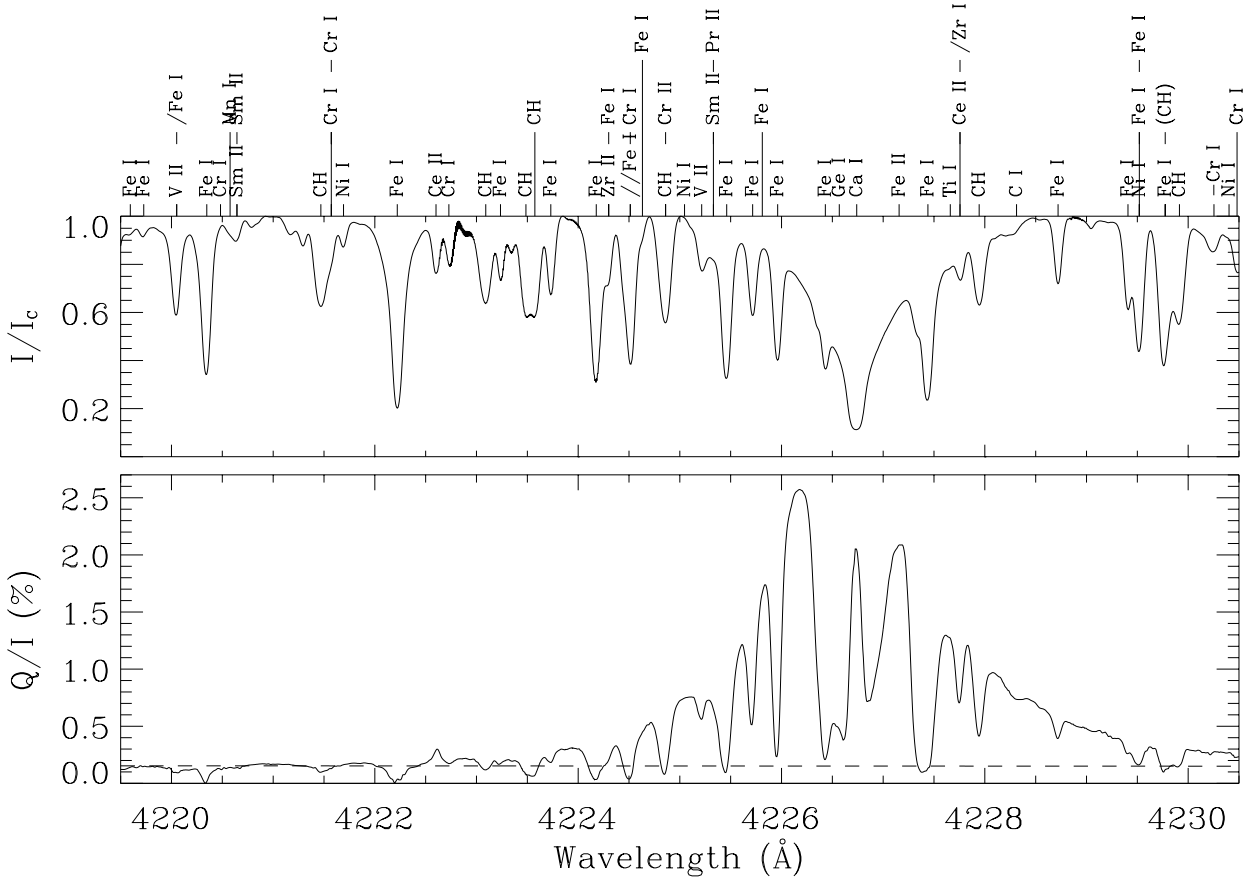

I/I_c
Q/I (%)
Wavelength (Å)
4170
4172
4174
4176
4178
4180

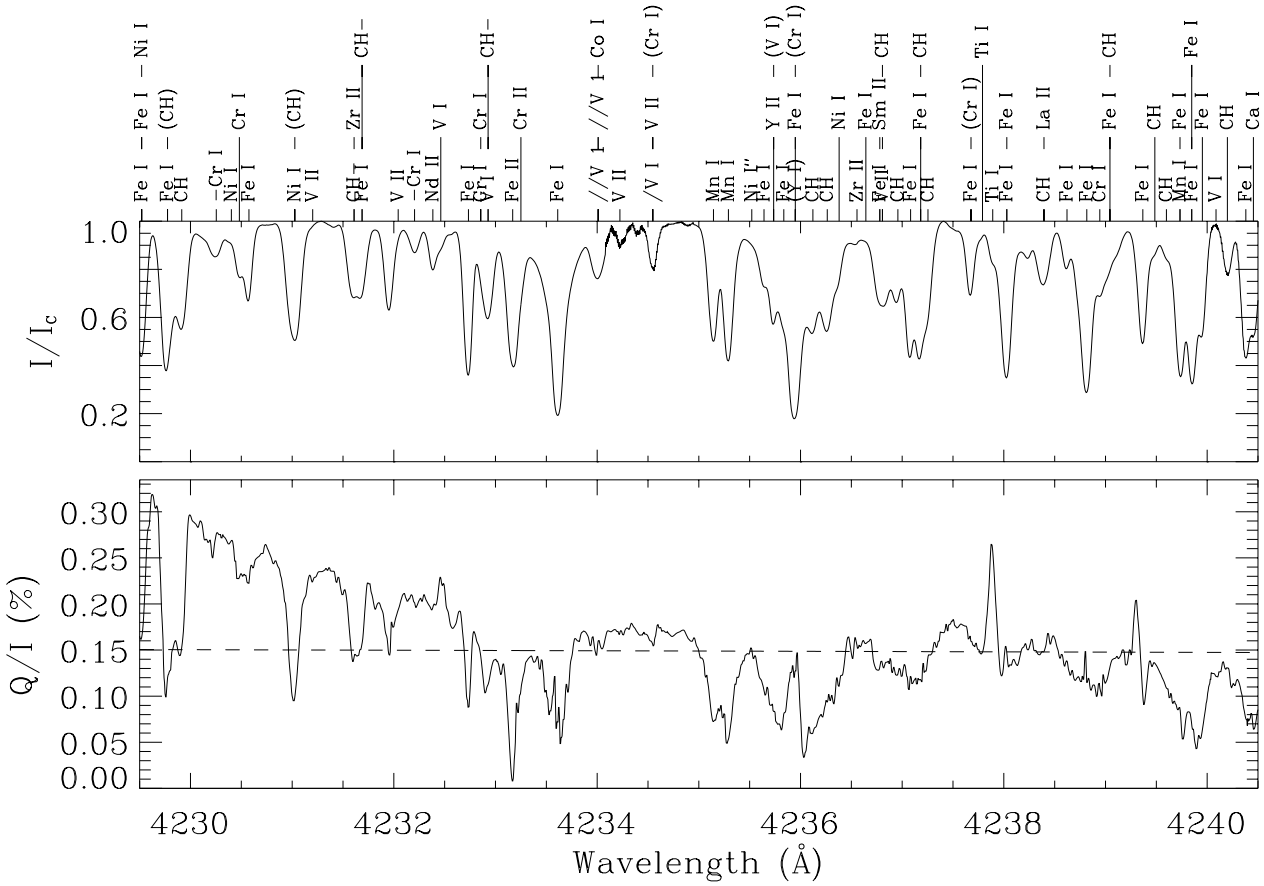

I/I_c
Q/I (%)
Wavelength (Å)
4180
4182
4184
4186
4188
4190

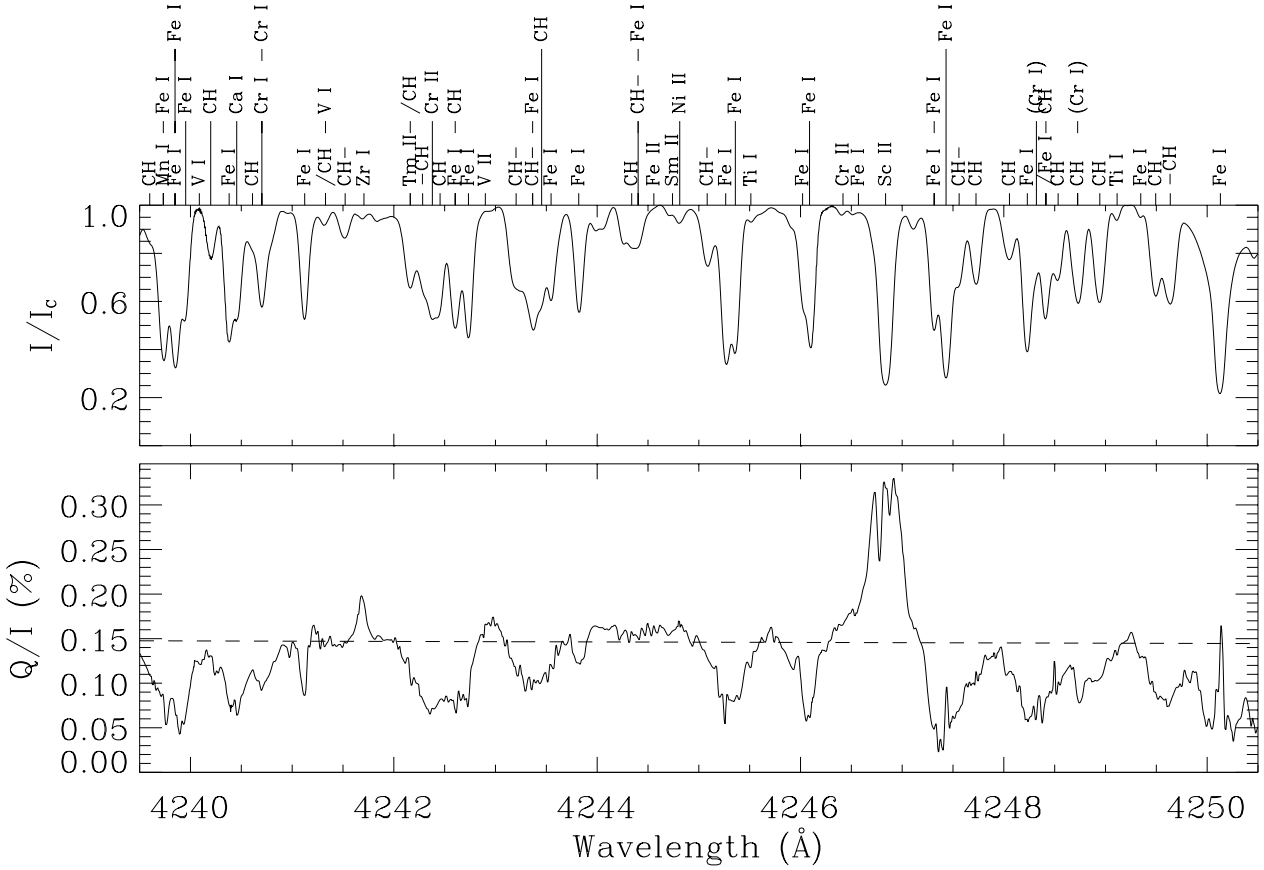

I/I_c
Q/I (%)
Wavelength (Å)
4190
4192
4194
4196
4198
4200

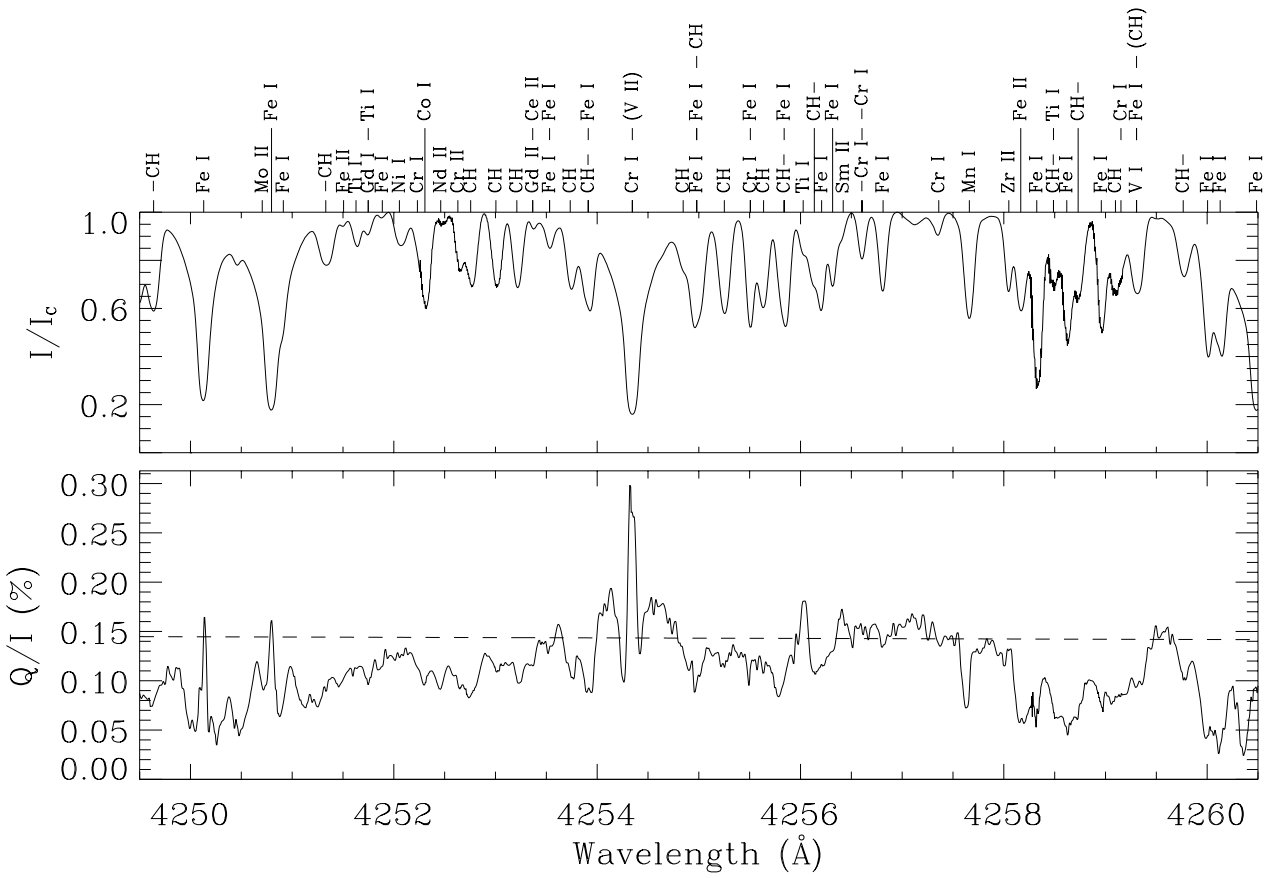

Fe I
CN
CN
Ru I
Fe I
Ni I
CH
CH
Fe I
Ti I
Fe I
Ca I
Zr I
CH
Ni I
Fe I
Fe I
V II
CN
Fe I
CN
Fe I
CN''
Ce II
Ca I
CH
Fe I
Ti I
Fe I
Cr I
CN
Fe I
Fe I
V II
CN
Cr I
Cr I
CN
Y II
CH
Eu II = (V IIP)
V II
Mn II
CH
Fe I
(CH)
CN
CN
Sm II
CH
Fe I
CH
Cr I
Fe I
Mn II
CH
Co I
CN
Cr I
Fe I
CN
CN
Zr II
Cr I
CH
Cr I
V II
V I
CN
CN''
Fe I
1.0
0.6
0.2
I/I_c
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4200
4202
4204
4206
4208
4210
Wavelength (Å)

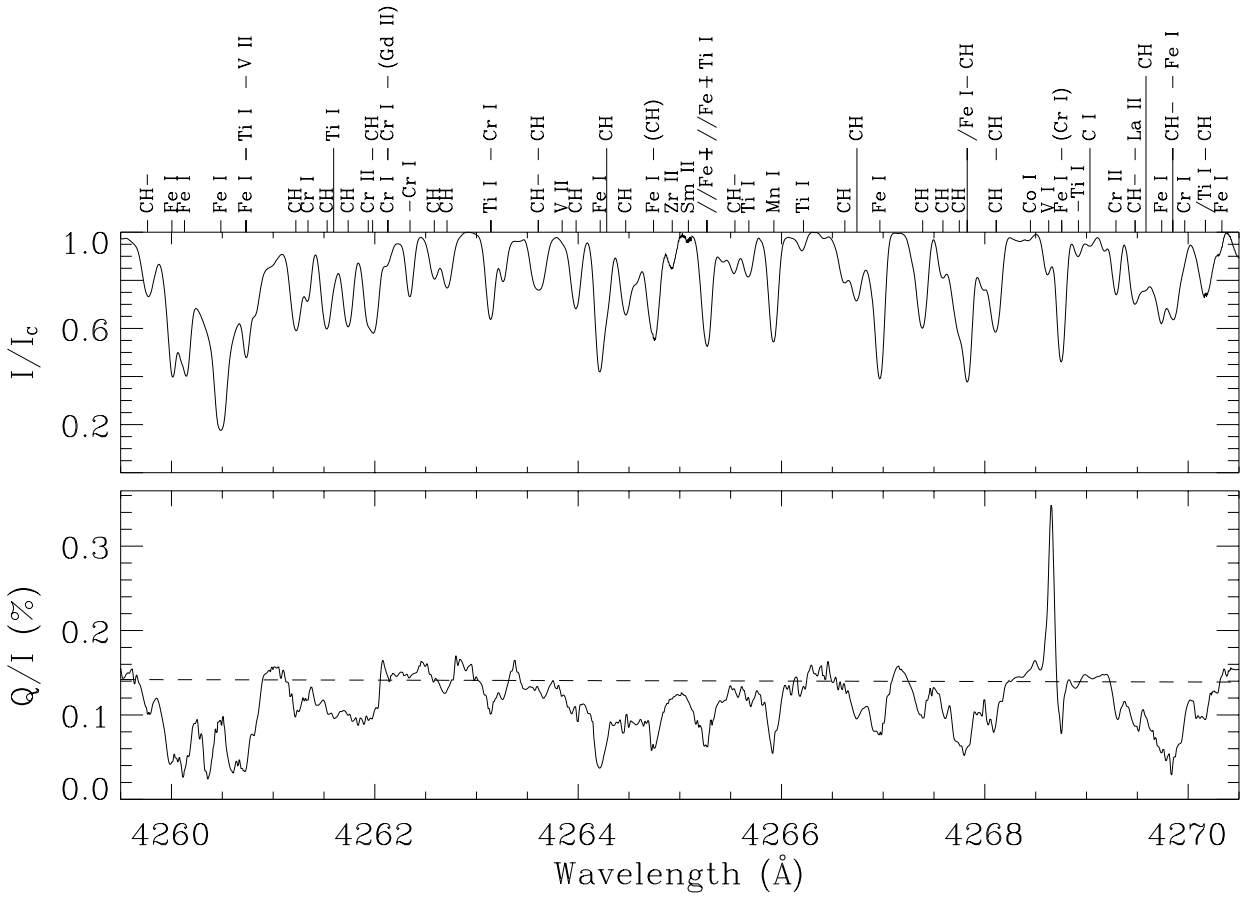

I/I_c
1.0
0.6
0.2
Q/I (%)
0.15
0.10
0.05
0.00
4210
4212
4214
4216
4218
4220
Wavelength (Å)

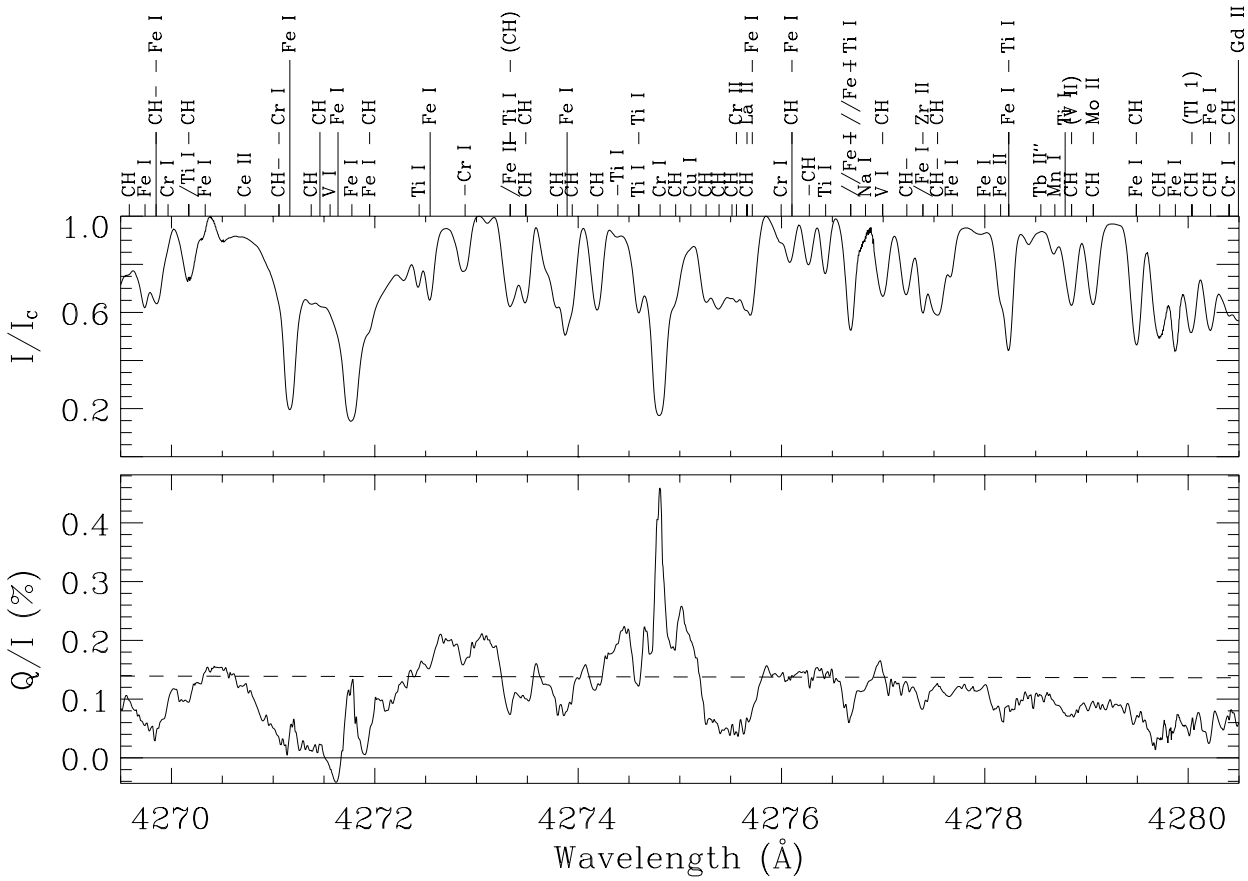

Fe I
Fe I
V II – /Fe I
Fe I
Cr I
Sm II
Mn I
CH
Cr I – Cr I
Ni I
Fe I
Ce II
Cr I
CH
Fe I
CH
Fe I
Fe I – Fe I
Zr II
//Fe I
Cr I
Fe I
CH – Cr II
Ni I
V II
Sm II – Pr II
Fe I
Fe I
Fe I
Fe I
Ge I
Ca I
Fe II
Fe I
Ti I
Ce II – /Zr I
CH
C I
Fe I
Fe I
Ni I
Fe I – Fe I
Fe I – (CH)
CH
Cr I
Ni I
Cr I
I/I$_c$
1.0
0.6
0.2
Q/I (%)
2.5
2.0
1.5
1.0
0.5
0.0
4220
4222
4224
4226
4228
4230
Wavelength (Å)

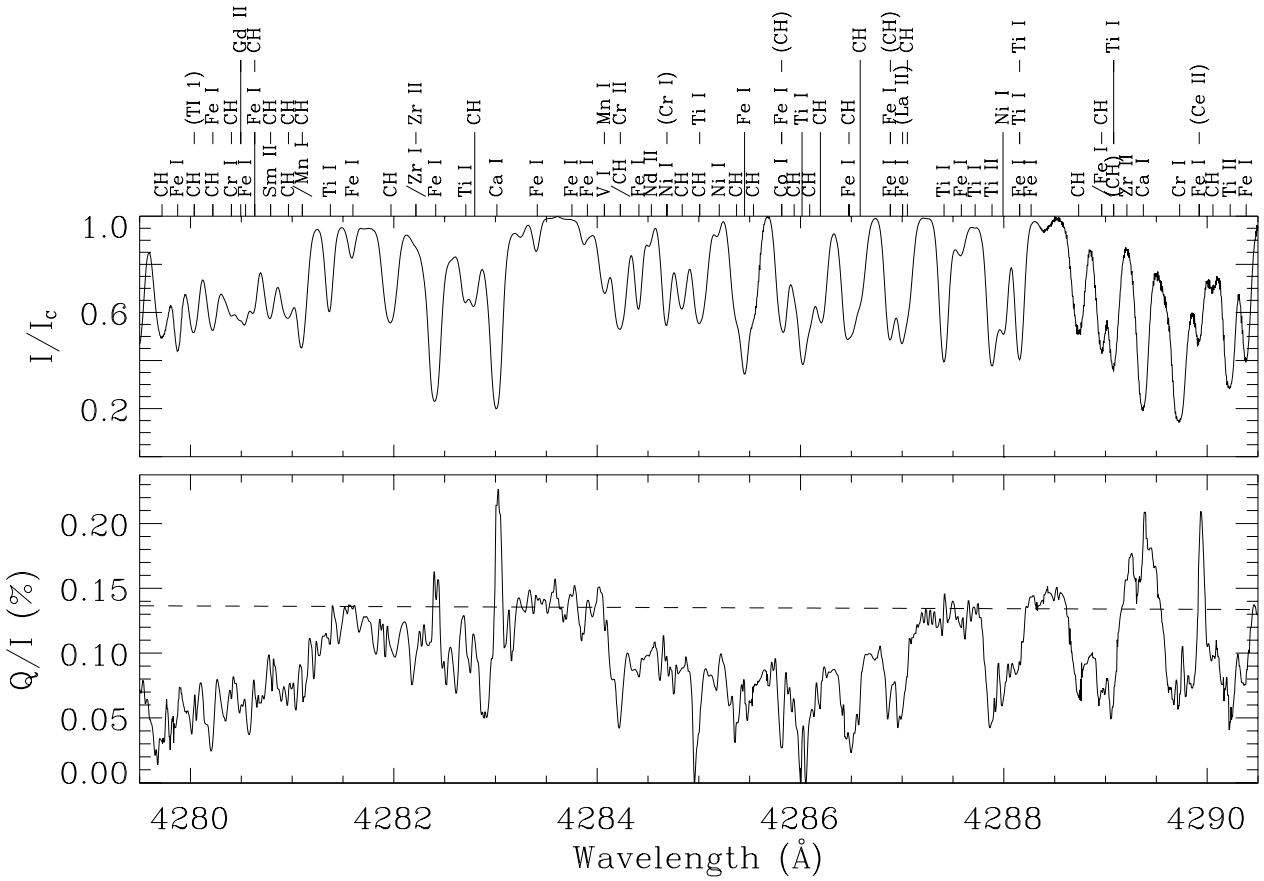

Fe I
Ni I
CH
Cr I
Zr II
V II
Nd II
V I
Cr II
Co I
(Cr I)
Mn I
Y II
(V I)
Ni I
Zr II
Sm II
Ti I
La II
Ca I
I/I_c
Q/I (%)
Wavelength (Å)

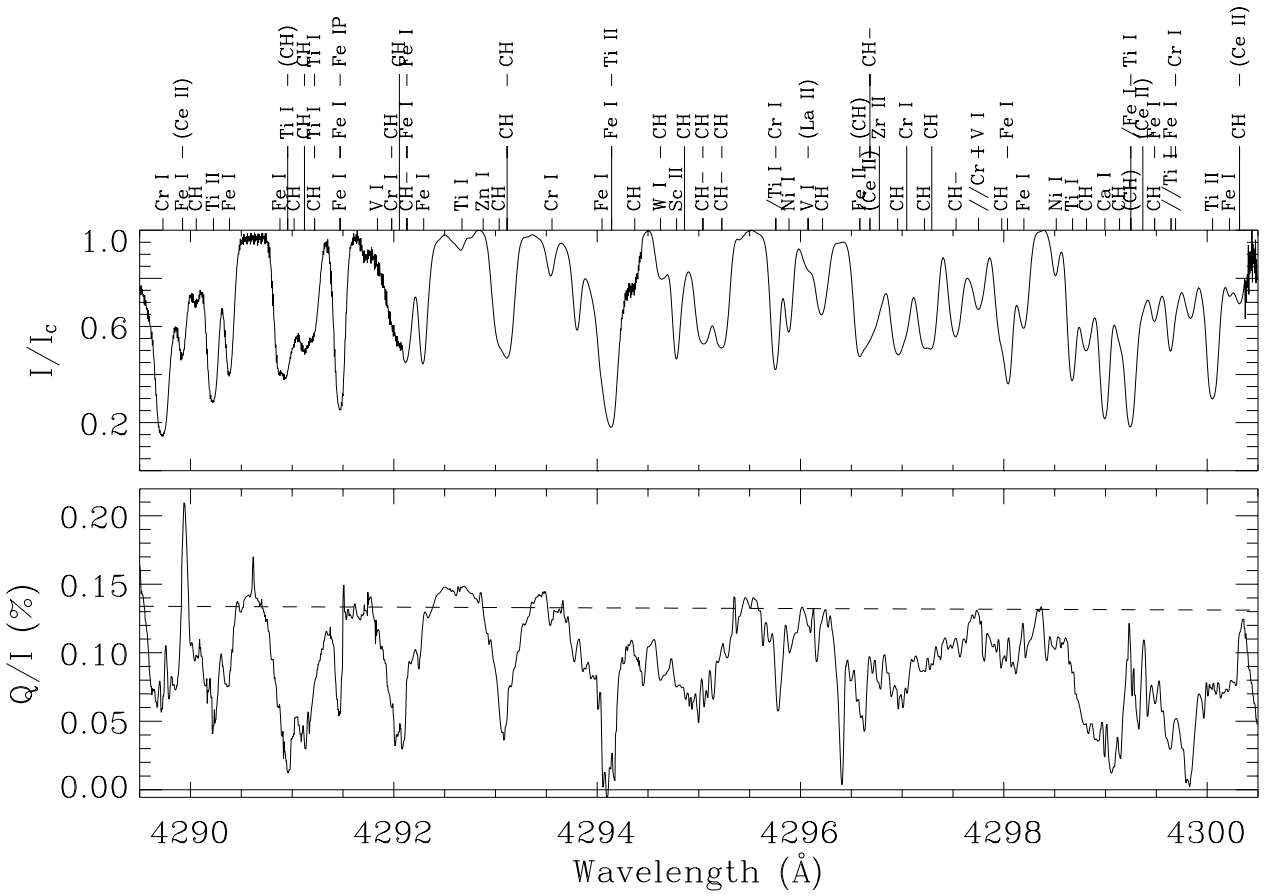

I/I_c
Q/I (%)
Wavelength (Å)
4240
4242
4244
4246
4248
4250

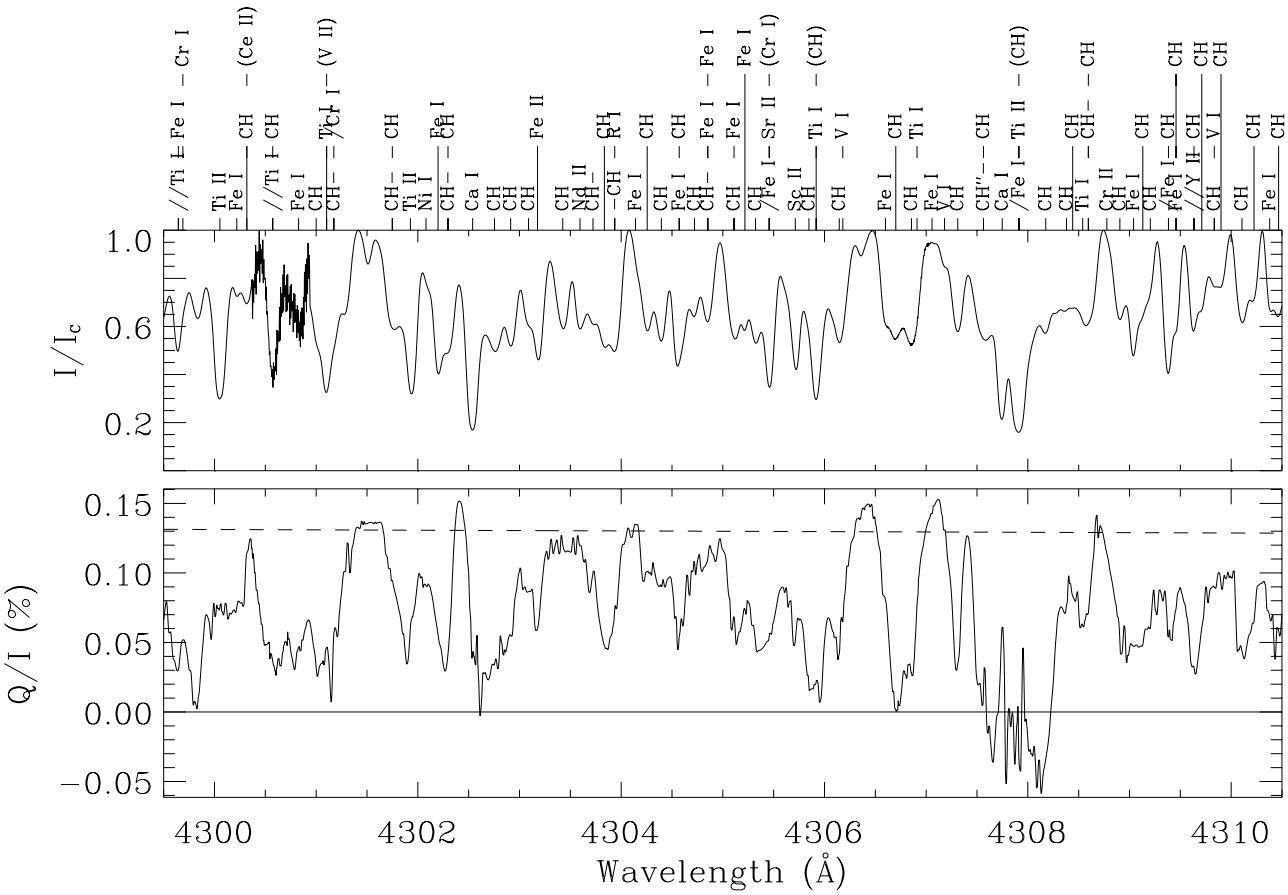

I/I_c
Q/I (%)
Wavelength (Å)
4250
4252
4254
4256
4258
4260

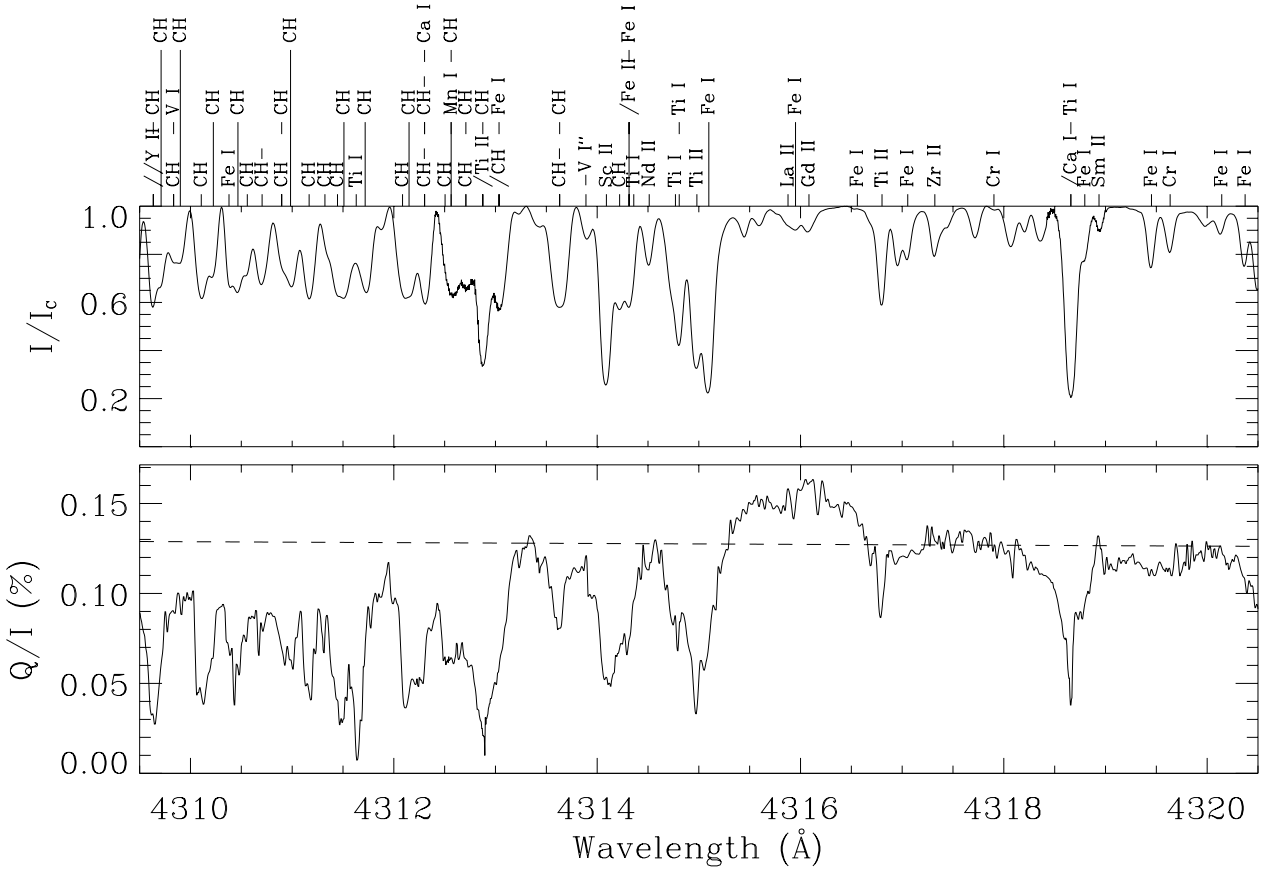

CH
Fe I
Fe I
Fe I
Fe I
Ti I
V II
CH
Cr I
CH
Ti I
CH
Cr II
CH
Cr I
(Gd II)
Cr I
Cr I
CH
CH
CH
Ti I
Cr I
CH
CH
V II
CH
Fe I
CH
Fe I
(CH)
Zr II
Sn II
Fe I
Ti I
Ti I
CH
CH
Mn I
Ti I
CH
Fe I
CH
CH
CH
Fe I
CH
CH
Co I
V I
Fe I
(Cr I)
Ti I
C I
Cr II
CH
La II
CH
Fe I
CH
Fe I
Cr I
Ti I
CH
Fe I
1.0
0.6
0.2
I/I$_c$
0.3
0.2
0.1
0.0
Q/I (%)
4260
4262
4264
4266
4268
4270
Wavelength (Å)

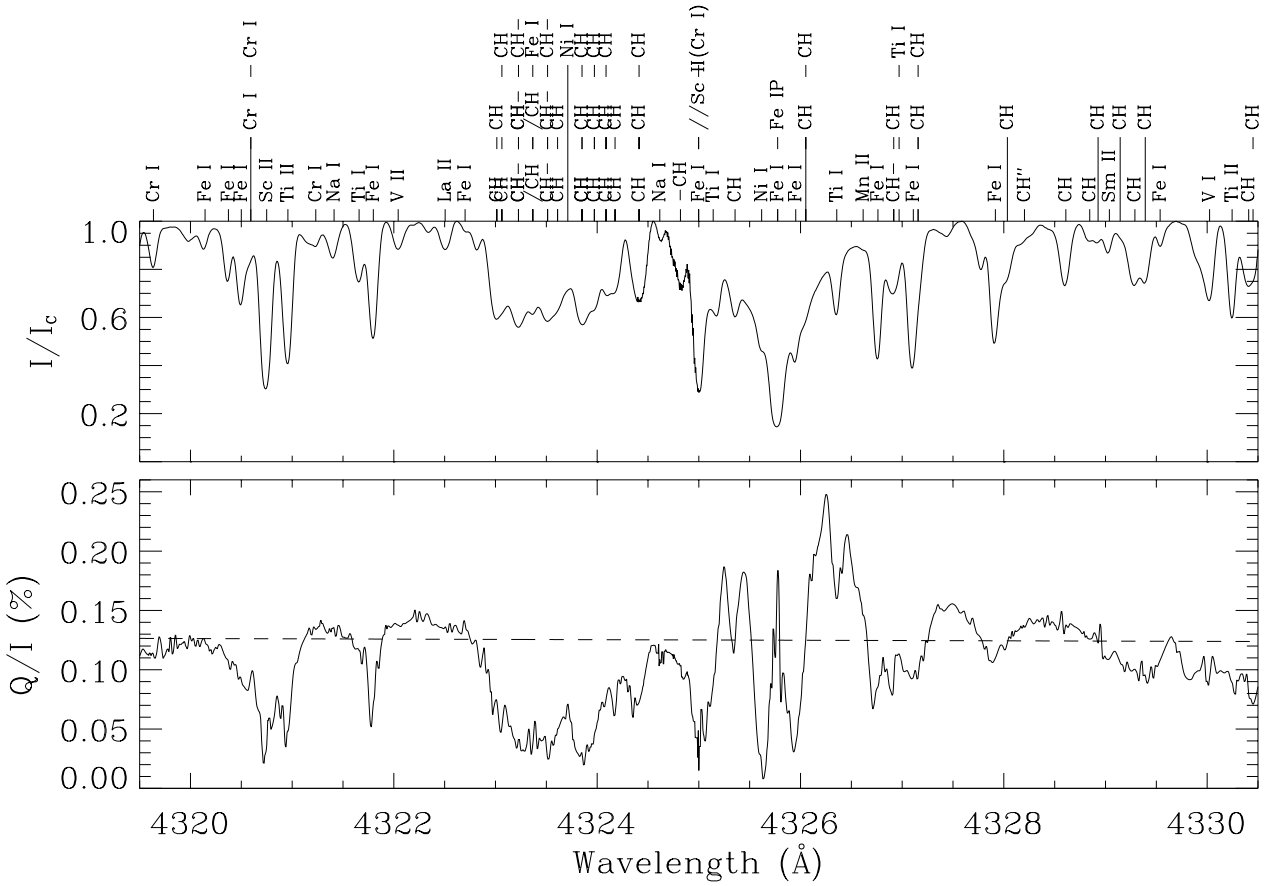

I/I_c
Q/I (%)
Wavelength (Å)
4270
4272
4274
4276
4278
4280

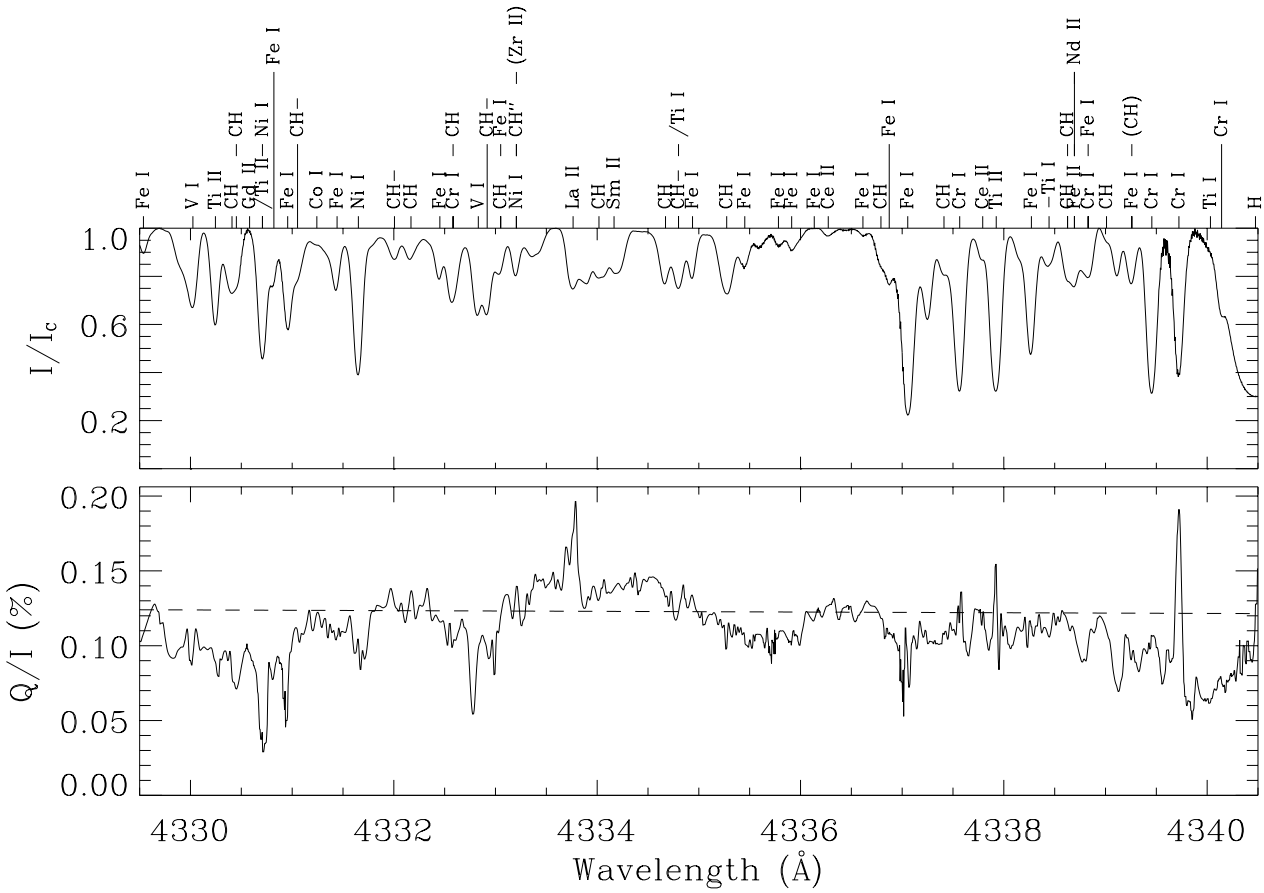

CH
Fe I
(Tl I)
Fe I
CH
Cr I
Fe I
Gd II
CH
Fe I
Sm II
CH
CH
/Mn I
CH
Ti I
Fe I
CH
/Zr I
Zr II
Fe I
Ti I
CH
Ca I
Fe I
Fe I
Fe I
V I
Mn I
/CH
Cr II
Fe I
Nd II
Ni I
(Cr I)
CH
Ti I
Ni I
CH
Fe I
CH
Co I
Fe I
(CH)
CH
Ti I
CH
Fe I
CH
CH
Fe I
Fe I
(La II)
(CH)
CH
Ti I
Fe I
Ti I
Ti II
Ni I
Fe I
Ti I
CH
/Fe I
CH
(CH)
Ti I
Zr II
Ca I
Cr I
Fe I
CH
(Ce II)
Ti II
Fe I
1.0
0.6
0.2
I/I_c
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4280
4282
4284
4286
4288
4290
Wavelength (Å)

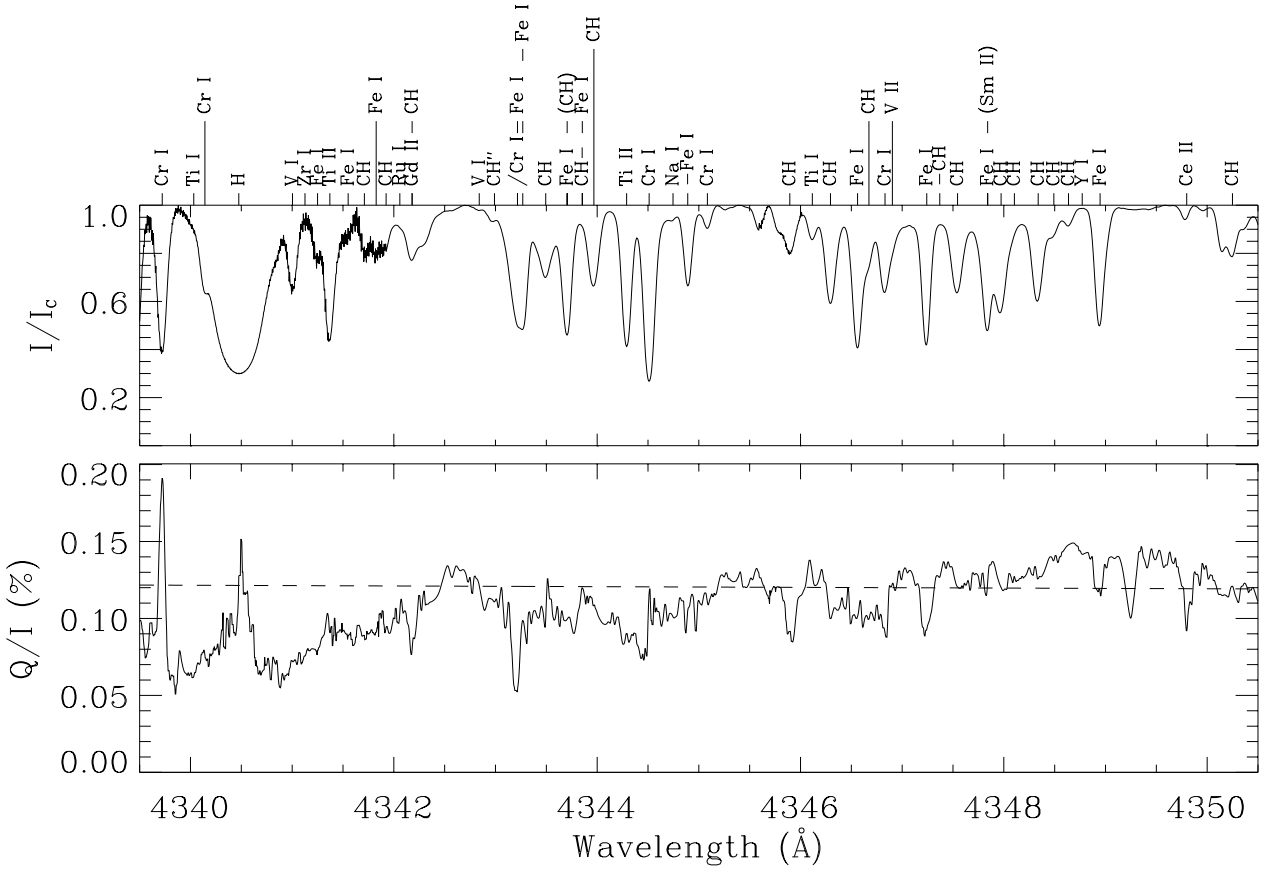

I/I_c
Q/I (%)
Wavelength (Å)
4290
4292
4294
4296
4298
4300

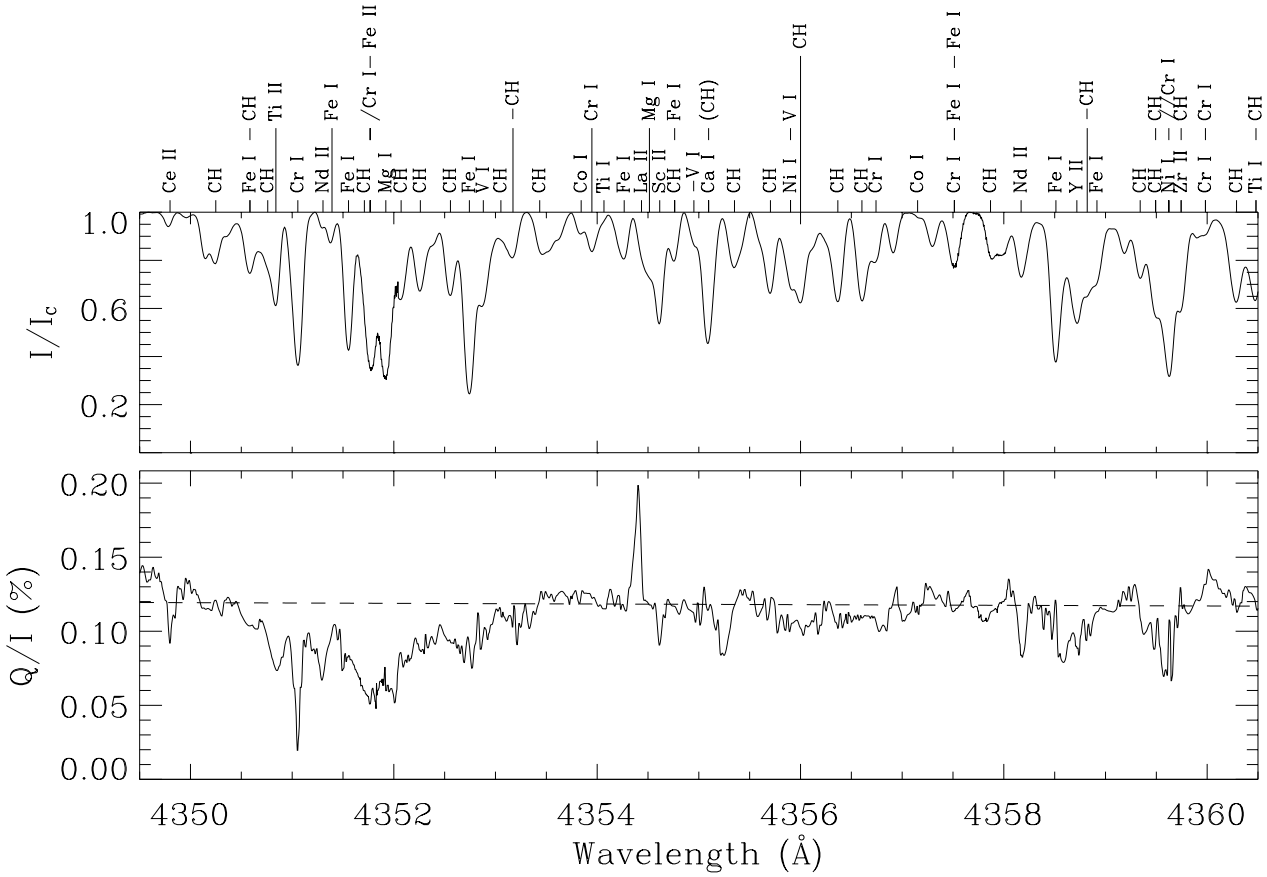

I/I_c
Q/I (%)
Wavelength (Å)
4300
4302
4304
4306
4308
4310

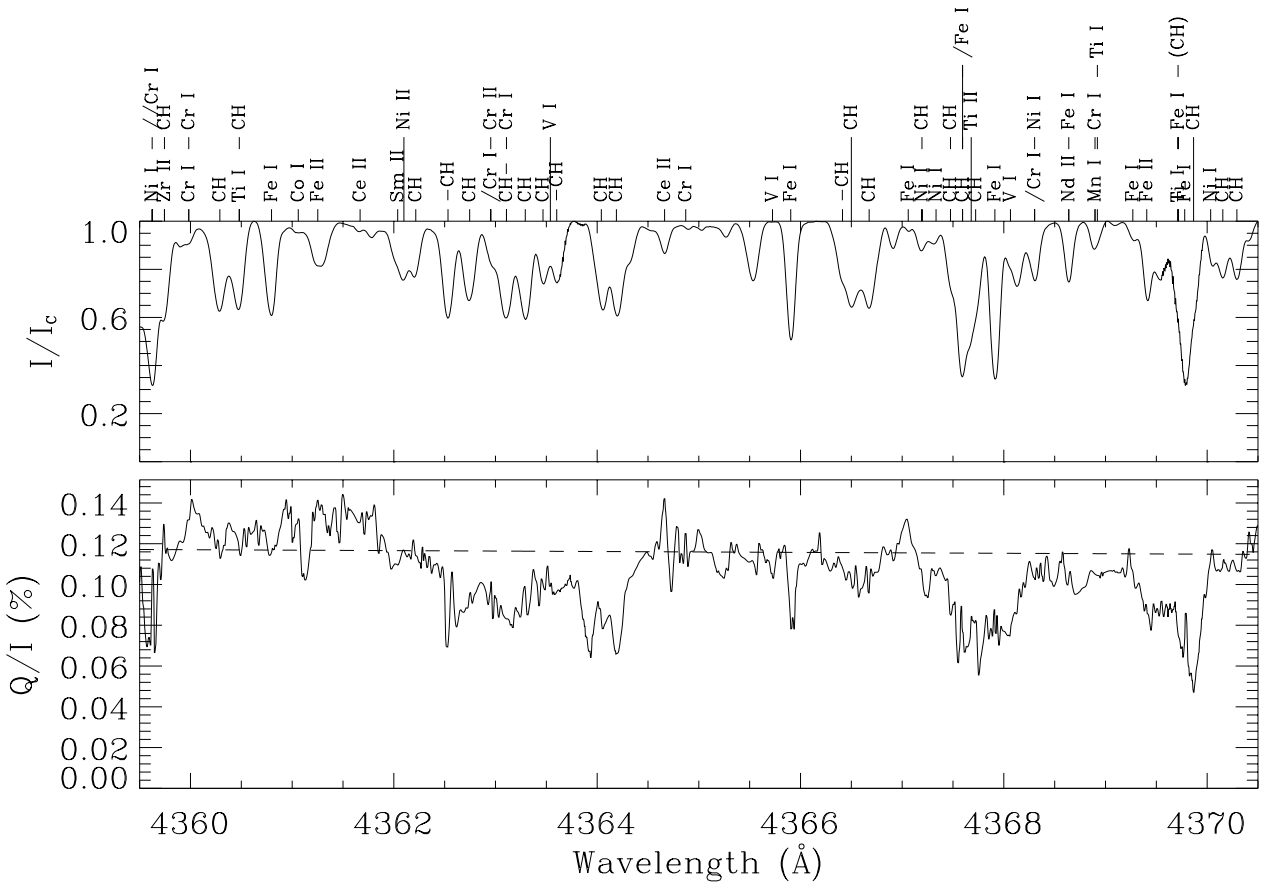

CH
CH
CH

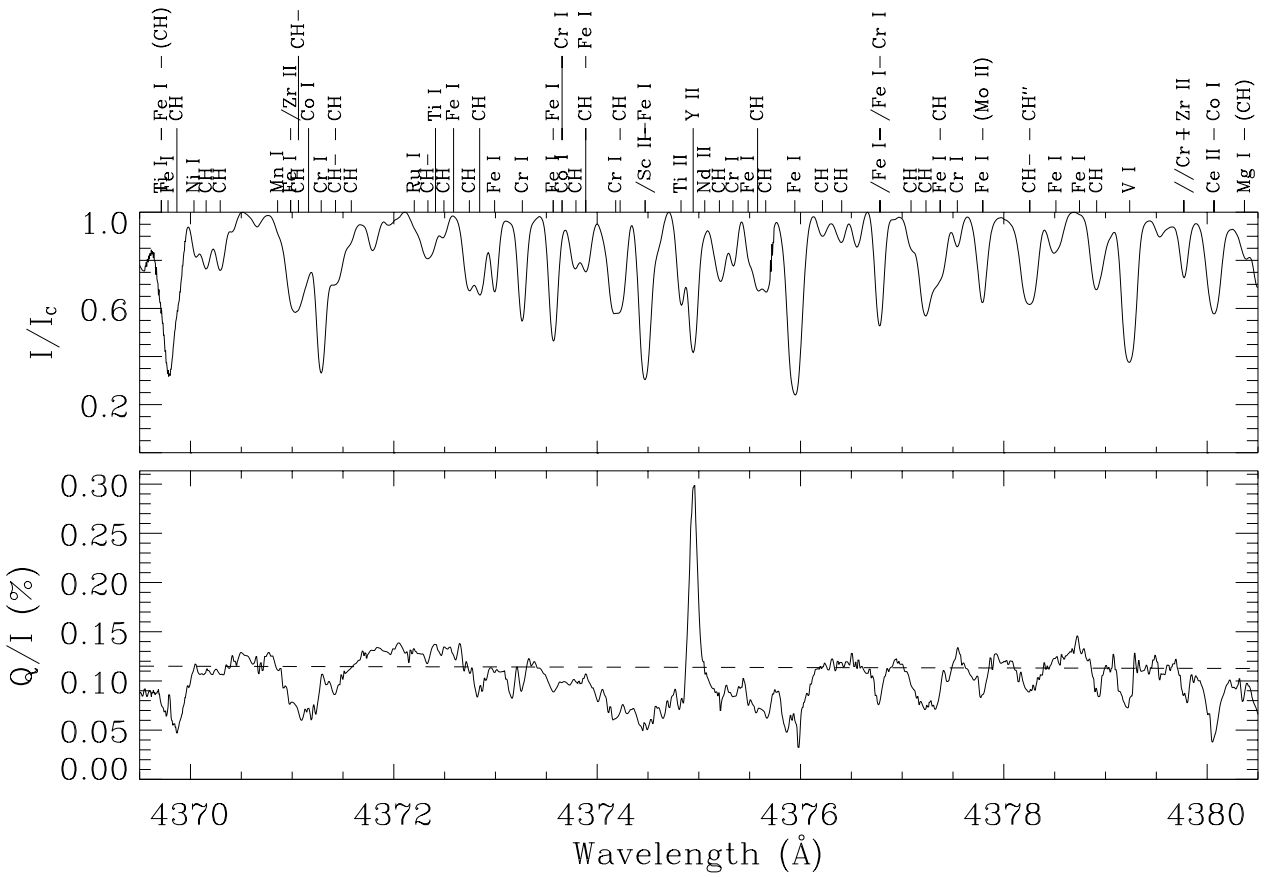

Cr I
Fe I
Fe I
Cr I
Sc II
Ti II
Cr I
Na I
Ti I
Fe I
V II
La II
Fe I
CH
CH
CH
Fe I
CH
CH
CH
Ni I
CH
CH
CH

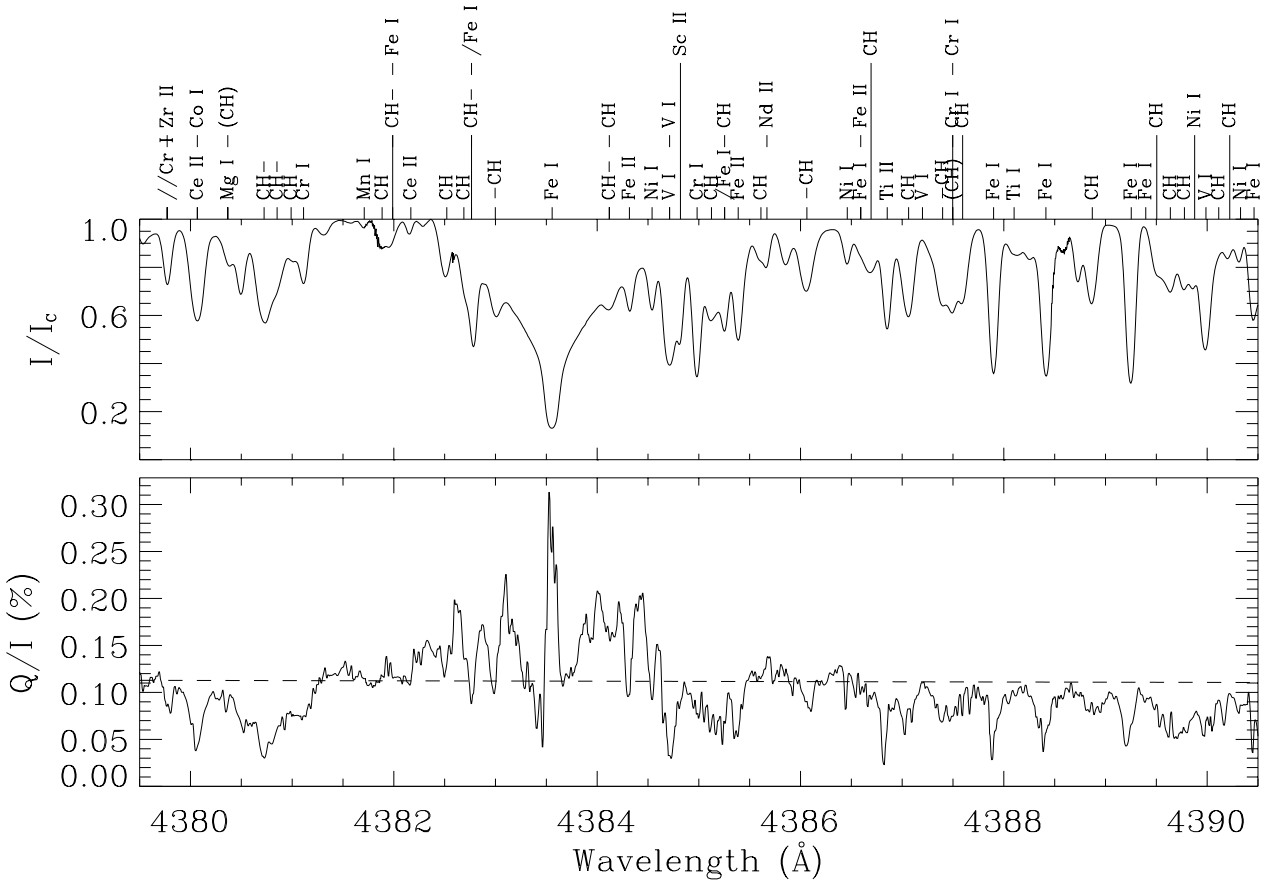

Fe I
V I
Ti II
CH
Ca II
Ti II
Ni I
Fe I
CH
Fe I
Co I
Fe I
Ni I
CH
CH
Fe I
Cr I
CH
V I
CH
Ni I
CH
Fe I
(Zr II)
La II
CH
Sm II
CH
CH
Fe I
Ti I
CH
Fe I
Fe I
Fe I
Fe I
Ce II
Fe I
CH
Fe I
CH
Cr I
Ce II
Ti II
Fe I
Ti I
CH
Fe I
Cr I
Nd II
CH
CH
Fe I
(CH)
Cr I
Cr I
Ti I
Cr I
H
1.0
0.6
0.2
I/I_c
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4330
4332
4334
4336
4338
4340
Wavelength (Å)

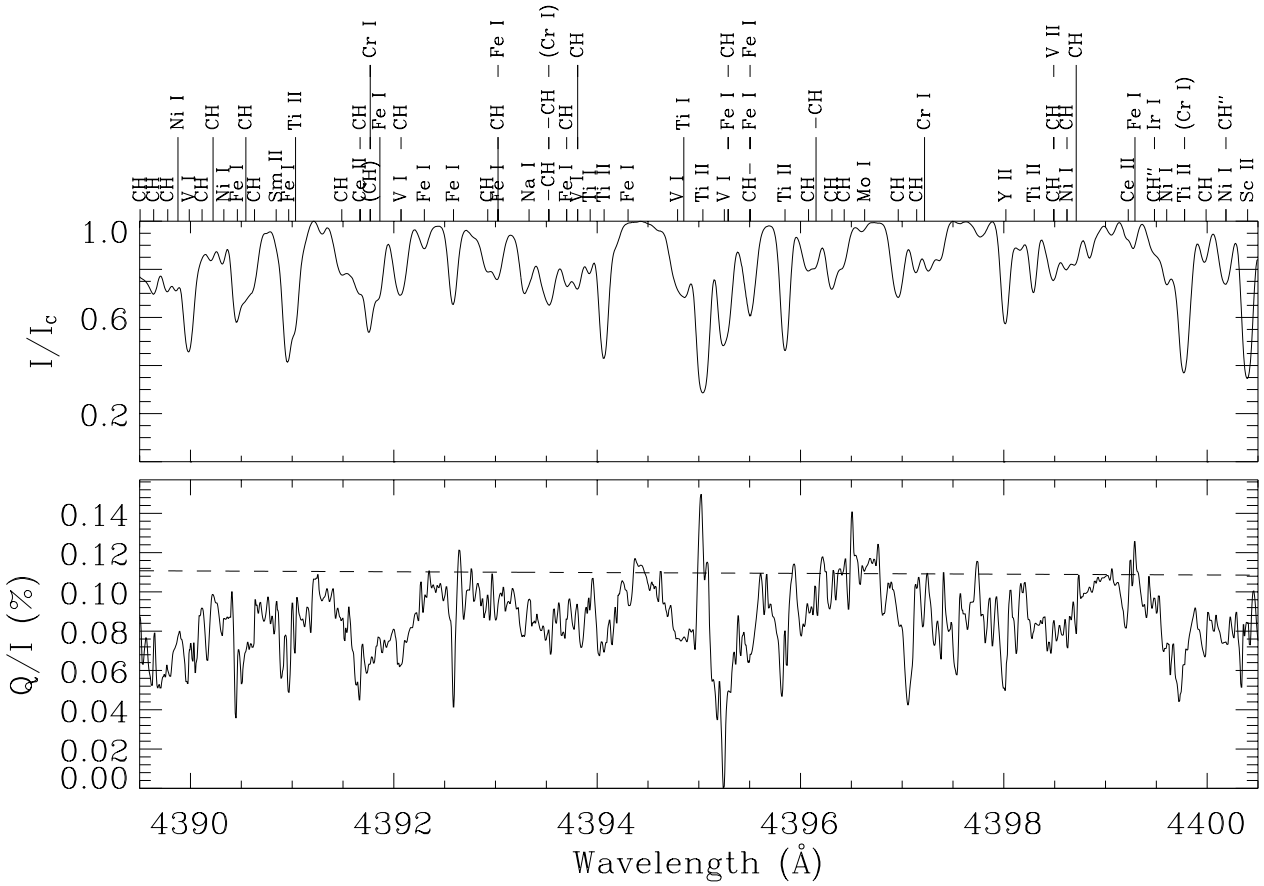

Cr I
Ti I
Cr I
H
V I
Zr I
Fe I
Ti II
Fe I
CH
Fe I
CH
Ba II
Gd II
CH
V I
CH
Cr I
Fe I
CH
CH
Fe I
(CH)
CH
Fe I
CH
Ti II
Cr I
Na I
Fe I
Cr I
CH
Ti I
CH
Fe I
CH
Cr I
V II
Fe I
CH
CH
Fe I
(Sm II)
CH
CH
CH
CH
CH
Y I
Fe I
Ce II
CH
1.0
0.6
0.2
I/I_c
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4340
4342
4344
4346
4348
4350
Wavelength (Å)

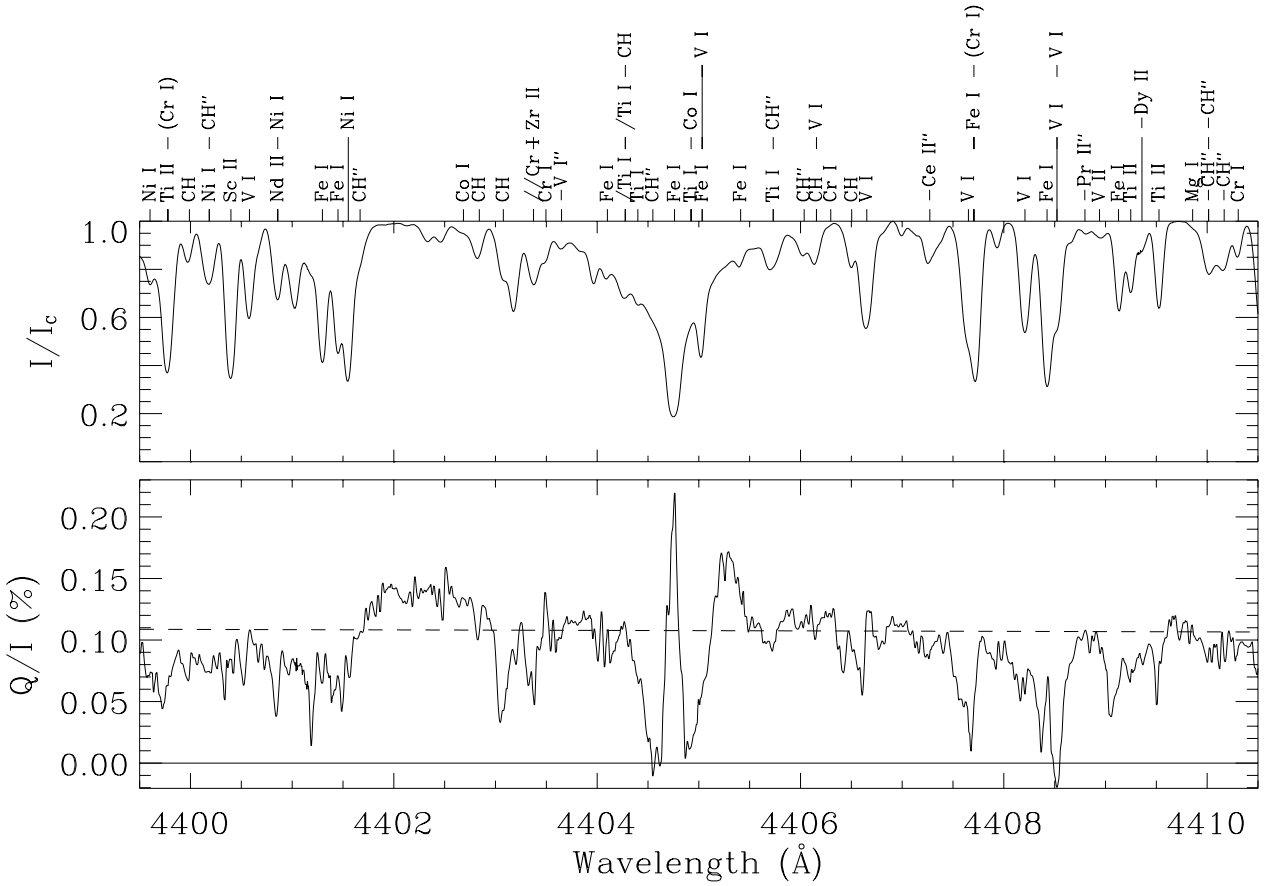

Ce II
CH
Fe I – CH
CH
Ti II
Cr I
Nd II
Fe I
Fe I
CH – /Cr I – Fe II
Mg I
CH
CH
CH
Fe I
V I
CH
–CH
CH
Co I
Cr I
Ti I
Fe I
La II
Mg I
Sc II
CH – Fe I
–V I
Ca I – (CH)
CH
CH
Ni I – V I
CH
CH
CH
Cr I
Co I
Cr I – Fe I – Fe I
CH
Nd II
Fe I
Y II
–CH
Fe I
CH
CH
Zr II
CH
Cr I
Cr I – Cr I
CH
Ti I – CH
1.0
0.6
0.2
I/I_c
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4350
4352
4354
4356
4358
4360
Wavelength (Å)

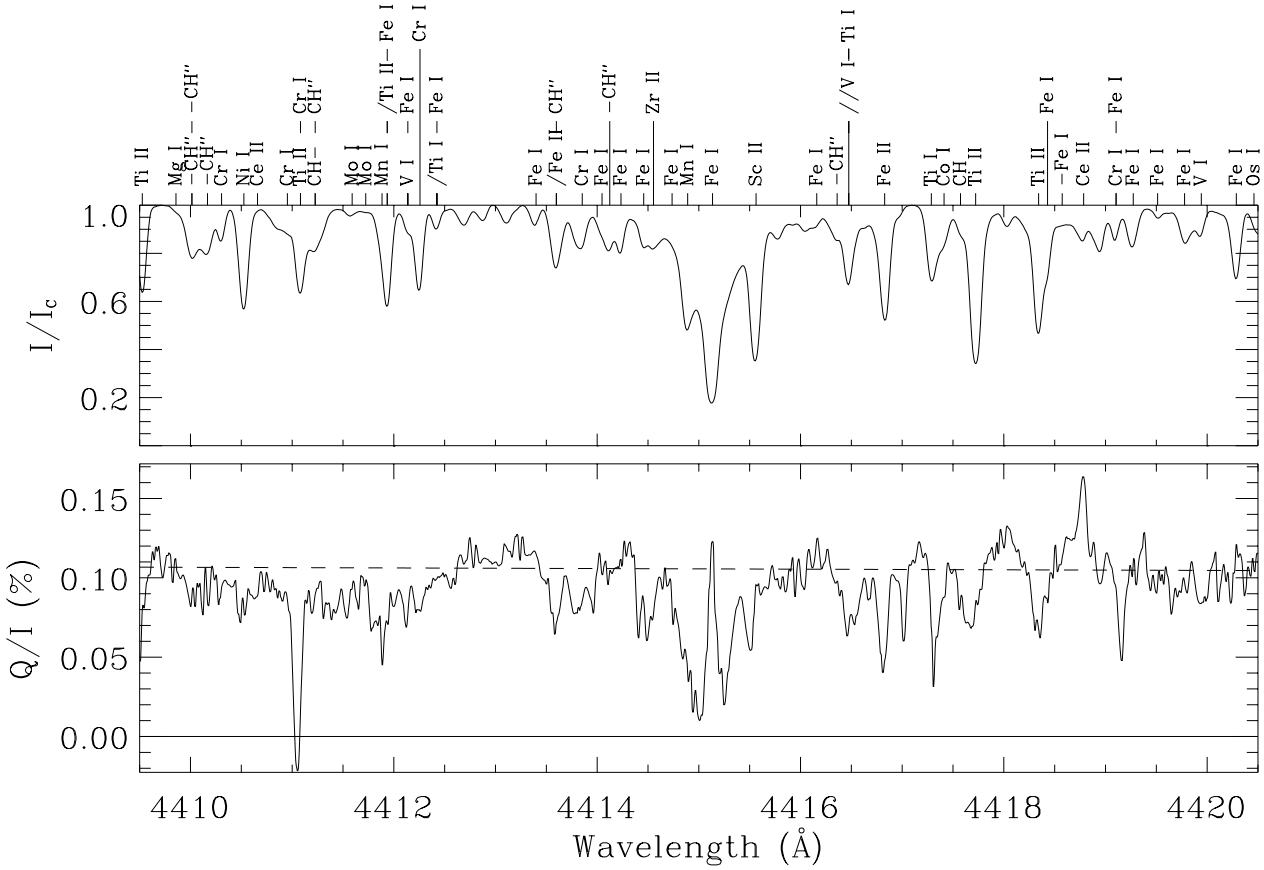

Ni I – Cr I
Zr II – CH
Cr I – Cr I
CH
Ti I – CH
Fe I
Co I
Fe II
Ce II
Sm II – Ni II
CH
–CH
CH
/Cr I – Cr II
CH – Cr I
CH
CH
–CH
V I
CH
CH
Ce II
Cr I
V I
Fe I
–CH
CH
Fe I – CH
Ni I
CH
CH
Ti II – /Fe I
Fe I
V I
/Cr I – Ni I
Nd II – Fe I
Mn I – Cr I – Ti I
Fe I
Fe II
Fe I – Fe I – (CH)
CH
Ni I
CH
CH
1.0
0.6
0.2
I/I_c
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Q/I (%)
4360
4362
4364
4366
4368
4370
Wavelength (Å)

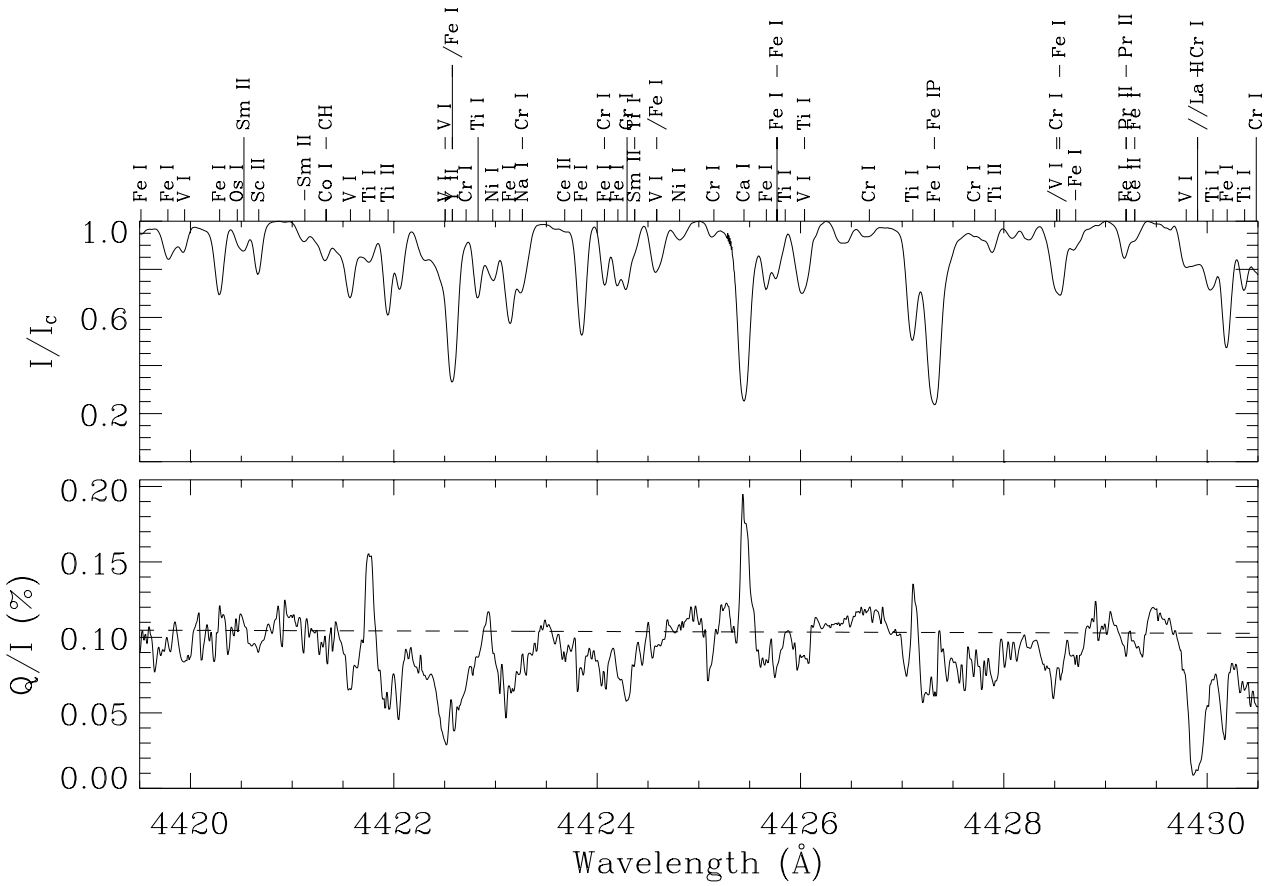

Fe I – (CH)
CH
Ni I
CH
Mn I
Fe I
/Zr II
CH–
Co I
Cr I
CH – CH
Ru I
Ti I
Fe I
CH
Fe I
Cr I
Fe I
Cr I
CH
Fe I
CH
Cr I – CH
/Sc II–Fe I
Ti II
Y II
Nd II
CH
Cr I
Fe I
CH
Fe I
CH
CH
/Fe I– /Fe I– Cr I
CH
CH
Fe I – CH
Cr I
Fe I – (Mo II)
CH– – CH''
Fe I
Fe I
CH
V I
//Cr + Zr II
Ce II – Co I
Mg I – (CH)
1.0
0.6
0.2
I/I$_c$
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4370
4372
4374
4376
4378
4380
Wavelength (Å)

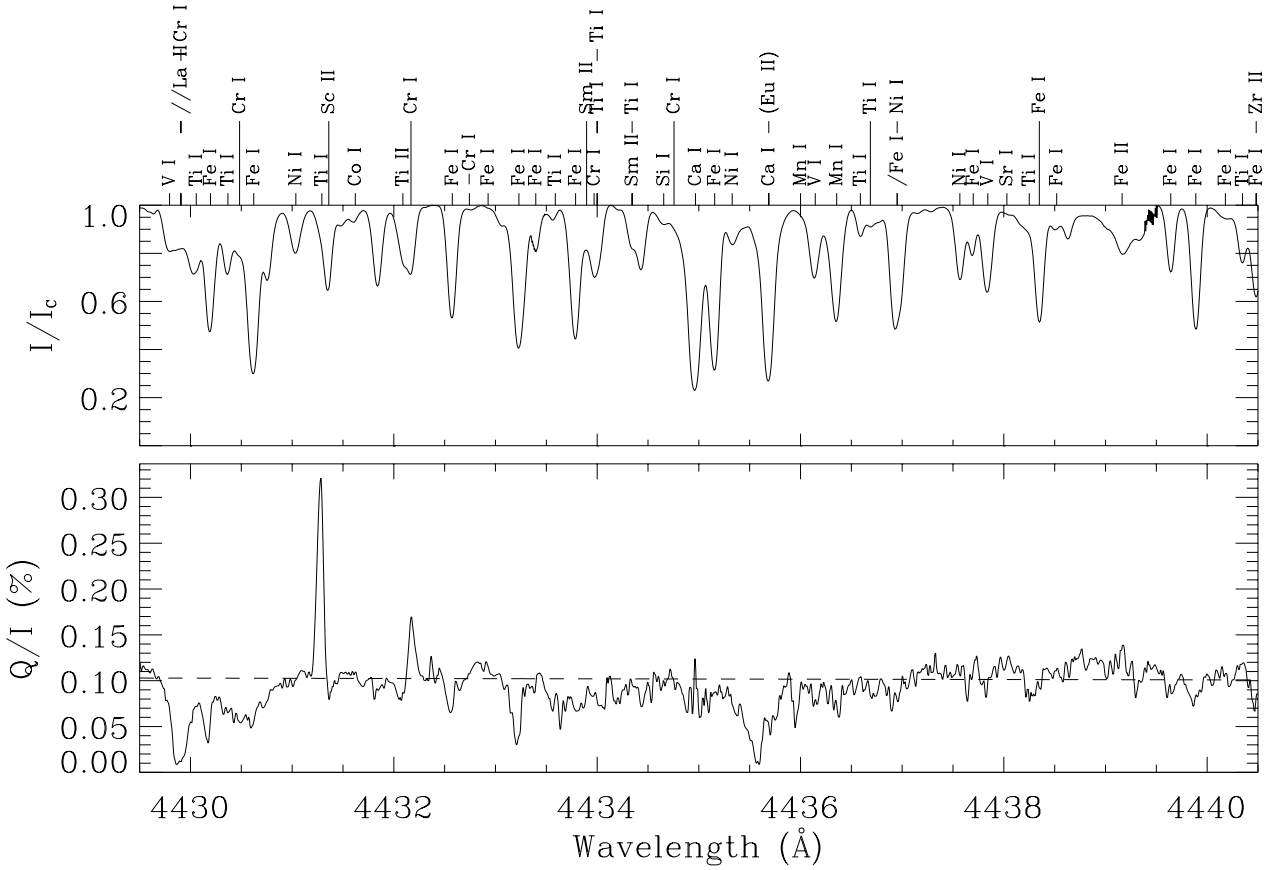

//Cr + Zr II
Ce II
Co I
Mg I
(CH)
CH
CH
CH
Cr I
Mn I
CH
CH
Fe I
Ce II
CH
CH
CH
/Fe I
CH
Fe I
CH
Fe II
Ni I
V I
V I
Sc II
Cr I
CH
Fe I
Fe II
CH
Nd II
CH
Ni I
Fe I
Fe II
CH
Ti II
CH
V I
(CH)
CH
Cr I
CH
Fe I
Ti I
Fe I
CH
Fe I
Fe I
CH
CH
CH
Ni I
V I
CH
CH
Ni I
Fe I
1.0
0.6
0.2
I/I_c
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4380
4382
4384
4386
4388
4390
Wavelength (Å)

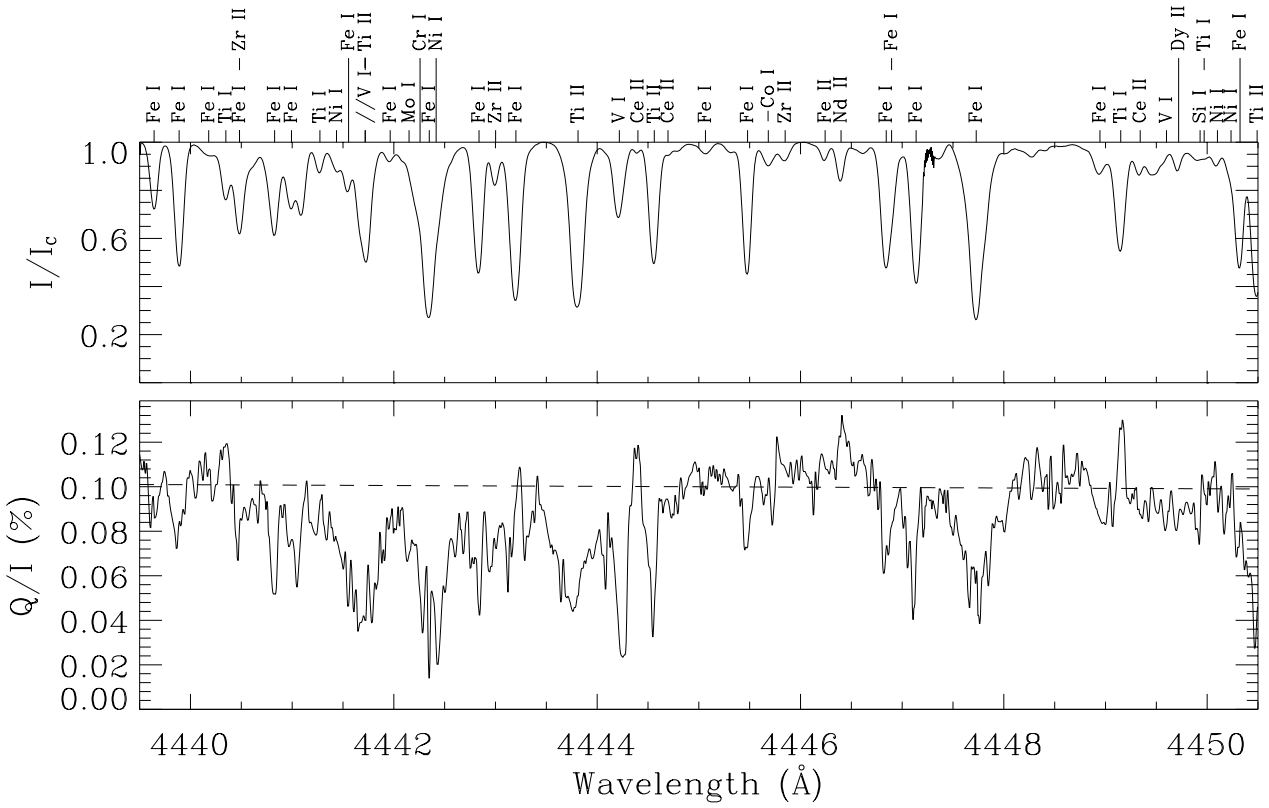

CH
CH
CH
V I
CH
Ni I
CH
Fe I
CH
Sm II
Fe I
Ti II
CH
Ce II
(CH)
CH
Cr I
Fe I
V I
CH
Fe I
Fe I
CH
Fe I
CH
Fe I
Na I
CH
CH
(Cr I)
Fe I
CH
Ti I
Ti II
Fe I
V I
Ti I
Ti II
V I
Fe I
CH
CH
Fe I
Ti II
CH
CH
CH
CH
Mo I
CH
CH
Cr I
Y II
Ti II
CH
Ni I
V II
CH
Ce II
Fe I
CH''
Ir I
Ni I
Ti II
(Cr I)
CH
Ni I
CH''
Sc II
1.0
0.6
0.2
I/I$_c$
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Q/I (%)
4390
4392
4394
4396
4398
4400
Wavelength (Å)

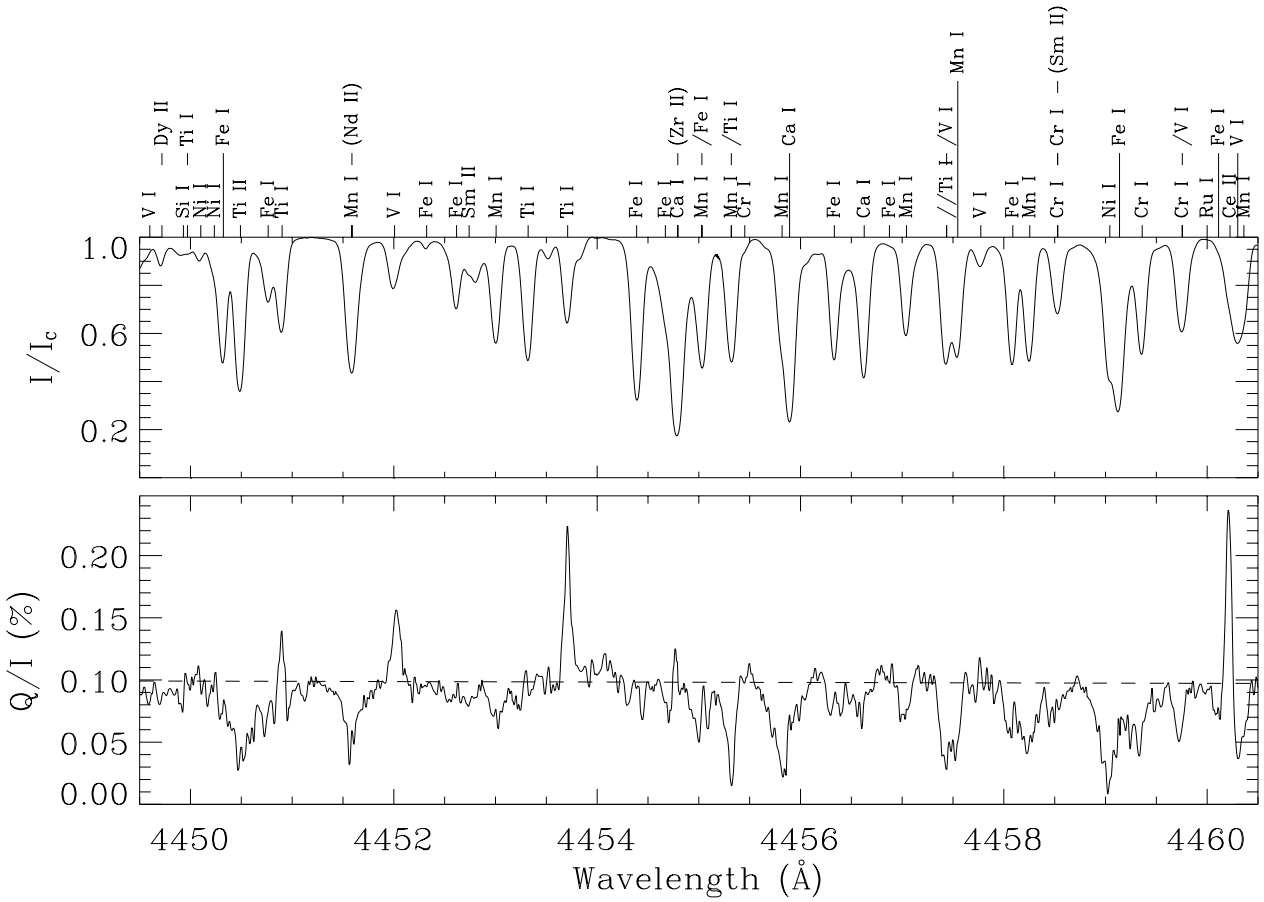

Ni I
Ti II
(Cr I)
CH
Ni I
CH''
Sc II
V I
Nd II
Ni I
Fe I
Fe I
Ni I
CH''
Co I
CH
CH
/Cr I
Zr II
Cr I
V I''
Fe I
/Ti I
Ti I
CH
CH''
Fe I
Ti I
Fe I
Co I
V I
Fe I
Ti I
CH''
CH''
CH
Cr I
CH
V I
V I
Ce II''
V I
Fe I
(Cr I)
V I
Fe I
V I
V I
Pr II''
V II
Fe I
Ti II
Dy II
Ti II
Mg I
CH''
CH''
CH''
Cr I
1.0
0.6
0.2
I/I_c
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4400
4402
4404
4406
4408
4410
Wavelength (Å)

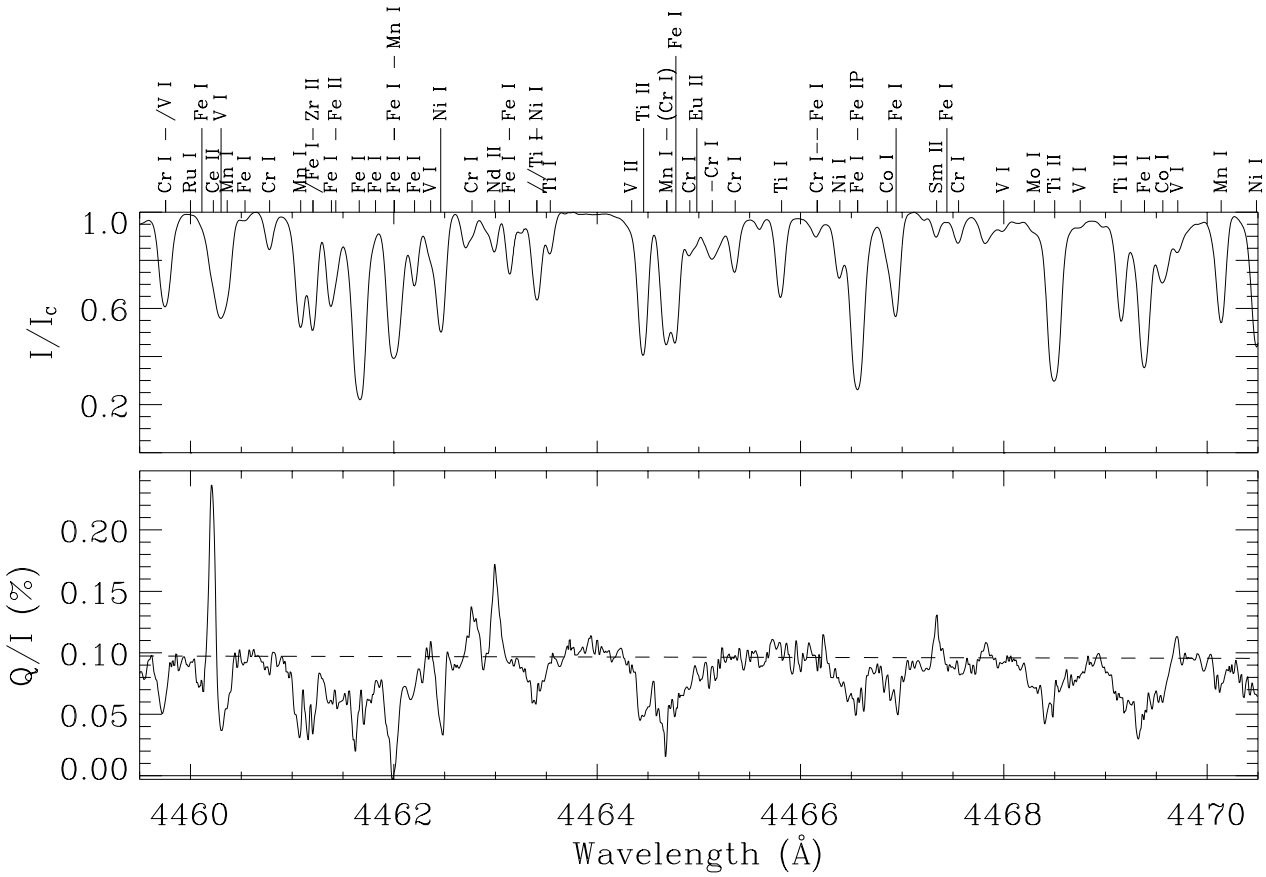

Ti II
Mg I
CH''
CH''
CH''
Cr I
Ni I
Ce II
Cr I
Ti II
CH''
CH''
Mo I
Mo I
Mn I
Ti II
Fe I
V I
Fe I
Cr I
Ti I
Fe I
Fe I
/Fe II
CH''
Cr I
Fe I
CH''
Fe I
Fe I
Zr II
Fe I
Mn I
Fe I
Sc II
Fe I
CH''
V I
Ti I
Fe II
Ti I
Co I
CH
Ti II
Ti II
Fe I
Fe I
Ce II
Cr I
Fe I
Fe I
Fe I
V I
Fe I
Os I
1.0
0.6
0.2
I/I_c
0.15
0.10
0.05
0.00
Q/I (%)
4410
4412
4414
4416
4418
4420
Wavelength (Å)

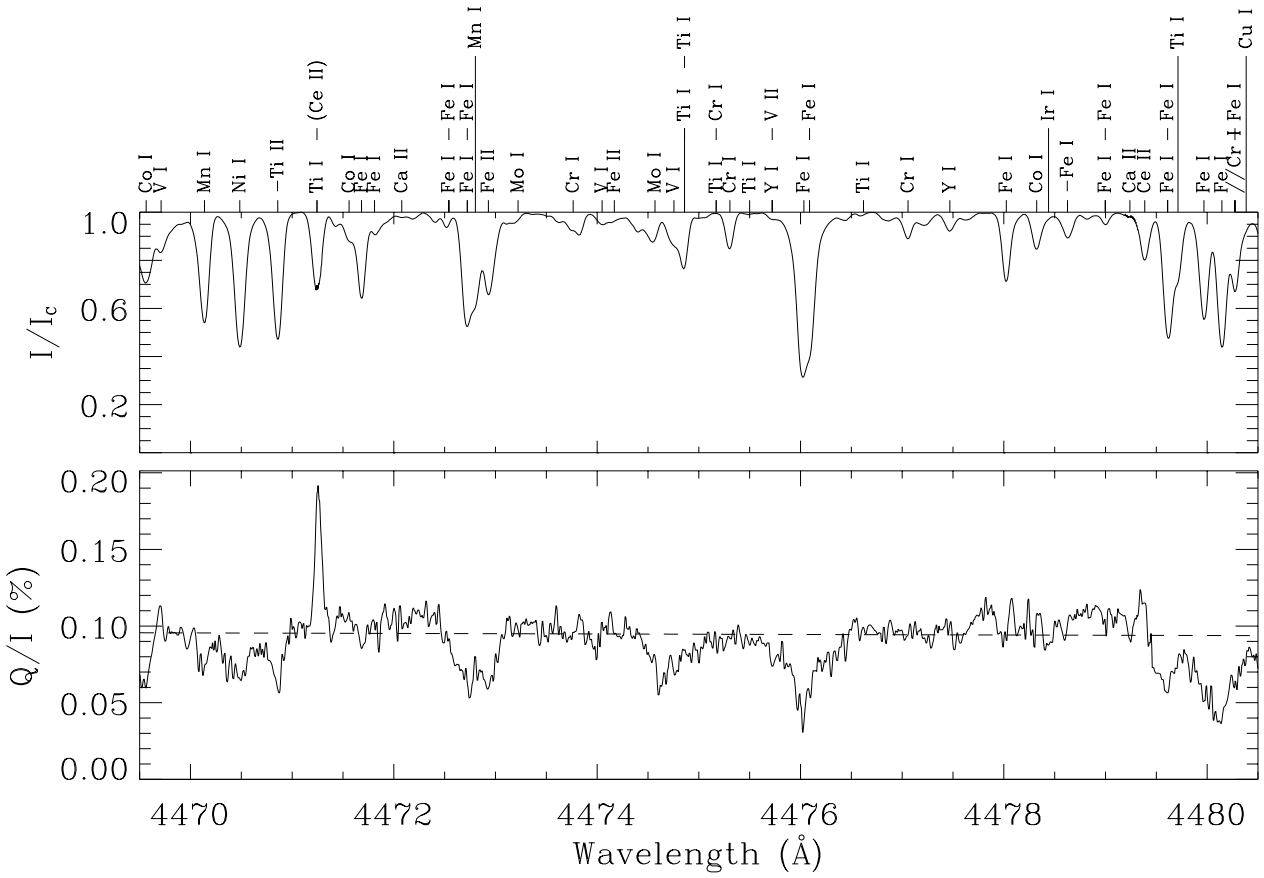

Fe I
Fe I
V I
Fe I
Os I
Sm II
Sc II
Sm II
Co I
CH
V I
Ti I
Ti II
V I
V I
/Fe I
Cr I
Ti I
Ni I
Fe I
Na I
Cr I
Ce II
Fe I
Fe I
Cr I
Fe I
Cr I
Sm II
Ti I
V I
/Fe I
Ni I
Cr I
Ca I
Fe I
Fe I
Fe I
Ti I
V I
Ti I
Cr I
Ti I
Fe I
Fe IP
Cr I
Ti II
V I
Cr I
Fe I
Fe I
Fe II
Pr II
Ce II
Fe I
V I
//La II
Cr I
Ti I
Fe I
Ti I
Cr I
1.0
0.6
0.2
I/I$_c$
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4420
4422
4424
4426
4428
4430
Wavelength (Å)

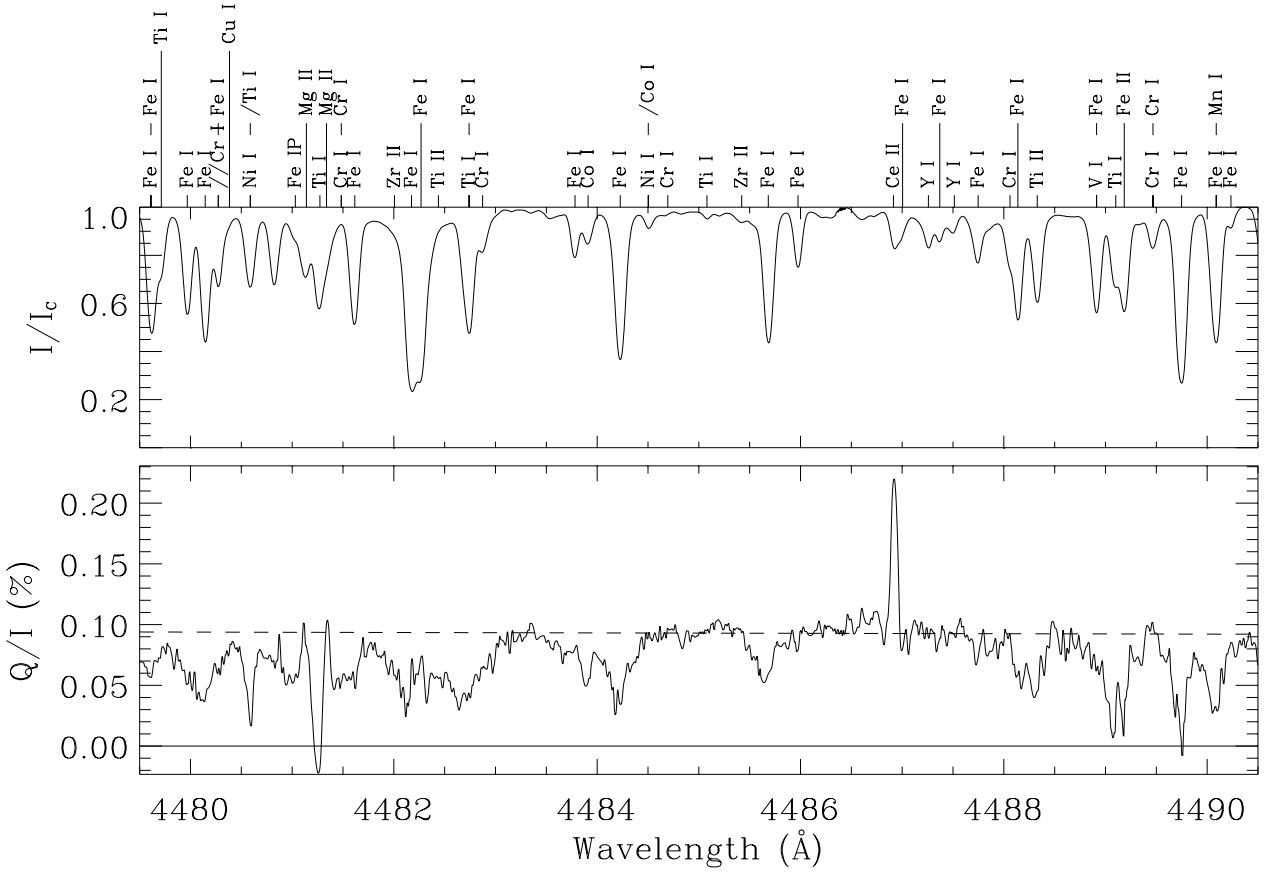

V I
Ti I
Fe I
Ti I
Fe I
Cr I
Ni I
Ti I
Sc II
Co I
Ti II
Cr I
Fe I
Cr I
Fe I
Fe I
Fe I
Ti I
Fe I
Cr I
Sm II
Ti I
Sm II
Ti I
Si I
Cr I
Ca I
Fe I
Ni I
Ca I
(Eu II)
Mn I
V I
Mn I
Ti I
Ti I
Fe I
Ni I
Ni I
Fe I
V I
Sr I
Ti I
Fe I
Fe II
Fe I
Fe I
Fe I
Ti I
Fe I
Zr II
1.0
0.6
0.2
I/I_c
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4430
4432
4434
4436
4438
4440
Wavelength (Å)

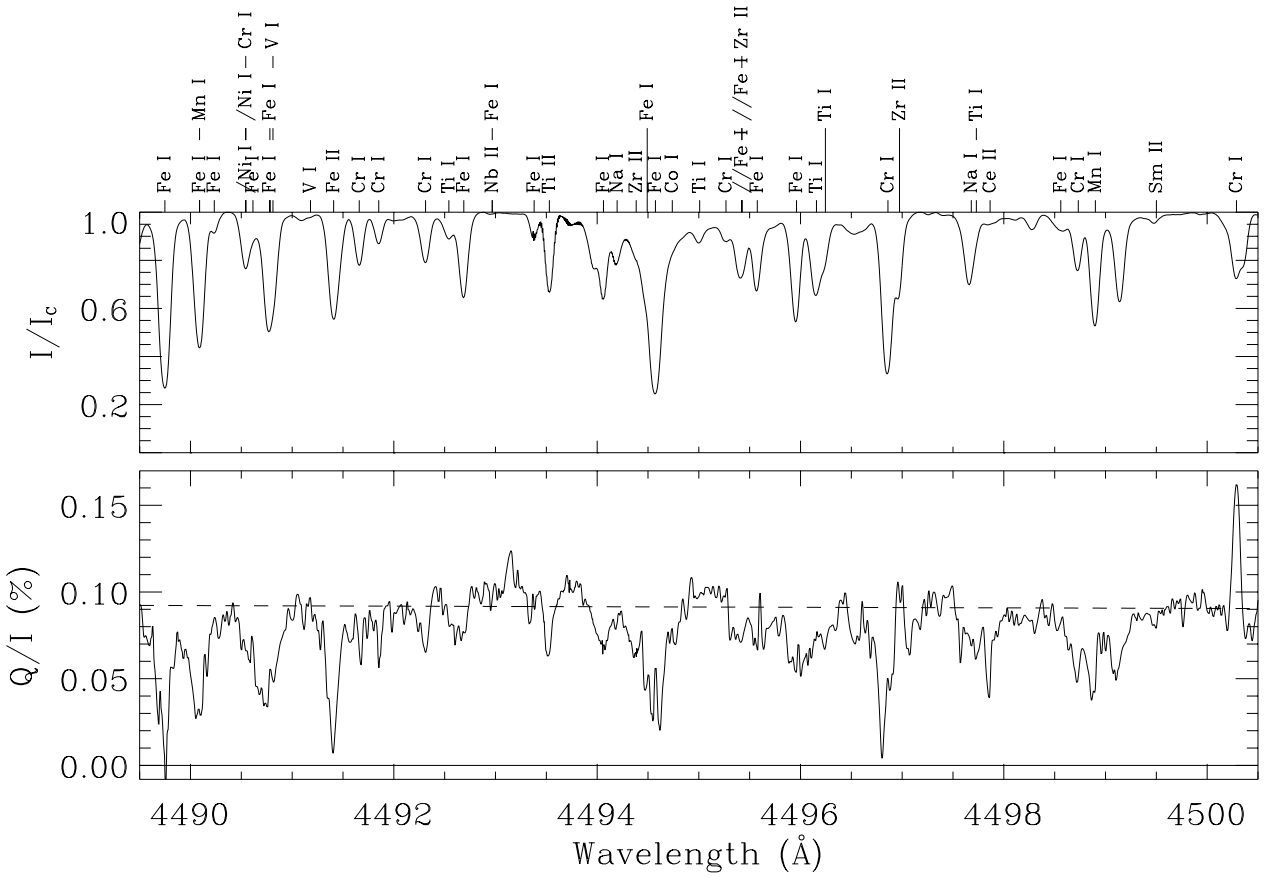

Fe I
Fe I
Fe I
Ti I
Fe I
Zr II
Fe I
Fe I
Ti I
Ni I
Fe I
Ti II
V I
Mo I
Cr I
Ni I
Fe I
Fe I
Zr II
Fe I
Ti II
V I
Ce II
Ti II
Ce II
Fe I
Fe I
Co I
Zr II
Fe II
Nd II
Fe I
Fe I
Fe I
Fe I
Ti I
Ce II
V I
Dy II
Si I
Ti I
Ni I
Ni I
Fe I
Ti II
1.0
0.6
0.2
I/I_c
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Q/I (%)
4440
4442
4444
4446
4448
4450
Wavelength (Å)

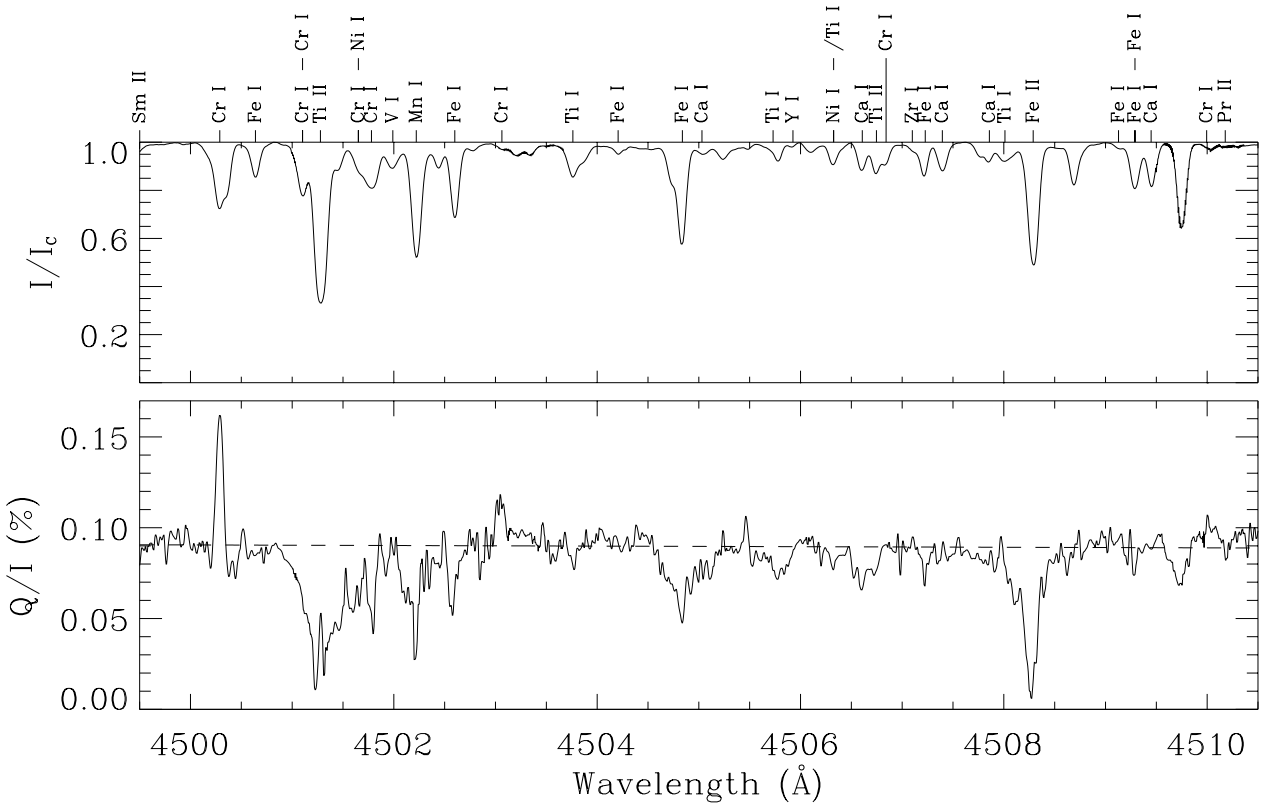

V I
Dy II
Si I
Ti I
Ni I
Ni I
Fe I
Ti II
Fe I
Ti I
Mn I
(Nd II)
V I
Fe I
Fe I
Sm II
Mn I
Ti I
Ti I
Fe I
Fe I
Ca I
(Zr II)
Mn I
/Fe I
Mn I
Cr I
/Ti I
Mn I
Ca I
Fe I
Ca I
Fe I
Mn I
/Ti I
/V I
Mn I
V I
Fe I
Mn I
Cr I
Cr I
(Sm II)
Ni I
Fe I
Cr I
Cr I
/V I
Ru I
Fe I
Ce II
V I
Mn I
1.0
0.6
0.2
I/I_c
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4450
4452
4454
4456
4458
4460
Wavelength (Å)

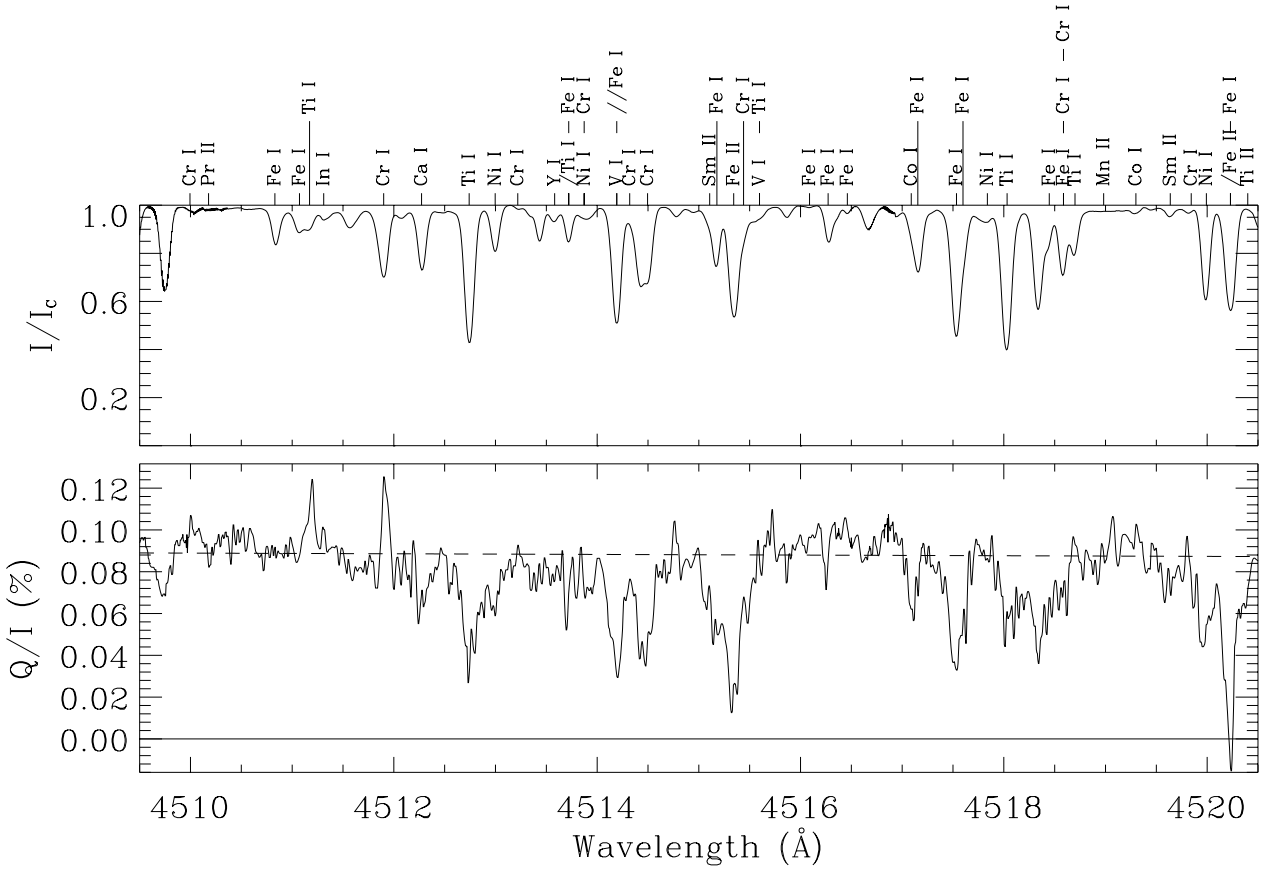

Cr I
V I
Ru I
Fe I
Ce II
Mn I
V I
Fe I
Cr I
Mn I
Fe I
Zr II
Fe I
Fe II
Fe I
Fe I
Fe I
Mn I
Fe I
V I
Ni I
Cr I
Nd II
Fe I
Ti I
Ni I
Ti I
V II
Ti II
Mn I
(Cr I)
Fe I
Cr I
Eu II
Cr I
Cr I
Ti I
Cr I
Fe I
Ni I
Fe I
Fe IP
Co I
Fe I
Sm II
Fe I
Cr I
V I
Mo I
Ti II
V I
Ti II
Fe I
Co I
V I
Mn I
Ni I
1.0
0.6
0.2
I/I_c
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4460
4462
4464
4466
4468
4470
Wavelength (Å)

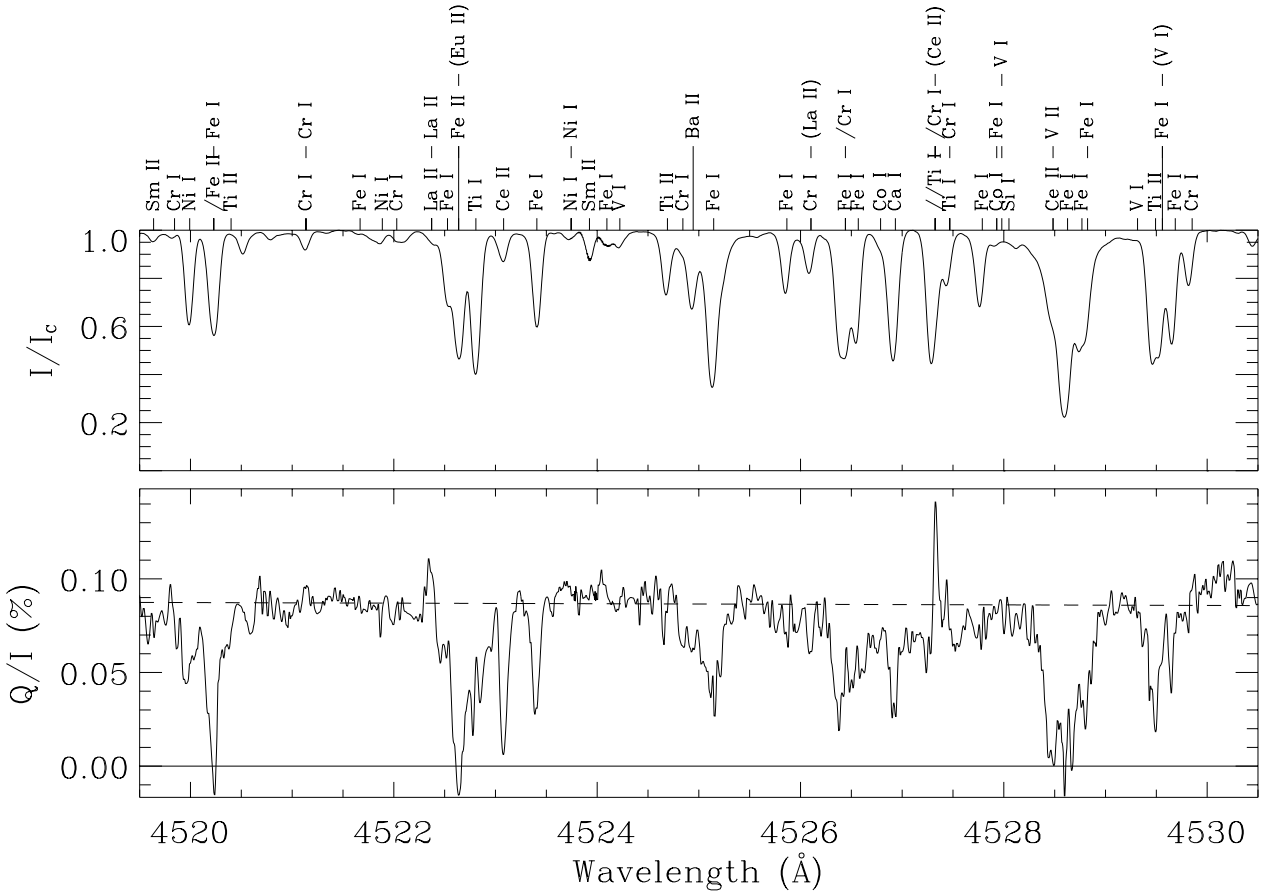

Co I
V I
Mn I
Ni I
Ti II
Ti I
(Ce II)
Co I
Fe I
Fe I
Ca II
Fe I
Fe I
Fe I
Fe II
Mn I
Mo I
Cr I
Y I
Fe II
Mo I
V I
Ti I
Ti I
Cr I
Cr I
Ti I
V II
Y I
Fe I
Fe I
Ti I
Cr I
Y I
Fe I
Co I
Ir I
Fe I
Fe I
Fe I
Ca II
Ce II
Fe I
Ti I
Fe I
Fe I
Cr I
Fe I
Cu I
1.0
0.6
0.2
I/I_c
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4470
4472
4474
4476
4478
4480
Wavelength (Å)

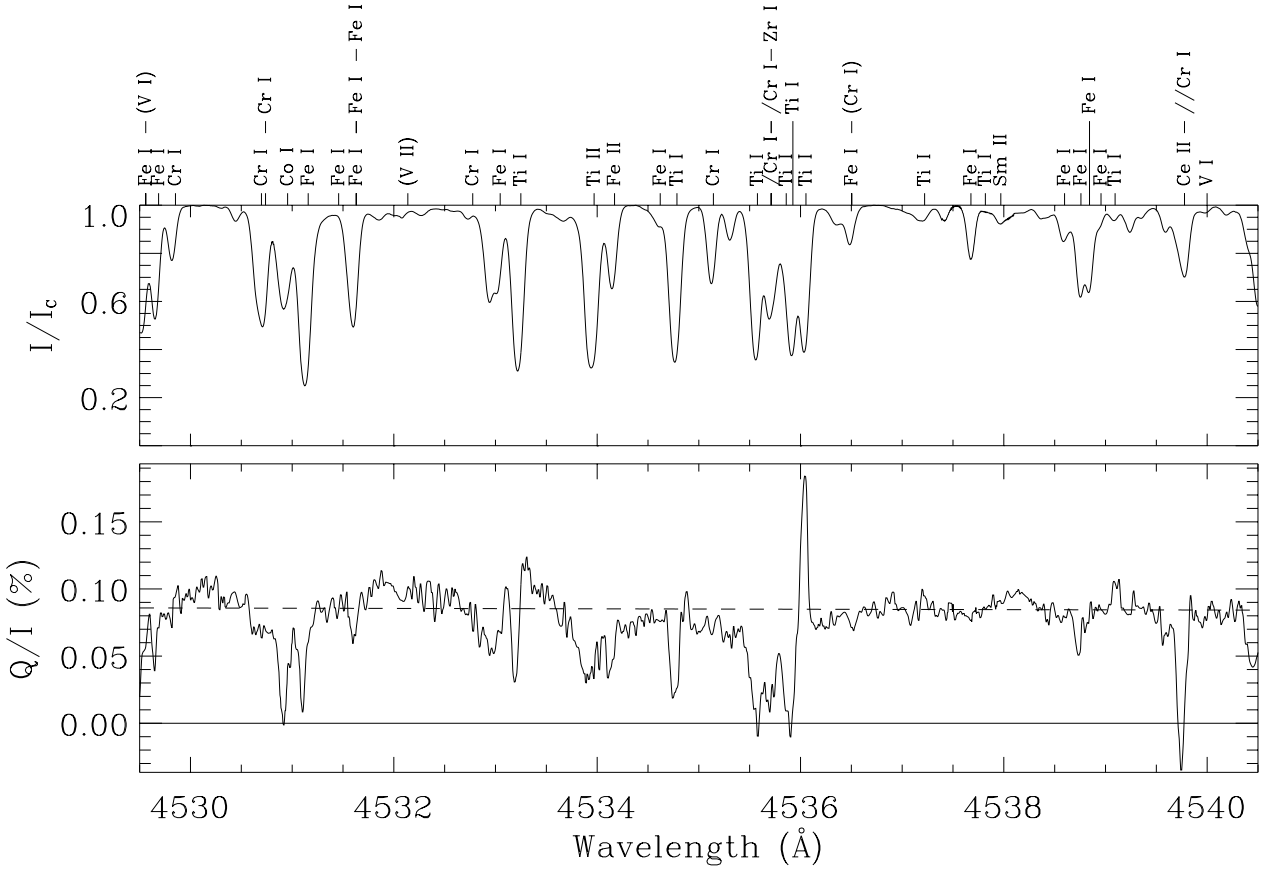

Fe I
Fe I
Ti I
Fe I
Fe I
Cu I
Cr I
Fe I
Ni I
Ti I
Fe IP
Mg II
Ti I
Mg II
Cr I
Cr I
Fe I
Zr II
Fe I
Fe I
Ti II
Ti I
Cr I
Fe I
Co I
Fe I
Ni I
Co I
Cr I
Ti I
Zr II
Fe I
Fe I
Ce II
Fe I
Y I
Fe I
Y I
Fe I
Cr I
Fe I
Ti II
V I
Fe I
Ti I
Fe II
Cr I
Cr I
Fe I
Mn I
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4480
4482
4484
4486
4488
4490
Wavelength (Å)

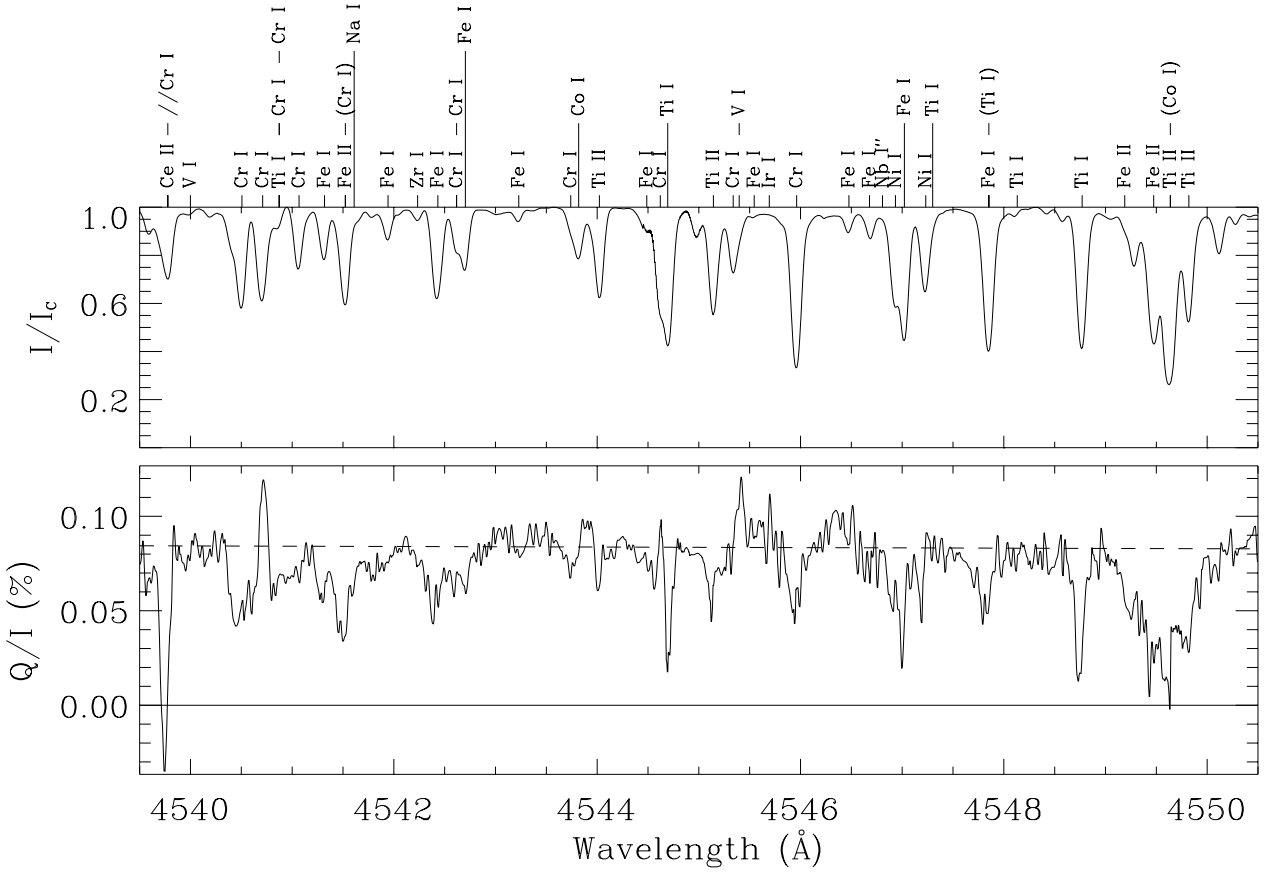

Fe I
Fe I – Mn I
Fe I
Ni I – /Ni I – Cr I
Fe I
Fe I = Fe I – V I
V I
Fe II
Cr I
Cr I
Cr I
Ti I
Fe I
Nb II – Fe I
Fe I
Ti II
Fe I
Na I
Zr II
Fe I
Fe I
Co I
Ti I
Cr I
Fe I + /Fe I + Zr II
Fe I
Fe I
Ti I
Ti I
Cr I
Zr II
Na I – Ti I
Ce II
Fe I
Cr I
Mn I
Sm II
Cr I
1.0
0.6
0.2
I/I_c
0.15
0.10
0.05
0.00
Q/I (%)
4490
4492
4494
4496
4498
4500
Wavelength (Å)

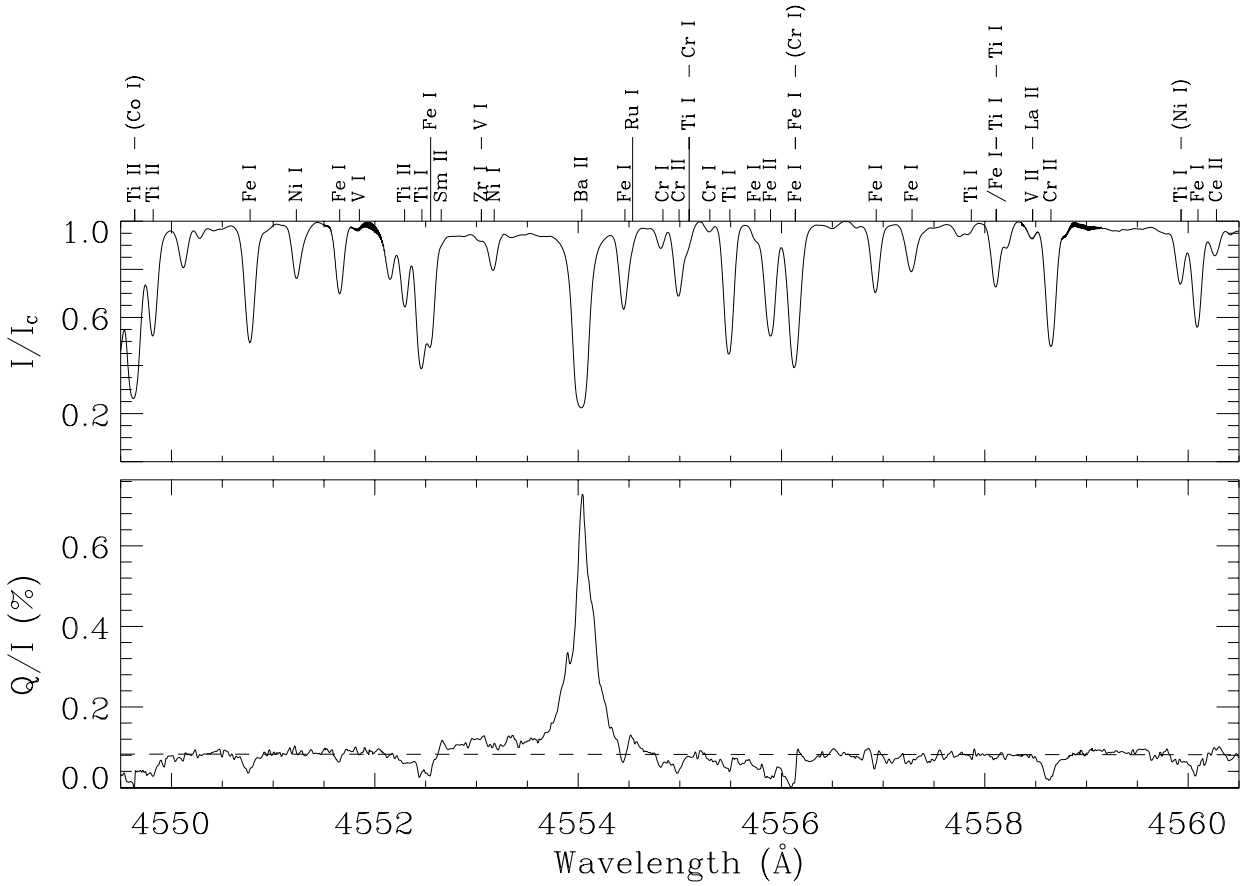

Sm II
Cr I
Fe I
Cr I – Cr I
Ti II
Cr I – Ni I
Cr I
V I
Mn I
Fe I
Cr I
Ti I
Fe I
Fe I
Ca I
Ti I
Y I
Ni I – /Ti I
Ca I
Ti II
Cr I
Zr I
Fe I
Ca I
Ca I
Ti I
Fe II
Fe I – Fe I
Fe I
Ca I
Cr I
Pr II
1.0
0.6
0.2
I/I_c
0.15
0.10
0.05
0.00
Q/I (%)
4500
4502
4504
4506
4508
4510
Wavelength (Å)

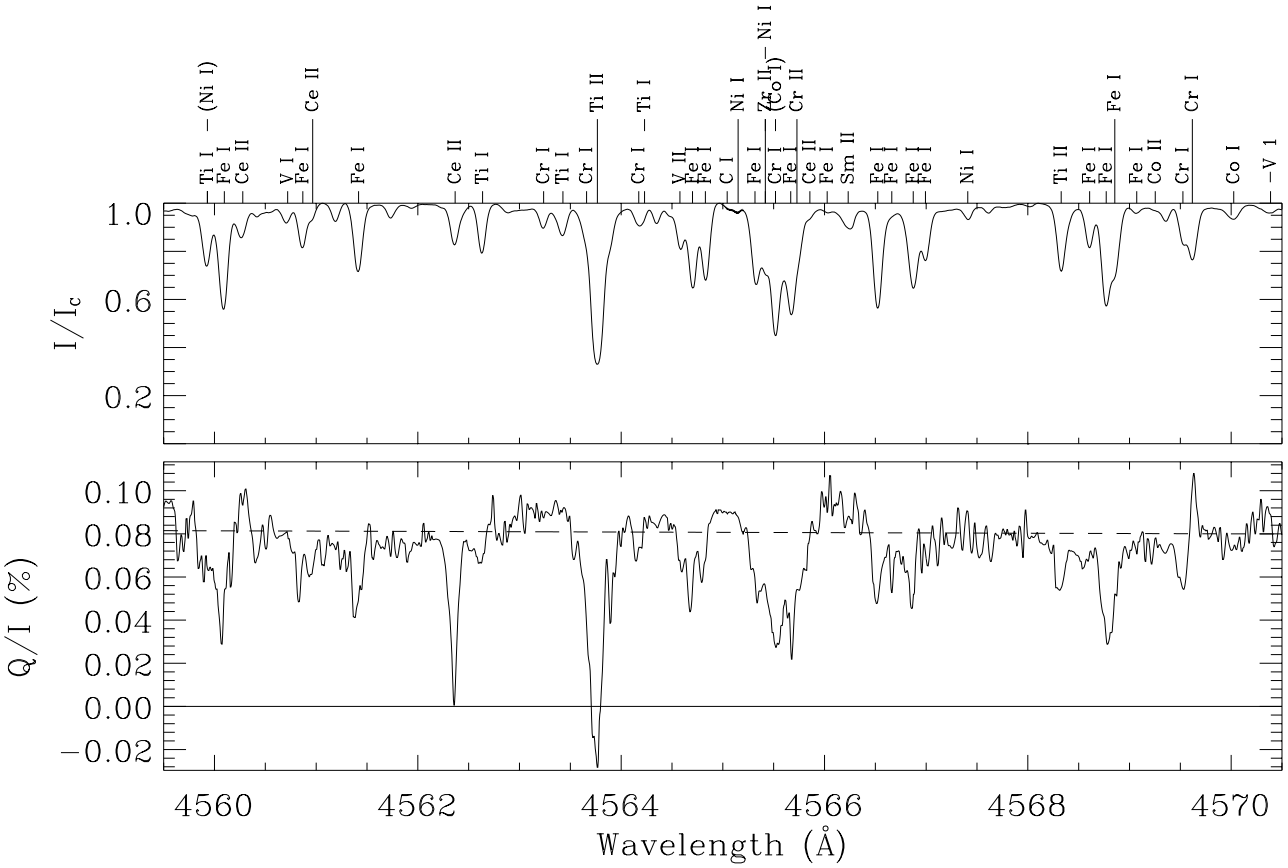

Cr I
Pr II
Fe I
Fe I
Ti I
In I
Cr I
Ca I
Ti I
Ni I
Cr I
Y I
Ti I
Fe I
Ni I
Cr I
Y I
Cr I
Cr I
Fe I
Sm II
Fe I
Fe II
Cr I
V I
Ti I
Fe I
Fe I
Fe I
Co I
Fe I
Fe I
Ni I
Ti I
Fe I
Cr I
Fe I
Ti I
Mn II
Co I
Sm II
Cr I
Ni I
Fe II
Fe I
Ti II
1.0
0.6
0.2
I/I_c
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Q/I (%)
4510
4512
4514
4516
4518
4520
Wavelength (Å)

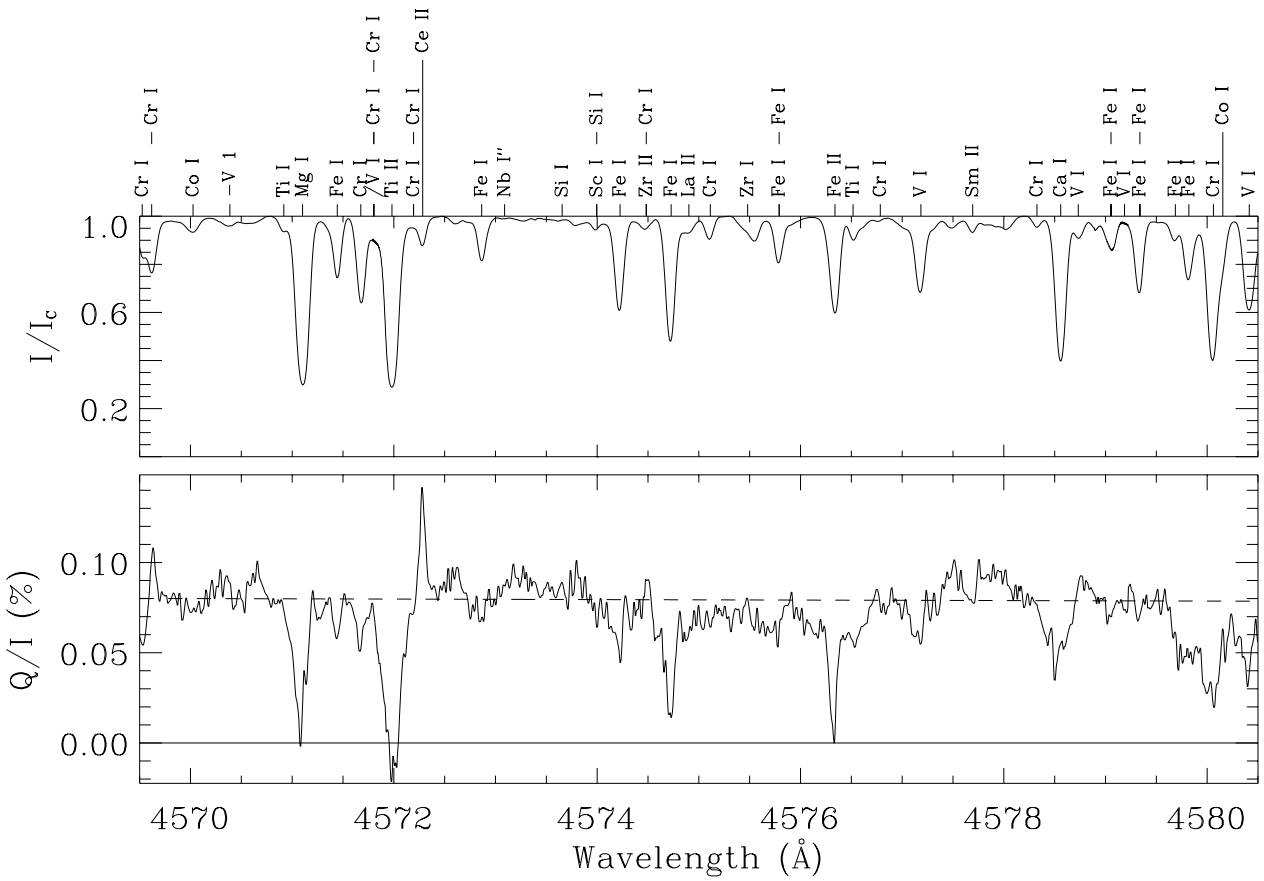

Sm II
Cr I
Ni I
/Fe II
Fe I
Ti II
Cr I
Cr I
Fe I
Ni I
Cr I
La II
La II
Fe I
Fe II
(Eu II)
Ti I
Ce II
Fe I
Ni I
Ni I
Sm II
Fe I
V I
Ti II
Cr I
Ba II
Fe I
Fe I
Cr I
(La II)
Fe I
/Cr I
Fe I
Co I
Ca I
/Ti I
Cr I
(Ce II)
Ti I
Cr I
Fe I
V I
Fe I
Co I
Si I
Ce II
V II
Fe I
Fe I
Fe I
V I
Ti II
Fe I
(V I)
Fe I
Cr I
1.0
0.6
0.2
I/I_c
0.10
0.05
0.00
Q/I (%)
4520
4522
4524
4526
4528
4530
Wavelength (Å)

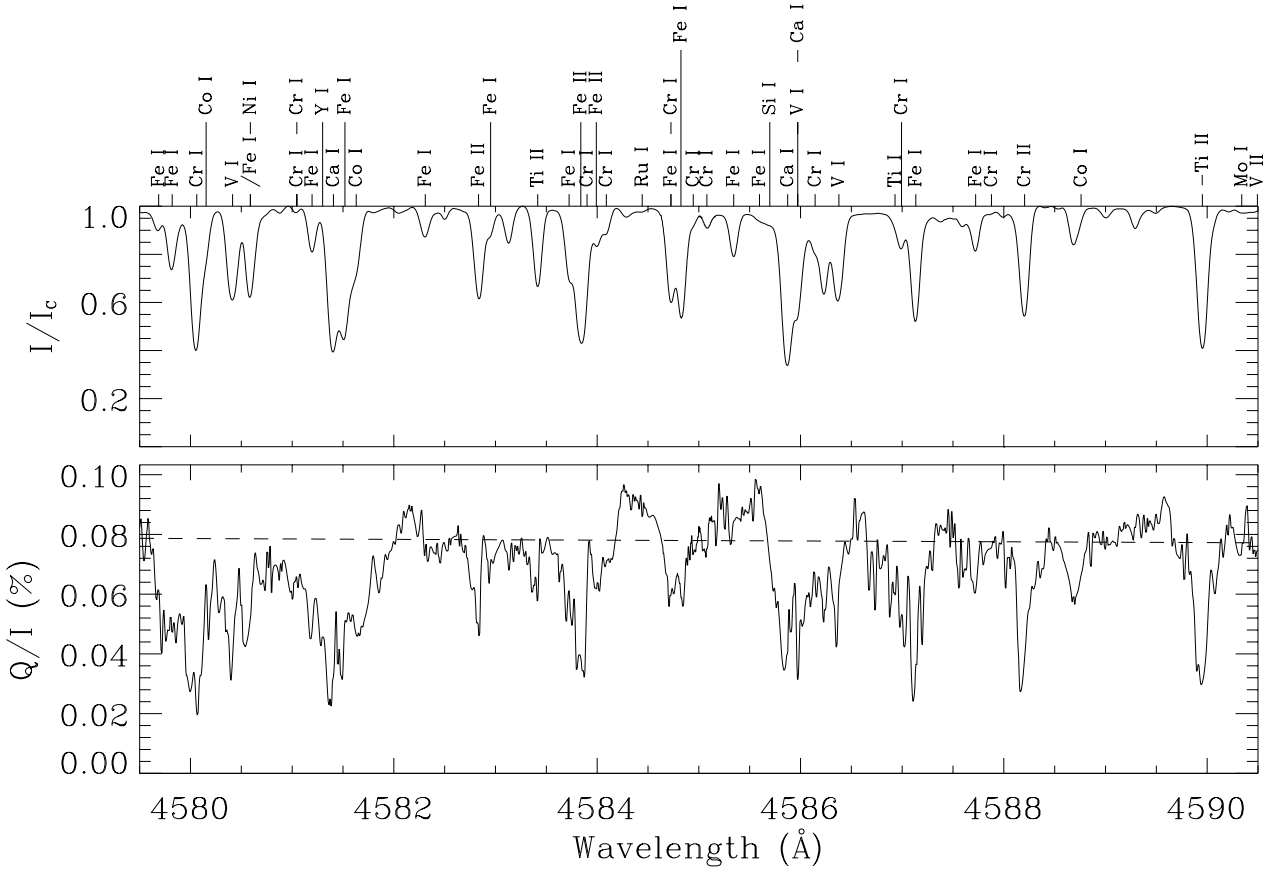

Fe I – (V I)
Fe I
Cr I
Cr I – Cr I
Co I
Fe I
Fe I
Fe I – Fe I
(V II)
Cr I
Fe I
Ti I
Ti II
Fe II
Fe I
Ti I
Cr I
Ti I
Cr I – /Cr I – Zr I
Ti I
Ti I
Fe I – (Cr I)
Ti I
Fe I
Ti I
Sm II
Fe I
Fe I
Fe I
Ti I
Ce II – //Cr I
V I
1.0
0.6
0.2
I/I_c
0.15
0.10
0.05
0.00
Q/I (%)
4530
4532
4534
4536
4538
4540
Wavelength (Å)

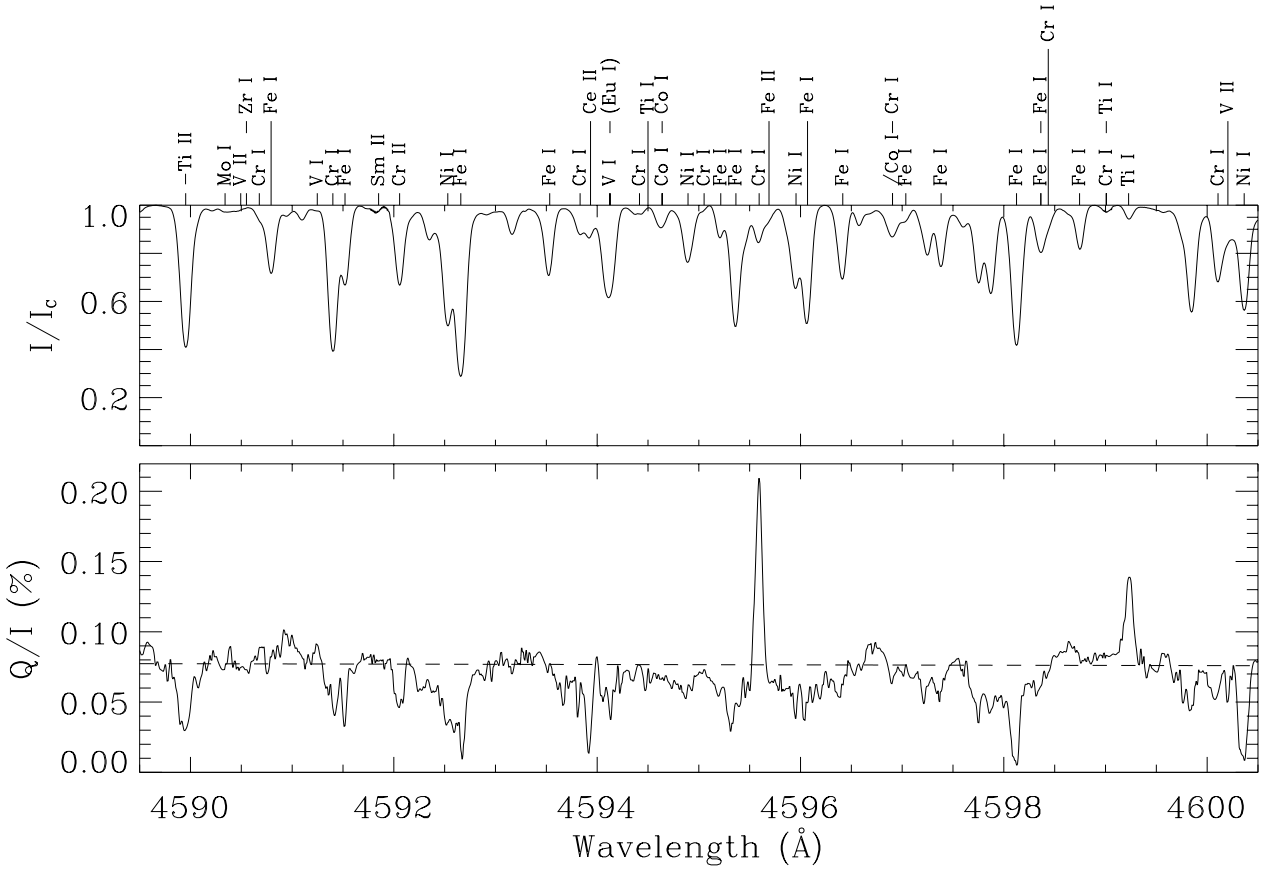

Ce II – //Cr I
V I
Cr I
Cr I
Ti I – Cr I
Cr I
Fe I
Fe II – (Cr I)
Na I
Fe I
Zr I
Fe I
Cr I – Cr I
Fe I
Fe I
Cr I
Co I
Ti II
Fe I
Cr I
Ti I
Ti II
Cr I – V I
Fe I
Ir I
Cr I
Fe I
Fe I
Nb I
Ni I
Fe I
Ni I
Ti I
Fe I – (Ti I)
Ti I
Ti I
Fe II
Fe II
Ti II – (Co I)
Ti II
1.0
0.6
0.2
I/I_c
0.10
0.05
0.00
Q/I (%)
4540
4542
4544
4546
4548
4550
Wavelength (Å)

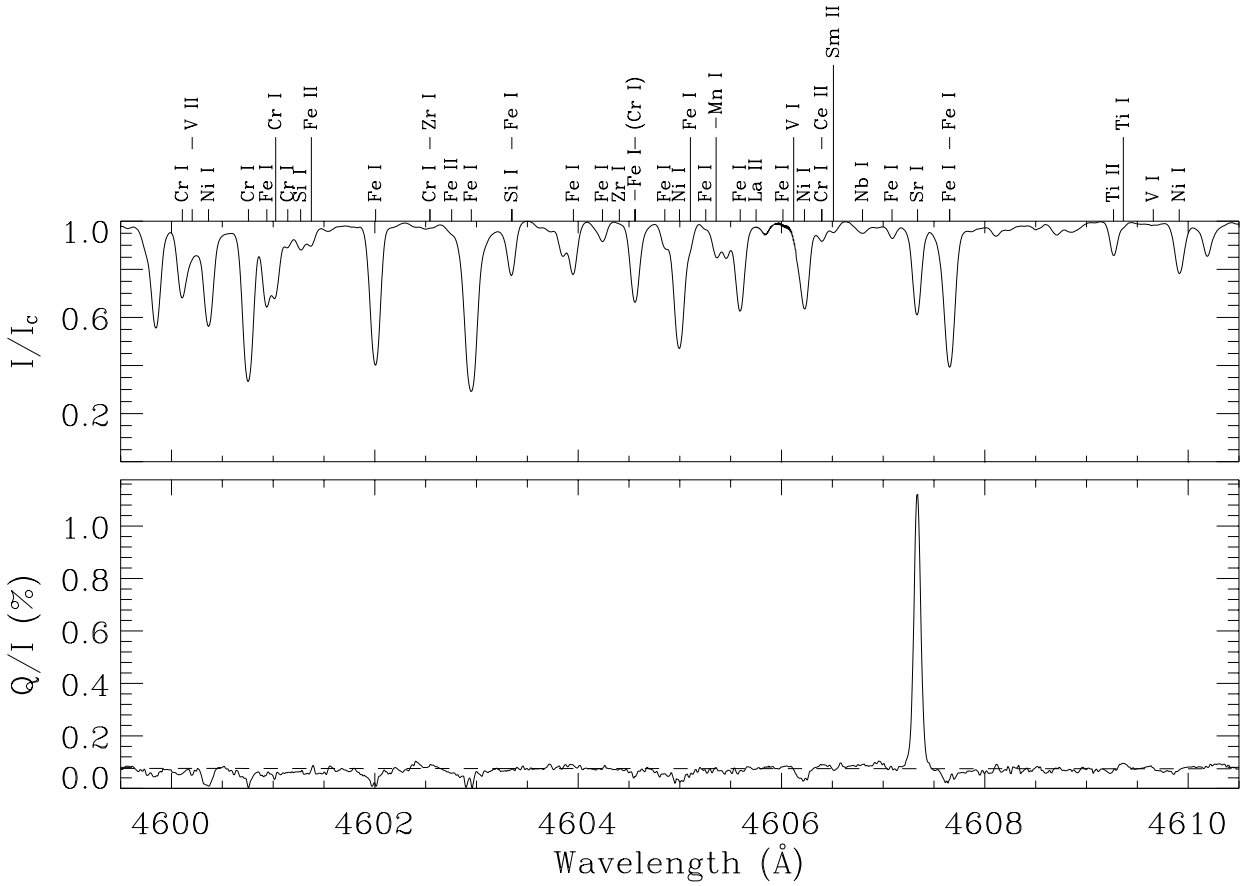

Ti II – (Co I)
Ti II
Fe I
Ni I
Fe I
V I
Ti II
Ti I
Fe I
Sm II
Zr I – V I
Ni I
Ba II
Fe I
Ru I
Cr I
Cr II
Ti I – Cr I
Cr I
Ti I
Fe I
Fe II
Fe I – (Cr I)
Fe I
Fe I
Ti I
/Fe I – Ti I – Ti I
V II – La II
Cr II
Ti I – (Ni I)
Fe I
Ce II
1.0
0.6
0.2
I/I_c
0.6
0.4
0.2
0.0
Q/I (%)
4550
4552
4554
4556
4558
4560
Wavelength (Å)

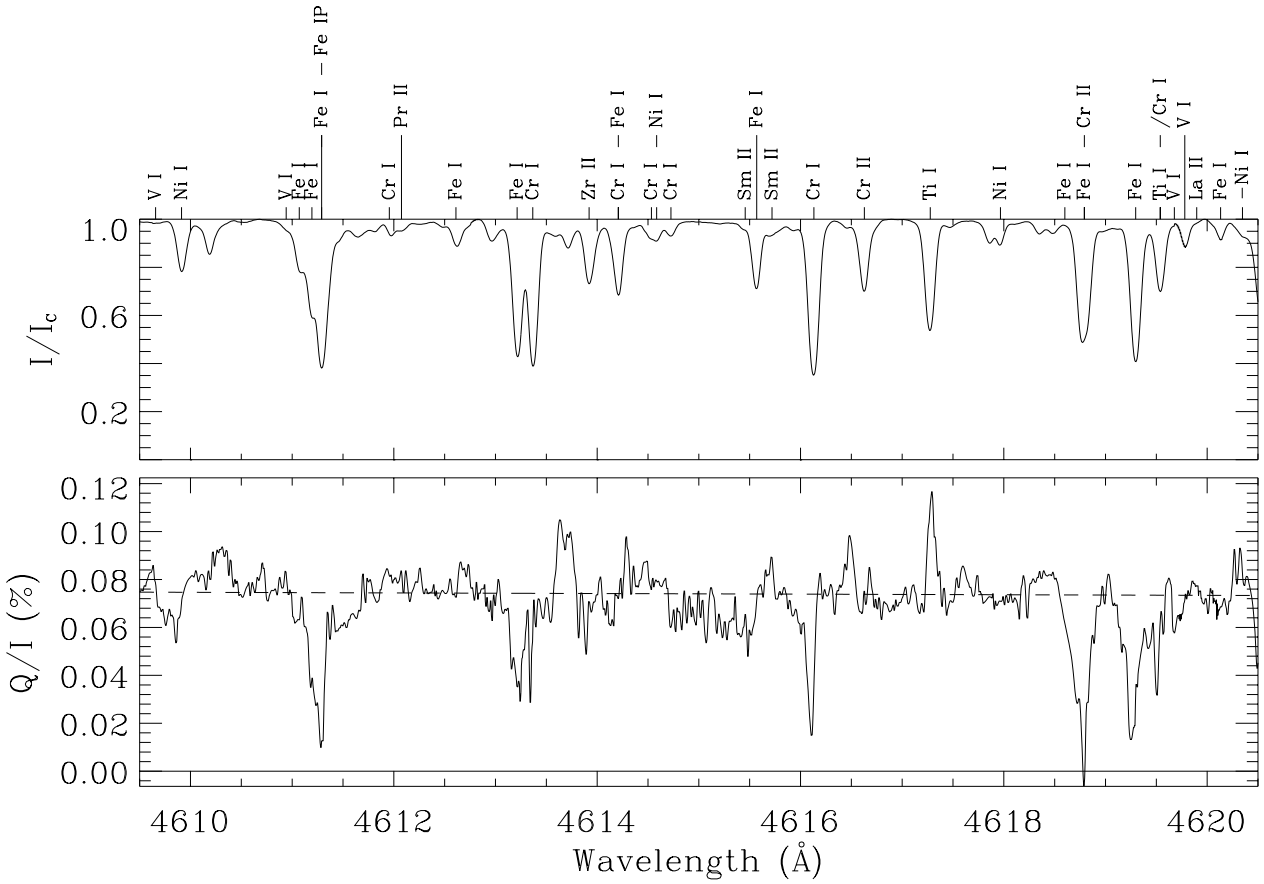

Ti I – (Ni I)
Fe I
Ce II
V I
Fe I
Ce II
Fe I
Ce II
Ti I
Cr I
Ti I
Cr I
Ti II
Cr I – Ti I
V II
Fe I
Fe I
C I
Ni I
Fe I
Zr II – Ni I
Cr I – (Co I)
Fe I
Cr II
Ce II
Fe I
Sm II
Fe I
Fe I
Fe I
Fe I
Ni I
Ti II
Fe I
Fe I
Fe I
Co II
Cr I
Cr I
Co I
–V 1
1.0
0.6
0.2
I/I_c
0.10
0.08
0.06
0.04
0.02
0.00
−0.02
Q/I (%)
4560
4562
4564
4566
4568
4570
Wavelength (Å)

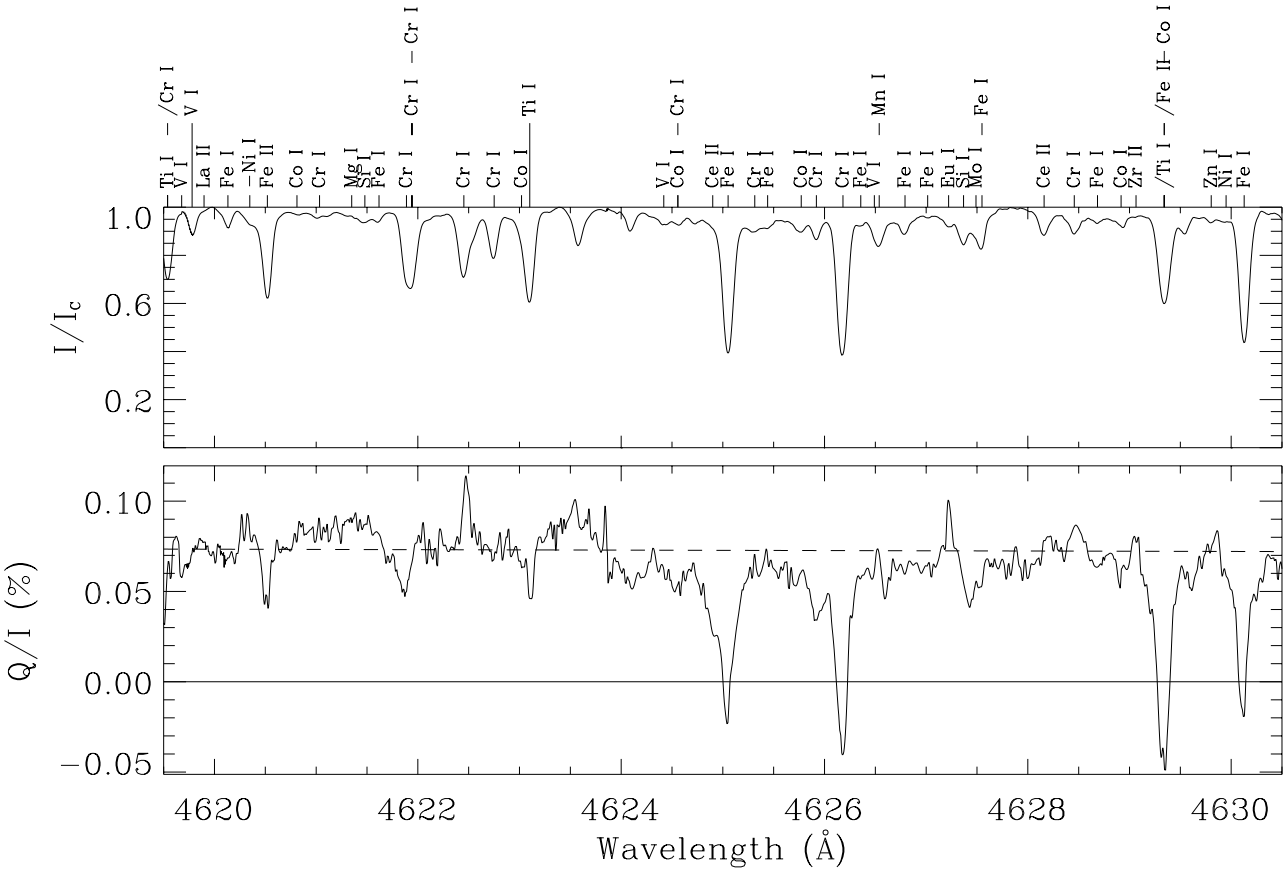

Cr I
Cr I
Co I
V I
Ti I
Mg I
Fe I
Cr I
V I
Cr I
Ti II
Cr I
Cr I
Ce II
Fe I
Nb I''
Si I
Sc I
Si I
Fe I
Zr II
Cr I
Fe I
La II
Cr I
Zr I
Fe I
Fe I
Fe II
Ti I
Cr I
V I
Sm II
Cr I
Ca I
V I
Fe I
V I
Fe I
Fe I
Fe I
Fe I
Cr I
Co I
V I
1.0
0.6
0.2
I/I_c
0.10
0.05
0.00
Q/I (%)
4570
4572
4574
4576
4578
4580
Wavelength (Å)

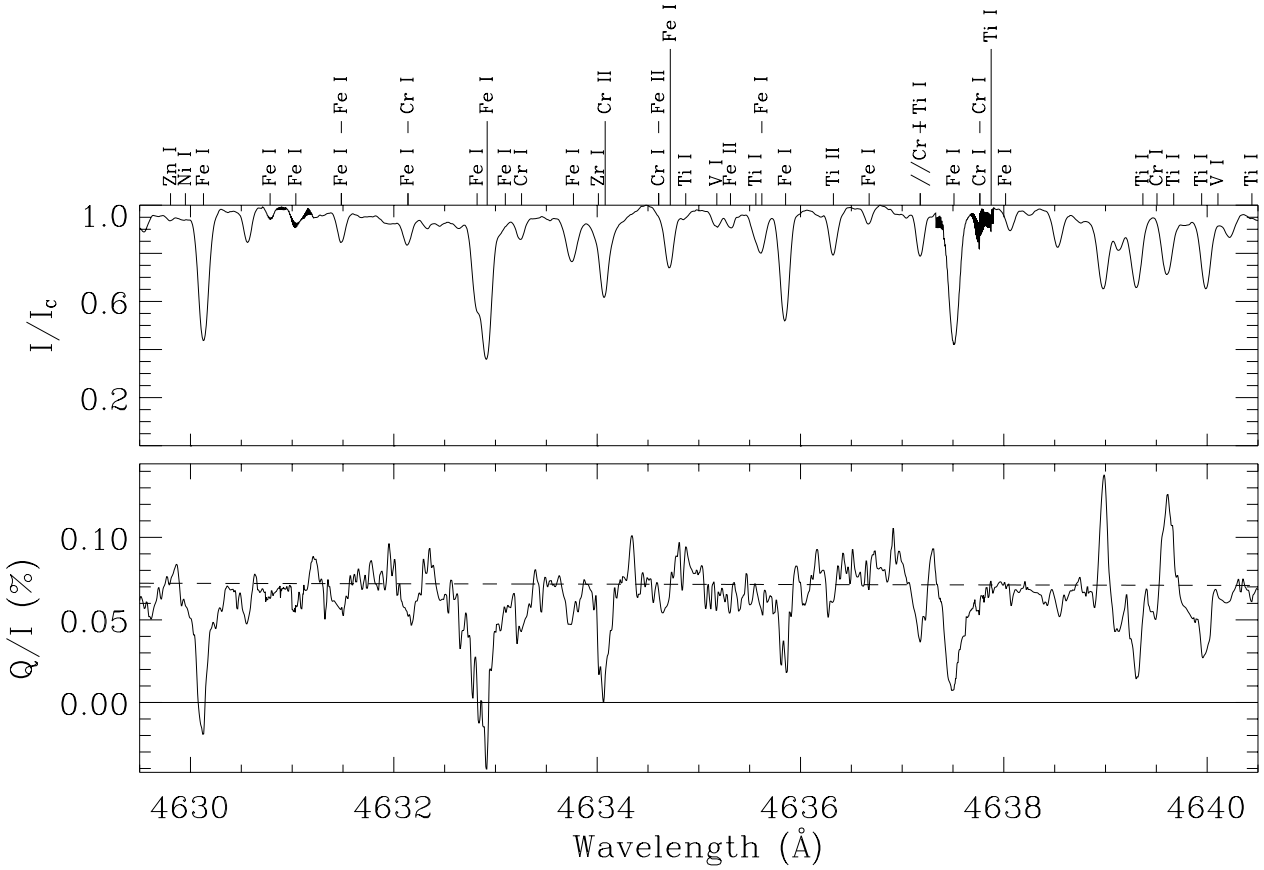

Fe I
Fe I
Cr I
Co I
V I
/Fe I
Ni I
Cr I
Fe I
Y I
Ca I
Fe I
Co I
Fe I
Fe II
Fe I
Ti II
Fe I
Cr I
Fe II
Cr I
Ru I
Fe I
Cr I
Fe I
Cr I
Fe I
Fe I
Si I
Ca I
V I
Cr I
V I
Ti I
Fe I
Cr I
Fe I
Cr I
Cr II
Co I
Ti II
Mo I
V II
1.0
0.6
0.2
I/I_c
0.10
0.08
0.06
0.04
0.02
0.00
Q/I (%)
4580
4582
4584
4586
4588
4590
Wavelength (Å)

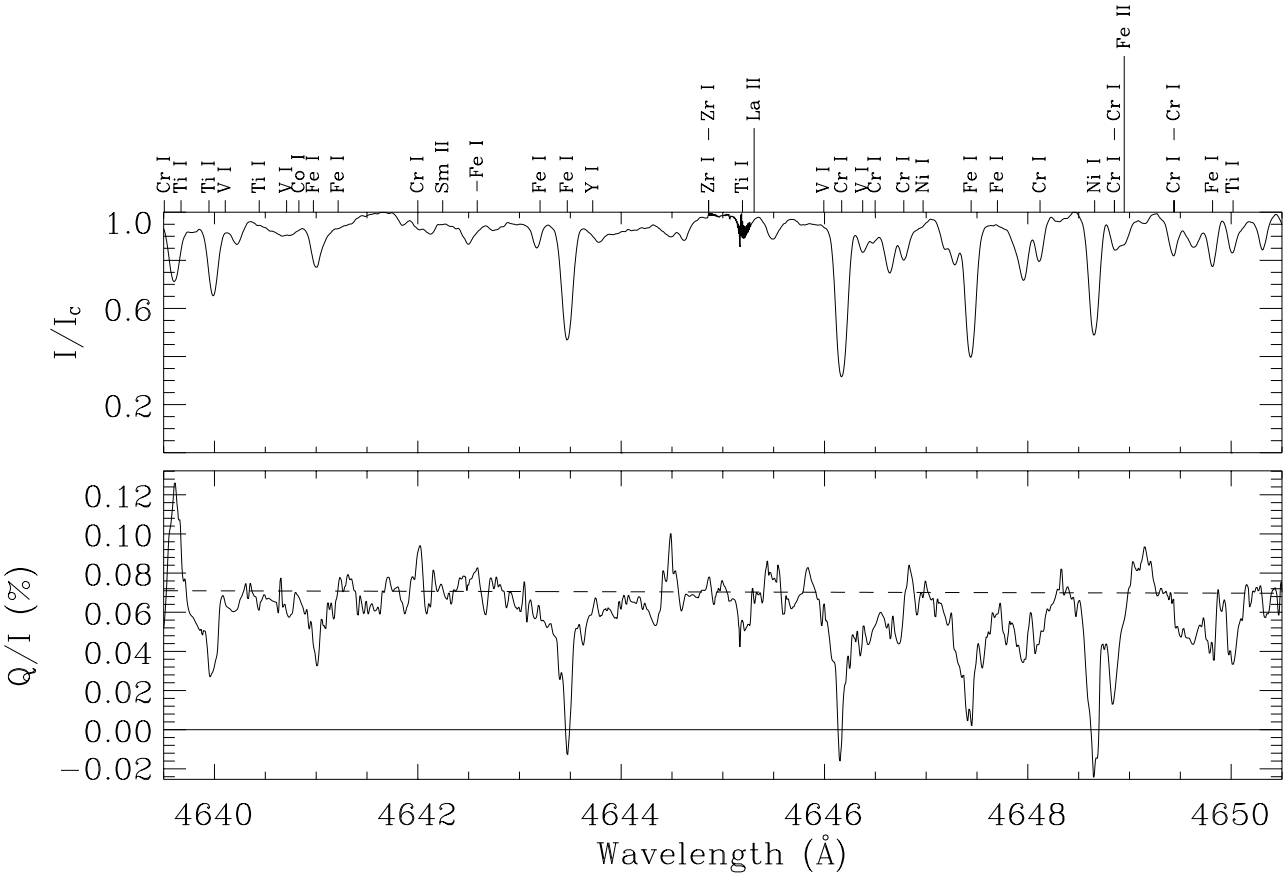

Ti II
Mo I
V II
Zr I
Cr I
Fe I
V I
Cr I
Fe I
Sm II
Cr II
Ni I
Fe I
Fe I
Cr I
Ce II
(Eu I)
V I
Cr I
Ti I
Co I
Co I
Ni I
Cr I
Fe I
Fe I
Cr I
Fe II
Ni I
Fe I
Fe I
Co I
Cr I
Fe I
Fe I
Fe I
Fe I
Cr I
Fe I
Fe I
Cr I
Ti I
Ti I
Cr I
V II
Ni I
1.0
0.6
0.2
I/I_c
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4590
4592
4594
4596
4598
4600
Wavelength (Å)

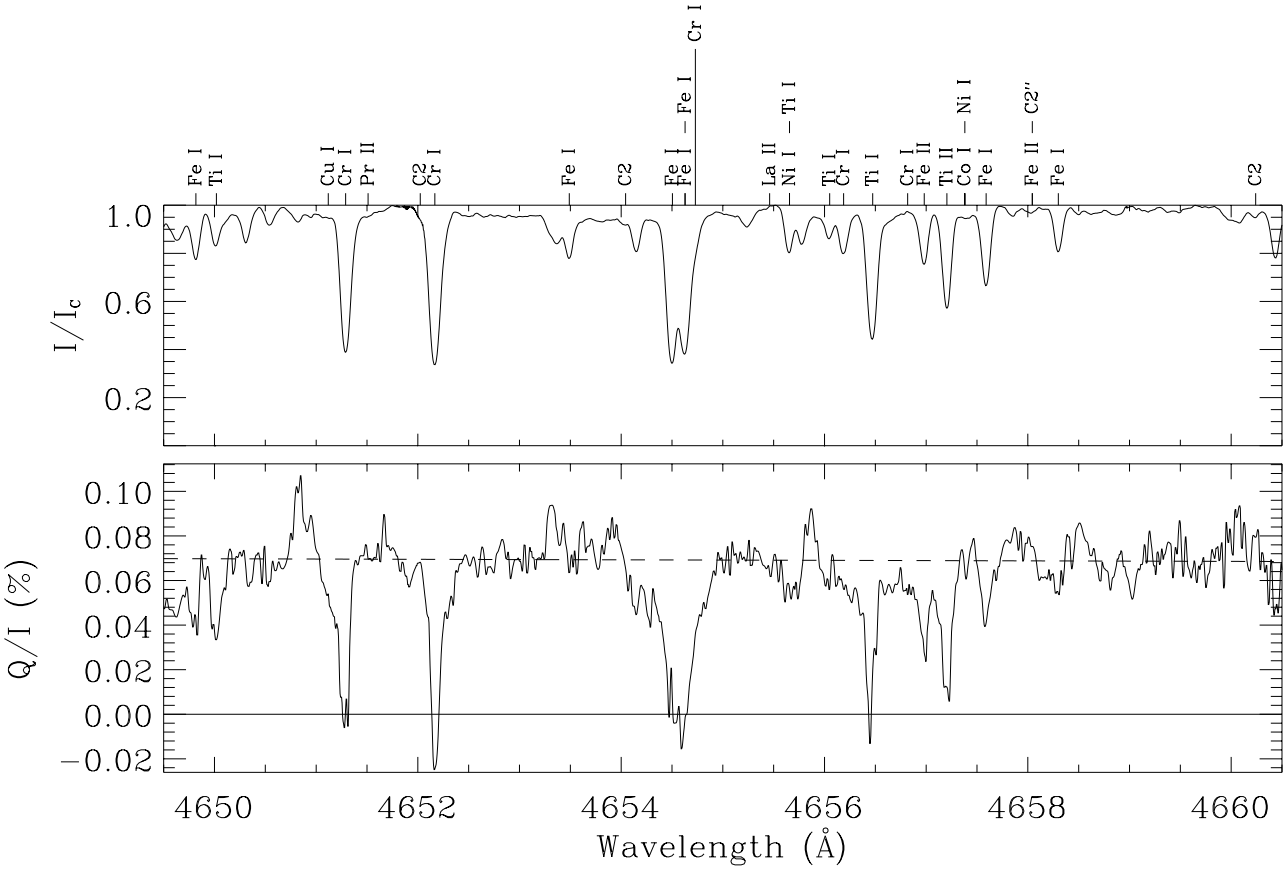

Cr I
V II
Ni I
Cr I
Fe I
Cr I
Si I
Cr I
Fe II
Fe I
Cr I
Zr I
Fe II
Fe I
Si I
Fe I
Fe I
Fe I
Zr I
Fe I
(Cr I)
Fe I
Ni I
Fe I
Mn I
Fe I
La II
Fe I
V I
Ni I
Cr I
Ce II
Sm II
Nb I
Fe I
Sr I
Fe I
Fe I
Ti II
Ti I
V I
Ni I
1.0
0.6
0.2
I/I_c
1.0
0.8
0.6
0.4
0.2
0.0
Q/I (%)
4600
4602
4604
4606
4608
4610
Wavelength (Å)

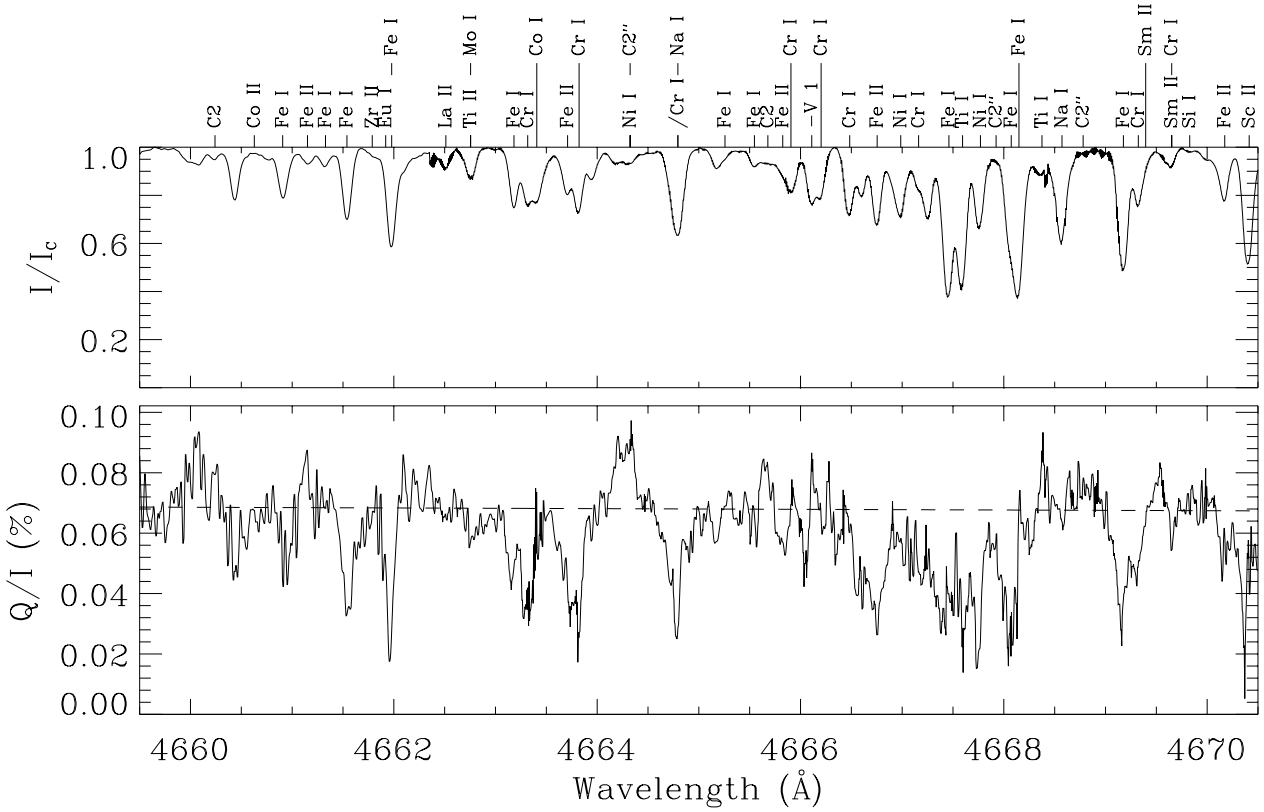

V I
Ni I
V I
Fe I
Fe I
Fe I – Fe IP
Cr I
Pr II
Fe I
Fe I
Cr I
Zr II
Cr I – Fe I
Cr I – Ni I
Cr I
Sm II
Fe I
Sm II
Cr I
Cr II
Ti I
Ni I
Fe I
Fe I – Cr II
Fe I
Ti I – /Cr I
V I
La II
Fe I
–Ni I
1.0
0.6
0.2
I/I_c
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Q/I (%)
4610
4612
4614
4616
4618
4620
Wavelength (Å)

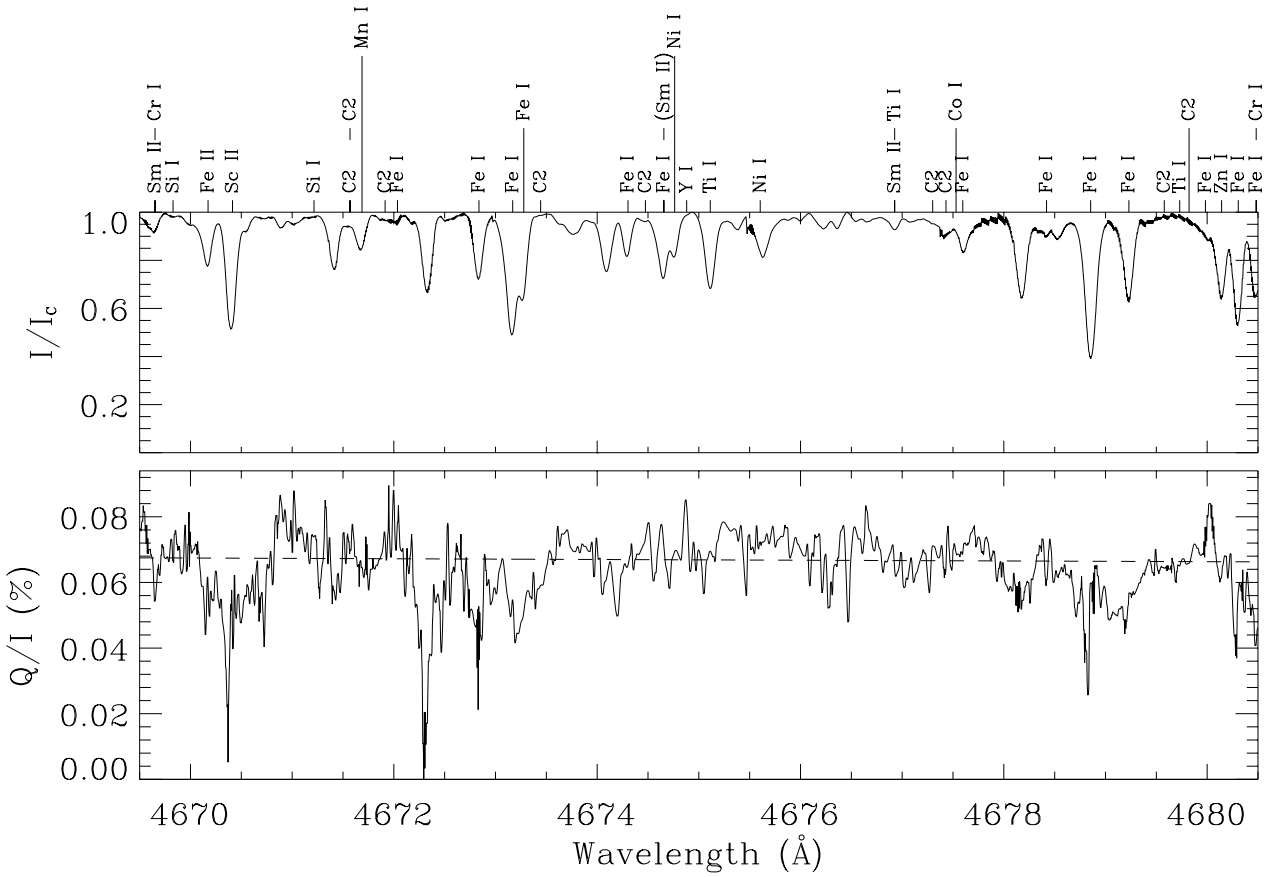

Ti I
V I
/Cr I
V I
La II
Fe I
Ni I
Fe II
Co I
Cr I
Mg I
Si I
Fe I
Cr I
Cr I
Cr I
Cr I
Cr I
Co I
Ti I
V I
Co I
Cr I
Ce II
Fe I
Cr I
Fe I
Co I
Cr I
Cr I
Fe I
V I
Mn I
Fe I
Fe I
Eu I
Si I
Mo I
Fe I
Ce II
Cr I
Fe I
Co I
Zr II
/Ti I
/Fe II
Co I
Zn I
Ni I
Fe I
1.0
0.6
0.2
I/I_c
0.10
0.05
0.00
−0.05
Q/I (%)
4620
4622
4624
4626
4628
4630
Wavelength (Å)

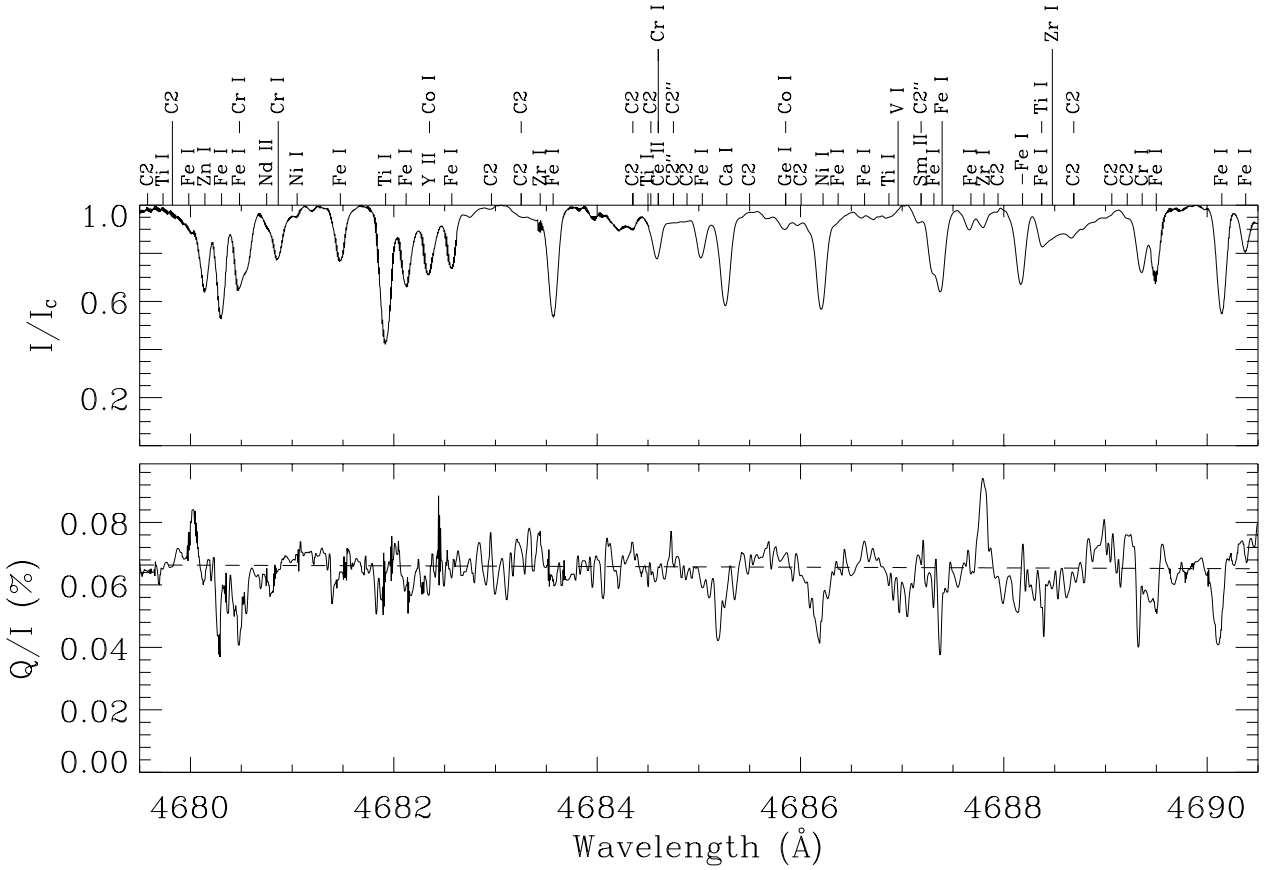

Zn I
Ni I
Fe I
Fe I
Fe I
Fe I – Fe I
Fe I – Cr I
Fe I
Fe I
Cr I
Fe I
Zr I
Cr II
Cr I – Fe II
Fe I
Ti I
V I
Fe II
Ti I – Fe I
Fe I
Ti II
Fe I
//Cr + Ti I
Fe I
Cr I – Cr I
Ti I
Fe I
Ti I
Cr I
Ti I
Ti I
V I
Ti I
1.0
0.6
0.2
I/I_c
0.10
0.05
0.00
Q/I (%)
4630
4632
4634
4636
4638
4640
Wavelength (Å)

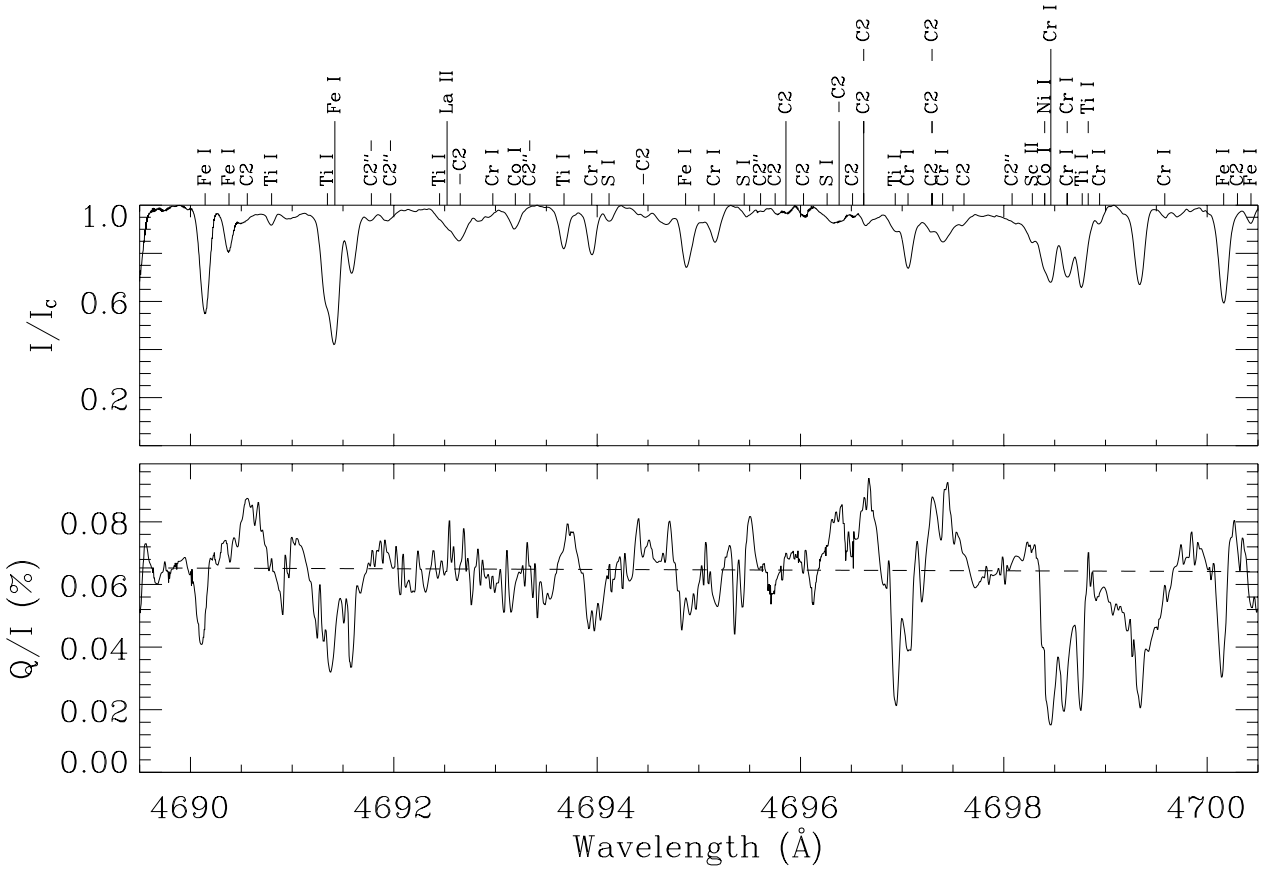

Cr I
Ti I
Ti I
V I
Ti I
V I
Co I
Fe I
Fe I
Cr I
Sm II
Fe I
Fe I
Fe I
Y I
Zr I
Zr I
Ti I
La II
V I
Cr I
V I
Cr I
Cr I
Ni I
Fe I
Fe I
Cr I
Ni I
Cr I
Cr I
Fe II
Cr I
Fe I
Ti I
1.0
0.6
0.2
I/I_c
0.12
0.10
0.08
0.06
0.04
0.02
0.00
−0.02
Q/I (%)
4640
4642
4644
4646
4648
4650
Wavelength (Å)

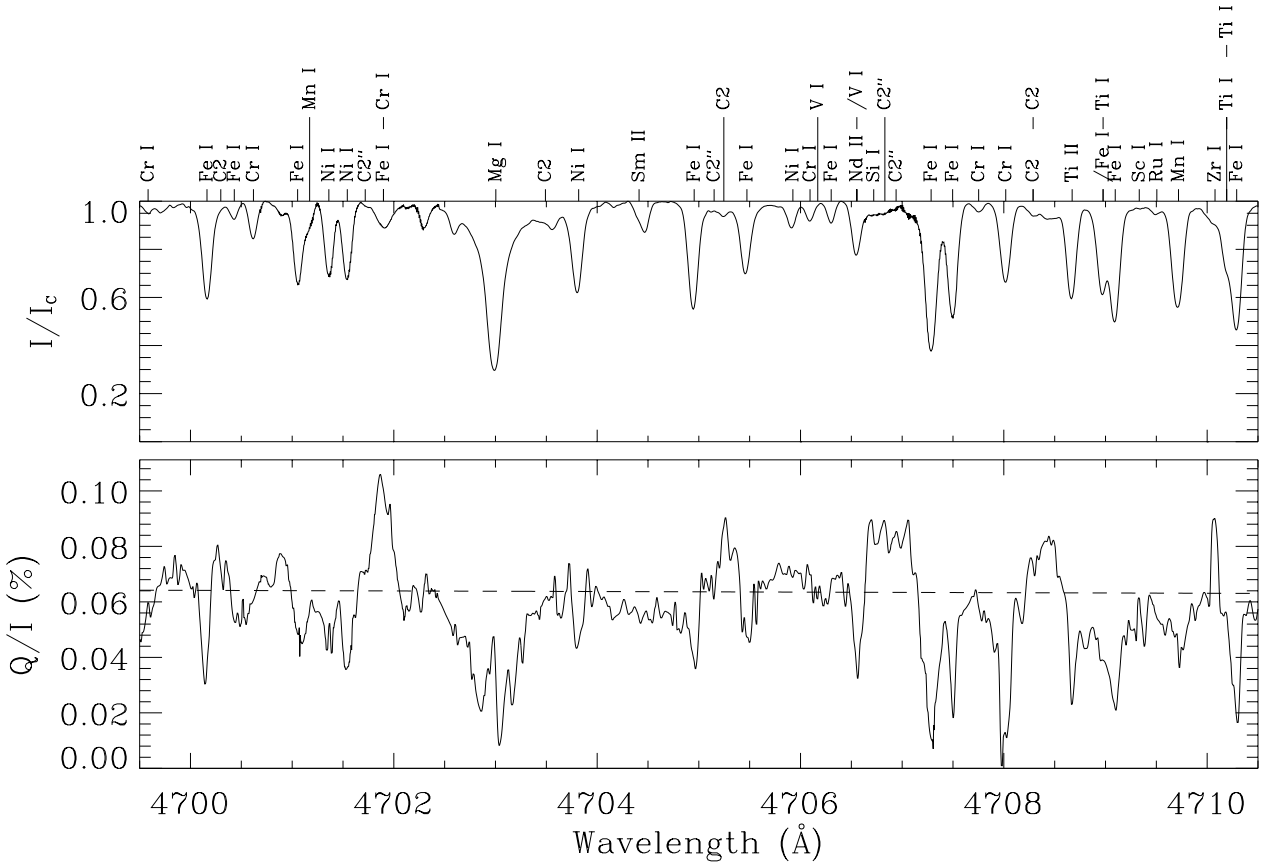

Fe I
Ti I
Cu I
Cr I
Pr II
C2
Cr I
Fe I
C2
Fe I
Fe I
Cr I
La II
Ni I
Ti I
Ti I
Cr I
Ti I
Cr I
Fe II
Ti II
Co I
Ni I
Fe I
Fe II
C2''
Fe I
C2
1.0
0.6
0.2
I/I_c
0.10
0.08
0.06
0.04
0.02
0.00
−0.02
Q/I (%)
4650
4652
4654
4656
4658
4660
Wavelength (Å)

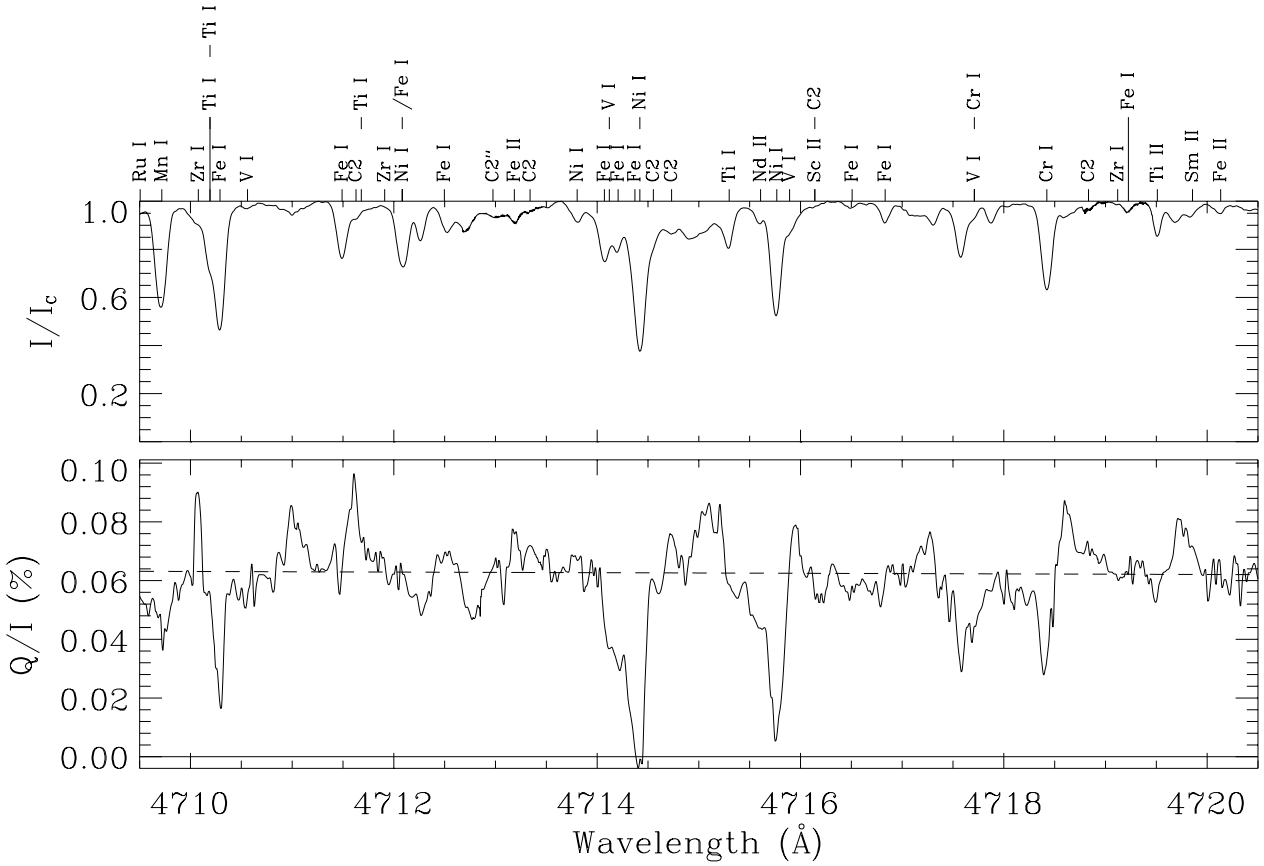

C2
Co II
Fe I
Fe II
Fe I
Fe I
Zr II
Eu I – Fe I
La II
Ti II – Mo I
Fe I
Cr I
Co I
Fe II
Cr I
Ni I – C2''
/Cr I – Na I
Fe I
Fe I
C2
Fe II
Cr I
–V 1
Cr I
Cr I
Fe II
Ni I
Cr I
Fe I
Ti I
Ni I
C2''
Fe I
Fe I
Ti I
Na I
C2''
Fe I
Cr I
Sm II
Sm II– Cr I
Si I
Fe II
Sc II
1.0
0.6
0.2
I/I_c
0.10
0.08
0.06
0.04
0.02
0.00
Q/I (%)
4660
4662
4664
4666
4668
4670
Wavelength (Å)

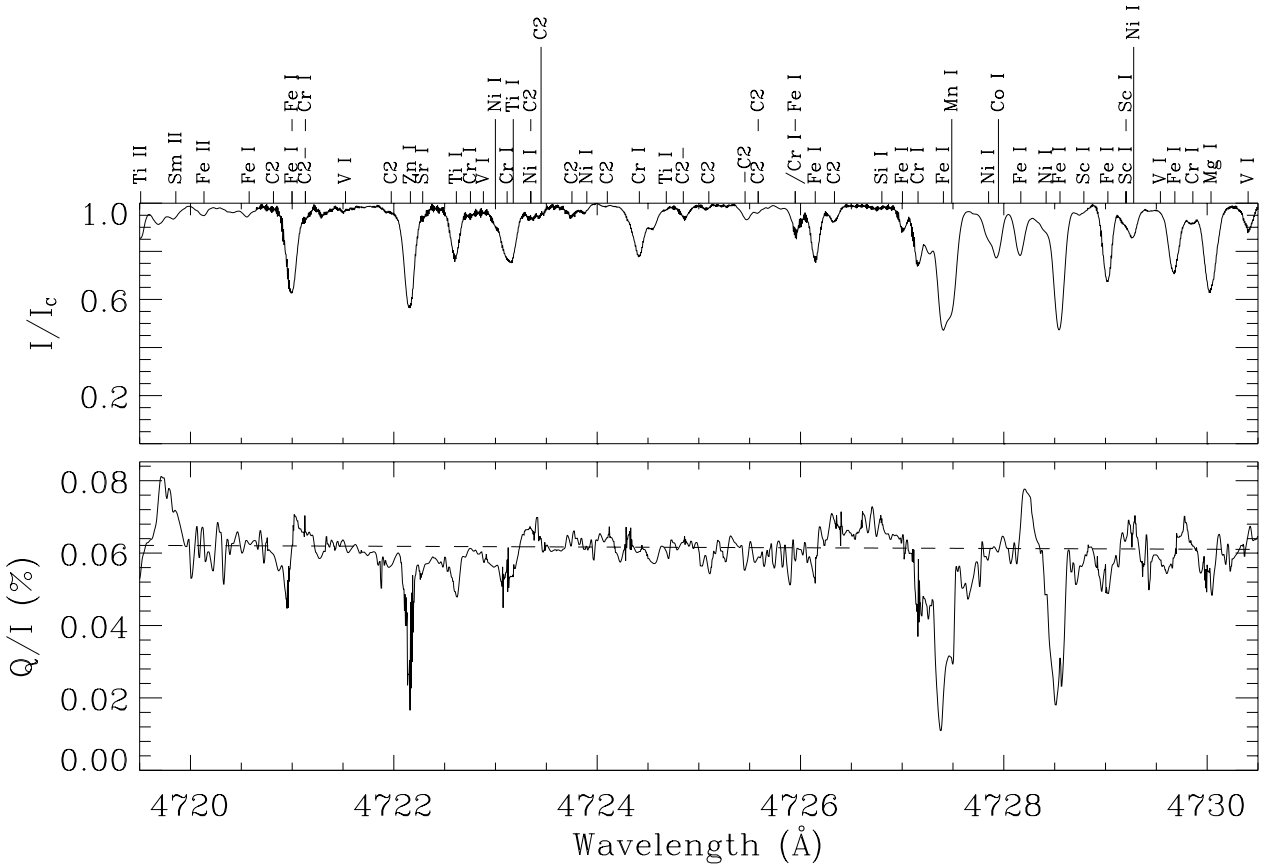

Sm II
Cr I
Si I
Fe II
Sc II
Si I
C2
Mn I
C2
C2
Fe I
Fe I
Fe I
Fe I
C2
Fe I
C2
Fe I
(Sm II)
Ni I
Y I
Ti I
Ni I
Sm II
Ti I
C2
C2
C2
Co I
Fe I
Fe I
Fe I
Fe I
C2
Ti I
C2
Fe I
Zn I
Fe I
Fe I
Cr I
1.0
0.6
0.2
I/I_c
0.08
0.06
0.04
0.02
0.00
Q/I (%)
4670
4672
4674
4676
4678
4680
Wavelength (Å)

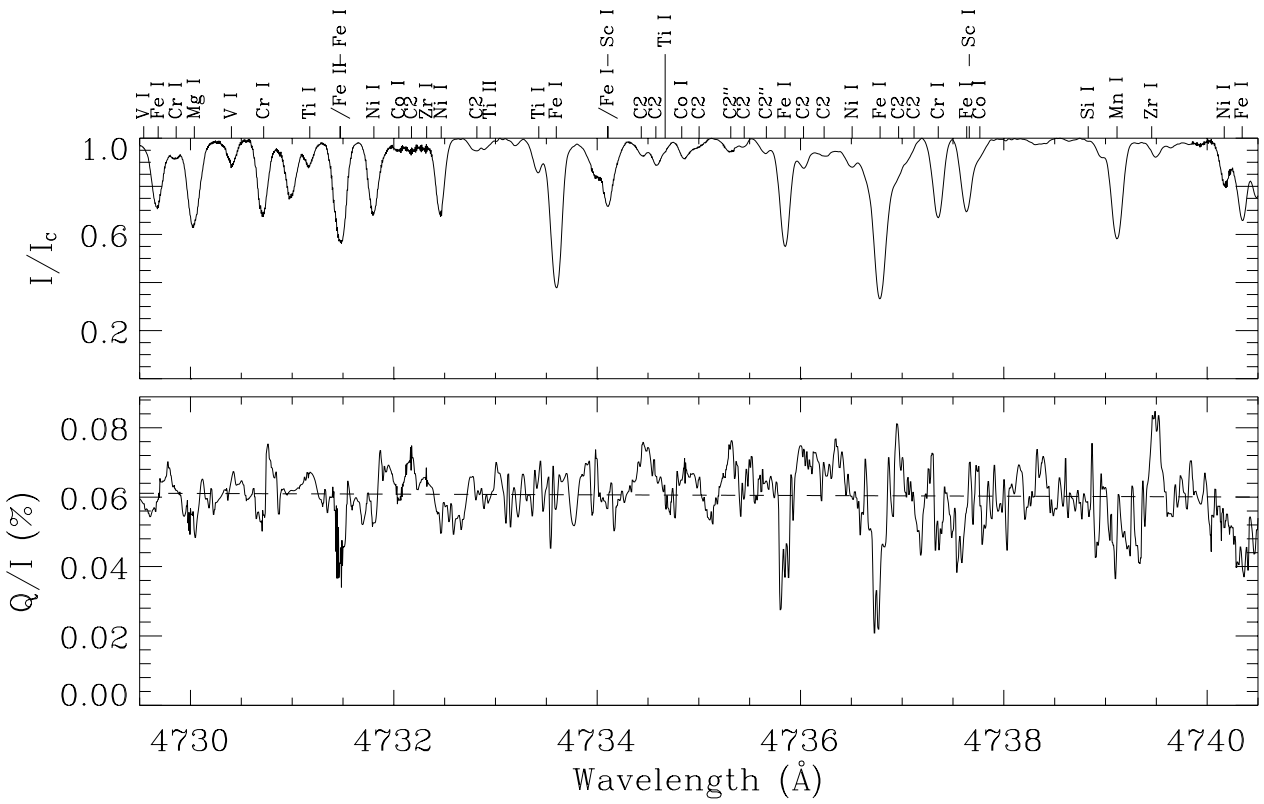

C2
Ti I
C2
Fe I
Zn I
Fe I
Cr I
Nd II
Cr I
Ni I
Fe I
Ti I
Fe I
Y II
Co I
Fe I
C2
C2
Zr I
Fe I
C2
Ti I
Ce II
C2''
C2
C2
Cr I
C2''
Fe I
Ca I
C2
Ge I
Co I
C2
Ni I
Fe I
Fe I
Ti I
V I
Sm II
C2''
Fe I
Fe I
Zr I
C2
Fe I
Fe I
Ti I
Zr I
C2
C2
C2
C2
Cr I
Fe I
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.08
0.06
0.04
0.02
0.00
Q/I (%)
4680
4682
4684
4686
4688
4690
Wavelength (Å)

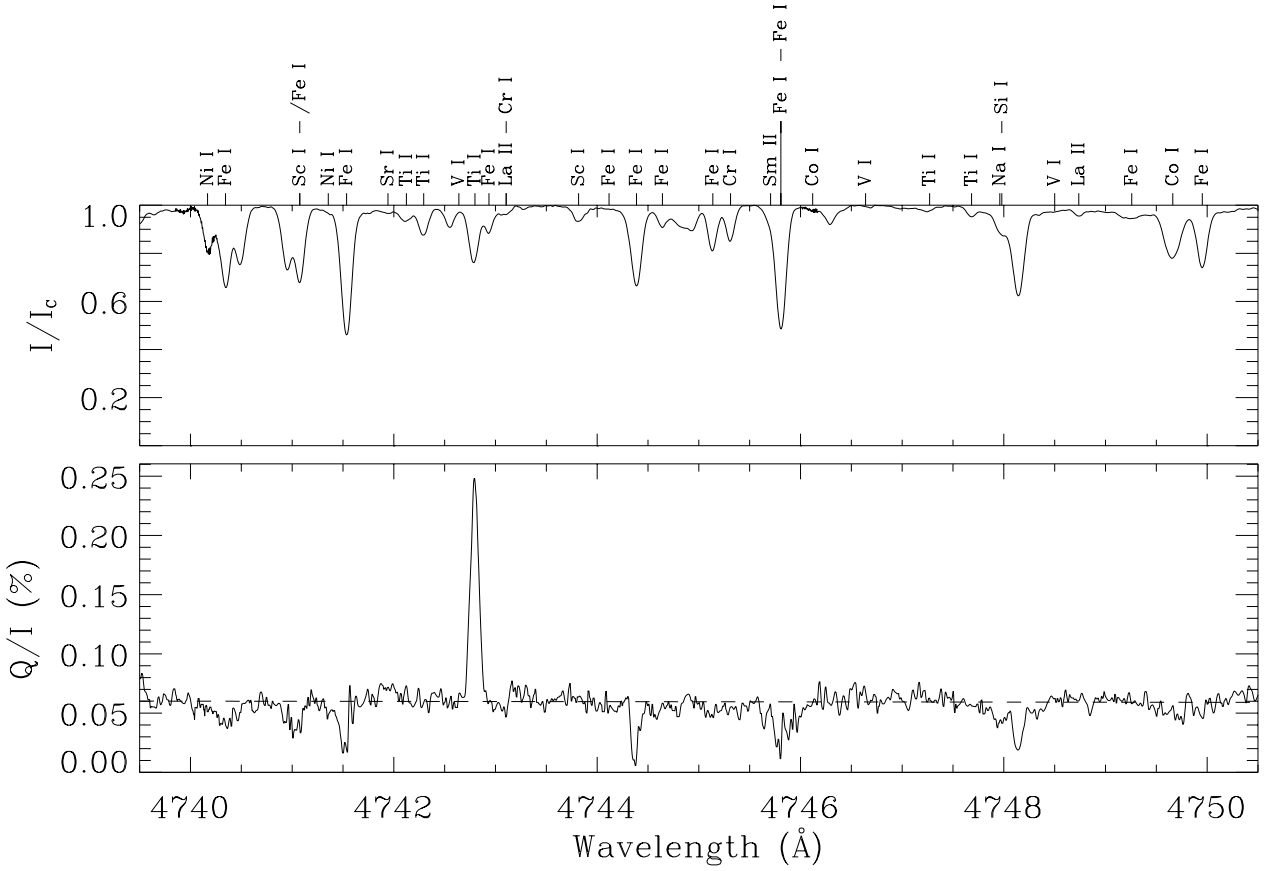

Fe I
Fe I
C2
Ti I
Ti I
Fe I
C2''
C2''
Ti I
La II
C2
Cr I
Co I
C2''
Ti I
Cr I
S I
C2
Fe I
Cr I
S I
C2''
C2
C2
C2
S I
C2
C2
C2
Ti I
Cr I
C2
Cr I
C2
C2
C2''
Sc II
Co I
Ni I
Cr I
Cr I
Ti I
Ti I
Cr I
Cr I
Fe I
C2
Fe I
1.0
0.6
0.2
I/I_c
0.08
0.06
0.04
0.02
0.00
Q/I (%)
4690
4692
4694
4696
4698
4700
Wavelength (Å)

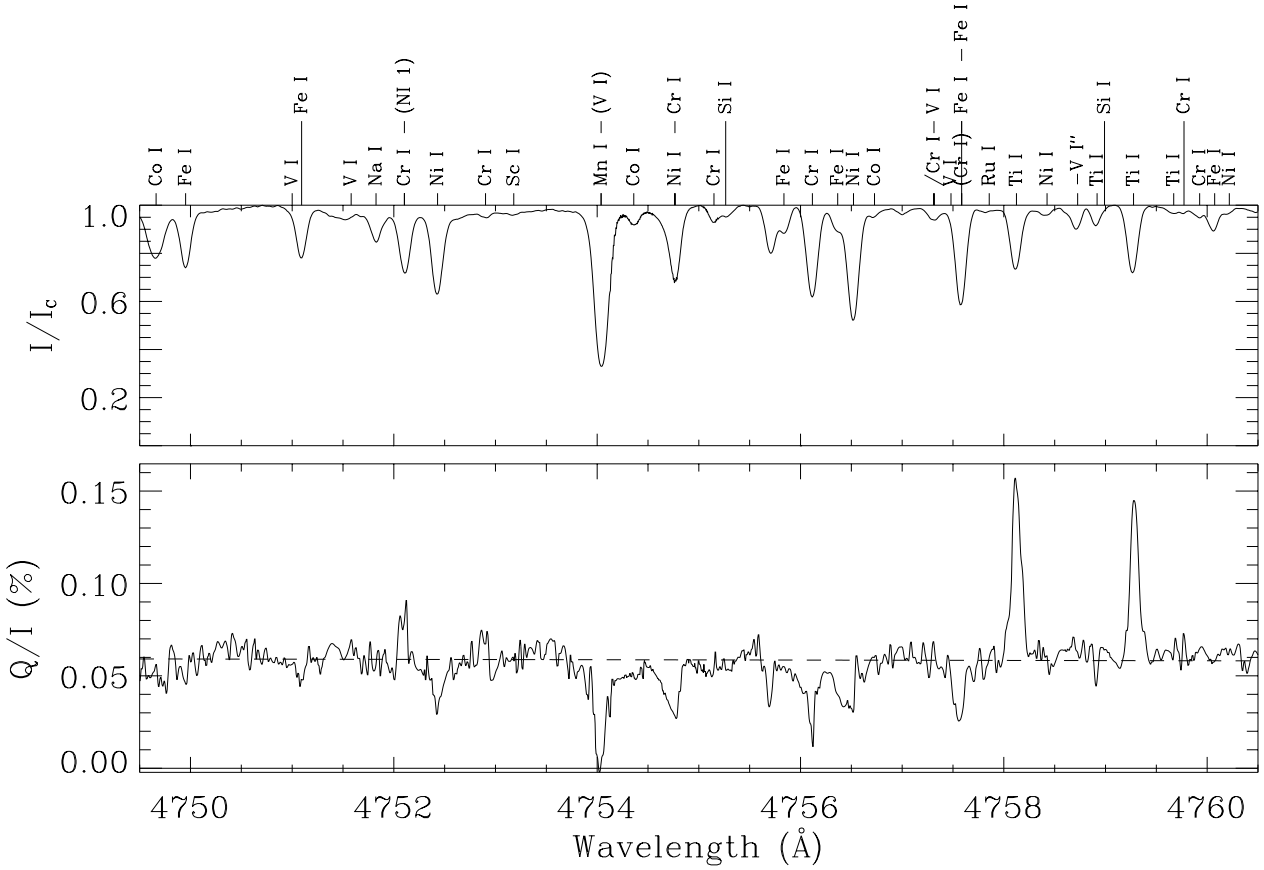

Cr I
Fe I
C2
Fe I
Cr I
Fe I
Mn I
Ni I
Ni I
C2''
Fe I
Cr I
Mg I
C2
Ni I
Sm II
Fe I
C2''
C2
Fe I
Ni I
Cr I
V I
Fe I
Nd II
Si I
V I
C2''
C2''
Fe I
Fe I
Cr I
Cr I
C2
C2
Ti II
Fe I
Ti I
Fe I
Sc I
Ru I
Mn I
Zr I
Ti I
Ti I
Fe I
1.0
0.6
0.2
I/I_c
0.10
0.08
0.06
0.04
0.02
0.00
Q/I (%)
4700
4702
4704
4706
4708
4710
Wavelength (Å)

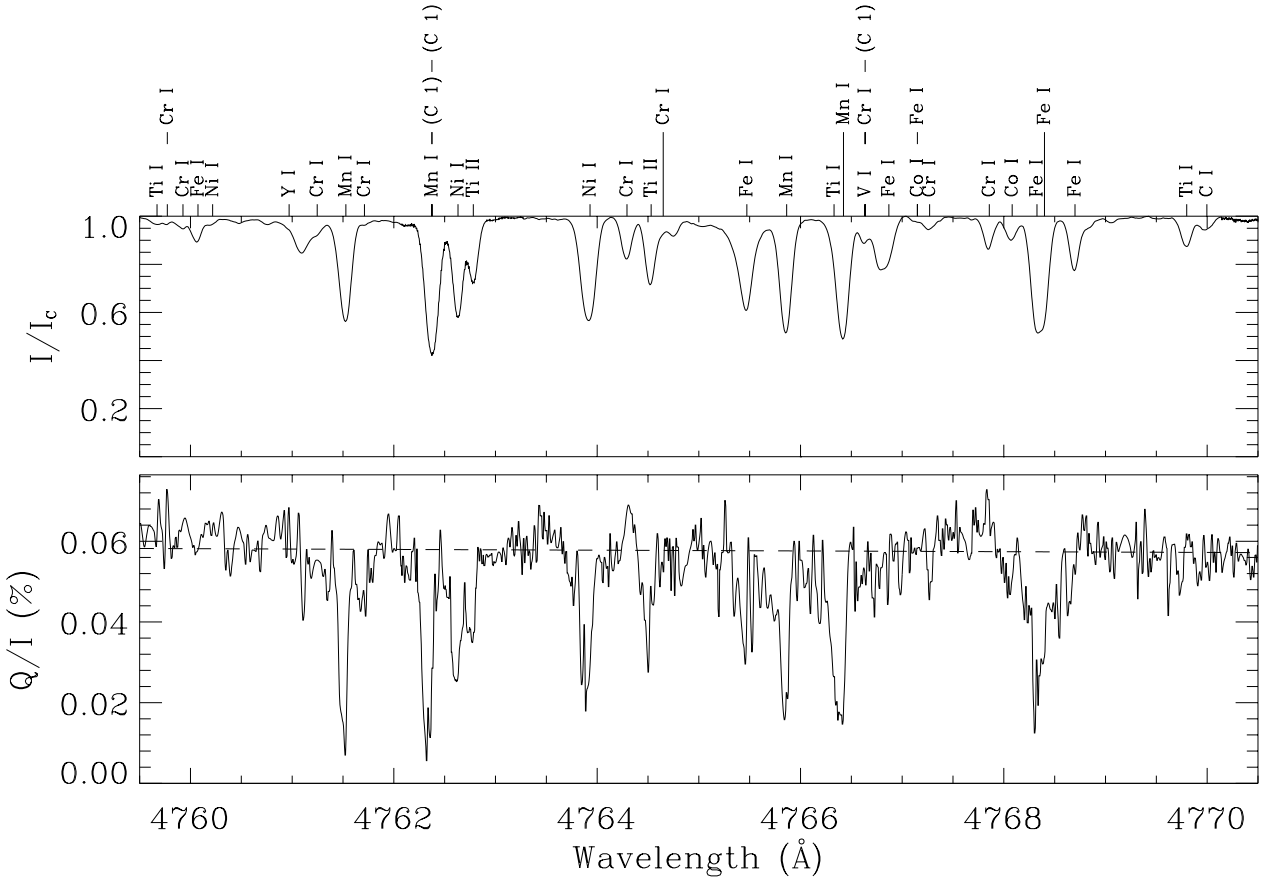

Ru I
Mn I
Zr I
Ti I
Fe I
Ti I
V I
Fe I
C2
Ti I
Zr I
Ni I
/Fe I
Fe I
C2''
Fe II
C2
Ni I
Fe I
V I
Fe I
Fe I
Ni I
C2
C2
Ti I
Nd II
Ni I
V I
Sc II
C2
Fe I
Fe I
V I
Cr I
Cr I
C2
Zr I
Fe I
Ti II
Sm II
Fe II
1.0
0.6
0.2
I/I_c
0.10
0.08
0.06
0.04
0.02
0.00
Q/I (%)
4710
4712
4714
4716
4718
4720
Wavelength (Å)

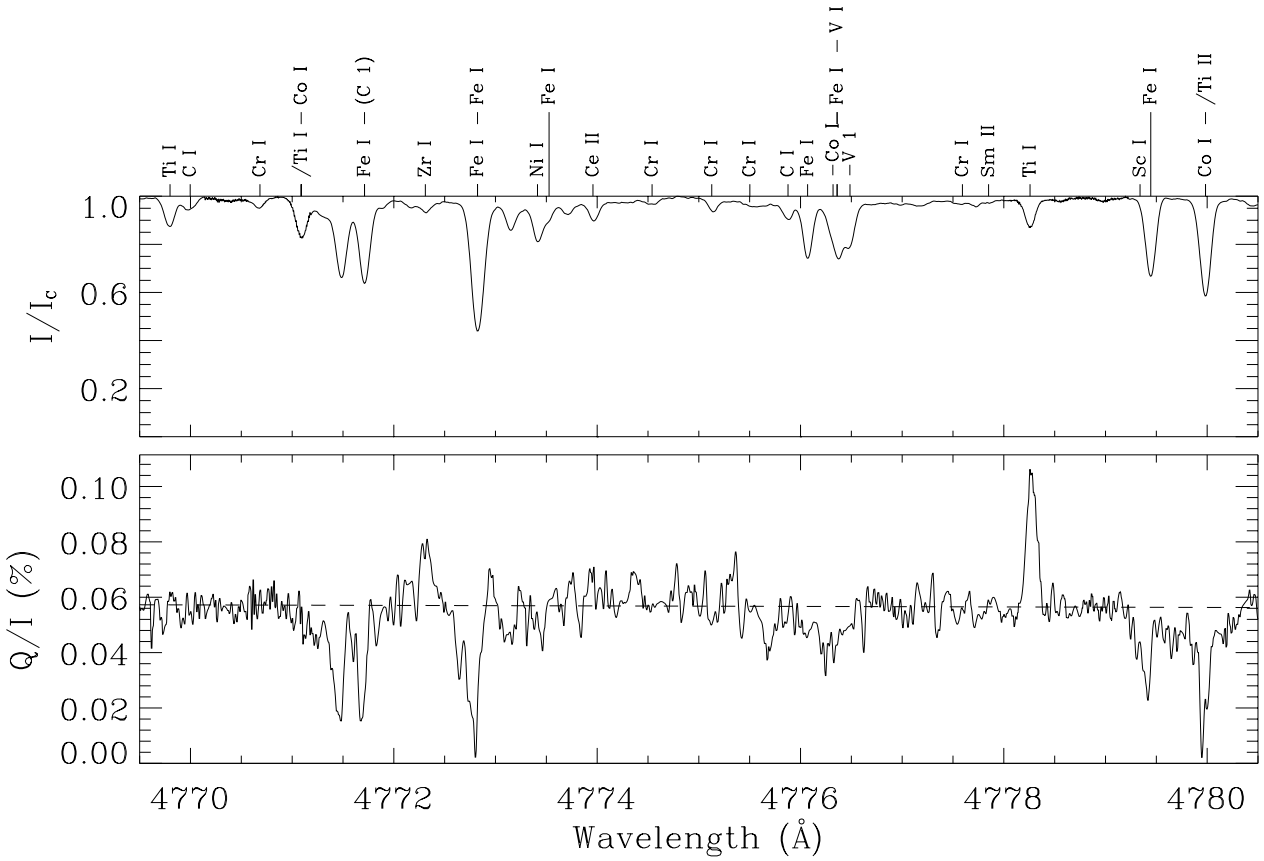

Ti II
Sm II
Fe II
Fe I
C2
Fe I
C2
Fe I
Cr I
V I
C2
Zn I
Sr I
Ti I
Cr I
V I
Ni I
Cr I
Ti I
Ni I
C2
C2
Ni I
C2
Cr I
Ti I
C2
C2
C2
C2
/Cr I
Fe I
Fe I
C2
Si I
Fe I
Cr I
Fe I
Mn I
Ni I
Co I
Fe I
Ni I
Fe I
Sc I
Fe I
Sc I
Ni I
V I
Fe I
Cr I
Mg I
V I
1.0
0.6
0.2
I/I_c
0.08
0.06
0.04
0.02
0.00
Q/I (%)
4720
4722
4724
4726
4728
4730
Wavelength (Å)

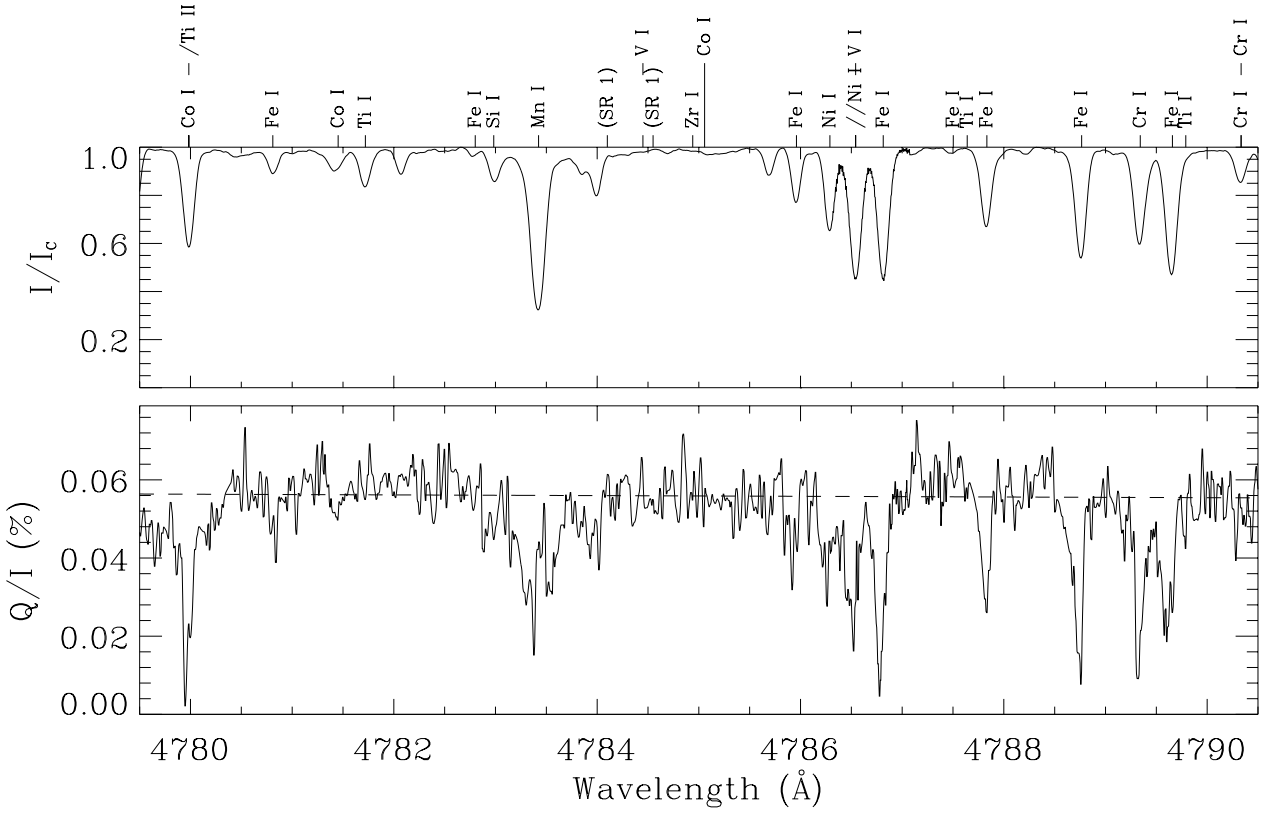

V I
Fe I
Cr I
Mg I
V I
Cr I
Ti I
/Fe II
Fe I
Ni I
Co I
Zr I
Ni I
C2
Ti II
Ti I
Fe I
/Fe I
Sc I
C2
C2
Ti I
Co I
C2
C2''
C2
C2''
Fe I
C2
C2
Ni I
Fe I
C2
C2
Cr I
Fe I
Co I
Sc I
Si I
Mn I
Zr I
Ni I
Fe I
1.0
0.6
0.2
I/I_c
0.08
0.06
0.04
0.02
0.00
Q/I (%)
4730
4732
4734
4736
4738
4740
Wavelength (Å)

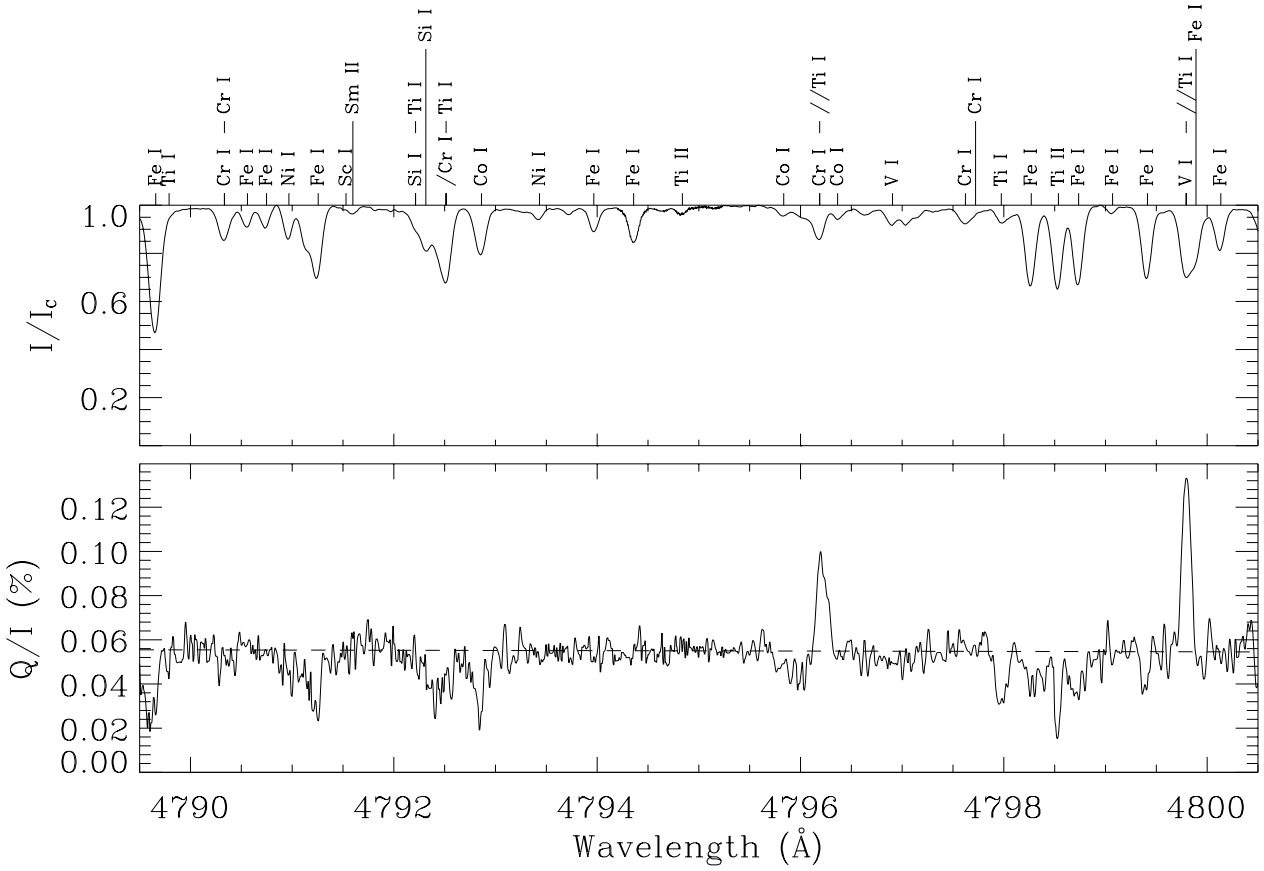

Ni I
Fe I
Sc I – /Fe I
Ni I
Fe I
Sr I
Ti I
Ti I
V I
Ti I
Fe I
La II – Cr I
Sc I
Fe I
Fe I
Fe I
Fe I
Cr I
Sm II
Fe I – Fe I
Co I
V I
Ti I
Ti I
Na I – Si I
V I
La II
Fe I
Co I
Fe I
1.0
0.6
0.2
I/I_c
0.25
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4740
4742
4744
4746
4748
4750
Wavelength (Å)

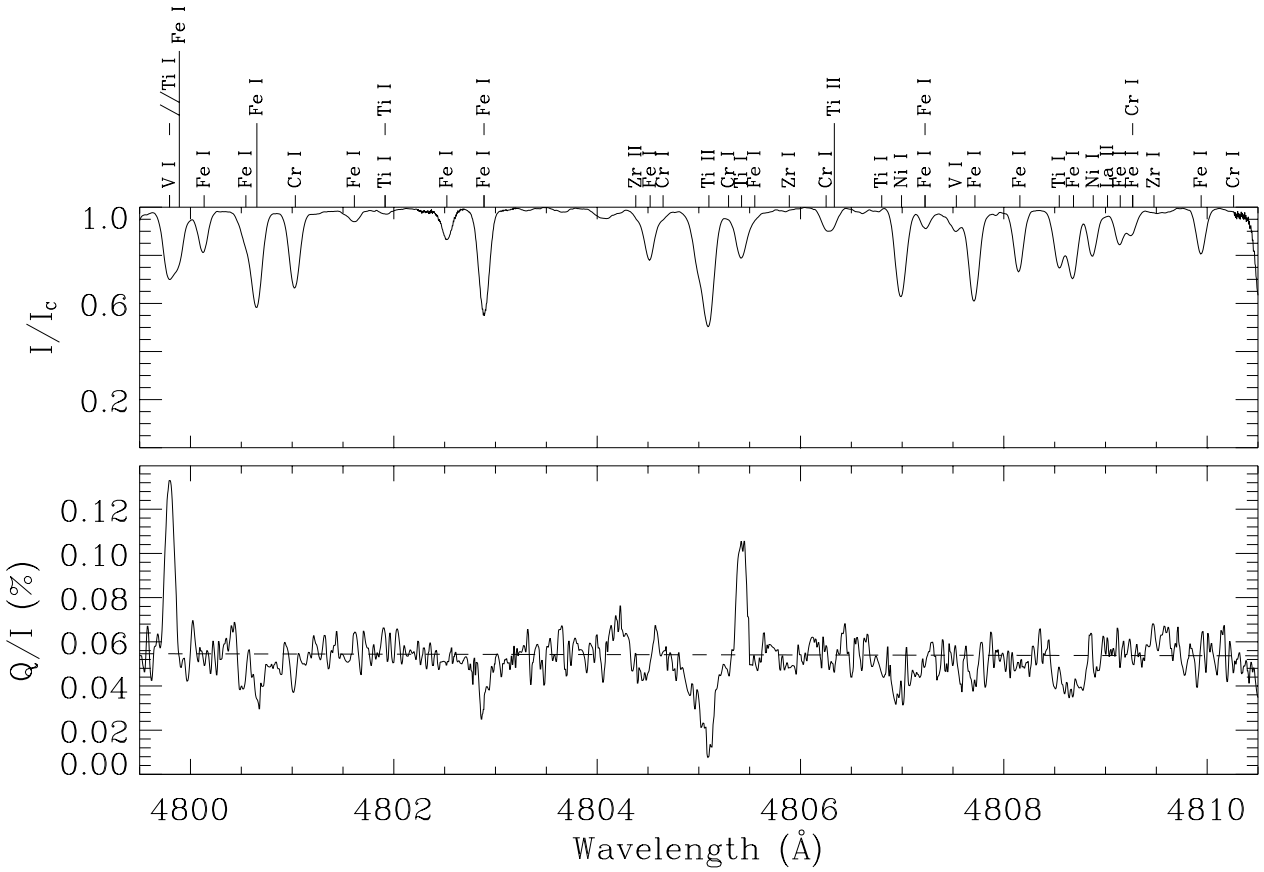

Co I
Fe I
V I
Fe I
V I
Na I
Cr I – (Ni I)
Ni I
Cr I
Sc I
Mn I – (V I)
Co I
Ni I – Cr I
Cr I
Si I
Fe I
Cr I
Fe I
Ni I
Co I
Cr I – V I
Cr I
(Cr I)
Fe I – Fe I
Ru I
Ti I
Ni I
– V I"
Ti I
Si I
Ti I
Ti I
Cr I
Cr I
Fe I
Ni I
1.0
0.6
0.2
I/I_c
0.15
0.10
0.05
0.00
Q/I (%)
4750
4752
4754
4756
4758
4760
Wavelength (Å)

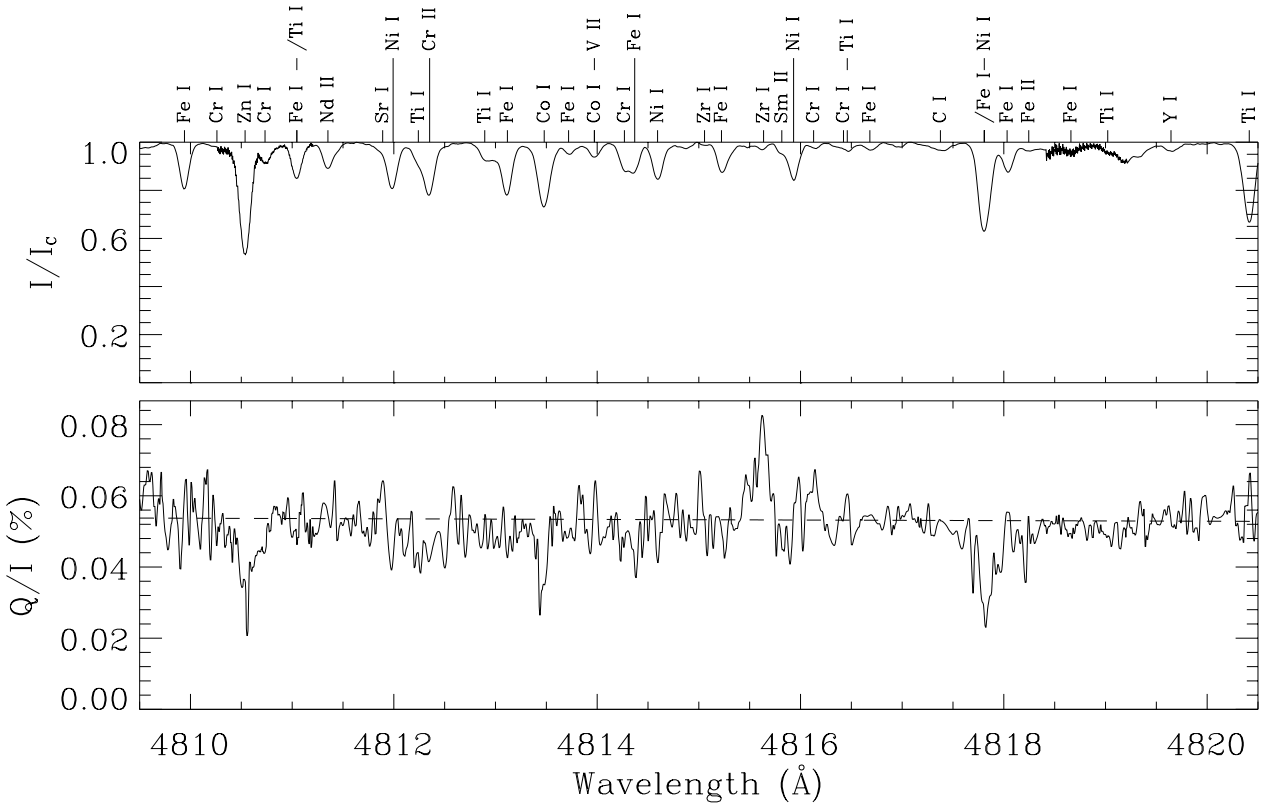

Ti I
Cr I
Cr I
Fe I
Ni I
Y I
Cr I
Mn I
Cr I
Mn I
(C 1)
(C 1)
Ni I
Ti II
Ni I
Cr I
Ti II
Cr I
Fe I
Mn I
Ti I
Mn I
V I
Cr I
(C 1)
Fe I
Co I
Cr I
Fe I
Cr I
Co I
Fe I
Fe I
Ti I
C I
1.0
0.6
0.2
I/I_c
0.06
0.04
0.02
0.00
Q/I (%)
4760
4762
4764
4766
4768
4770
Wavelength (Å)

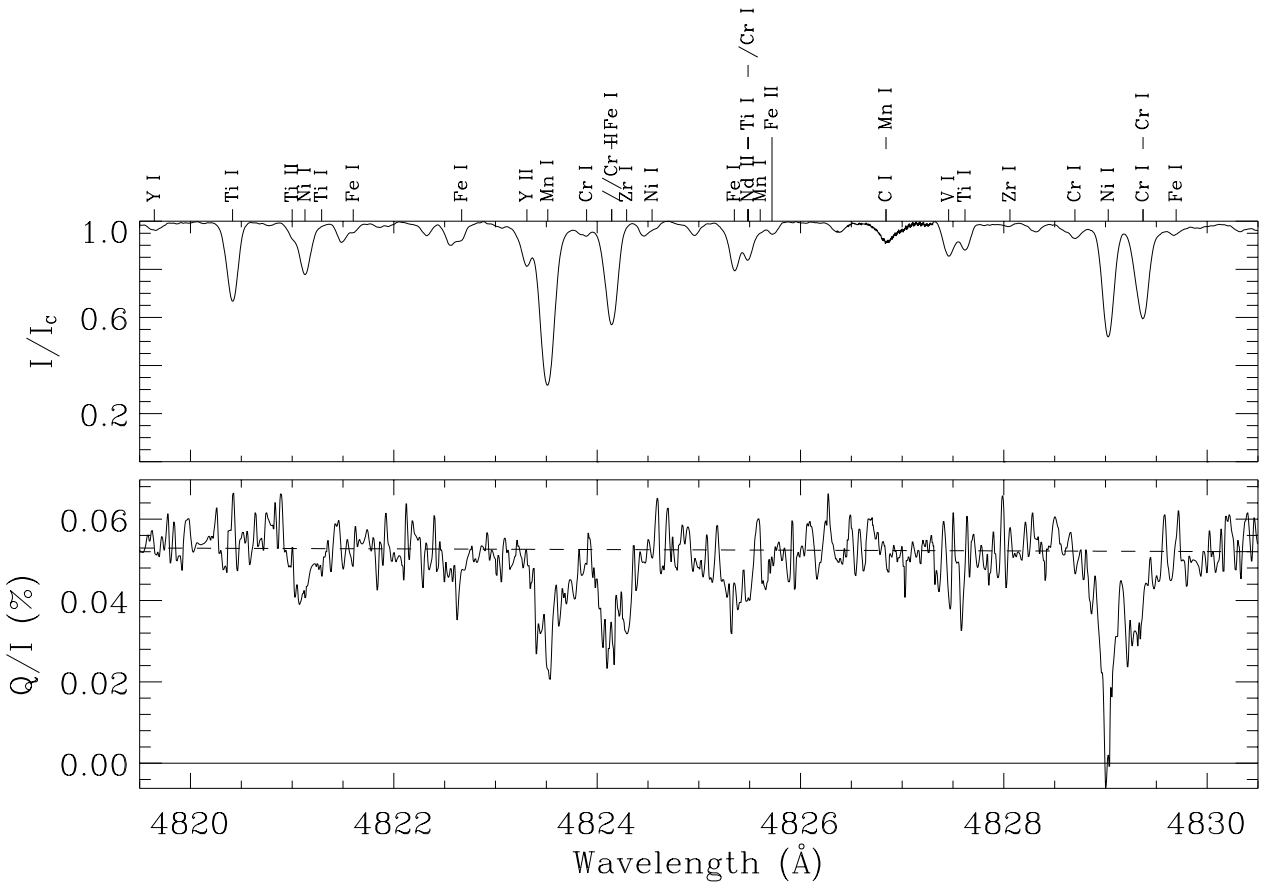

Ti I
C I
Cr I
/Ti I – Co I
Fe I – (C 1)
Zr I
Fe I – Fe I
Ni I
Fe I
Ce II
Cr I
Cr I
Cr I
C I
Fe I
–Co I
–V I
Fe I – V I
Cr I
Sm II
Ti I
Sc I
Fe I
Co I – /Ti II
1.0
0.6
0.2
I/I_c
0.10
0.08
0.06
0.04
0.02
0.00
Q/I (%)
4770
4772
4774
4776
4778
4780
Wavelength (Å)

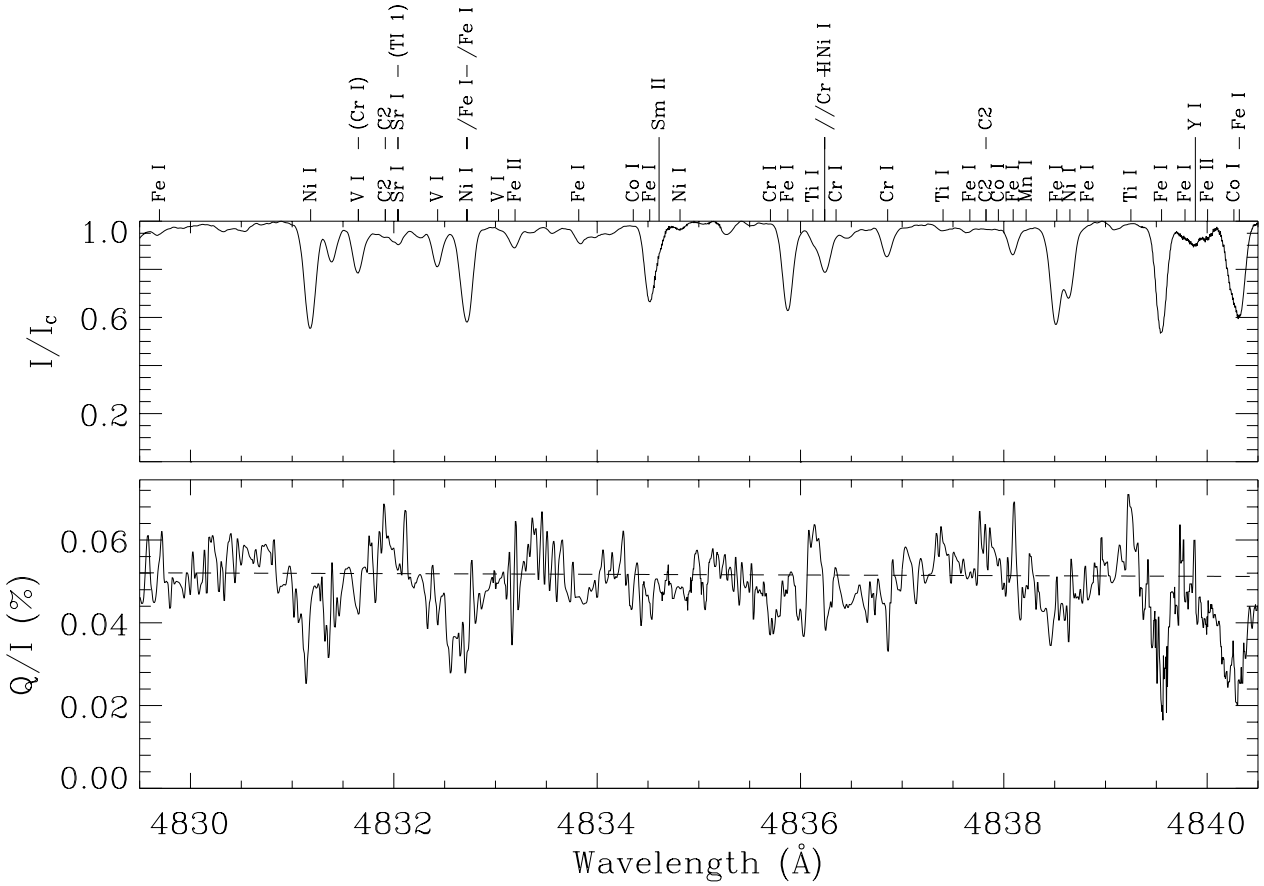

Co I – /Ti II
Fe I
Co I
Ti I
Fe I
Si I
Mn I
(SR 1)
(SR 1)
V I
Zr I
Co I
Fe I
Ni I
//Ni + V I
Fe I
Fe I
Ti I
Fe I
Fe I
Cr I
Fe I
Ti I
Cr I – Cr I
1.0
0.6
0.2
I/I_c
0.06
0.04
0.02
0.00
Q/I (%)
4780
4782
4784
4786
4788
4790
Wavelength (Å)

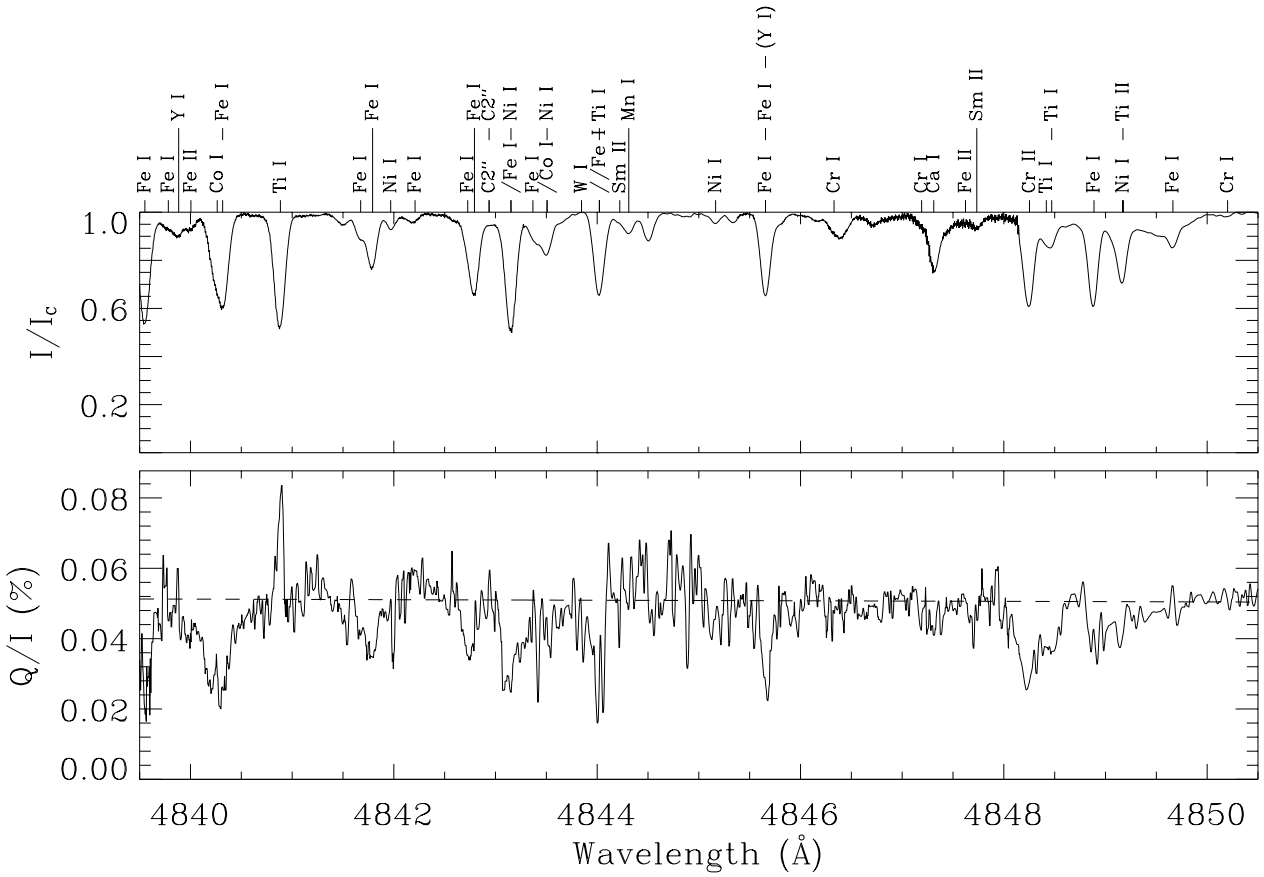

Fe I
Ti I
Cr I
Cr I
Fe I
Fe I
Ni I
Fe I
Sc I
Sm II
Si I
Ti I
Si I
Cr I
Ti I
Co I
Ni I
Fe I
Fe I
Ti II
Co I
Cr I
Co I
Ti I
V I
Cr I
Cr I
Ti I
Fe I
Ti II
Fe I
Fe I
Fe I
V I
Ti I
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Q/I (%)
4790
4792
4794
4796
4798
4800
Wavelength (Å)

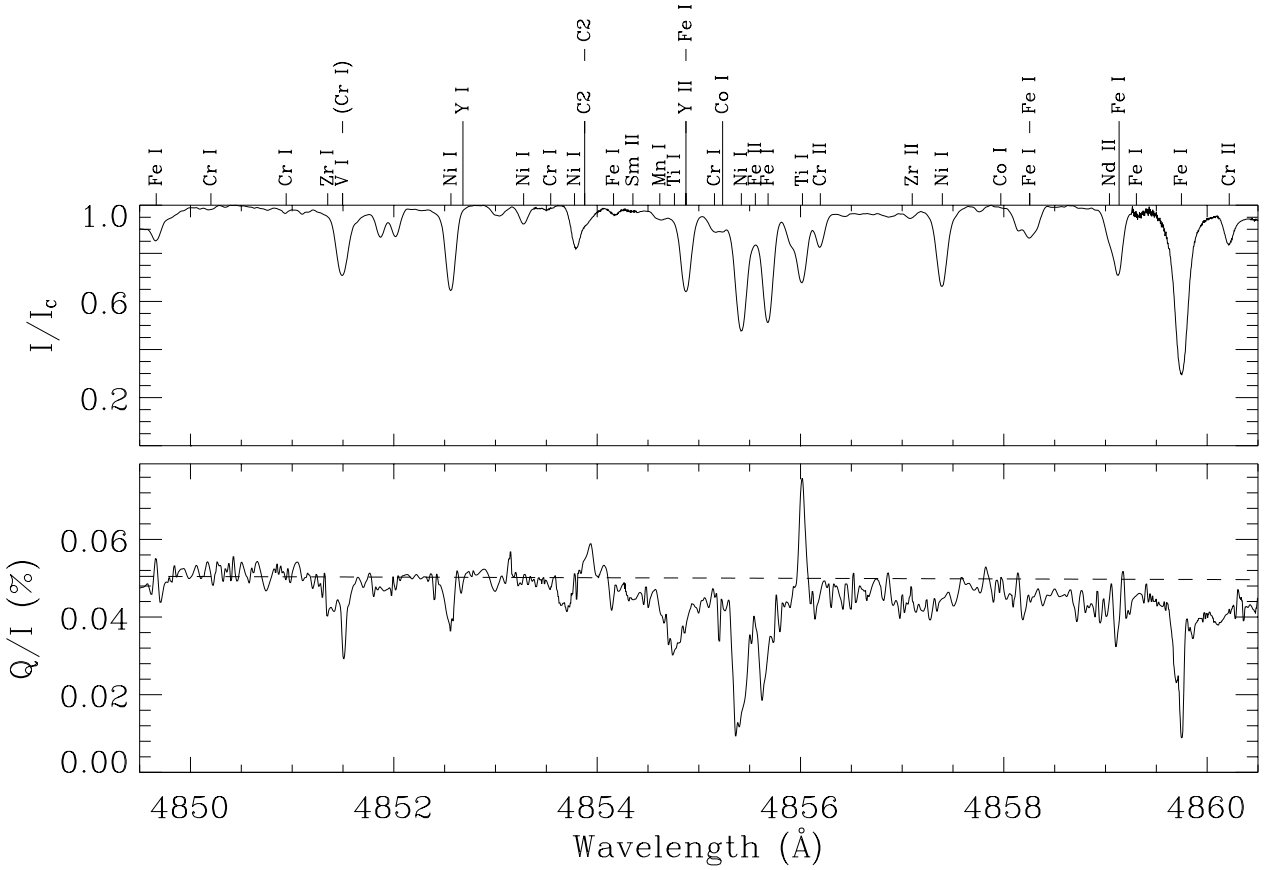

V I
Fe I
Ti I
Fe I
Fe I
Fe I
Cr I
Fe I
Ti I
Fe I
Fe I
Fe I
Zr II
Fe I
Cr I
Ti II
Cr I
Ti I
Fe I
Zr I
Cr I
Ti II
Ti I
Ni I
Fe I
V I
Fe I
Fe I
Ti I
Fe I
Ni I
La II
Fe I
Cr I
Zr I
Fe I
Cr I
I/I$_c$
1.0
0.6
0.2
Q/I (%)
0.12
0.10
0.08
0.06
0.04
0.02
0.00
4800
4802
4804
4806
4808
4810
Wavelength (Å)

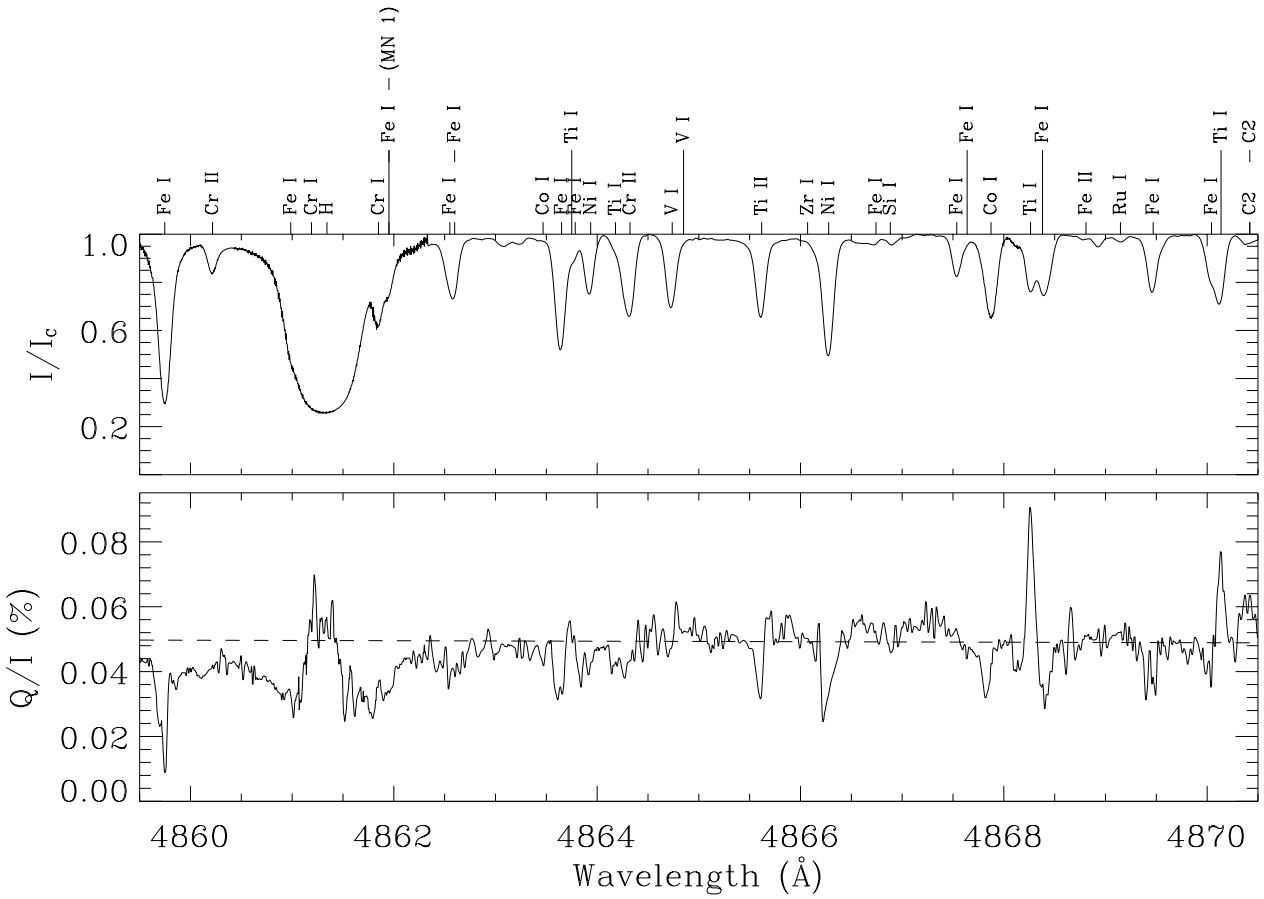

Fe I
Cr I
Zn I
Cr I
Fe I – /Ti I
Nd II
Sr I
Ni I
Ti I
Cr II
Ti I
Fe I
Co I
Fe I
Co I – V II
Cr I
Fe I
Ni I
Zr I
Fe I
Zr I
Sm II
Ni I
Cr I
Cr I – Ti I
Fe I
C I
/Fe I – Ni I
Fe I
Fe II
Fe I
Ti I
Y I
Ti I
1.0
0.6
0.2
I/I_c
0.08
0.06
0.04
0.02
0.00
Q/I (%)
4810
4812
4814
4816
4818
4820
Wavelength (Å)

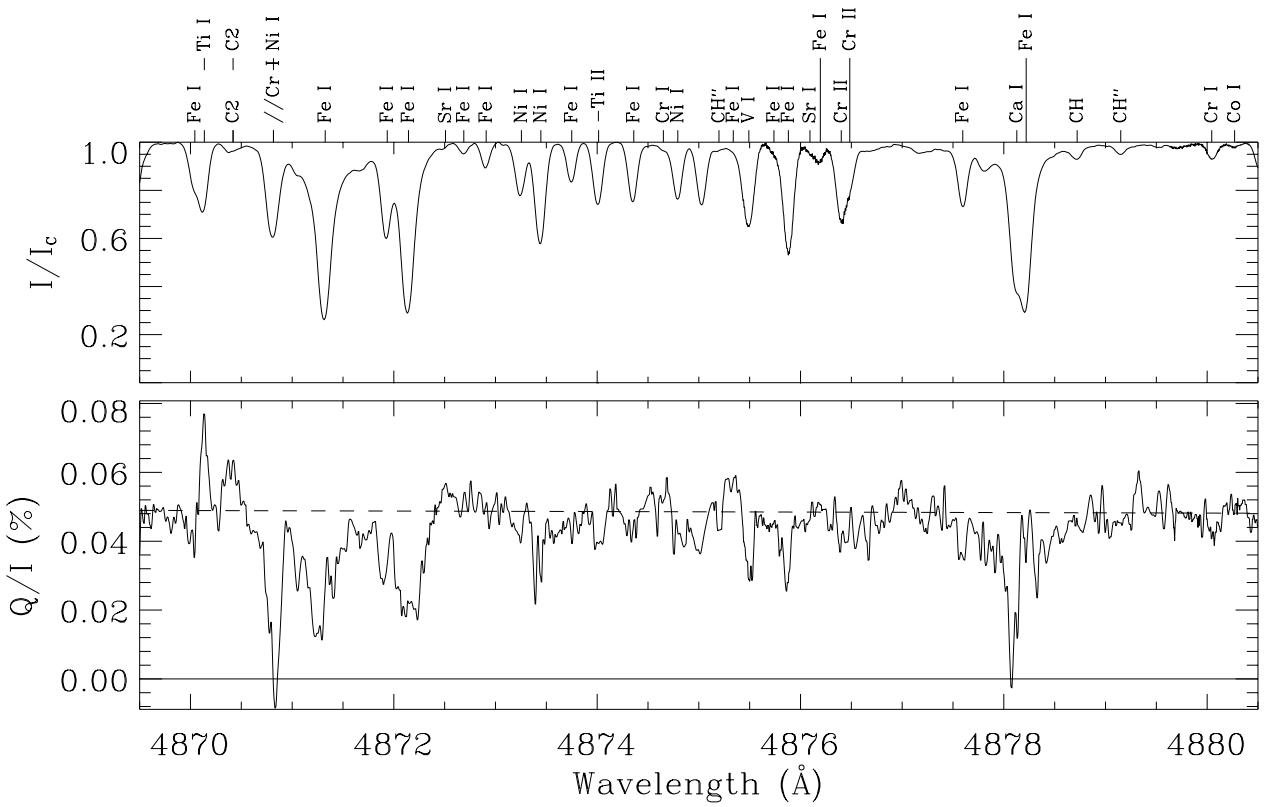

Y I
Ti I
Ti II
Ni I
Ti I
Fe I
Fe I
Y II
Mn I
Cr I
Cr I
Fe I
Zr I
Ni I
Fe I
Ti I
Cr I
Na I
Mn I
Fe II
C I
Mn I
V I
Ti I
Zr I
Cr I
Ni I
Cr I
Cr I
Fe I
1.0
0.6
0.2
I/I_c
0.06
0.04
0.02
0.00
Q/I (%)
4820
4822
4824
4826
4828
4830
Wavelength (Å)

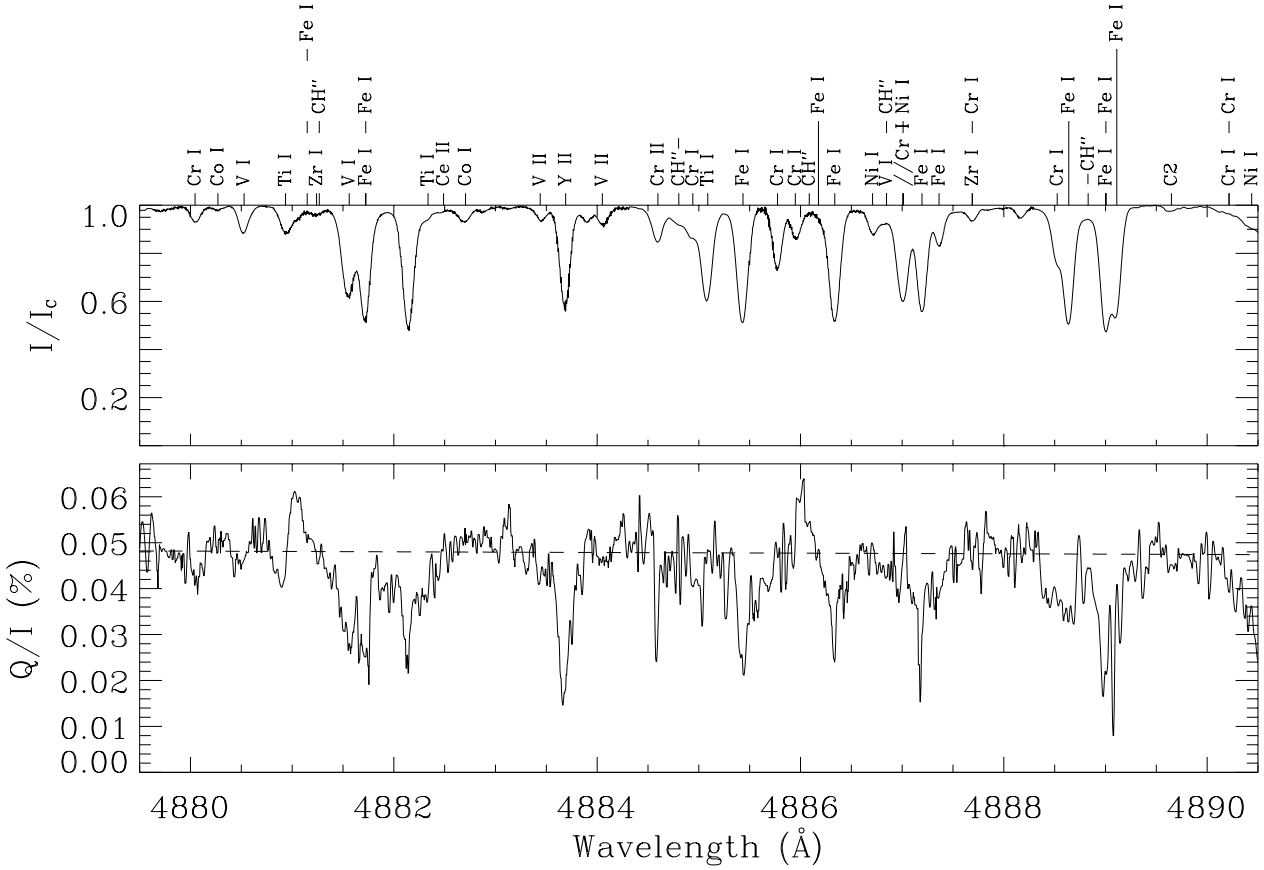

Fe I
Ni I
V I
(Cr I)
C2
Sr I
(Ti 1)
V I
Ni I
/Fe I
/Fe I
V I
Fe II
Fe I
Co I
Fe I
Sm II
Ni I
Cr I
Fe I
Ti I
Cr I
//Cr I
Ni I
Cr I
Ti I
Fe I
C2
Co I
Fe I
Mn I
Fe I
Ni I
Fe I
Ti I
Fe I
Fe I
Y I
Fe II
Co I
Fe I
1.0
0.6
0.2
I/I_c
0.06
0.04
0.02
0.00
Q/I (%)
4830
4832
4834
4836
4838
4840
Wavelength (Å)

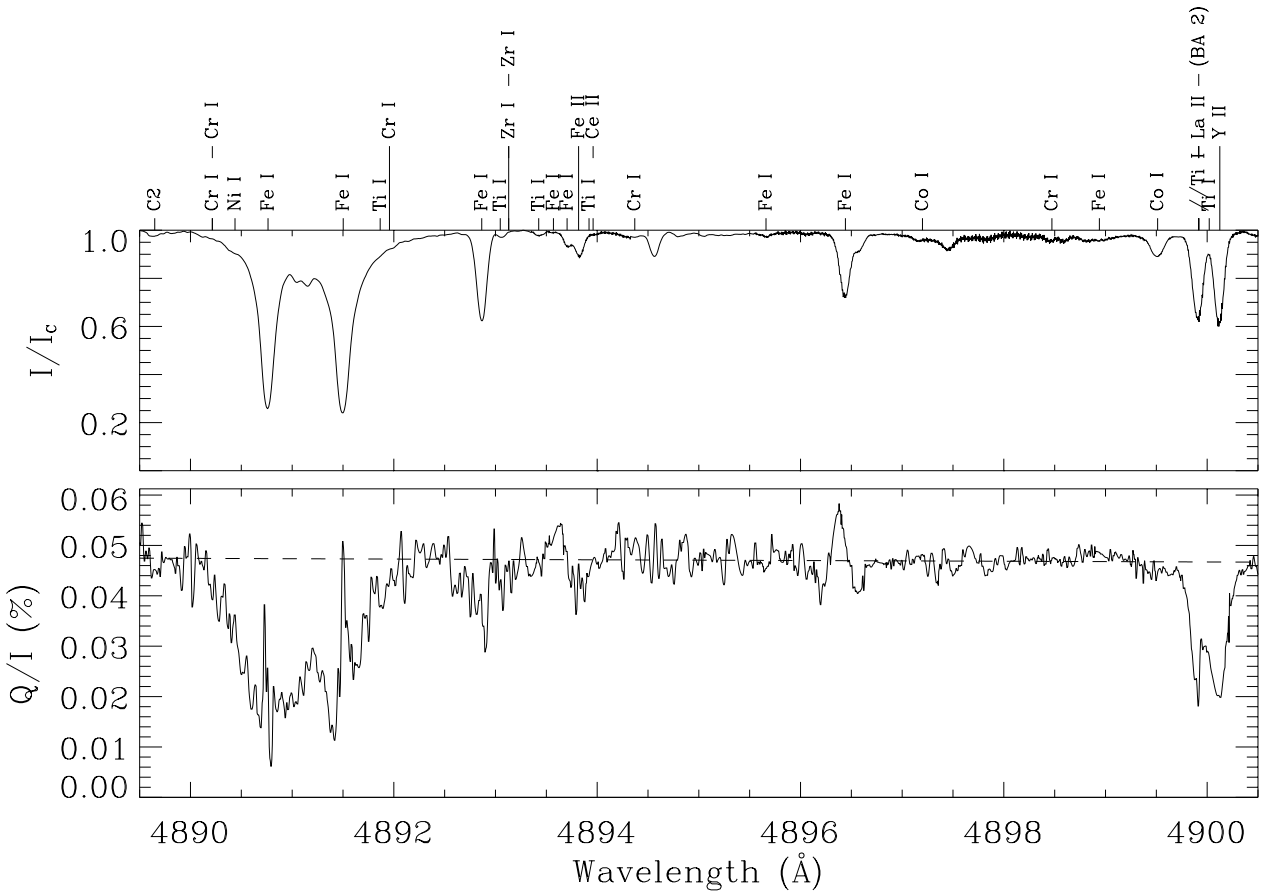

Fe I
Fe I
Y I
Fe II
Co I
Fe I
Ti I
Fe I
Fe I
Ni I
Fe I
Fe I
Fe I
C2''
Fe I
Ni I
Fe I
Co I
Ni I
W I
Fe I
Ti I
Sm II
Mn I
Ni I
Fe I
(Y I)
Cr I
Cr I
Ca I
Fe II
Sm II
Cr II
Ti I
Ti I
Fe I
Ni I
Ti II
Fe I
Cr I
1.0
0.6
0.2
I/I_c
0.08
0.06
0.04
0.02
0.00
Q/I (%)
4840
4842
4844
4846
4848
4850
Wavelength (Å)

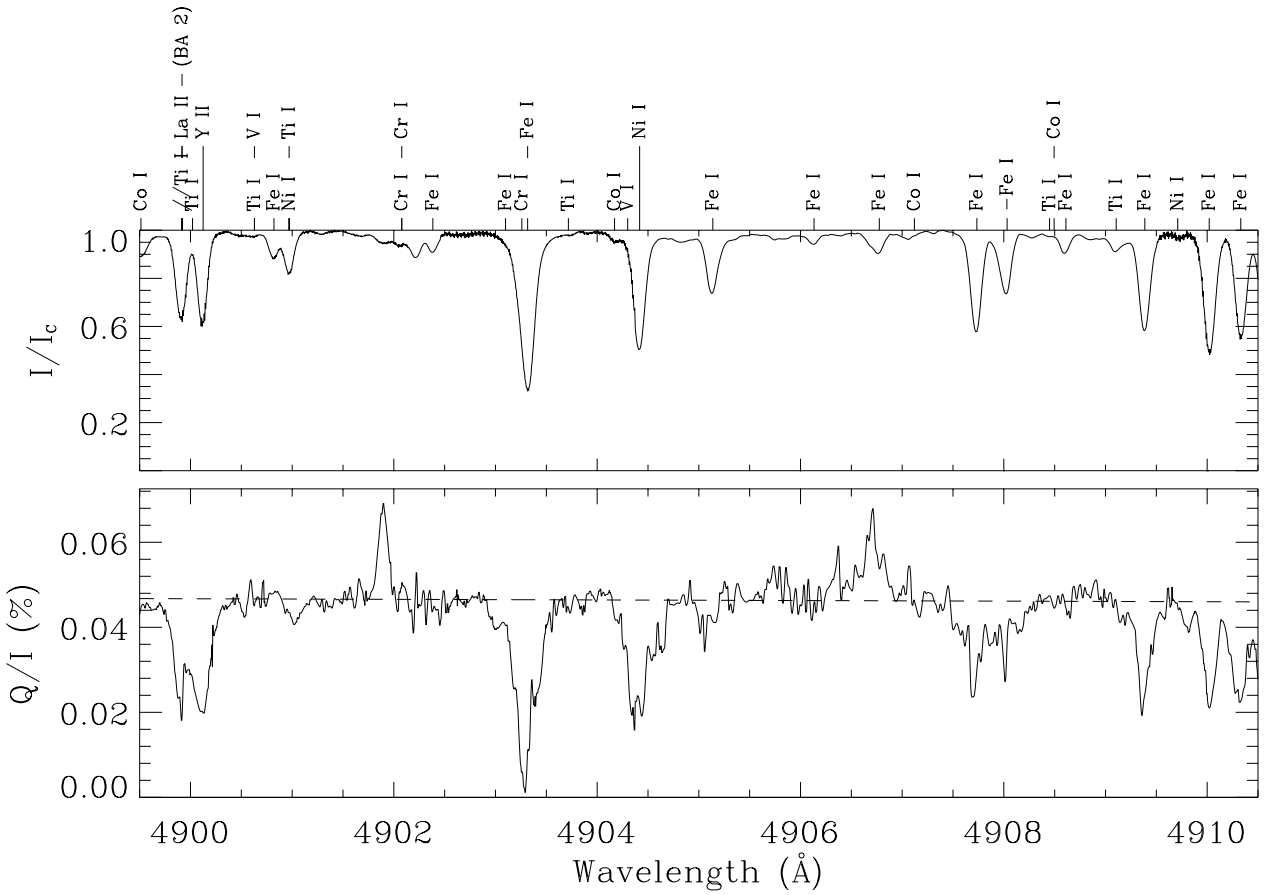

Fe I
Cr I
Cr I
Zr I
V I
(Cr I)
Ni I
Y I
Ni I
Cr I
Ni I
C2
C2
Fe I
Sm II
Mn I
Ti I
Y II
Fe I
Cr I
Co I
Ni I
Fe II
Fe I
Ti I
Cr II
Zr II
Ni I
Co I
Fe I
Fe I
Nd II
Fe I
Fe I
Cr II
1.0
0.6
0.2
I/I_c
0.06
0.04
0.02
0.00
Q/I (%)
4850
4852
4854
4856
4858
4860
Wavelength (Å)

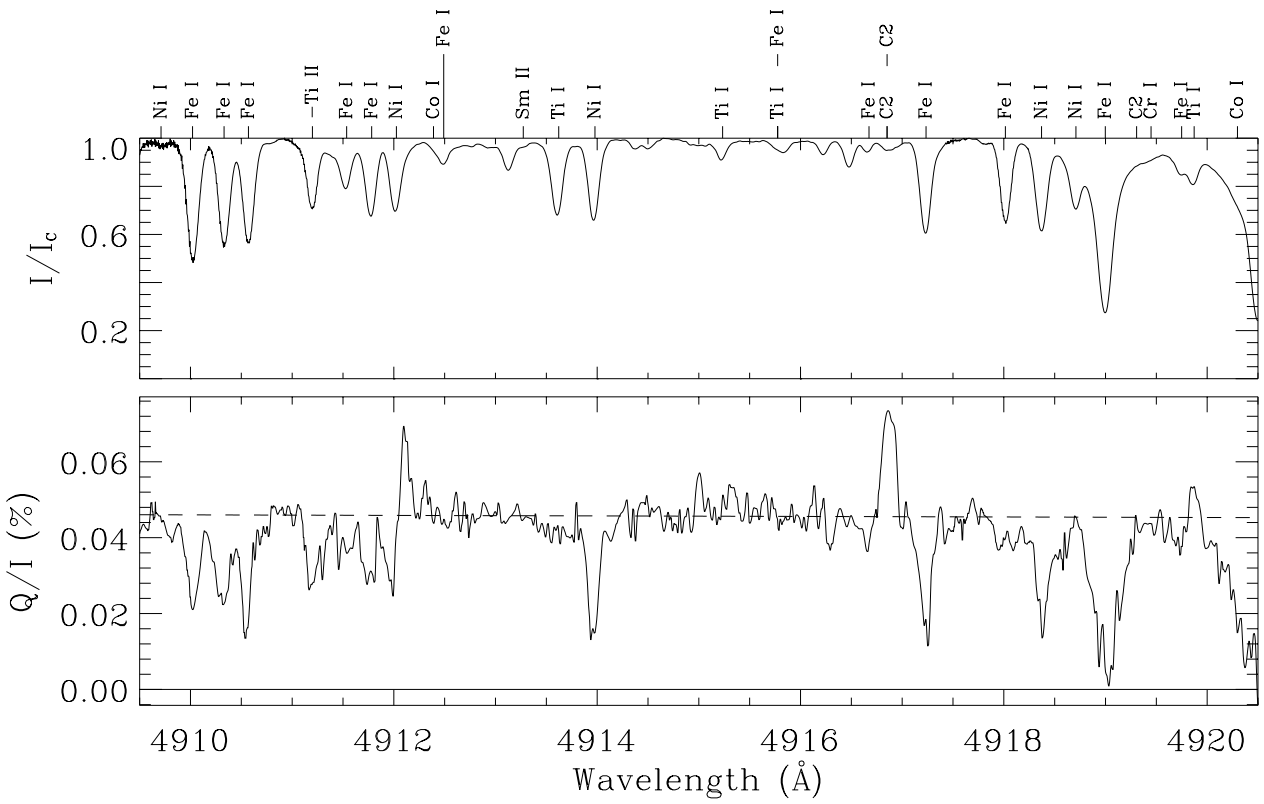

Fe I
Cr II
Fe I
Cr I
H
Cr I
Fe I – (MN 1)
Fe I – Fe I
Co I
Fe I
Fe I
Ni I
Ti I
Cr II
Ti I
V I
V I
Ti II
Zr I
Ni I
Fe I
Si I
Fe I
Co I
Ti I
Fe I
Fe II
Ru I
Fe I
Fe I
Ti I
C2 – C2
1.0
0.6
0.2
I/I_c
0.08
0.06
0.04
0.02
0.00
Q/I (%)
4860
4862
4864
4866
4868
4870
Wavelength (Å)

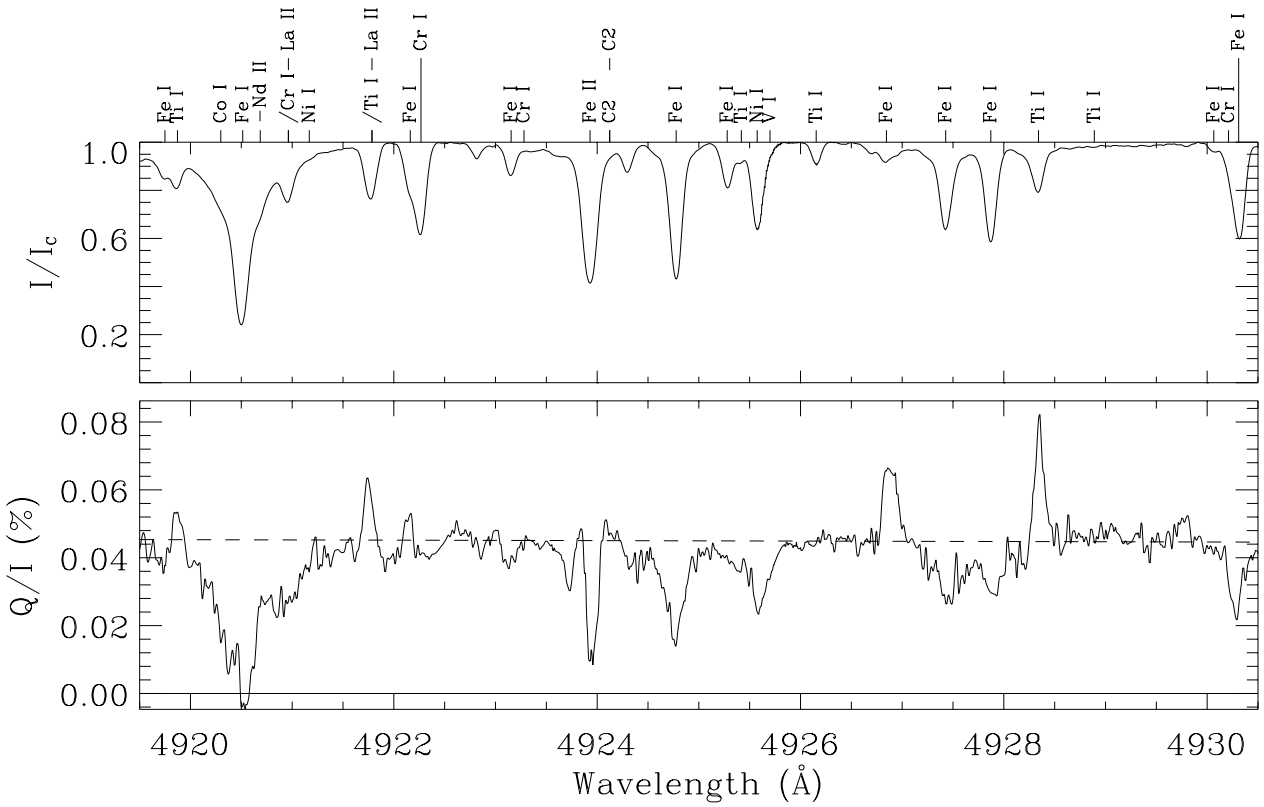

Fe I
Ti I
C2
C2
Cr + Ni I
Fe I
Fe I
Fe I
Sr I
Fe I
Fe I
Ni I
Ni I
Fe I
Ti II
Fe I
Cr I
Ni I
CH''
Fe I
V I
Fe I
Fe I
Sr I
Fe I
Cr II
Cr II
Fe I
Ca I
Fe I
CH
CH''
Cr I
Co I
1.0
0.6
0.2
I/I_c
0.08
0.06
0.04
0.02
0.00
Q/I (%)
4870
4872
4874
4876
4878
4880
Wavelength (Å)

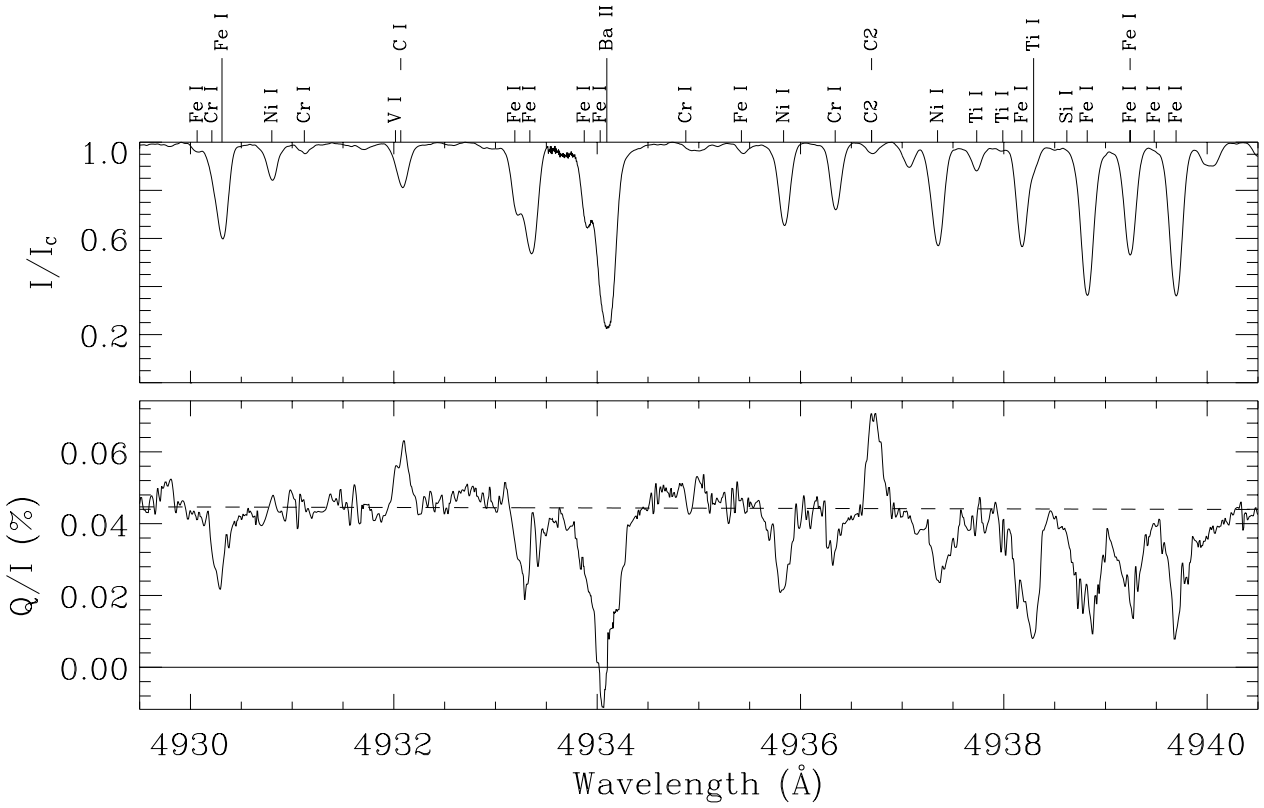

Cr I
Co I
V I
Ti I
Zr I
CH''
Fe I
V I
Fe I
Fe I
Ti I
Ce II
Co I
V II
Y II
V II
Cr II
CH''
Cr I
Ti I
Fe I
Cr I
Cr I
CH''
Fe I
Fe I
Ni I
V I
CH''
Cr I
Ni I
Fe I
Fe I
Zr I
Cr I
Cr I
Fe I
CH''
Fe I
Fe I
C2
Cr I
Cr I
Ni I
1.0
0.6
0.2
I/I_c
0.06
0.05
0.04
0.03
0.02
0.01
0.00
Q/I (%)
4880
4882
4884
4886
4888
4890
Wavelength (Å)

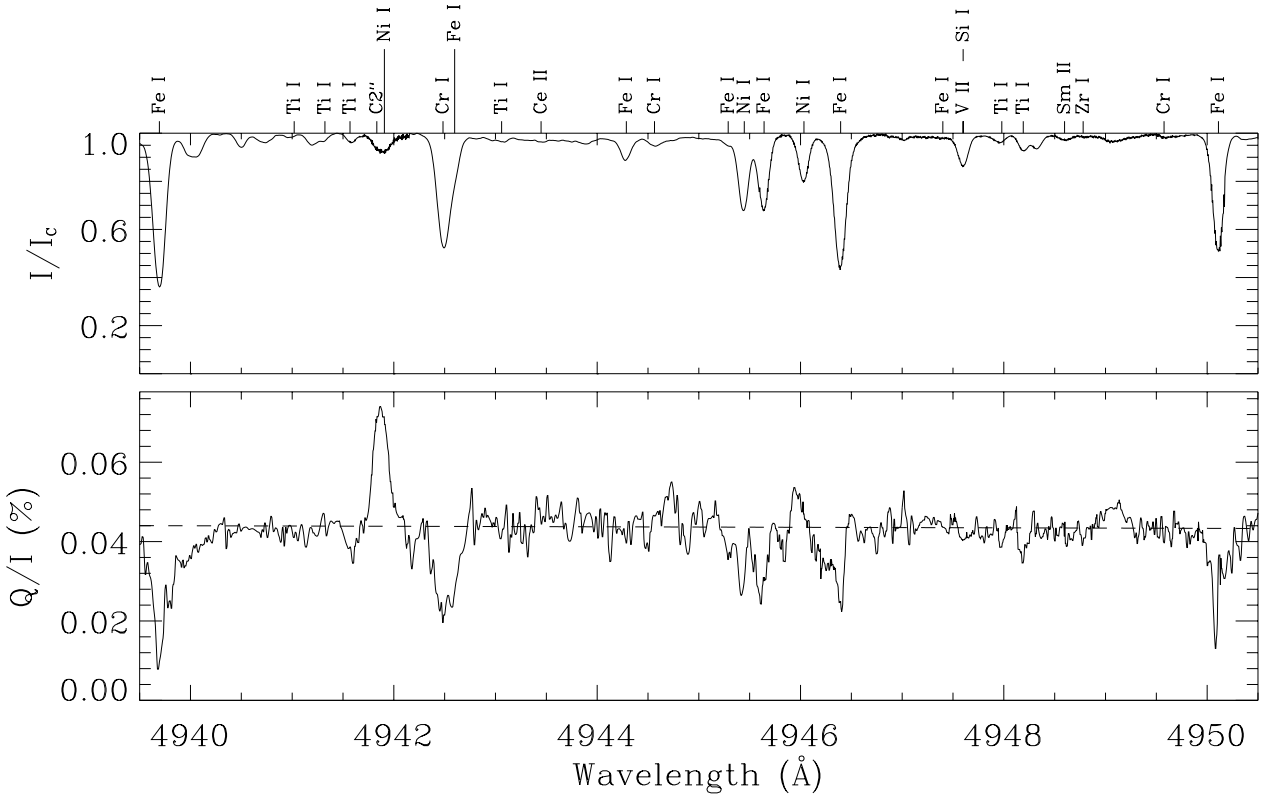

C2
Cr I – Cr I
Ni I
Fe I
Fe I
Ti I
Cr I
Fe I
Ti I
Zr I – Zr I
Ti I
Fe I
Fe I
Fe II
Ce II
Ti I – Ce II
Cr I
Fe I
Fe I
Co I
Cr I
Fe I
Co I
Ti I + La II – (BA 2)
Ti I
Y II
1.0
0.6
0.2
I/I_c
0.06
0.05
0.04
0.03
0.02
0.01
0.00
Q/I (%)
4890
4892
4894
4896
4898
4900
Wavelength (Å)

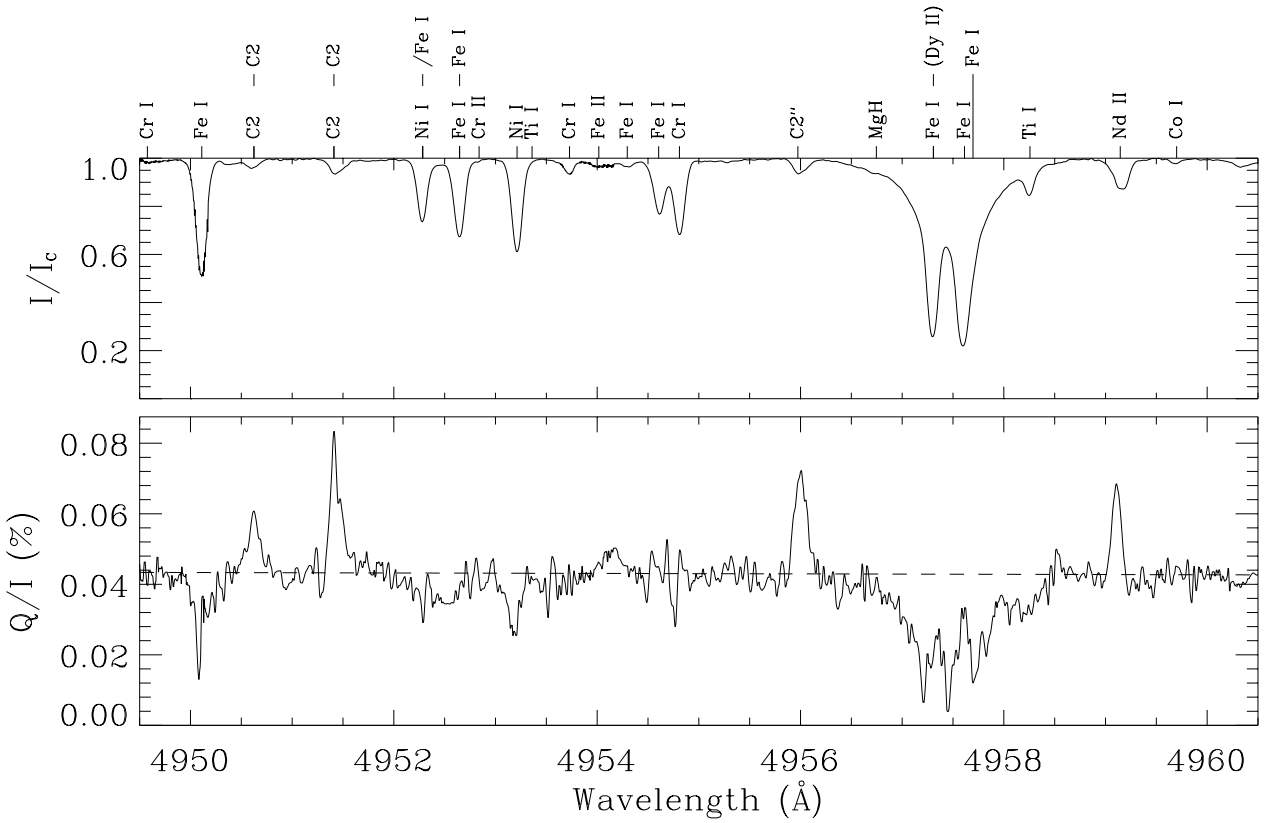

Co I
Ti I
Ti I + La II – (BA 2)
Y II
Ti I – V I
Fe I
Ni I – Ti I
Cr I – Cr I
Fe I
Fe I
Cr I – Fe I
Ti I
Co I
V I
Ni I
Fe I
Fe I
Fe I
Co I
Fe I
Fe I
Ti I – Co I
Fe I
Ti I
Fe I
Ni I
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.06
0.04
0.02
0.00
Q/I (%)
4900
4902
4904
4906
4908
4910
Wavelength (Å)

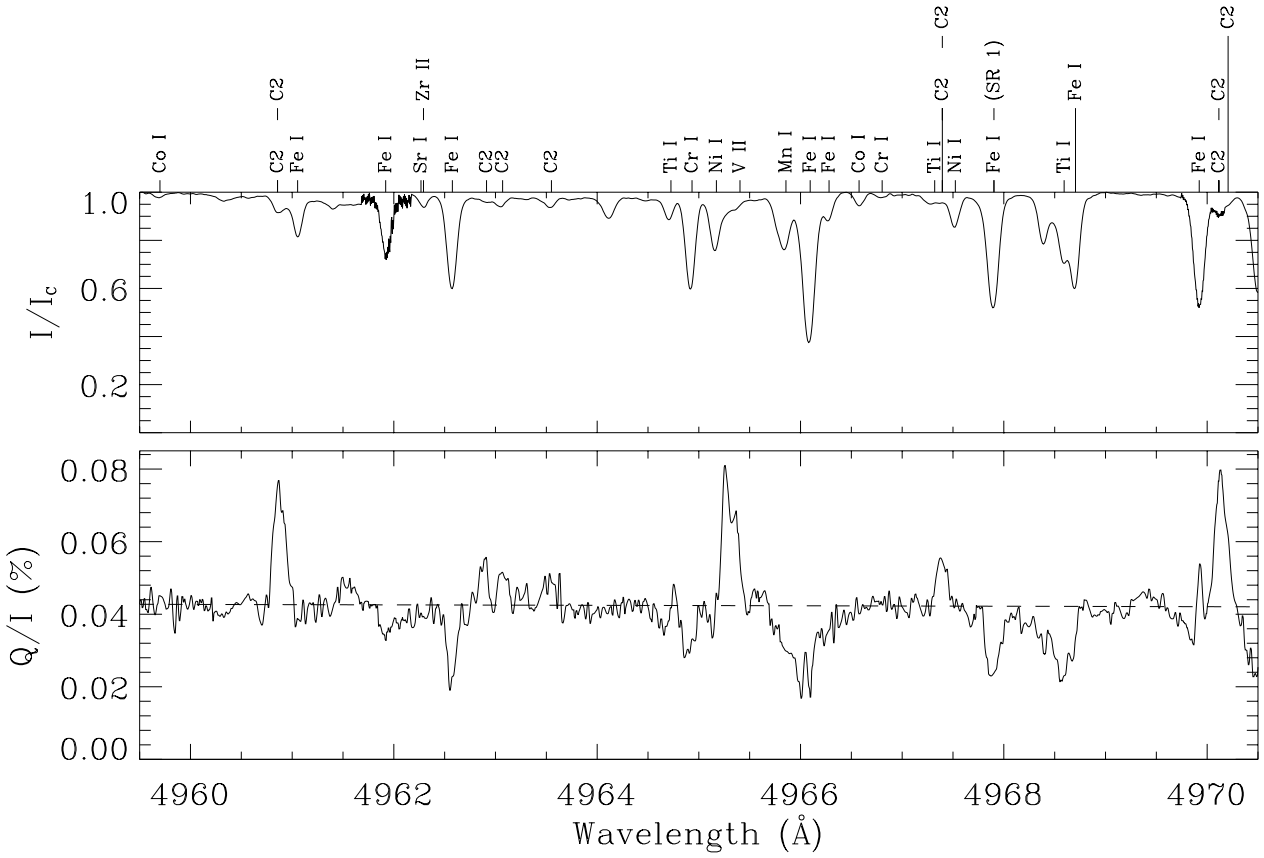

Ni I
Fe I
Fe I
Fe I
Ti II
Fe I
Fe I
Ni I
Co I
Fe I
Sm II
Ti I
Ni I
Ti I
Ti I
Fe I
Fe I
C2
C2
Fe I
Fe I
Ni I
Ni I
Fe I
C2
Cr I
Fe I
Ti I
Co I
1.0
0.6
0.2
I/I_c
0.06
0.04
0.02
0.00
Q/I (%)
4910
4912
4914
4916
4918
4920
Wavelength (Å)

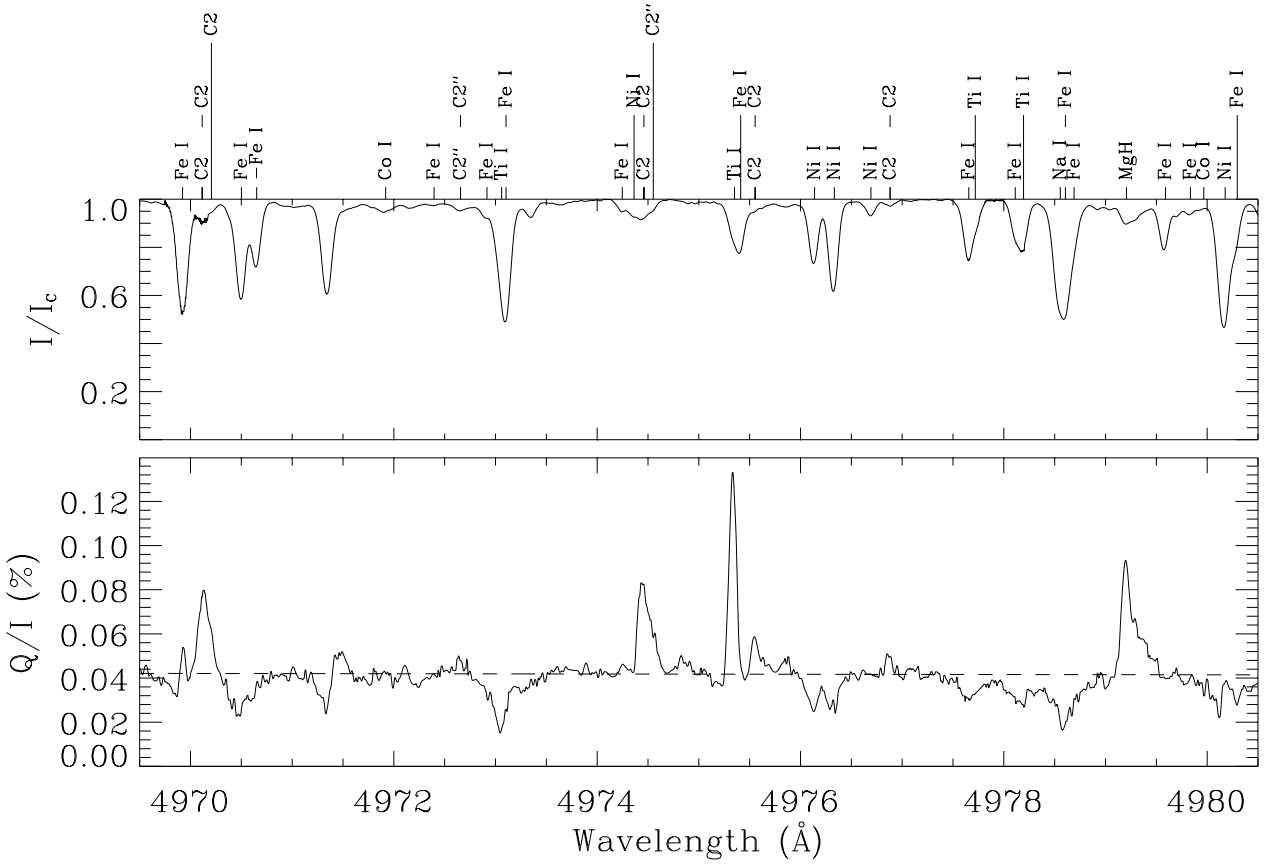

Fe I
Ti I
Co I
Fe I
-Nd II
/Cr I- La II
Ni I
/Ti I - La II
Fe I
Cr I
Fe I
Cr I
Fe II
C2
- C2
Fe I
Fe I
Ti I
Ni I
Ti I
Fe I
Fe I
Fe I
Ti I
Ti I
Fe I
Cr I
Fe I
1.0
0.6
0.2
I/I_c
0.08
0.06
0.04
0.02
0.00
Q/I (%)
4920
4922
4924
4926
4928
4930
Wavelength (Å)

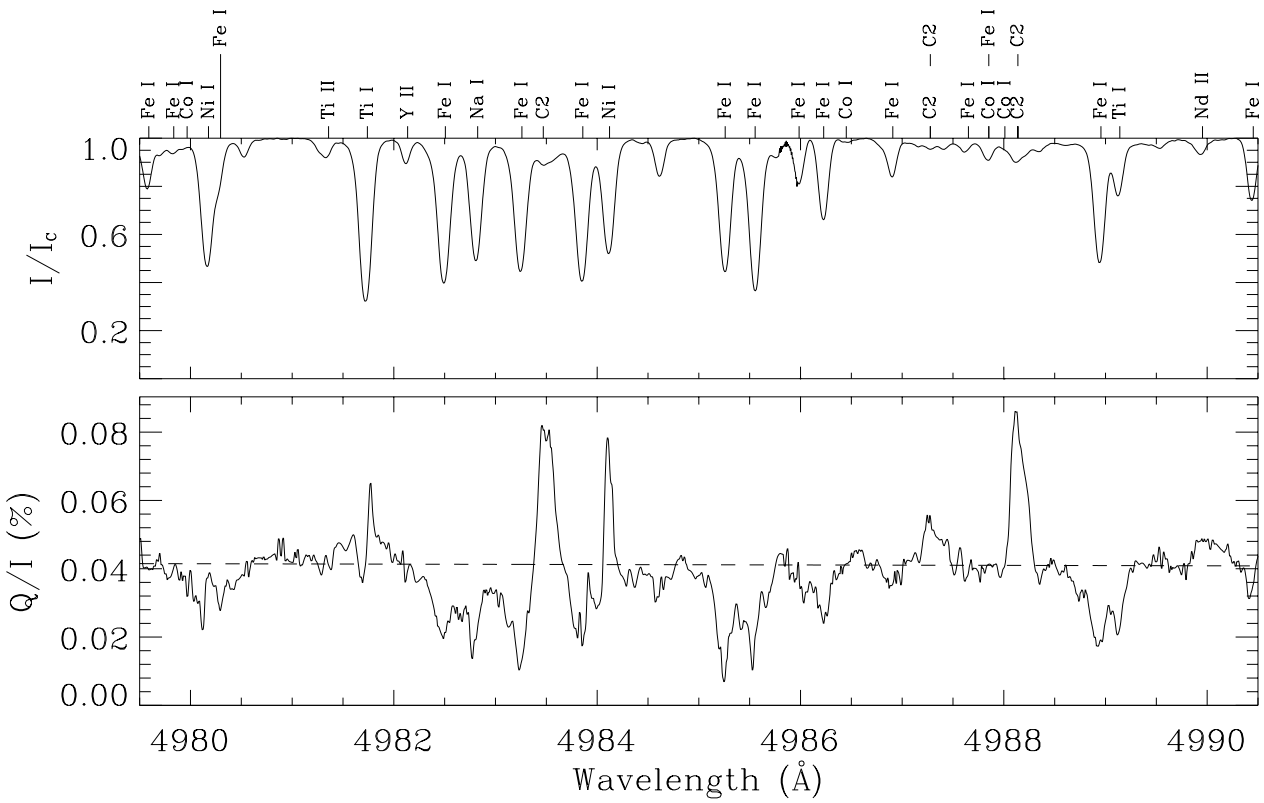

Fe I
Cr I
Fe I
Ni I
Cr I
V I
C I
Fe I
Fe I
Fe I
Fe I
Ba II
Cr I
Fe I
Ni I
Cr I
C2
C2
Ni I
Ti I
Ti I
Fe I
Ti I
Si I
Fe I
Fe I
Fe I
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.06
0.04
0.02
0.00
Q/I (%)
4930
4932
4934
4936
4938
4940
Wavelength (Å)

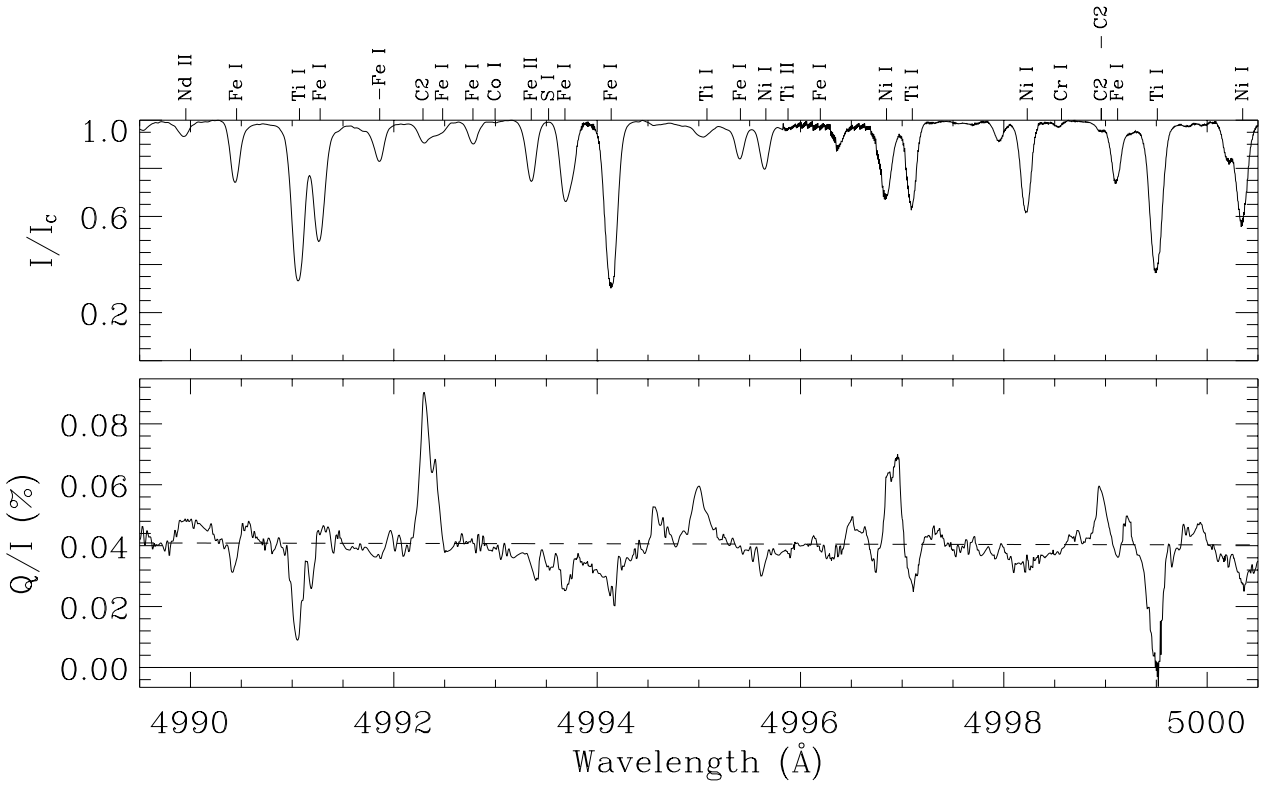

Fe I
Ti I
Ti I
Ti I
C2''
Ni I
Cr I
Fe I
Ti I
Ce II
Fe I
Cr I
Fe I
Ni I
Fe I
Ni I
Fe I
Fe I
V II
Si I
Ti I
Ti I
Sm II
Zr I
Cr I
Fe I
1.0
0.6
0.2
I/I_c
0.06
0.04
0.02
0.00
Q/I (%)
4940
4942
4944
4946
4948
4950
Wavelength (Å)

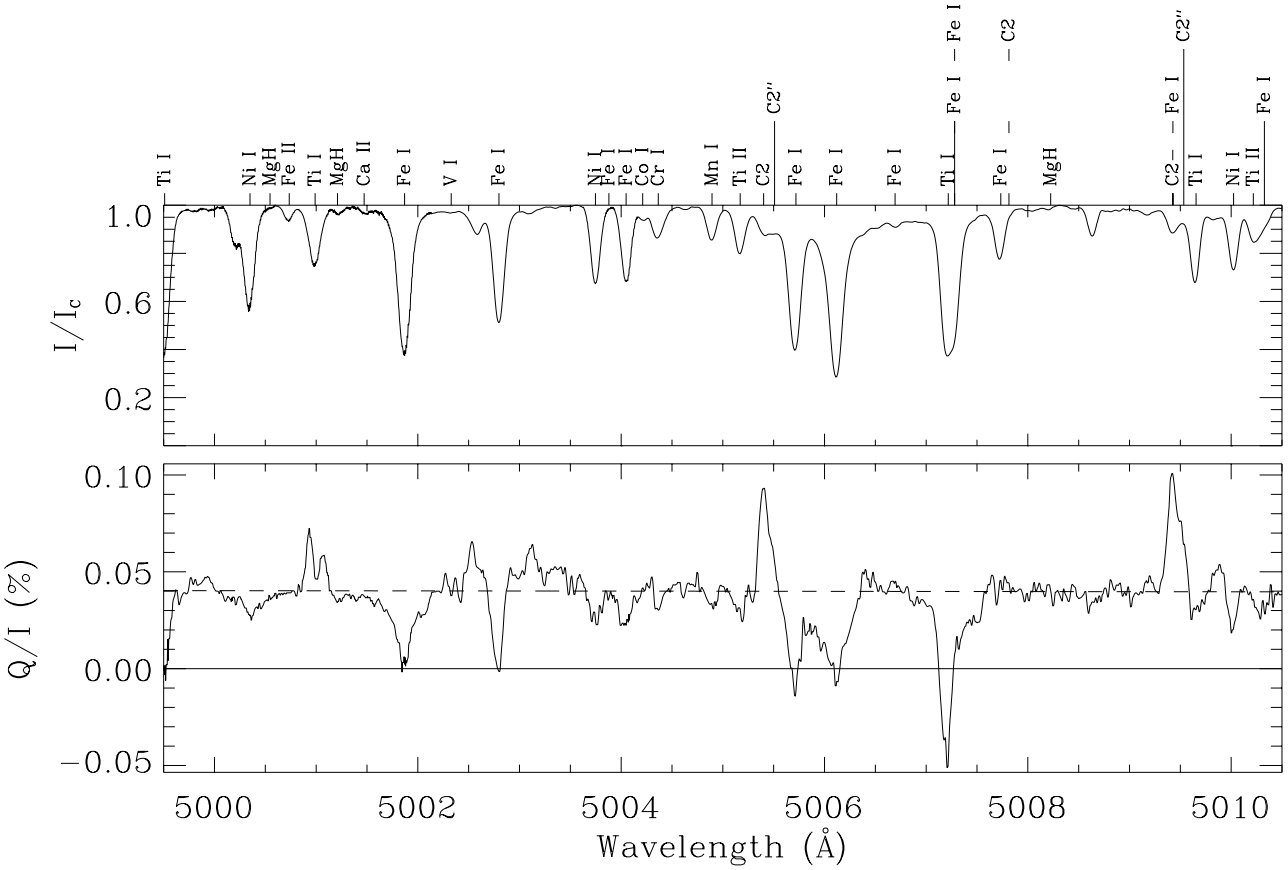

Cr I
Fe I
C2
C2
C2
C2
Ni I
Fe I
Fe I
Cr II
Ni I
Ti I
Cr I
Fe II
Fe I
Fe I
Cr I
C2''
MgH
Fe I
(Dy II)
Fe I
Fe I
Ti I
Nd II
Co I
1.0
0.6
0.2
I/I_c
0.08
0.06
0.04
0.02
0.00
Q/I (%)
4950
4952
4954
4956
4958
4960
Wavelength (Å)

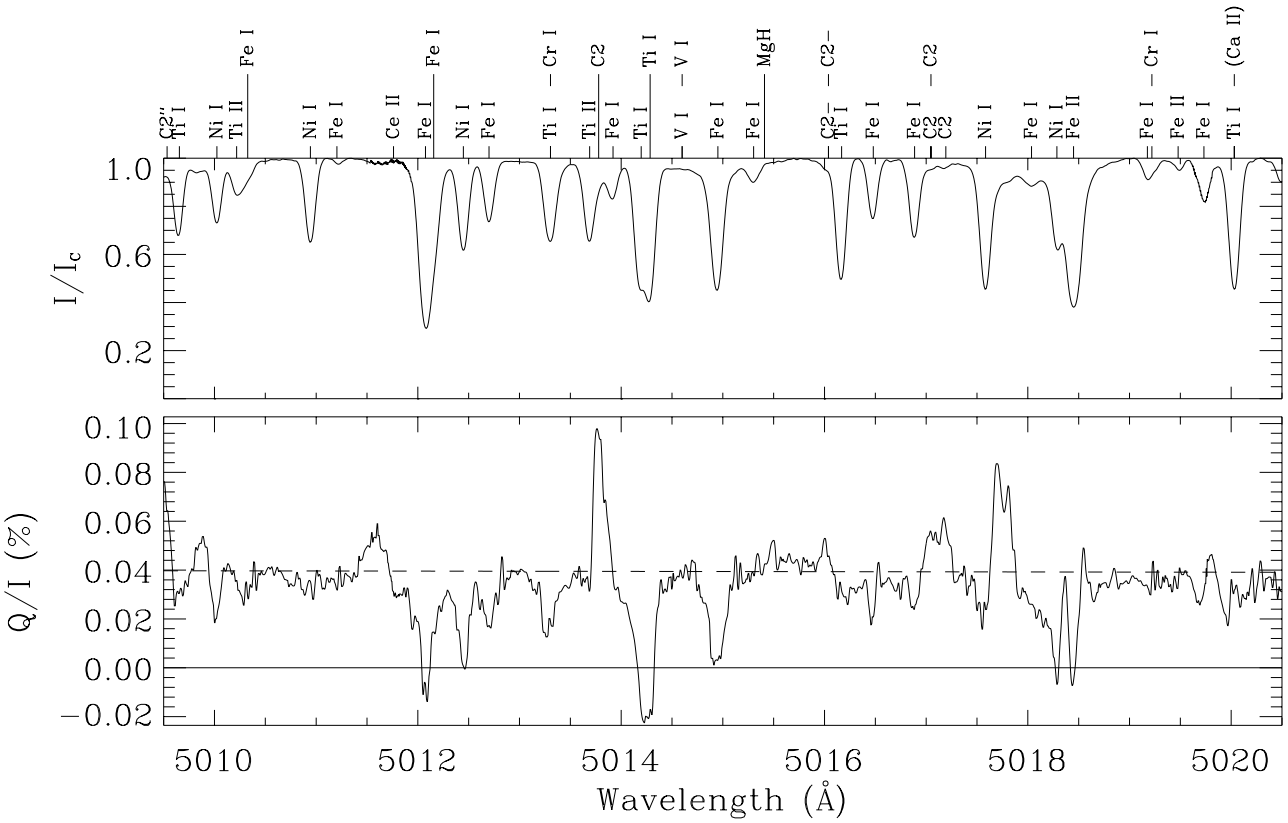

Co I
C2
C2
Fe I
Fe I
Sr I
Zr II
Fe I
C2
C2
C2
Ti I
Cr I
Ni I
V II
Mn I
Fe I
Fe I
Co I
Cr I
Ti I
C2
C2
Ni I
Fe I
(SR 1)
Ti I
Fe I
Fe I
C2
C2
C2
I/I$_c$
1.0
0.6
0.2
Q/I (%)
0.08
0.06
0.04
0.02
0.00
4960
4962
4964
4966
4968
4970
Wavelength (Å)

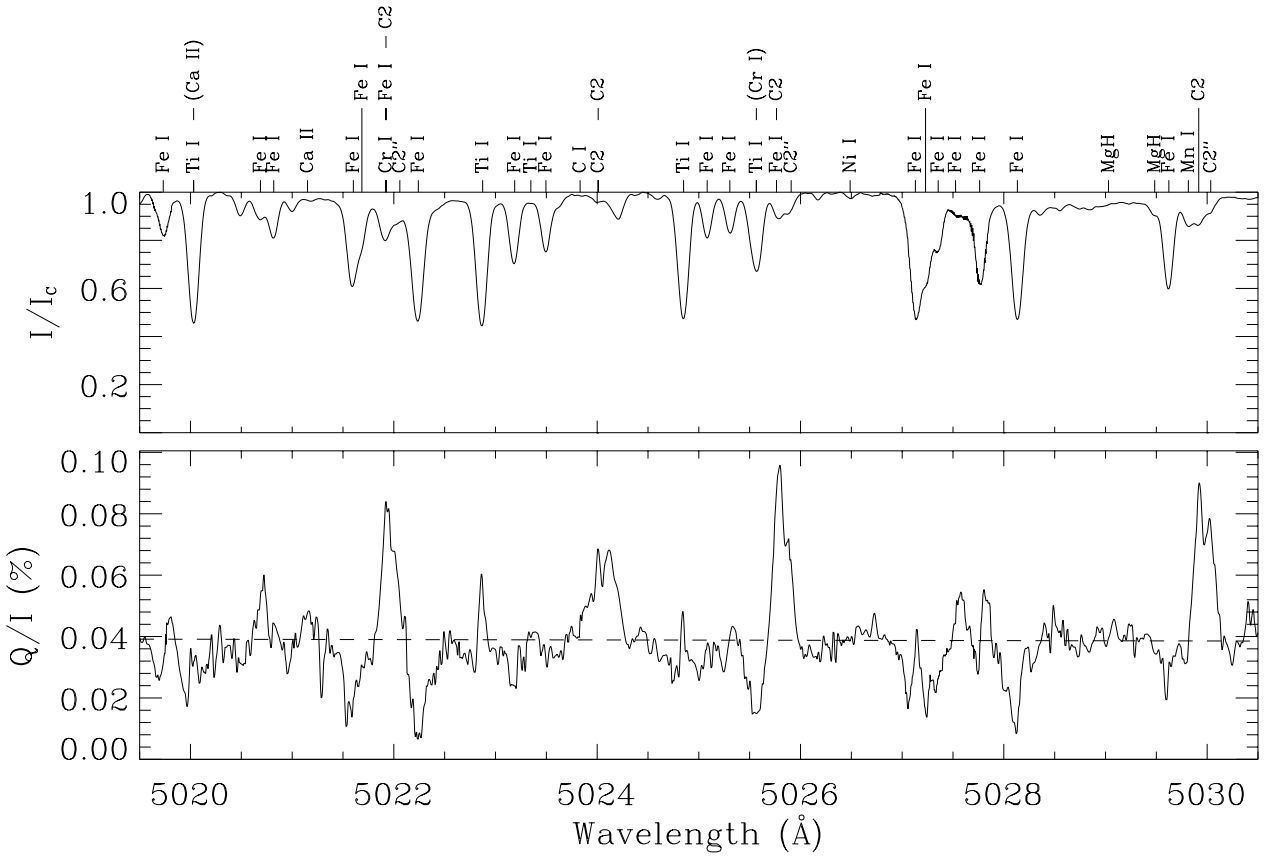

Fe I
C2
C2
Fe I
Fe I
Co I
Fe I
C2''
C2''
Fe I
Ti I
Fe I
Ni I
C2
C2
C2''
Ti I
Fe I
C2
C2
Ni I
Ni I
Ni I
C2
C2
Fe I
Ti I
Fe I
Ti I
Na I
Fe I
Fe I
MgH
Fe I
Fe I
Co I
Ni I
Fe I
I/I_c
1.0
0.6
0.2
Q/I (%)
0.12
0.10
0.08
0.06
0.04
0.02
0.00
4970
4972
4974
4976
4978
4980
Wavelength (Å)

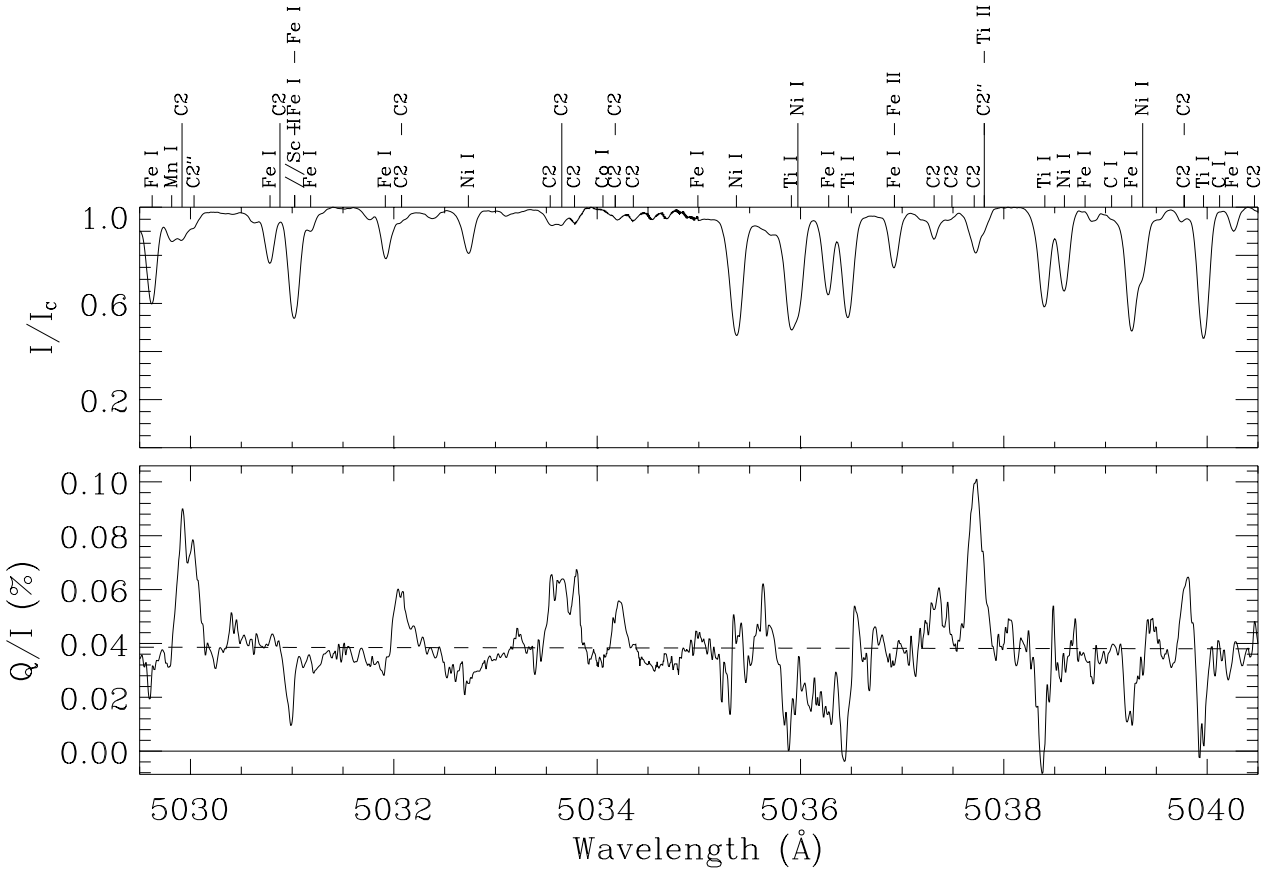

Fe I
Fe I
Co I
Ni I
Fe I
Ti II
Ti I
Y II
Fe I
Na I
Fe I
C2
Fe I
Ni I
Fe I
Fe I
Fe I
Fe I
Co I
Fe I
C2
C2
Fe I
Co I
C2
Fe I
C2
Fe I
Ti I
Nd II
Fe I
1.0
0.6
0.2
I/I_c
0.08
0.06
0.04
0.02
0.00
Q/I (%)
4980
4982
4984
4986
4988
4990
Wavelength (Å)

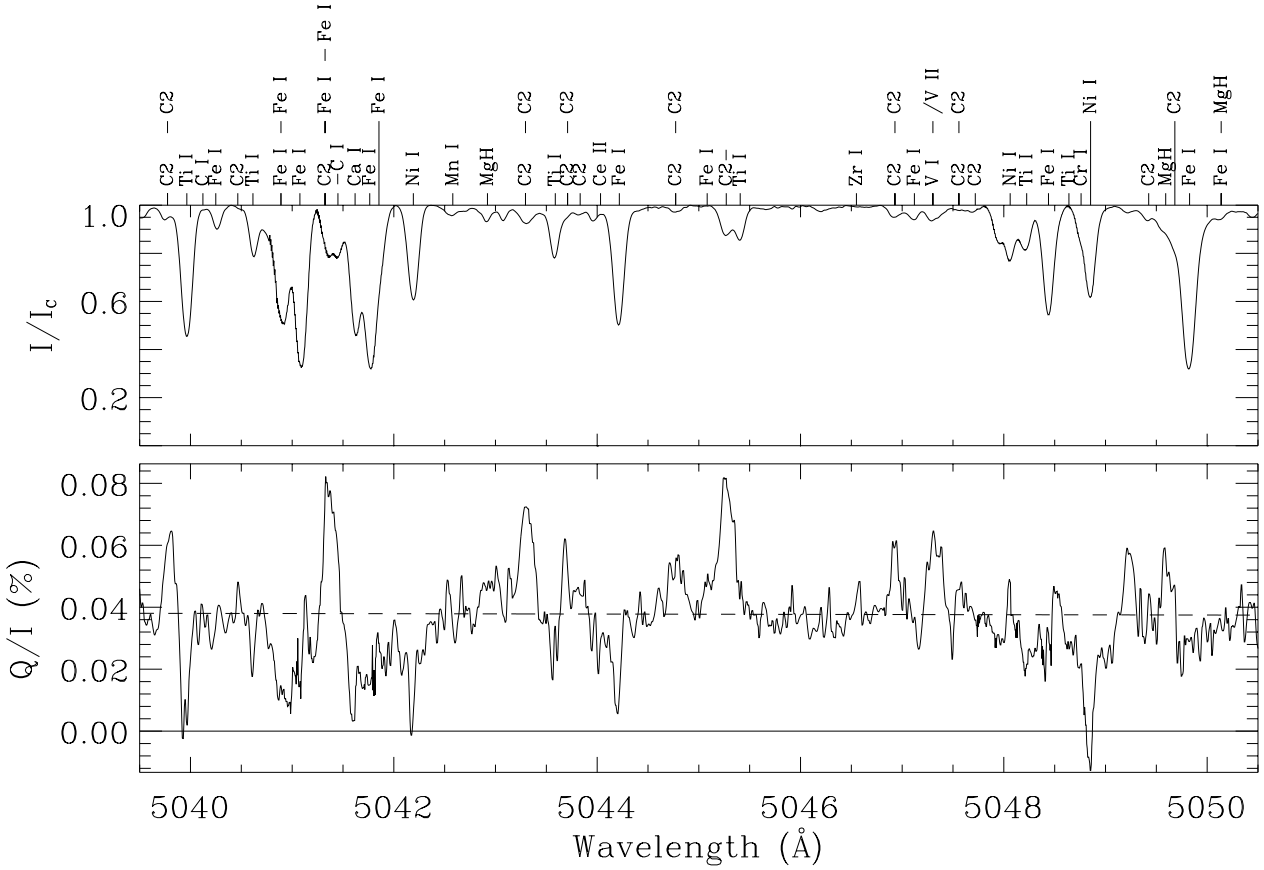

Nd II
Fe I
Ti I
Fe I
Fe I
C2
Fe I
Fe I
Co I
Fe II
S I
Fe I
Fe I
Ti I
Fe I
Ni I
Ti II
Fe I
Ni I
Ti I
Ni I
Cr I
C2
C2
Fe I
Ti I
Ni I
I/I$_c$
1.0
0.6
0.2
Q/I (%)
0.08
0.06
0.04
0.02
0.00
4990
4992
4994
4996
4998
5000
Wavelength (Å)

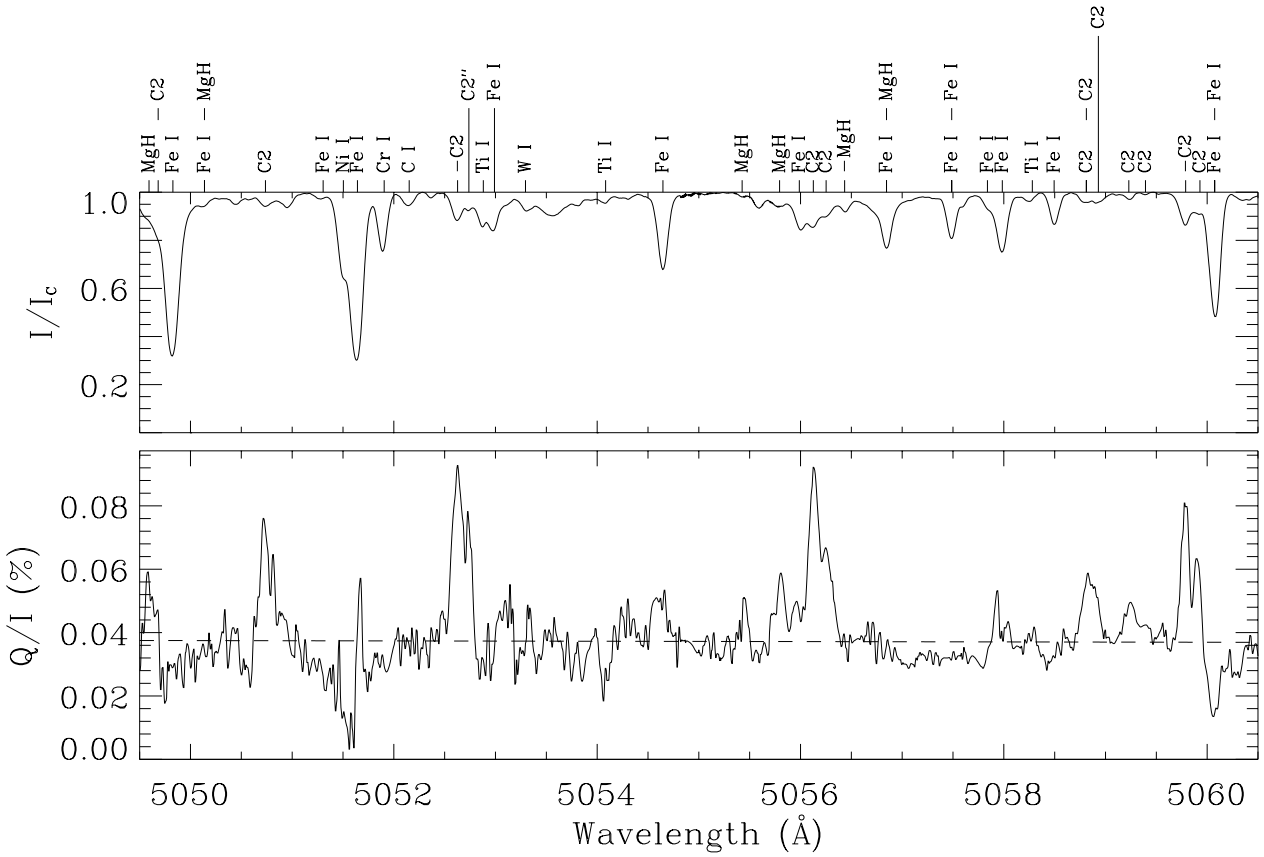

Ti I
Ni I
MgH
Fe II
Ti I
MgH
Ca II
Fe I
V I
Fe I
Ni I
Fe I
Fe I
Co I
Cr I
Mn I
Ti II
C2
C2''
Fe I
Fe I
Fe I
Ti I
Fe I
Fe I
C2
MgH
C2
Fe I
C2''
Ti I
Ni I
Ti II
Fe I
1.0
0.6
0.2
I/I_c
0.10
0.05
0.00
−0.05
Q/I (%)
5000
5002
5004
5006
5008
5010
Wavelength (Å)

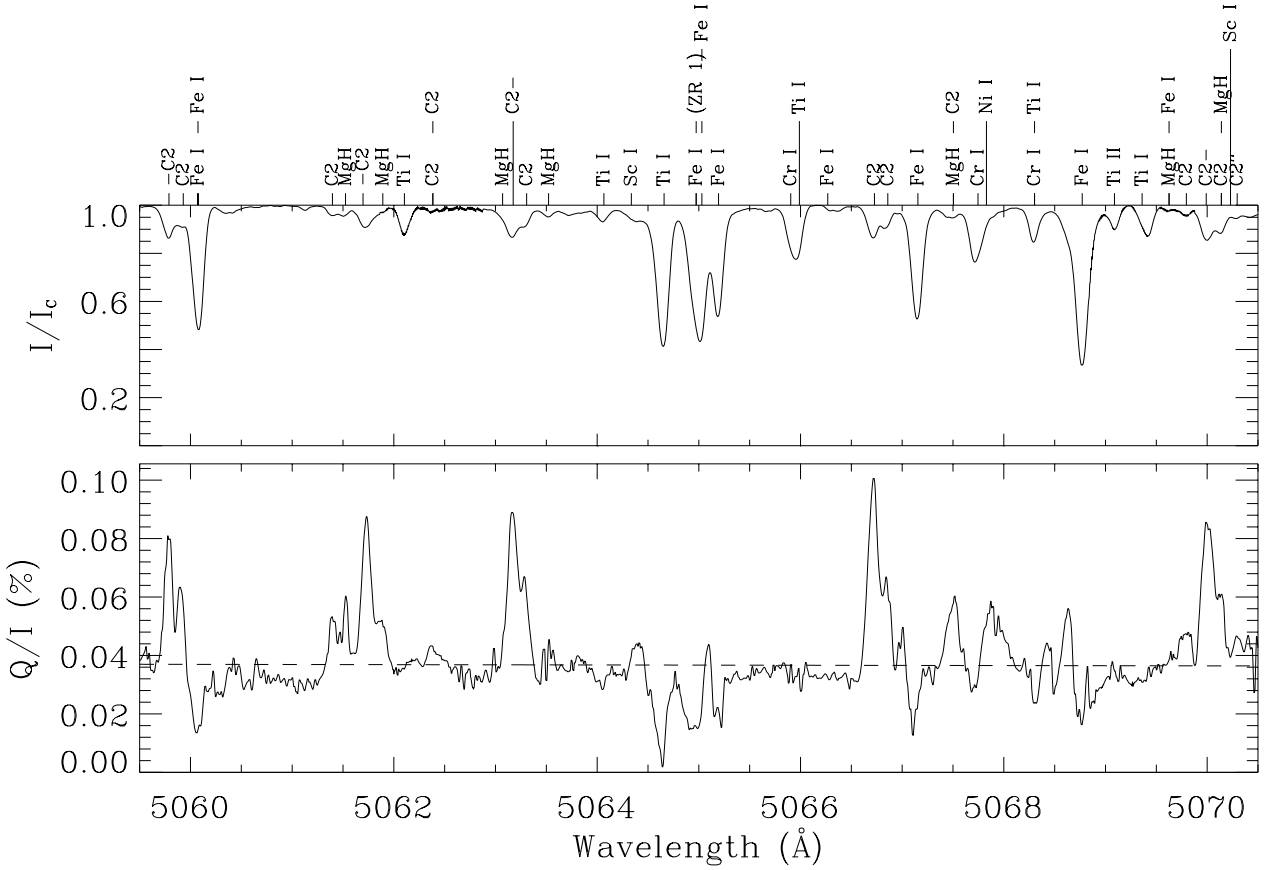

C2''
Ti I
Ni I
Ti II
Fe I
Ni I
Fe I
Ce II
Fe I
Fe I
Ni I
Fe I
Ti I
Cr I
Ti II
C2
Fe I
Ti I
Ti I
V I
V I
Fe I
Fe I
MgH
C2
C2
Ti I
Fe I
Fe I
C2
C2
C2
Ni I
Fe I
Ni I
Fe II
Fe I
Cr I
Fe II
Fe I
Ti I
(Ca II)
1.0
0.6
0.2
I/I_c
0.10
0.08
0.06
0.04
0.02
0.00
−0.02
Q/I (%)
5010
5012
5014
5016
5018
5020
Wavelength (Å)

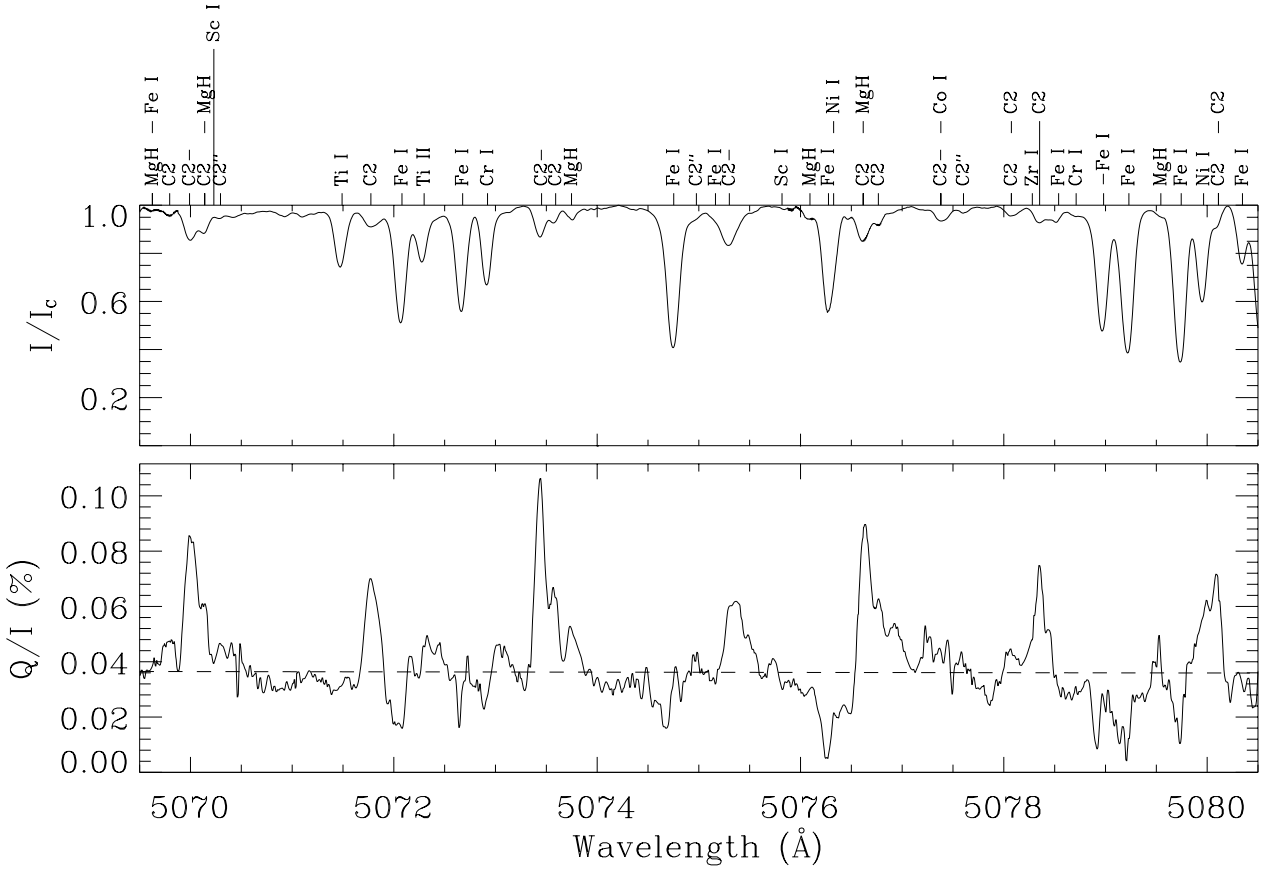

Fe I
Ti I
(Ca II)
Fe I
Fe I
Ca II
Fe I
Fe I
C2
Cr I
C2''
Fe I
Ti I
Fe I
Ti I
Fe I
C I
C2
C2
Ti I
Fe I
Fe I
Ti I
(Cr I)
Fe I
C2
C2''
Ni I
Fe I
Fe I
Fe I
Fe I
Fe I
MgH
MgH
Fe I
Mn I
C2''
C2
1.0
0.6
0.2
I/I_c
0.10
0.08
0.06
0.04
0.02
0.00
Q/I (%)
5020
5022
5024
5026
5028
5030
Wavelength (Å)

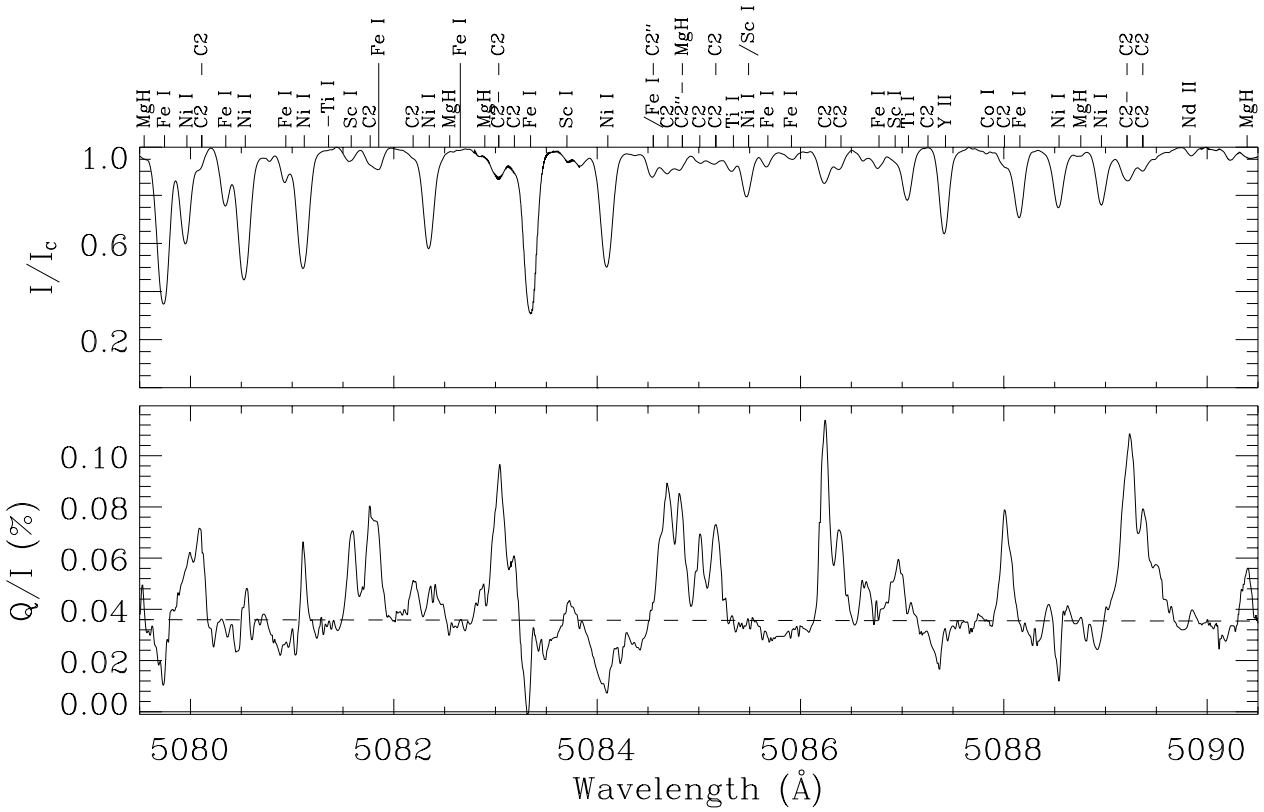

Fe I
Mn I
C2
C2''
Fe I
C2
Sc I
Fe I
Fe I
Fe I
C2
C2
Ni I
C2
C2
C2
C2
C2
C2
Fe I
Ni I
Ti I
Ni I
Fe I
Ti I
Fe I
Fe II
C2
C2
C2
C2''
Ti II
Ti I
Ni I
Fe I
C I
Fe I
Ni I
C2
Ti I
C I
Fe I
C2
1.0
0.6
0.2
I/I_c
0.10
0.08
0.06
0.04
0.02
0.00
Q/I (%)
5030
5032
5034
5036
5038
5040
Wavelength (Å)

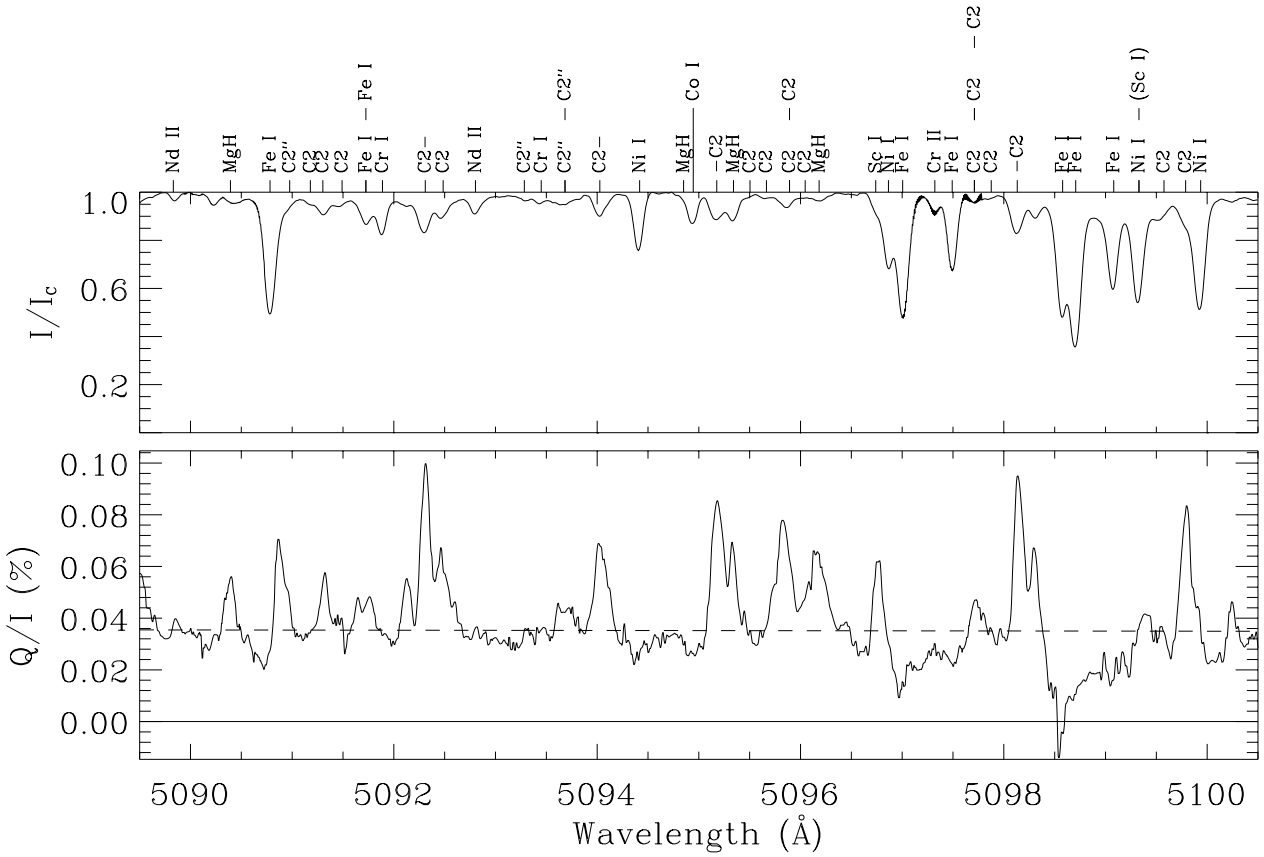

C2
Ti I
C I
Fe I
C2
Ti I
Fe I
Fe I
C2
C I
Ca I
Fe I
Fe I
Fe I
Ni I
Mn I
MgH
C2
Ti I
C2
C2
Ce II
Fe I
C2
Fe I
C2
Ti I
Zr I
C2
Fe I
V I
V II
C2
C2
C2
Ni I
Ti I
Fe I
Ti I
Cr I
Ni I
C2
MgH
Fe I
Fe I
MgH
1.0
0.6
0.2
I/I_c
0.08
0.06
0.04
0.02
0.00
Q/I (%)
5040
5042
5044
5046
5048
5050
Wavelength (Å)

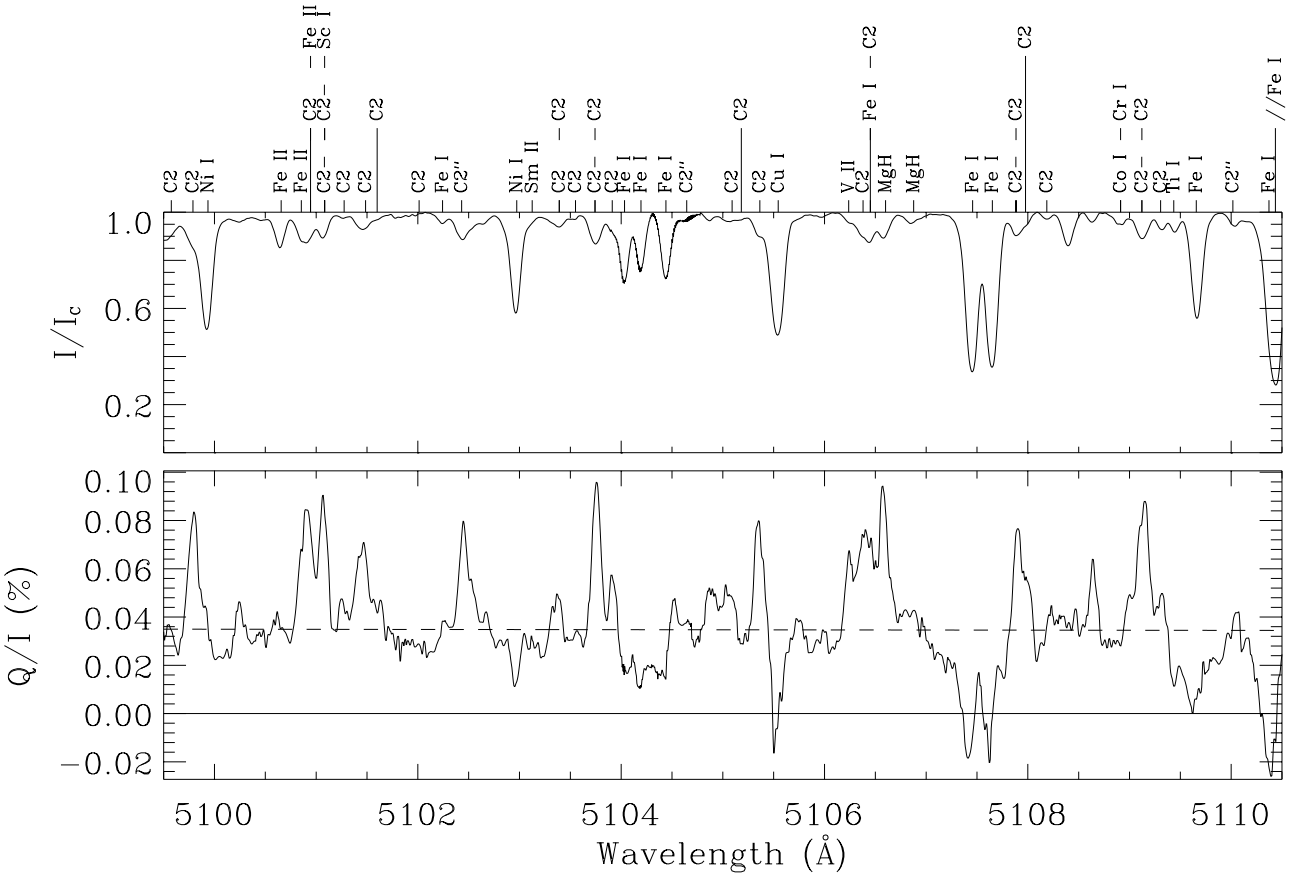

MgH
C2
Fe I
Fe I
MgH
C2
Fe I
Ni I
Fe I
Cr I
C I
C2
C2''
Ti I
Fe I
W I
Ti I
Fe I
MgH
MgH
Fe I
C2
C2
MgH
Fe I
MgH
Fe I
Fe I
Fe I
Fe I
Ti I
Fe I
C2
C2
C2
C2
C2
C2
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.08
0.06
0.04
0.02
0.00
Q/I (%)
5050
5052
5054
5056
5058
5060
Wavelength (Å)

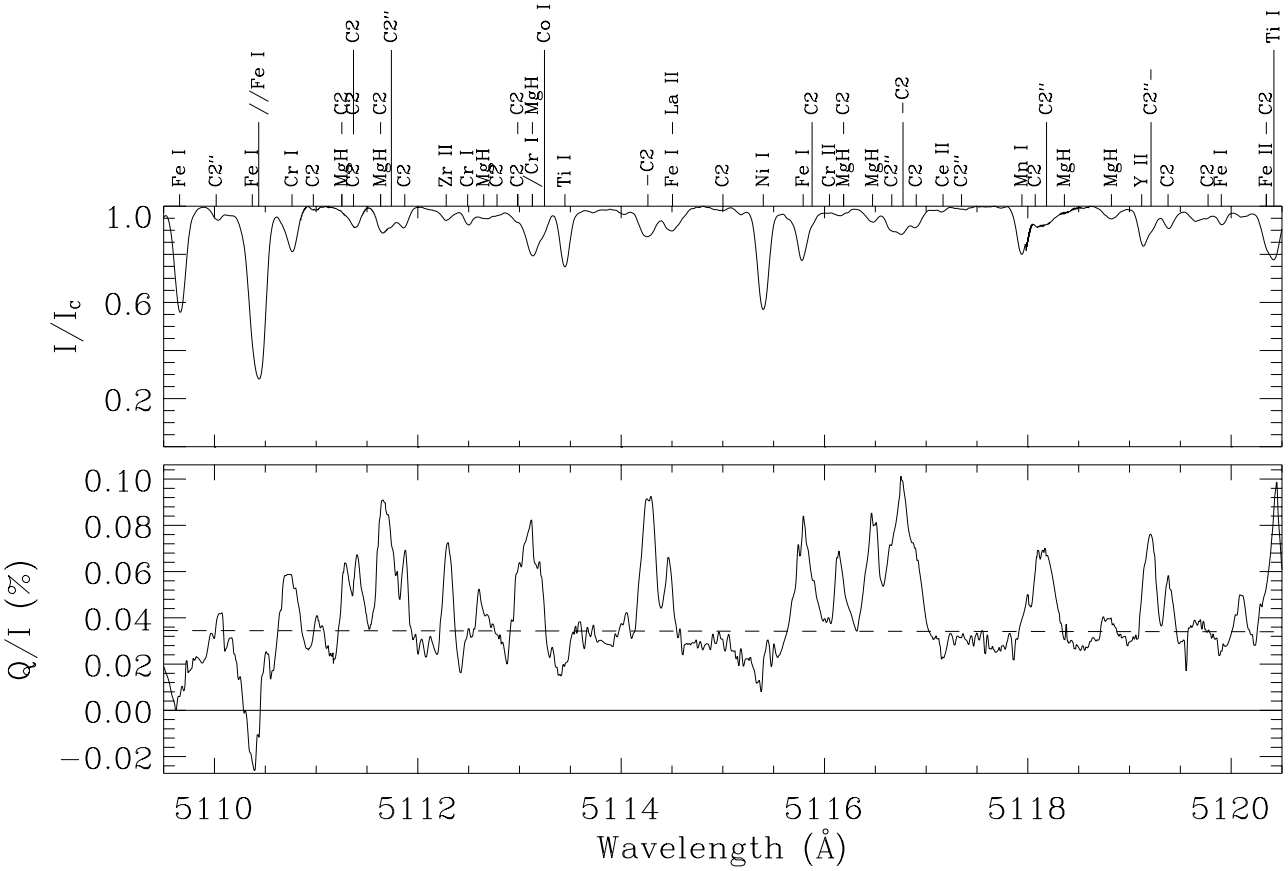

C2
C2
Fe I
Fe I
C2
MgH
C2
MgH
Ti I
C2
MgH
C2
MgH
Ti I
Sc I
Ti I
Fe I
(ZR 1)
Fe I
Fe I
Cr I
Ti I
Fe I
C2
C2
C2
Fe I
MgH
C2
Cr I
Ni I
Cr I
Ti I
Fe I
Ti II
Ti I
MgH
Fe I
C2
C2
C2
MgH
Sc I
1.0
0.6
0.2
I/I_c
0.10
0.08
0.06
0.04
0.02
0.00
Q/I (%)
5060
5062
5064
5066
5068
5070
Wavelength (Å)

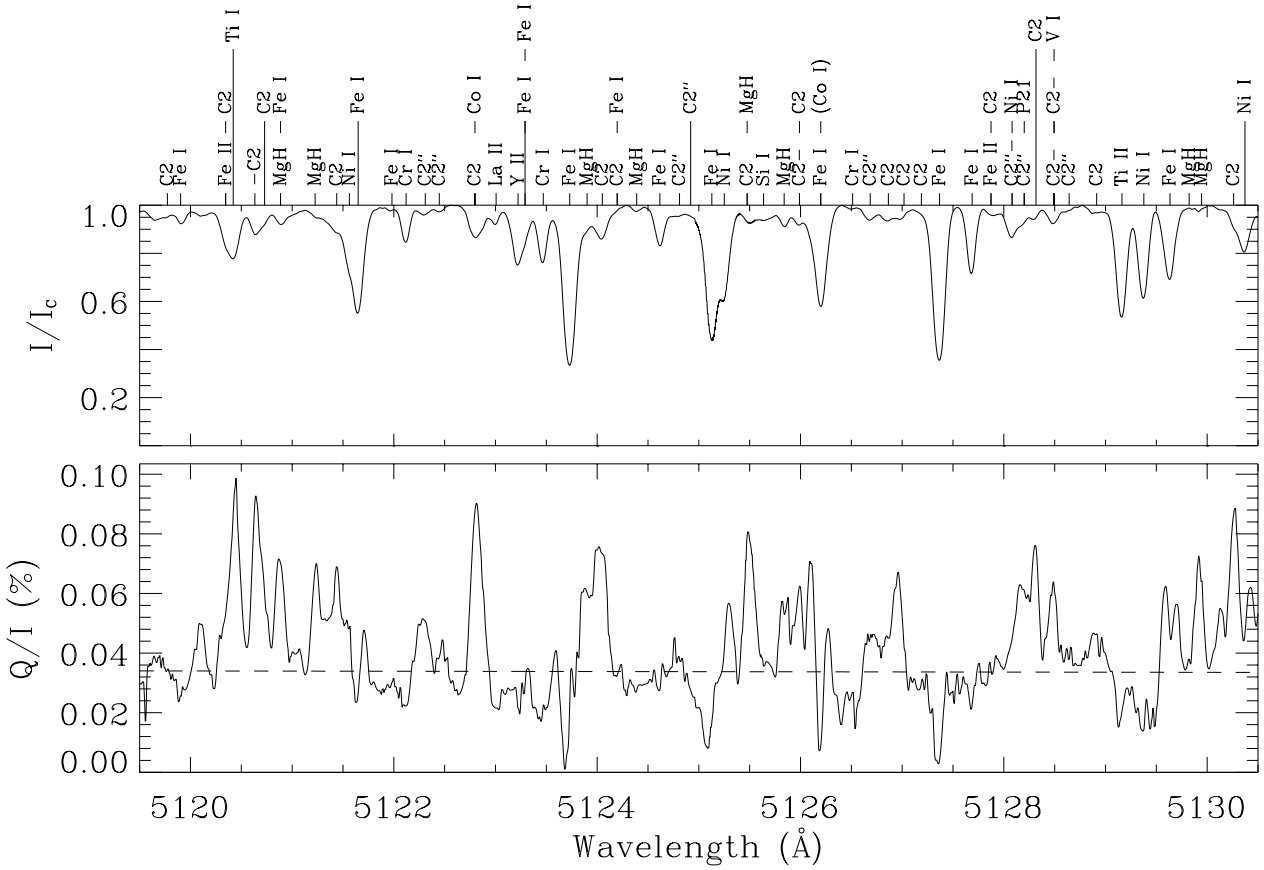

MgH
Fe I
C2
C2
C2
MgH
Sc I
C2''
C2''
Ti I
C2
Fe I
Ti II
Fe I
Cr I
C2
C2
C2
MgH
Fe I
C2''
Fe I
C2
Sc I
MgH
Fe I
Ni I
C2
C2
MgH
C2
C2''
Co I
C2
C2
Zr I
C2
Fe I
Cr I
Fe I
Fe I
MgH
Fe I
Ni I
C2
C2
Fe I
1.0
0.6
0.2
I/I_c
0.10
0.08
0.06
0.04
0.02
0.00
Q/I (%)
5070
5072
5074
5076
5078
5080
Wavelength (Å)

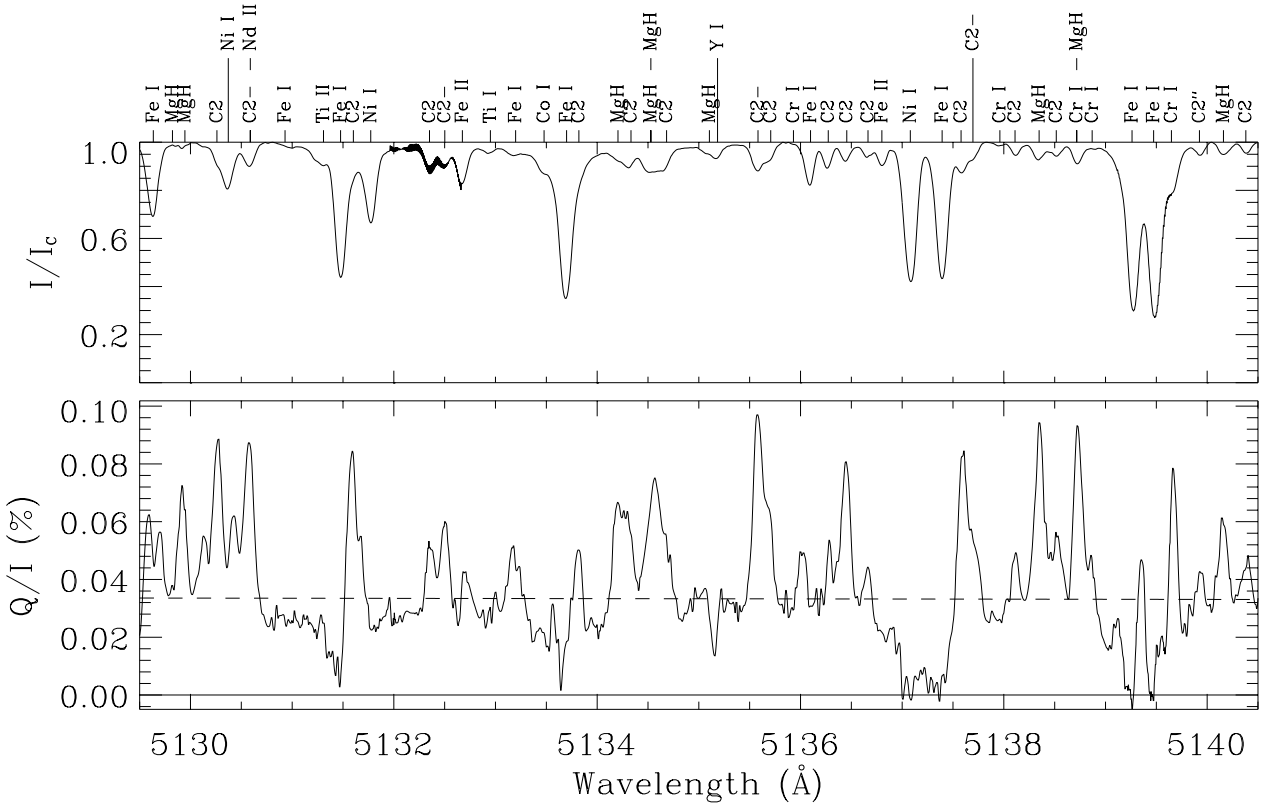

MgH
Fe I
Ni I
C2
Fe I
Ni I
Fe I
Ni I
Ti I
Sc I
C2
Fe I
C2
Ni I
MgH
Fe I
MgH
C2
C2
Fe I
Sc I
Ni I
Fe I
C2
C2
MgH
C2
C2
C2
Ti I
Ni I
Sc I
Fe I
Fe I
C2
C2
Fe I
Sc I
Ti I
C2
Y II
Co I
C2
Fe I
Ni I
MgH
Ni I
C2
C2
Nd II
MgH
1.0
0.6
0.2
I/I_c
0.10
0.08
0.06
0.04
0.02
0.00
Q/I (%)
5080
5082
5084
5086
5088
5090
Wavelength (Å)

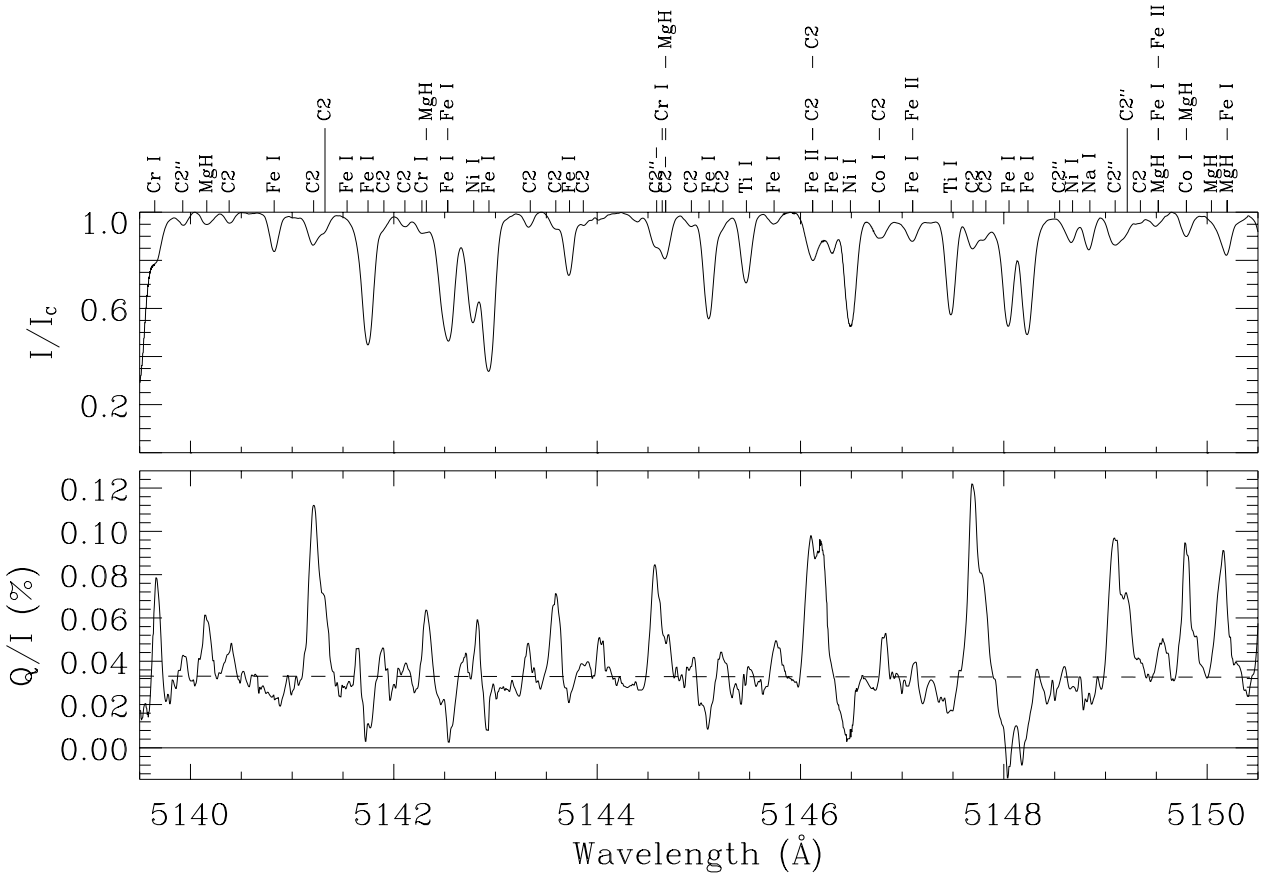

Nd II
MgH
Fe I
C2''
C2
C2
C2
Fe I
Cr I
C2
C2
Nd II
C2''
Cr I
C2''
C2
Ni I
MgH
Co I
C2
MgH
C2
C2
C2
C2
C2
MgH
Sc I
Ni I
Fe I
Cr II
Fe I
C2
C2
C2
C2
C2
Fe I
Fe I
Fe I
Ni I
(Sc I)
C2
C2
Ni I
1.0
0.6
0.2
I/I_c
0.10
0.08
0.06
0.04
0.02
0.00
Q/I (%)
5090
5092
5094
5096
5098
5100
Wavelength (Å)

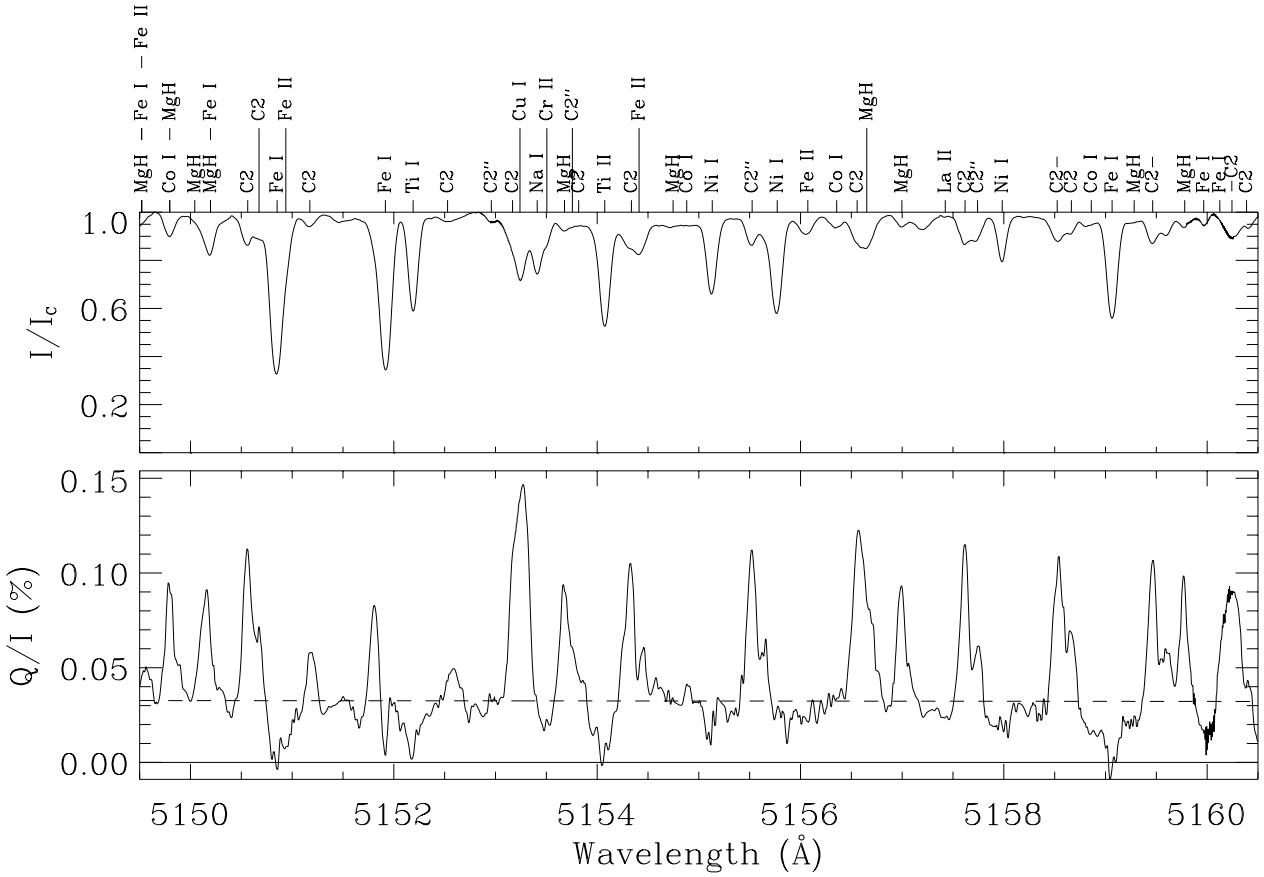

C2
C2
Ni I
Fe II
Fe II
C2
C2
C2
C2
C2
Fe II
Sc I
C2
C2
Fe I
C2''
Ni I
Sm II
C2
C2
C2
C2
Fe I
Fe I
Fe I
C2''
C2
C2
Cu I
V II
C2
Fe I
C2
MgH
MgH
Fe I
Fe I
C2
C2
C2
C2
Cr I
C2
C2
C2
Ti I
Fe I
C2''
Fe I
//Fe I
1.0
0.6
0.2
I/I_c
0.10
0.08
0.06
0.04
0.02
0.00
−0.02
Q/I (%)
5100
5102
5104
5106
5108
5110
Wavelength (Å)

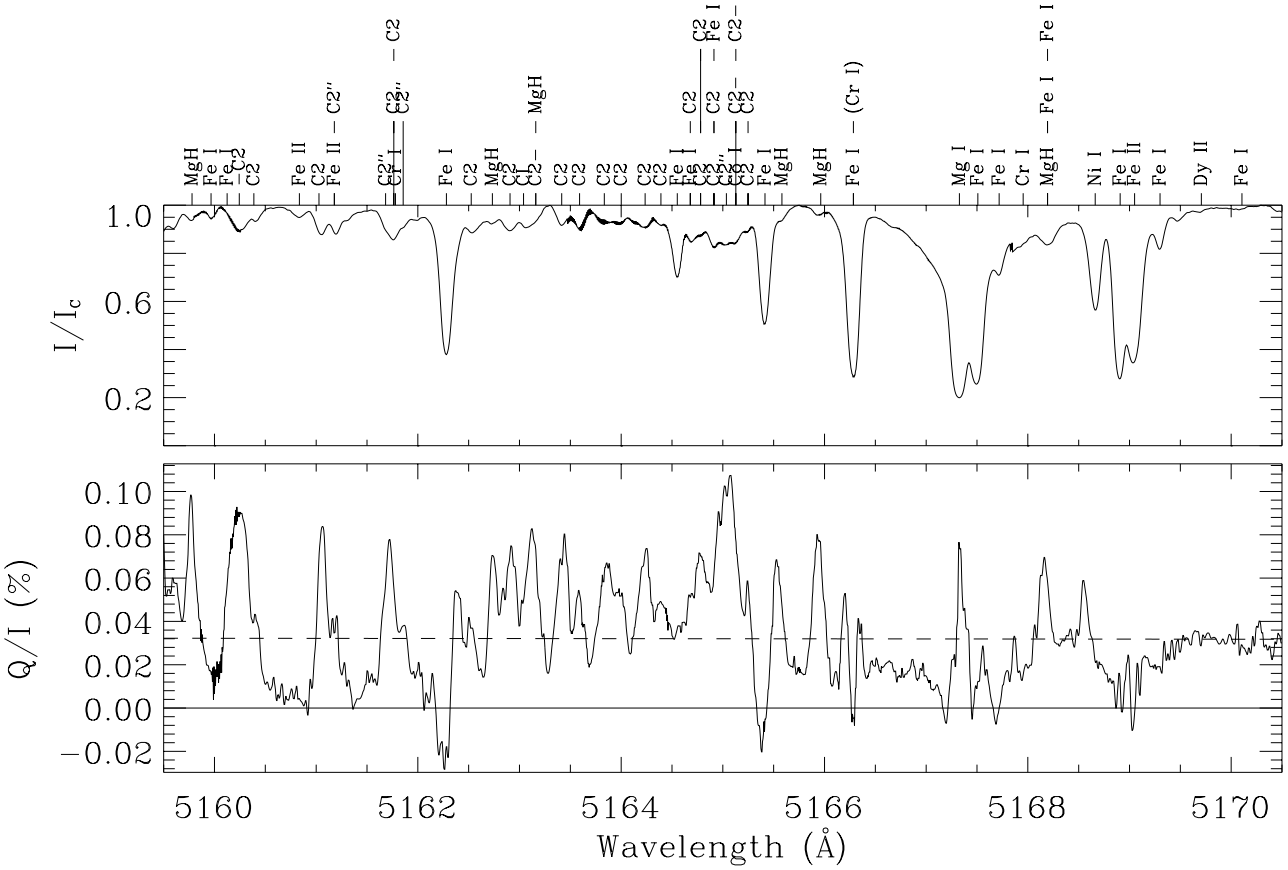

Fe I
C2''
Fe I
//Fe I
Cr I
C2
MgH
C2
C2
MgH
C2
C2''
C2
Zr II
Cr I
MgH
C2
C2
Cr I
MgH
Co I
Ti I
C2
Fe I
La II
C2
Ni I
Fe I
C2
Cr II
MgH
C2
MgH
C2''
C2
C2
Ce II
C2''
Mn I
C2
C2''
MgH
MgH
Y II
C2''
C2
C2
Fe I
Fe II
C2
Ti I
1.0
0.6
0.2
I/I_c
0.10
0.08
0.06
0.04
0.02
0.00
−0.02
Q/I (%)
5110
5112
5114
5116
5118
5120
Wavelength (Å)

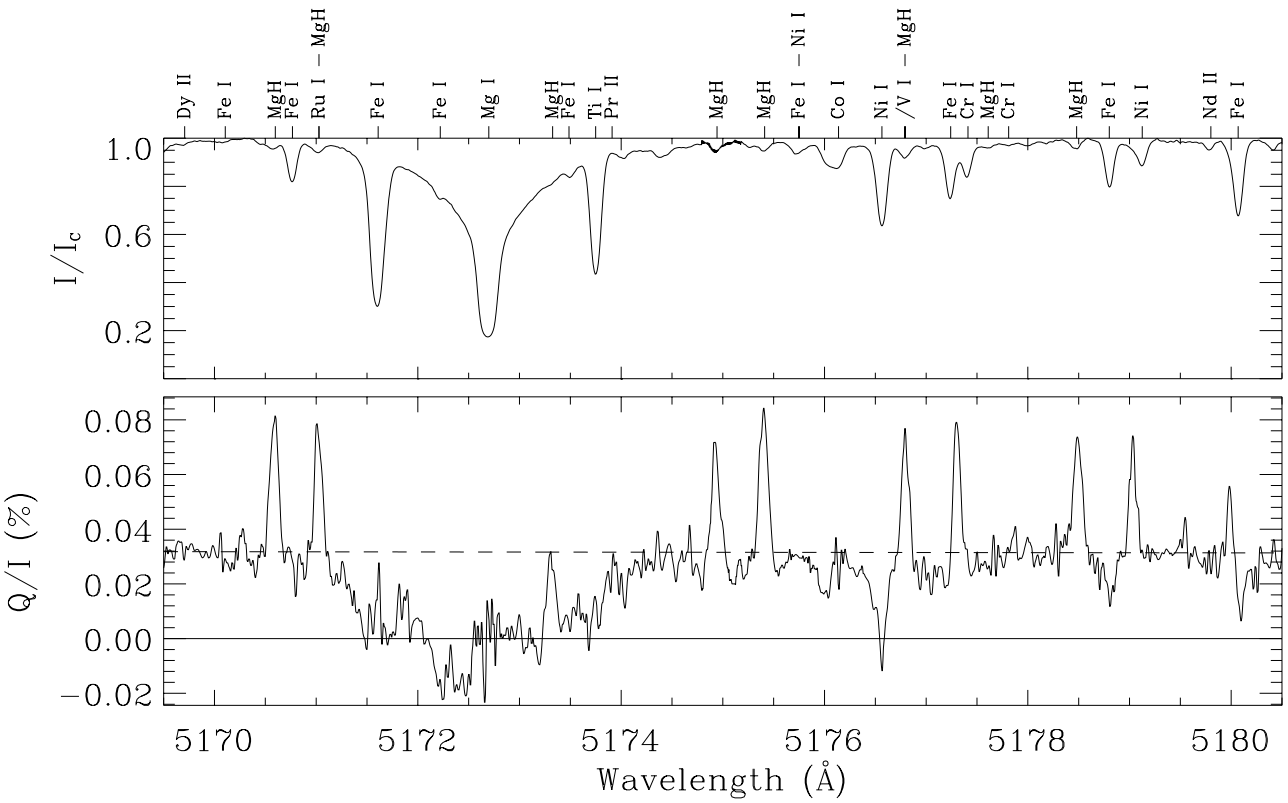

I/I_c
Q/I (%)
Wavelength (Å)
5120
5122
5124
5126
5128
5130

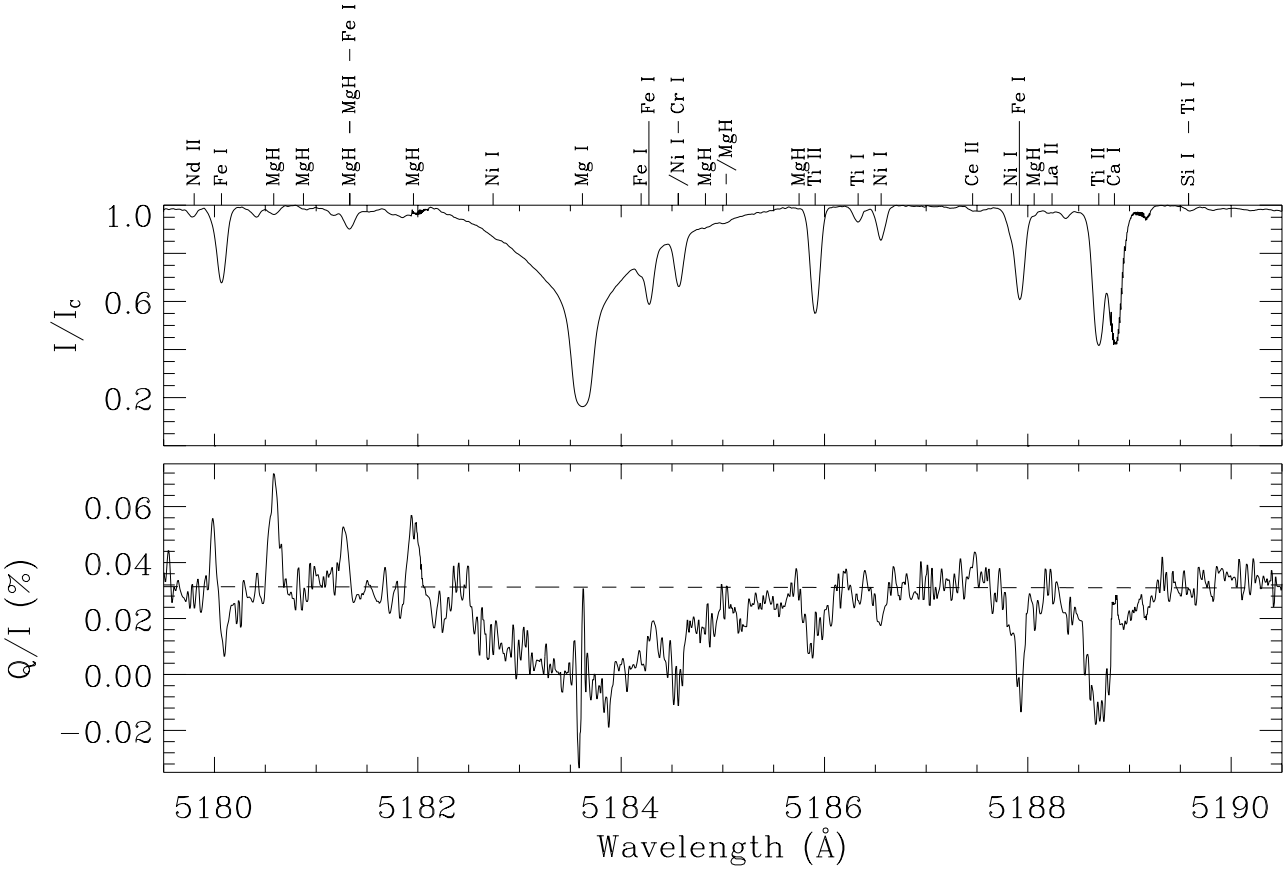

Fe I
MgH
MgH
C2
Ni I
C2 –
Nd II
Fe I
Ti II
Fe I
C2
Ni I
C2
C2 –
Fe II
Ti I
Fe I
Co I
Fe I
C2
MgH
C2
MgH
C2
MgH
Y I
C2 –
C2
Cr I
Fe I
C2
C2
C2
Fe II
Ni I
Fe I
C2
C2 –
Cr I
C2
MgH
C2
Cr I
Cr I
MgH
Fe I
Fe I
Cr I
C2''
MgH
C2
1.0
0.6
0.2
I/I_c
0.10
0.08
0.06
0.04
0.02
0.00
Q/I (%)
5130
5132
5134
5136
5138
5140
Wavelength (Å)

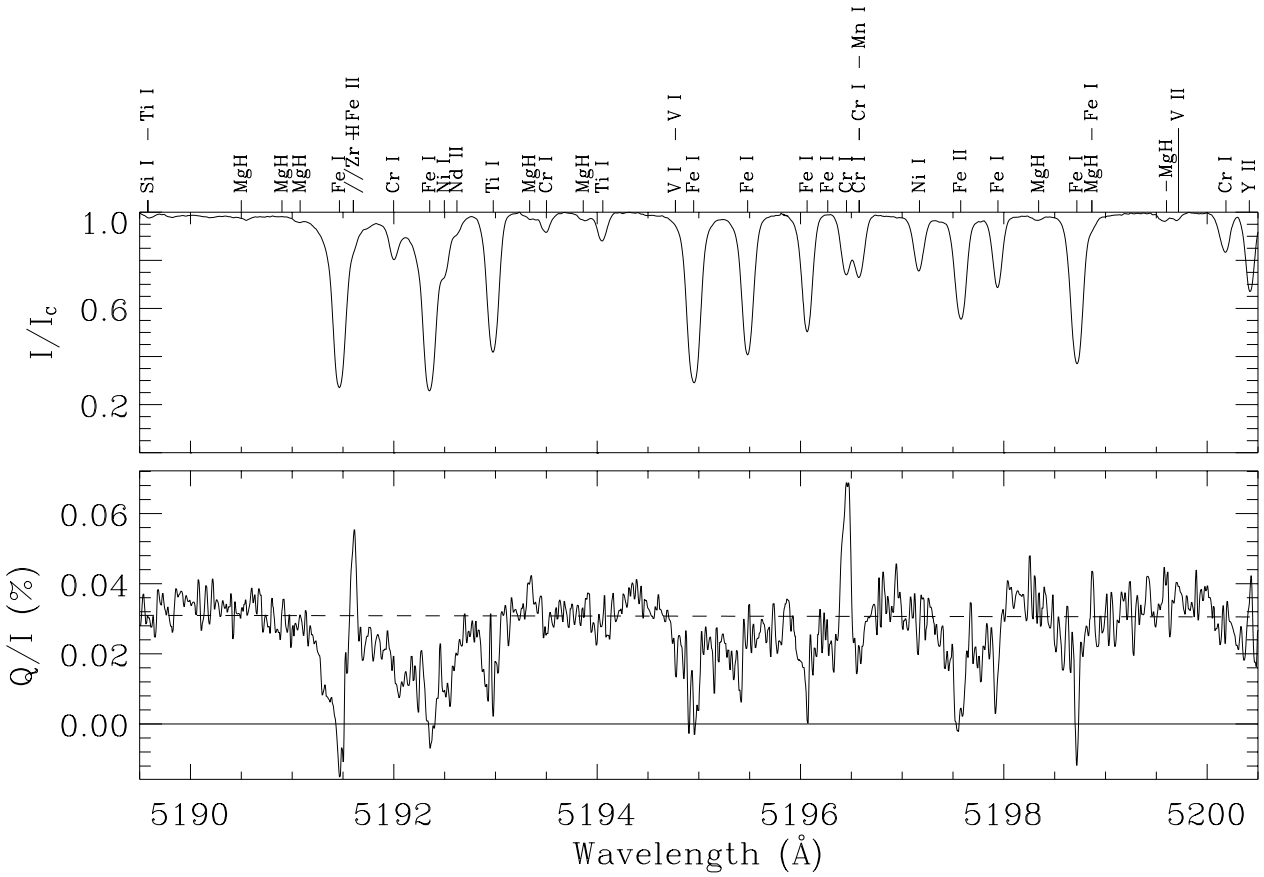

Cr I
C2''
MgH
C2
Fe I
C2
Fe I
Fe I
C2
C2
Cr I
MgH
Fe I
Fe I
Ni I
Fe I
C2
C2
Fe I
C2
C2''
C2
Cr I
MgH
C2
Fe I
C2
Ti I
Fe I
Fe II
C2
C2
Fe I
Ni I
Co I
C2
Fe I
Fe II
Ti I
C2
C2
Fe I
Fe I
C2''
Ni I
Na I
C2''
C2
MgH
Fe I
Fe II
Co I
MgH
MgH
MgH
Fe I
1.0
0.6
0.2
I/I_c
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Q/I (%)
5140
5142
5144
5146
5148
5150
Wavelength (Å)

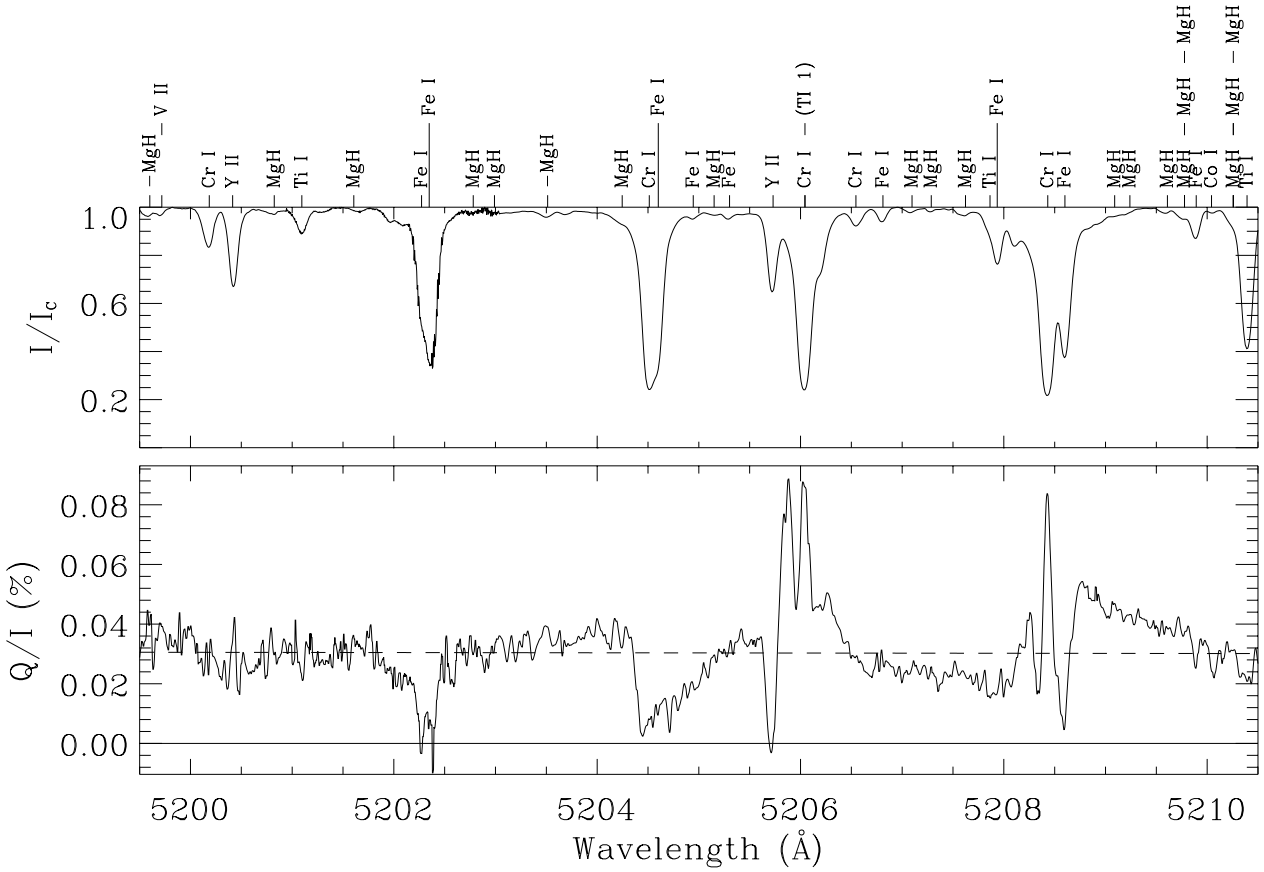

MgH
Fe I
Fe II
Co I
MgH
MgH
Fe I
C2
Fe II
Fe I
C2
Fe I
Ti I
C2
C2''
C2
Cu I
Na I
Cr II
MgH
C2
C2''
Ti II
C2
Fe II
MgH
Co I
Ni I
C2''
Ni I
Fe II
Co I
C2
MgH
MgH
La II
C2
C2''
Ni I
C2
C2
Co I
Fe I
MgH
C2
MgH
Fe I
Fe I
C2
C2
1.0
0.6
0.2
I/I_c
0.15
0.10
0.05
0.00
Q/I (%)
5150
5152
5154
5156
5158
5160
Wavelength (Å)

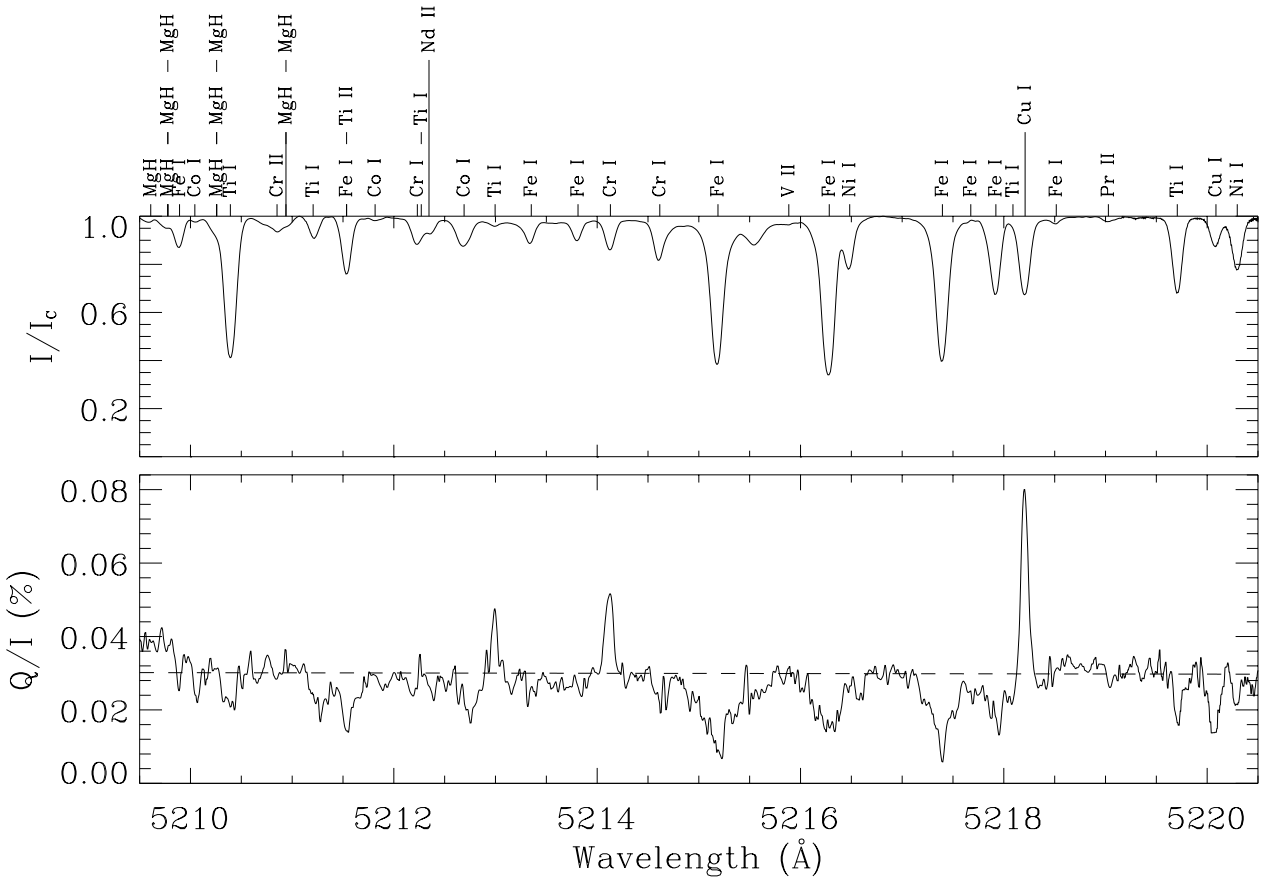

I/I_c
Q/I (%)
Wavelength (Å)
5160
5162
5164
5166
5168
5170

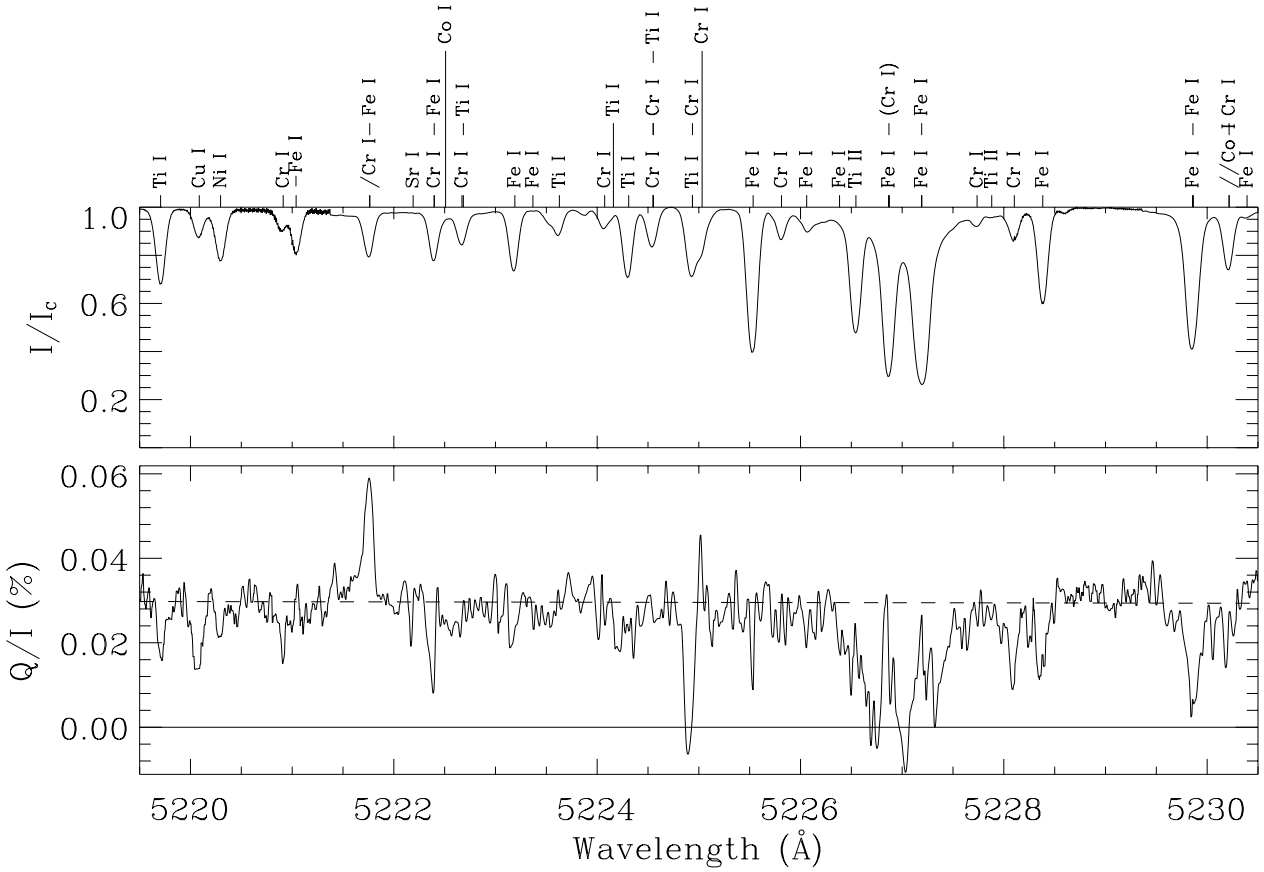

Dy II
Fe I
MgH
Fe I
Ru I – MgH
Fe I
Fe I
Mg I
MgH
Fe I
Ti I
Pr II
MgH
MgH
Fe I – Ni I
Co I
Ni I
/V I – MgH
Fe I
Cr I
MgH
Cr I
MgH
Fe I
Ni I
Nd II
Fe I
I/I_c
1.0
0.6
0.2
Q/I (%)
0.08
0.06
0.04
0.02
0.00
−0.02
5170
5172
5174
5176
5178
5180
Wavelength (Å)

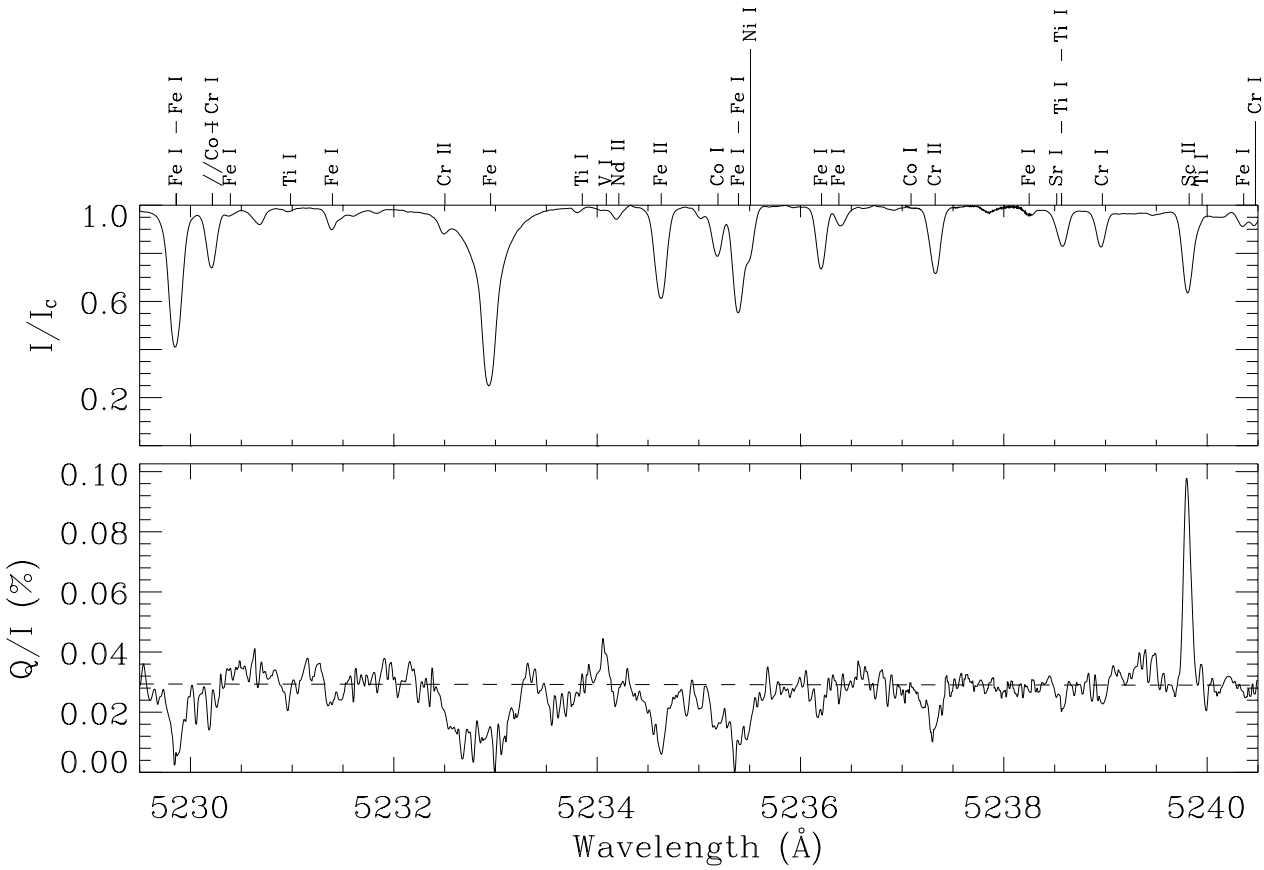

Nd II
Fe I
MgH
MgH
MgH
Fe I
MgH
Ni I
Mg I
Fe I
Fe I
Ni I
Cr I
MgH
MgH
MgH
Ti II
Ti I
Ni I
Ce II
Ni I
Fe I
MgH
La II
Ti II
Ca I
Si I
Ti I
1.0
0.6
0.2
I/I_c
0.06
0.04
0.02
0.00
−0.02
Q/I (%)
5180
5182
5184
5186
5188
5190
Wavelength (Å)

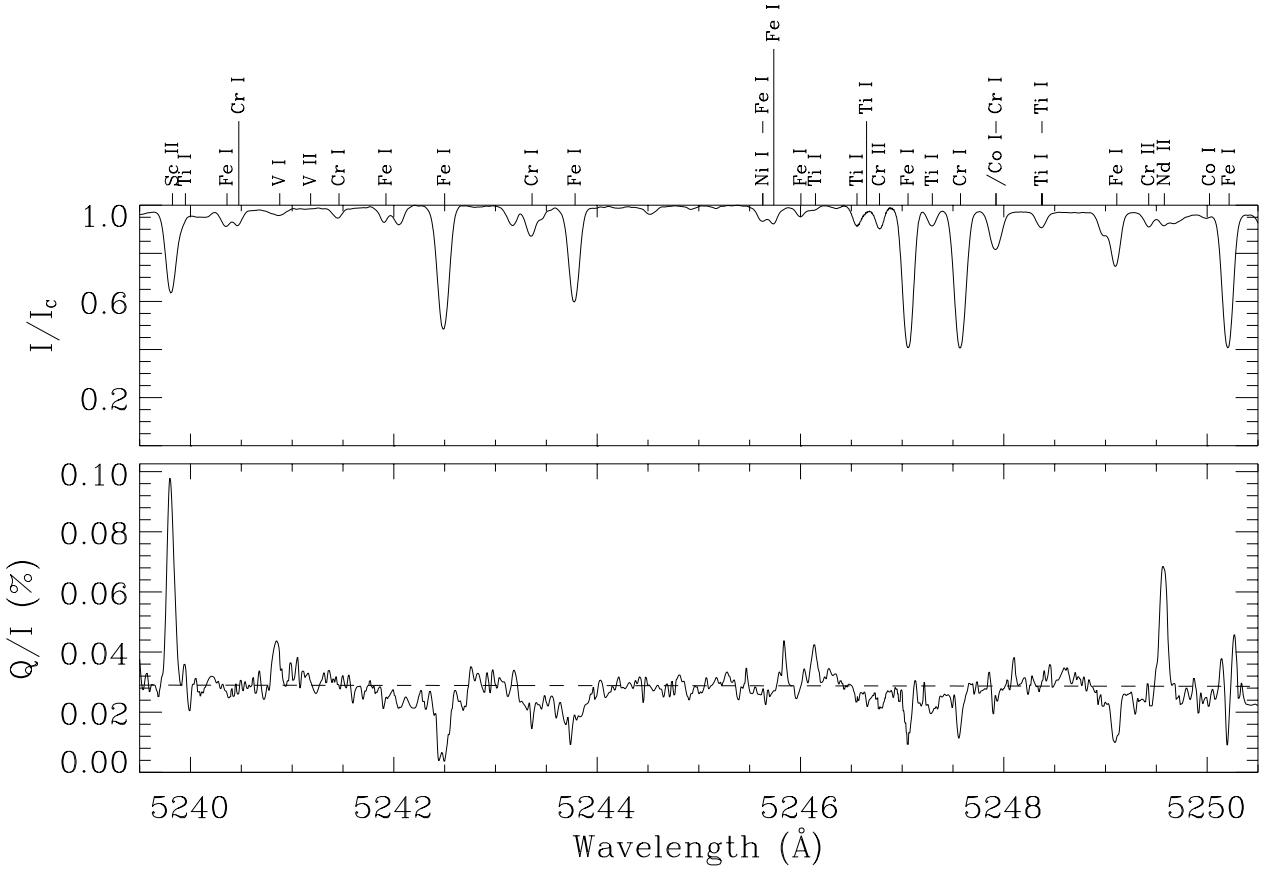

Si I
Ti I
MgH
MgH
MgH
Fe I
Zr II
Fe II
Cr I
Fe I
Ni I
Nd II
Ti I
MgH
Cr I
MgH
Ti I
V I
V I
Fe I
Fe I
Fe I
Fe I
Cr I
Cr I
Mn I
Cr I
Ni I
Fe II
Fe I
MgH
Fe I
MgH
Fe I
MgH
V II
Cr I
Y II
1.0
0.6
0.2
I/I_c
0.06
0.04
0.02
0.00
Q/I (%)
5190
5192
5194
5196
5198
5200
Wavelength (Å)

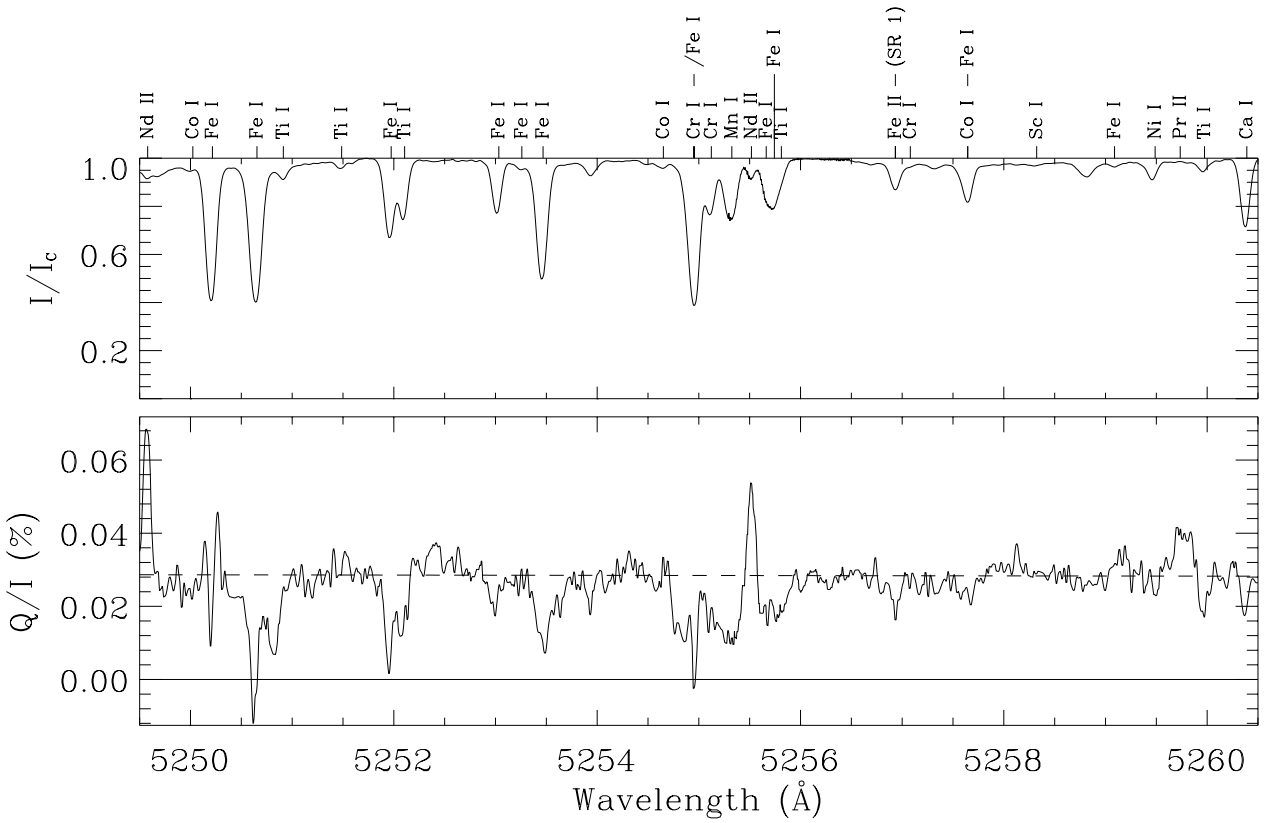

MgH
V II
Cr I
Y II
MgH
Ti I
MgH
Fe I
Fe I
MgH
MgH
MgH
MgH
Cr I
Fe I
Fe I
MgH
Fe I
Y II
Cr I
(Ti 1)
Cr I
Fe I
MgH
MgH
MgH
Ti I
Fe I
Cr I
Fe I
MgH
MgH
MgH
MgH
MgH
Fe I
Co I
MgH
MgH
Ti I
1.0
0.6
0.2
I/I_c
0.08
0.06
0.04
0.02
0.00
Q/I (%)
5200
5202
5204
5206
5208
5210
Wavelength (Å)

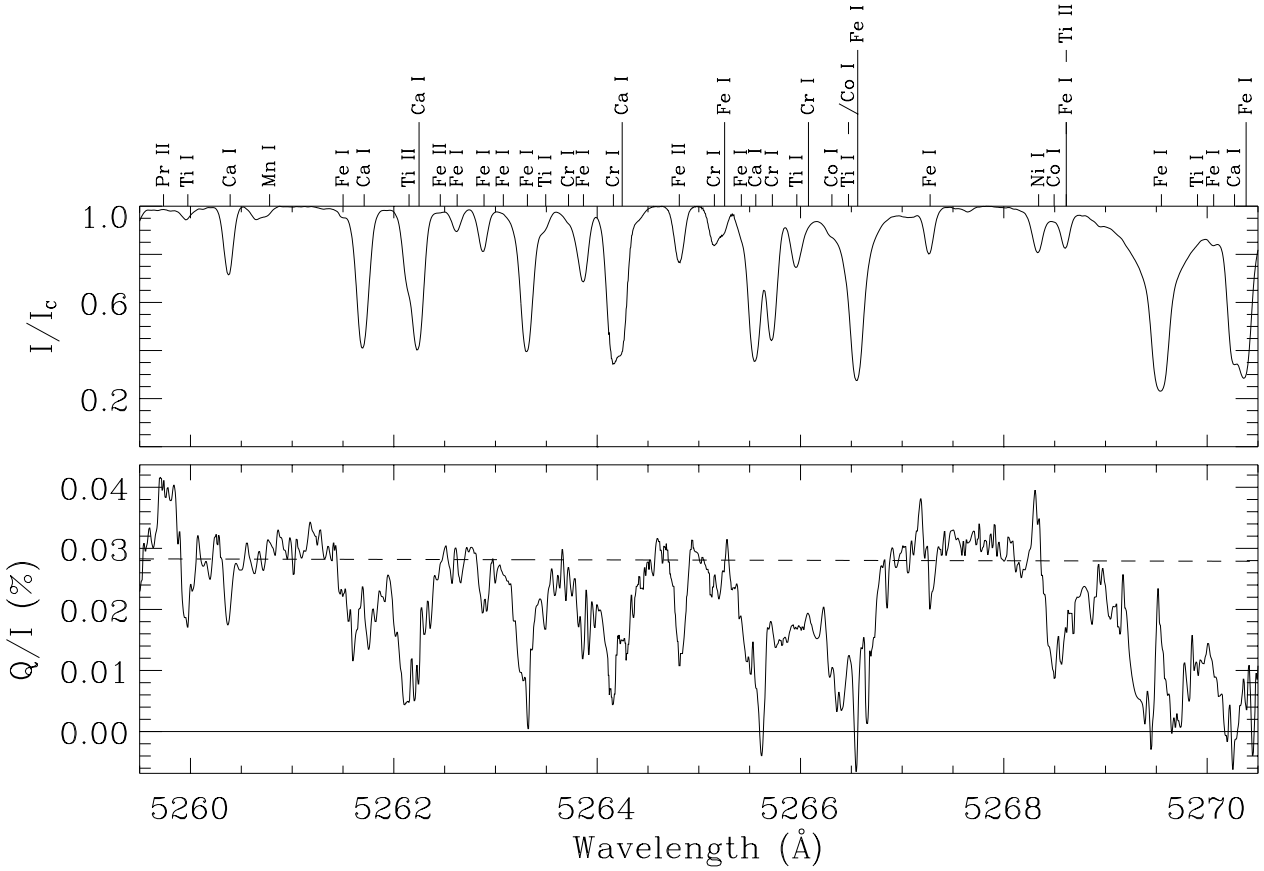

MgH
MgH
Fe I
Co I
MgH
MgH
Ti I
MgH
Cr II
MgH
Ti I
Fe I
Ti II
Co I
Cr I
Ti I
Nd II
Co I
Ti I
Fe I
Fe I
Cr I
Cr I
Fe I
V II
Fe I
Ni I
Fe I
Fe I
Fe I
Ti I
Cu I
Fe I
Pr II
Ti I
Cu I
Ni I
1.0
0.6
0.2
I/I_c
0.08
0.06
0.04
0.02
0.00
Q/I (%)
5210
5212
5214
5216
5218
5220
Wavelength (Å)

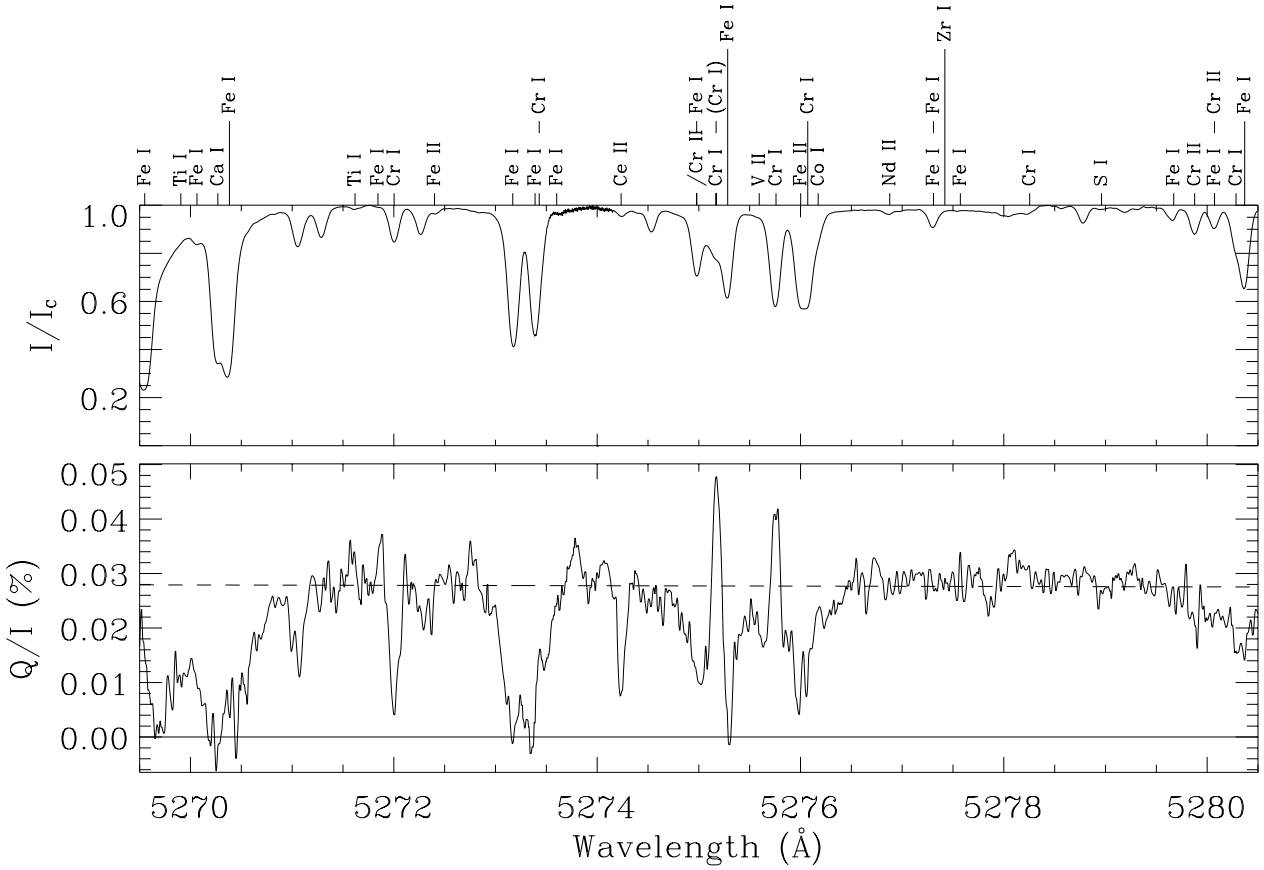

Ti I
Cu I
Ni I
Cr I
Fe I
/Cr I
Fe I
Sr I
Cr I
Fe I
Co I
Cr I
Ti I
Fe I
Fe I
Ti I
Cr I
Ti I
Ti I
Cr I
Ti I
Cr I
Cr I
Fe I
Cr I
Fe I
Fe I
Ti II
Fe I
(Cr I)
Fe I
Cr I
Ti II
Cr I
Fe I
Fe I
Fe I
/Co I
Cr I
Fe I
1.0
0.6
0.2
I/I_c
0.06
0.04
0.02
0.00
Q/I (%)
5220
5222
5224
5226
5228
5230
Wavelength (Å)

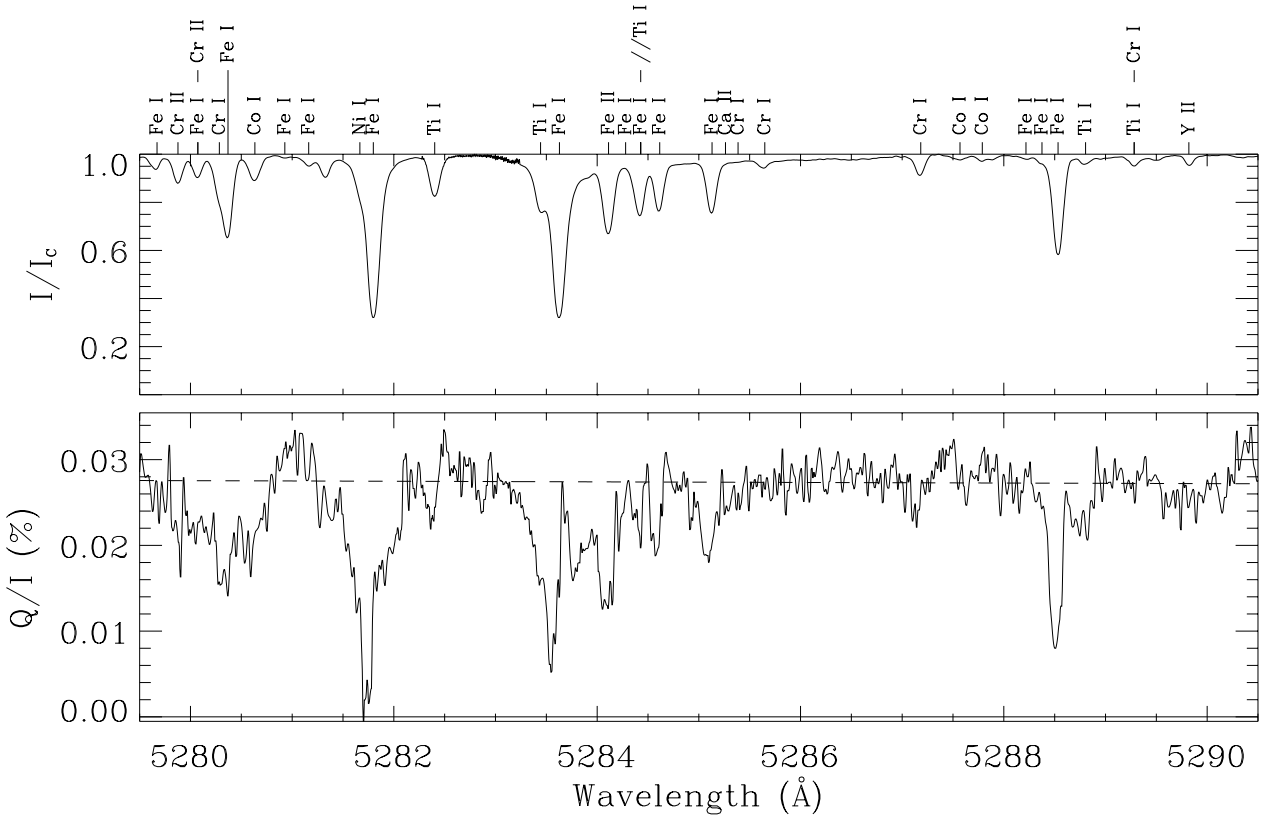

Fe I
Fe I
Co I
Cr I
Fe I
Ti I
Fe I
Cr II
Fe I
Ti I
V I
Nd II
Fe II
Co I
Fe I
Fe I
Ni I
Fe I
Fe I
Co I
Cr II
Fe I
Sr I
Ti I
Cr I
Sc II
Ti I
Fe I
Cr I
1.0
0.6
0.2
I/I_c
0.10
0.08
0.06
0.04
0.02
0.00
Q/I (%)
5230
5232
5234
5236
5238
5240
Wavelength (Å)

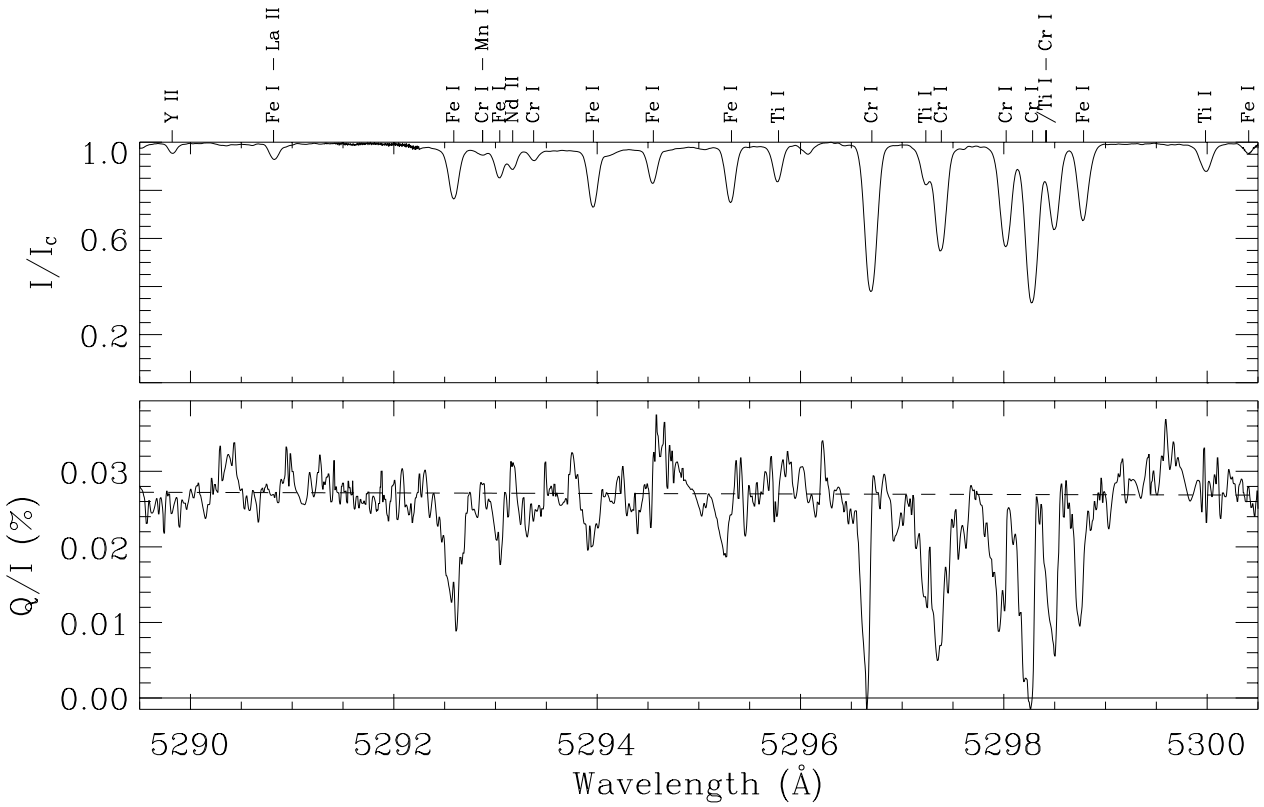

Sc II
Ti I
Fe I
Cr I
V I
V II
Cr I
Fe I
Fe I
Cr I
Fe I
Ni I
Fe I
Fe I
Ti I
Ti I
Cr II
Fe I
Ti I
Cr I
/Co I
Cr I
Ti I
Ti I
Fe I
Cr II
Nd II
Co I
Fe I
I/I_c
1.0
0.6
0.2
Q/I (%)
0.10
0.08
0.06
0.04
0.02
0.00
5240
5242
5244
5246
5248
5250
Wavelength (Å)

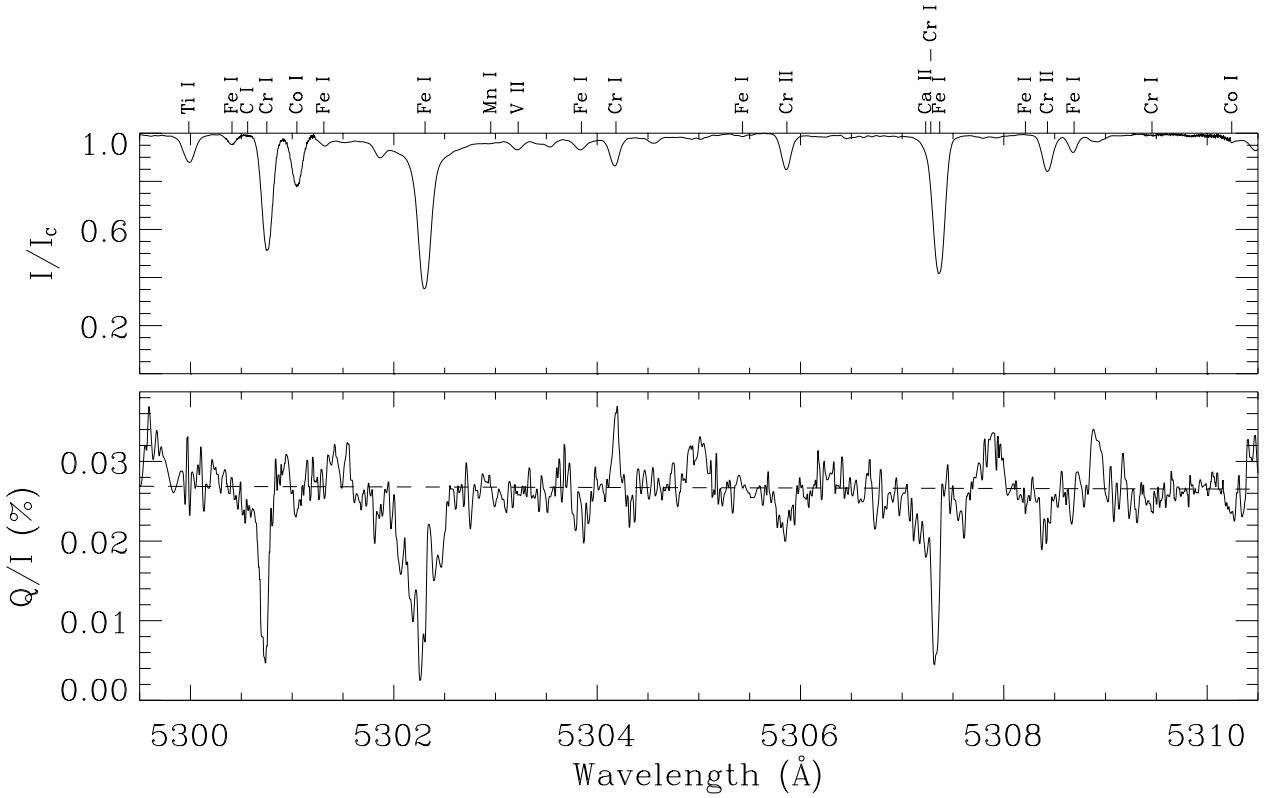

Nd II
Co I
Fe I
Fe I
Ti I
Ti I
Fe I
Ti I
Fe I
Fe I
Fe I
Co I
Cr I – /Fe I
Cr I
Mn I
Nd II
Fe I
Fe I
Ti I
Fe II – (SR 1)
Cr I
Co I – Fe I
Sc I
Fe I
Ni I
Pr II
Ti I
Ca I
1.0
0.6
0.2
I/I_c
0.06
0.04
0.02
0.00
Q/I (%)
5250
5252
5254
5256
5258
5260
Wavelength (Å)

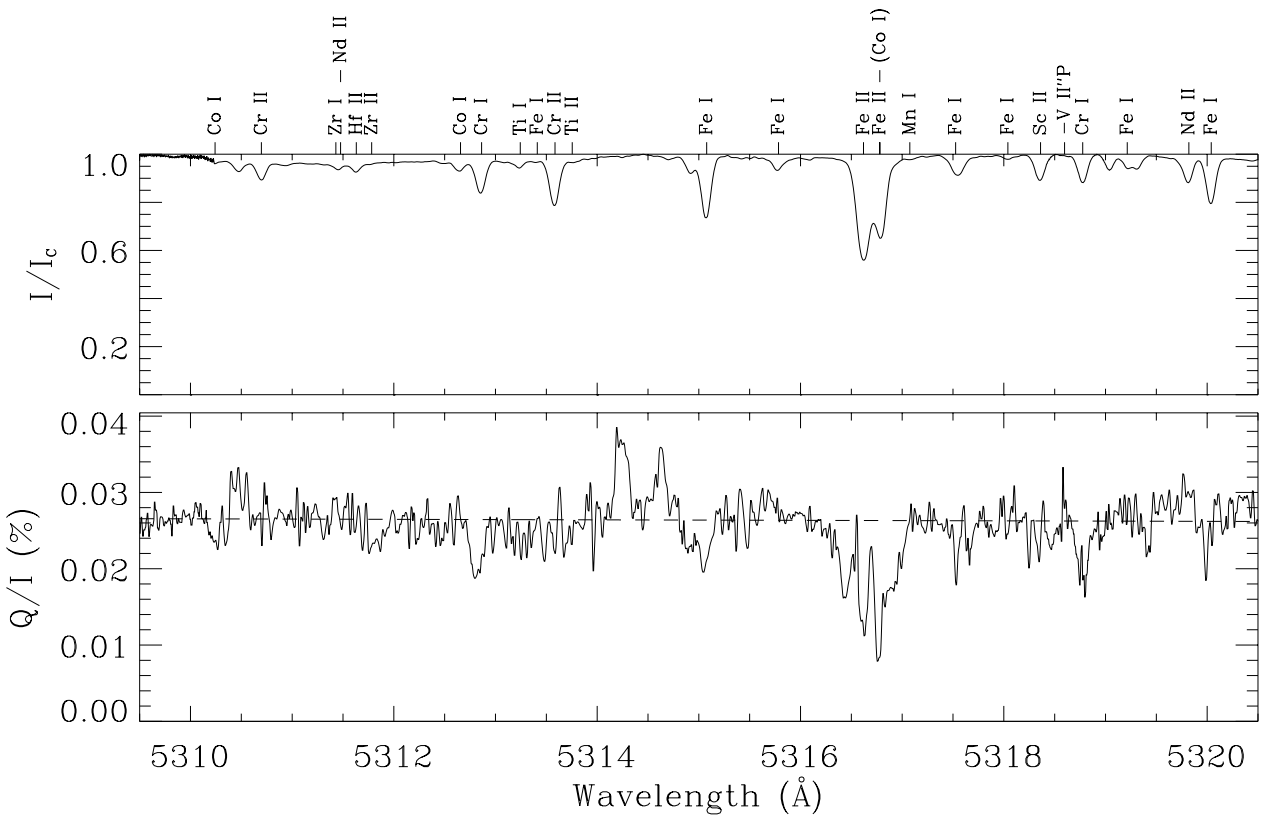

Pr II
Ti I
Ca I
Mn I
Fe I
Ca I
Ti II
Ca I
Fe II
Fe I
Fe I
Fe I
Fe I
Ti I
Cr I
Fe I
Cr I
Ca I
Fe II
Cr I
Fe I
Fe I
Ca I
Cr I
Ti I
Co I
Ti I
Co I
Fe I
Fe I
Ni I
Co I
Ti II
Fe I
Fe I
Ti I
Fe I
Ca I
Fe I
1.0
0.6
0.2
I/I_c
0.04
0.03
0.02
0.01
0.00
Q/I (%)
5260
5262
5264
5266
5268
5270
Wavelength (Å)

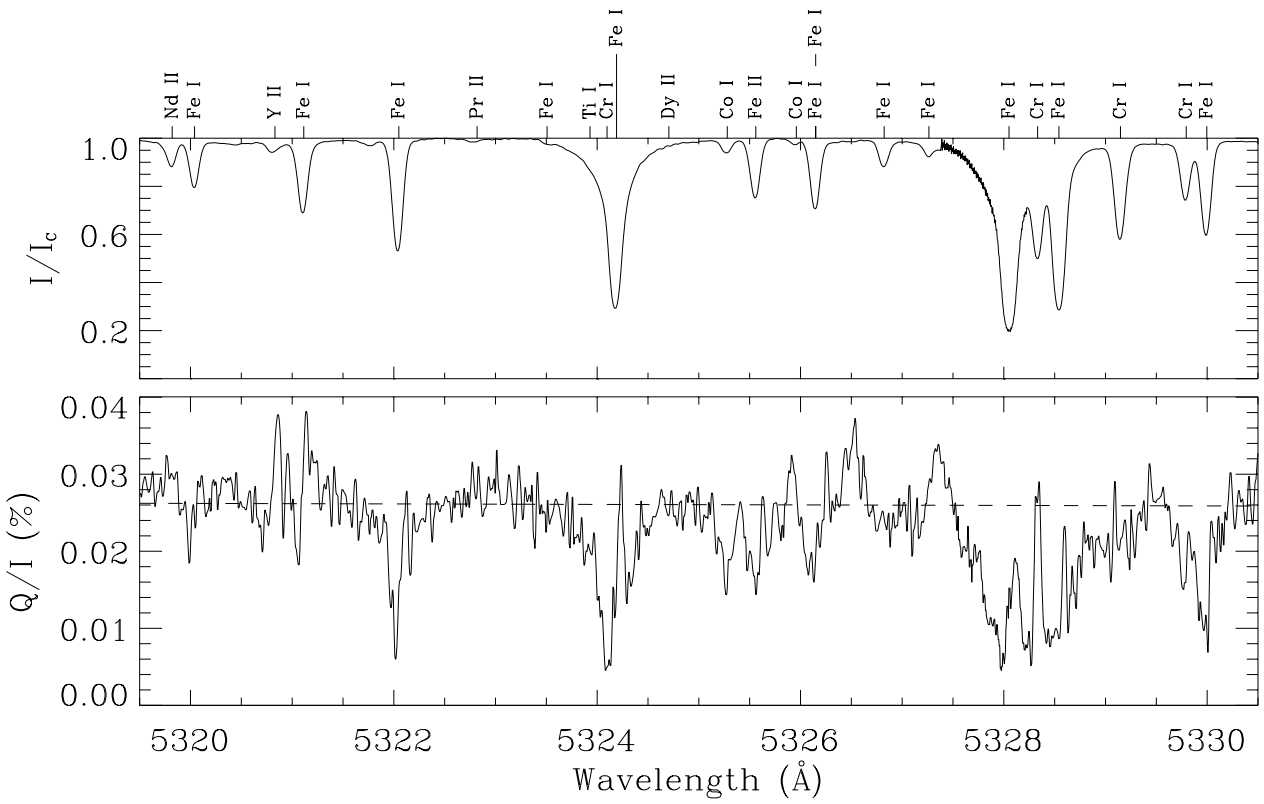

Fe I
Ti I
Fe I
Ca I
Fe I
Ti I
Fe I
Cr I
Fe II
Fe I
Fe I
Cr I
Fe I
Ce II
/Cr II
Fe I
Cr I
(Cr I)
Fe I
V II
Cr I
Fe II
Cr I
Co I
Nd II
Fe I
Fe I
Zr I
Fe I
Cr I
S I
Fe I
Cr II
Fe I
Cr II
Cr I
Fe I
1.0
0.6
0.2
I/I_c
0.05
0.04
0.03
0.02
0.01
0.00
Q/I (%)
5270
5272
5274
5276
5278
5280
Wavelength (Å)

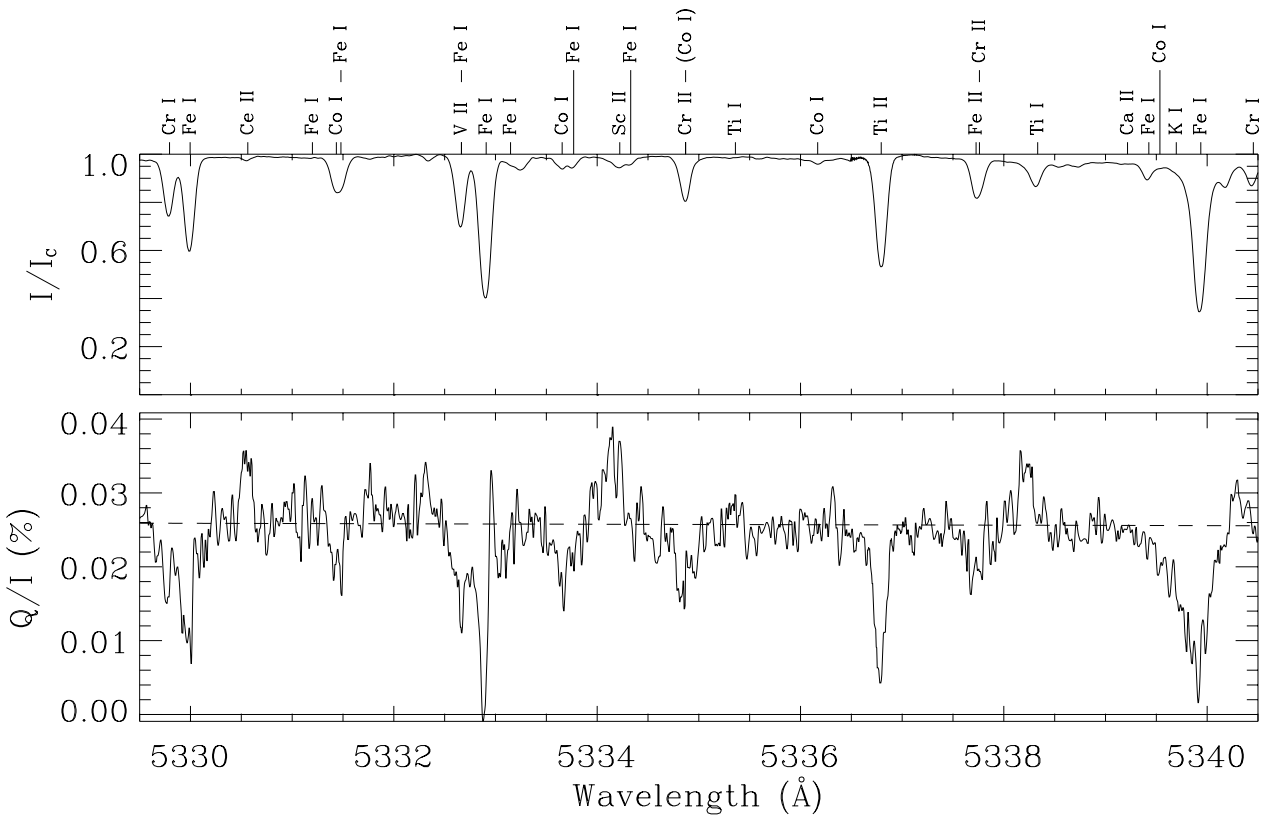

Fe I
Cr II
Fe I
Cr I
Cr II
Fe I
Co I
Fe I
Fe I
Ni I
Fe I
Ti I
Ti I
Fe I
Fe II
Fe I
Fe I
Fe I
Ti I
Fe I
Ca II
Cr I
Cr I
Cr I
Co I
Co I
Fe I
Fe I
Fe I
Ti I
Ti I
Cr I
Y II
1.0
0.6
0.2
I/I_c
0.03
0.02
0.01
0.00
Q/I (%)
5280
5282
5284
5286
5288
5290
Wavelength (Å)

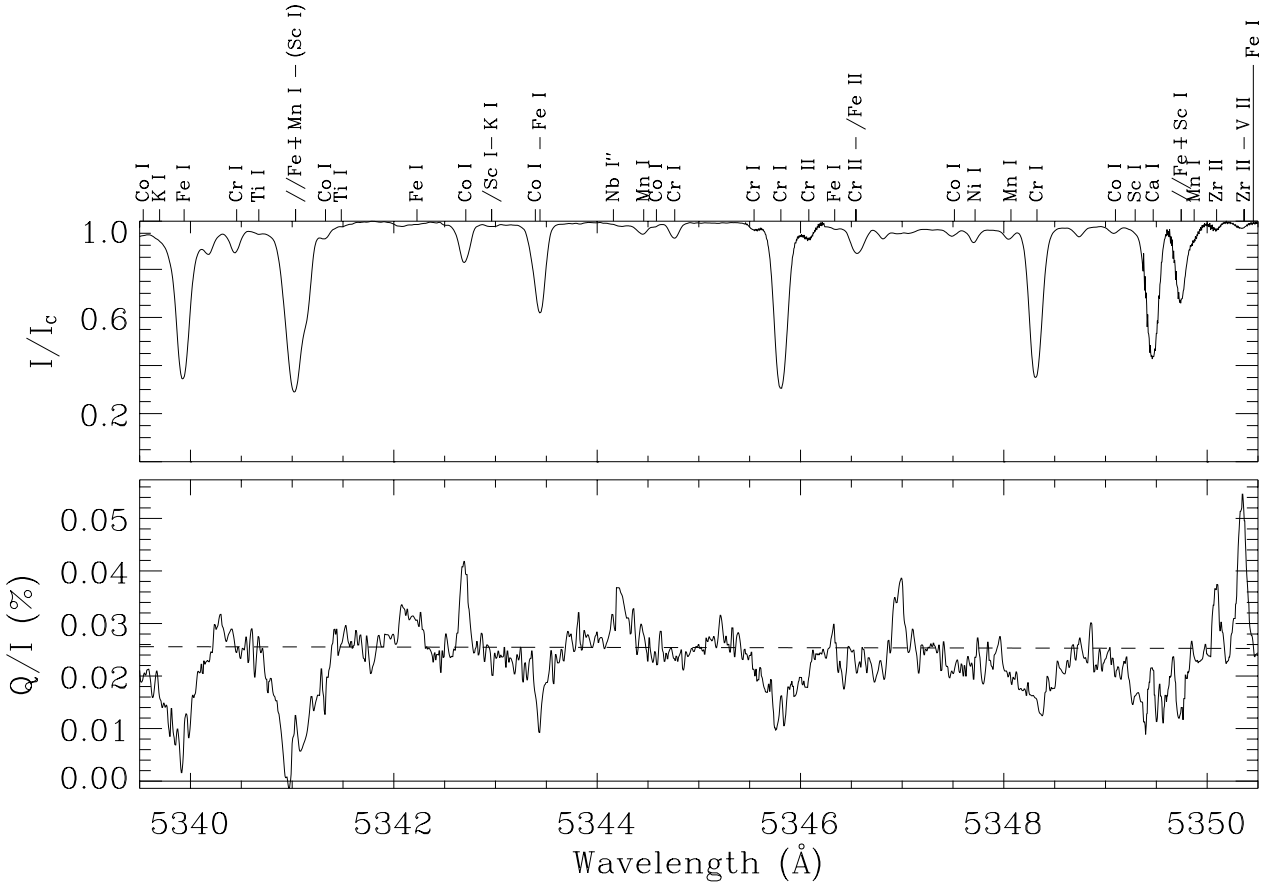

Y II
Fe I
La II
Fe I
Cr I
Mn I
Fe I
Nd II
Cr I
Fe I
Fe I
Fe I
Ti I
Cr I
Ti I
Cr I
Cr I
Cr I
Ti I
Cr I
Fe I
Ti I
Fe I
1.0
0.6
0.2
I/I_c
0.03
0.02
0.01
0.00
Q/I (%)
5290
5292
5294
5296
5298
5300
Wavelength (Å)

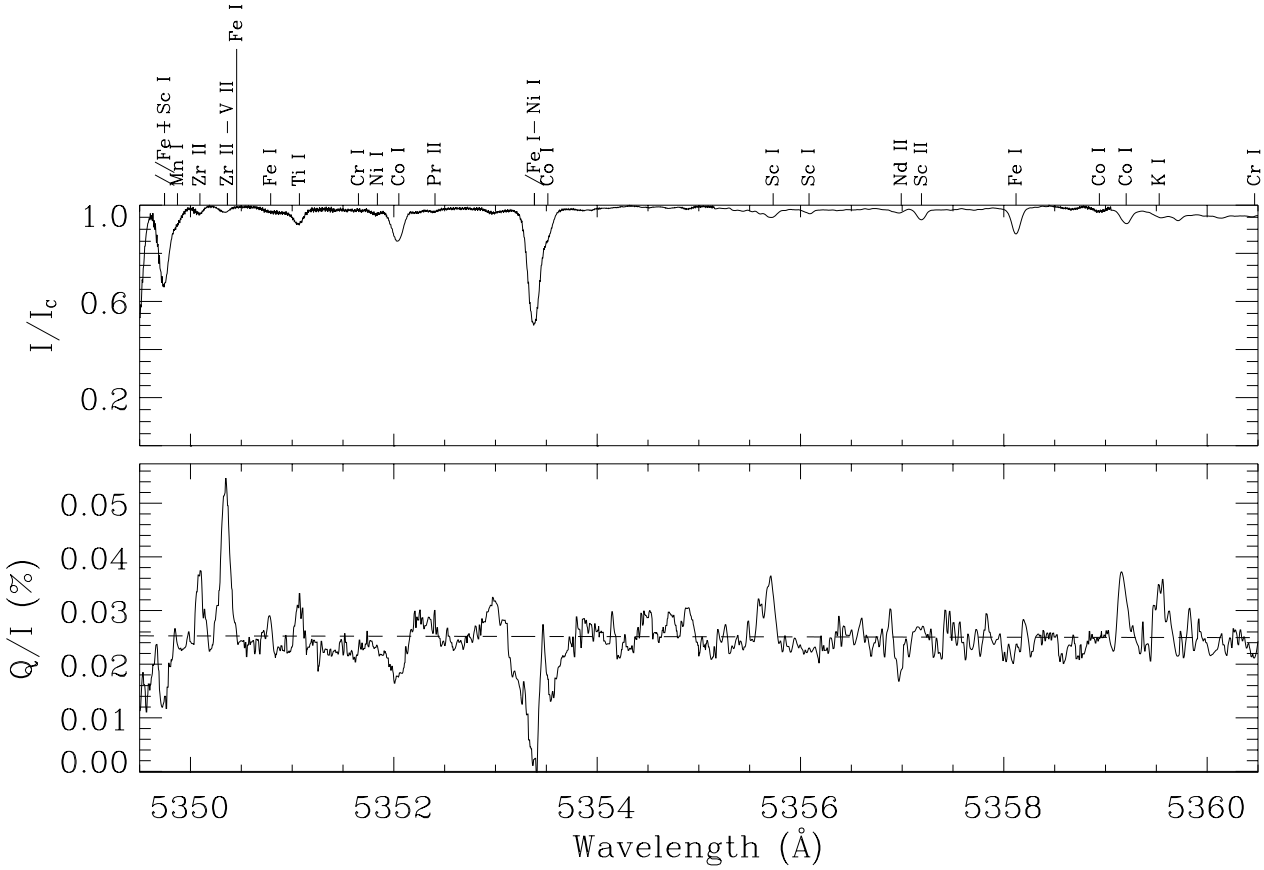

Ti I
Fe I
C I
Cr I
Co I
Fe I
Fe I
Mn I
V II
Fe I
Cr I
Fe I
Cr II
Ca II – Cr I
Fe I
Fe I
Cr II
Fe I
Cr I
Co I
1.0
0.6
0.2
I/I$_c$
0.03
0.02
0.01
0.00
Q/I (%)
5300
5302
5304
5306
5308
5310
Wavelength (Å)

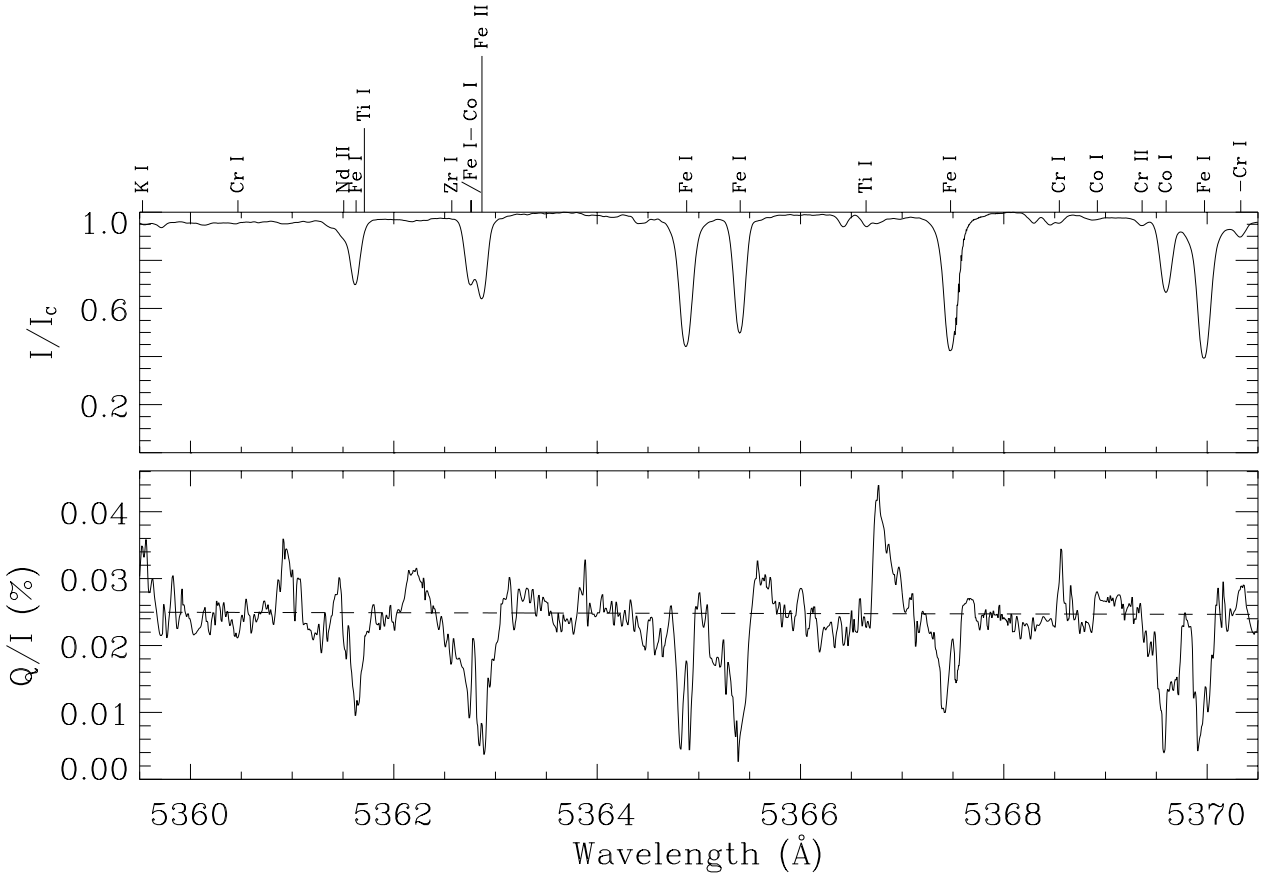

Co I
Cr II
Zr I – Nd II
Hf II
Zr II
Co I
Cr I
Ti I
Fe I
Cr II
Ti II
Fe I
Fe I
Fe II
Fe II – (Co I)
Mn I
Fe I
Fe I
Sc II
–V II"P
Cr I
Fe I
Nd II
Fe I
1.0
0.6
0.2
I/I_c
0.04
0.03
0.02
0.01
0.00
Q/I (%)
5310
5312
5314
5316
5318
5320
Wavelength (Å)

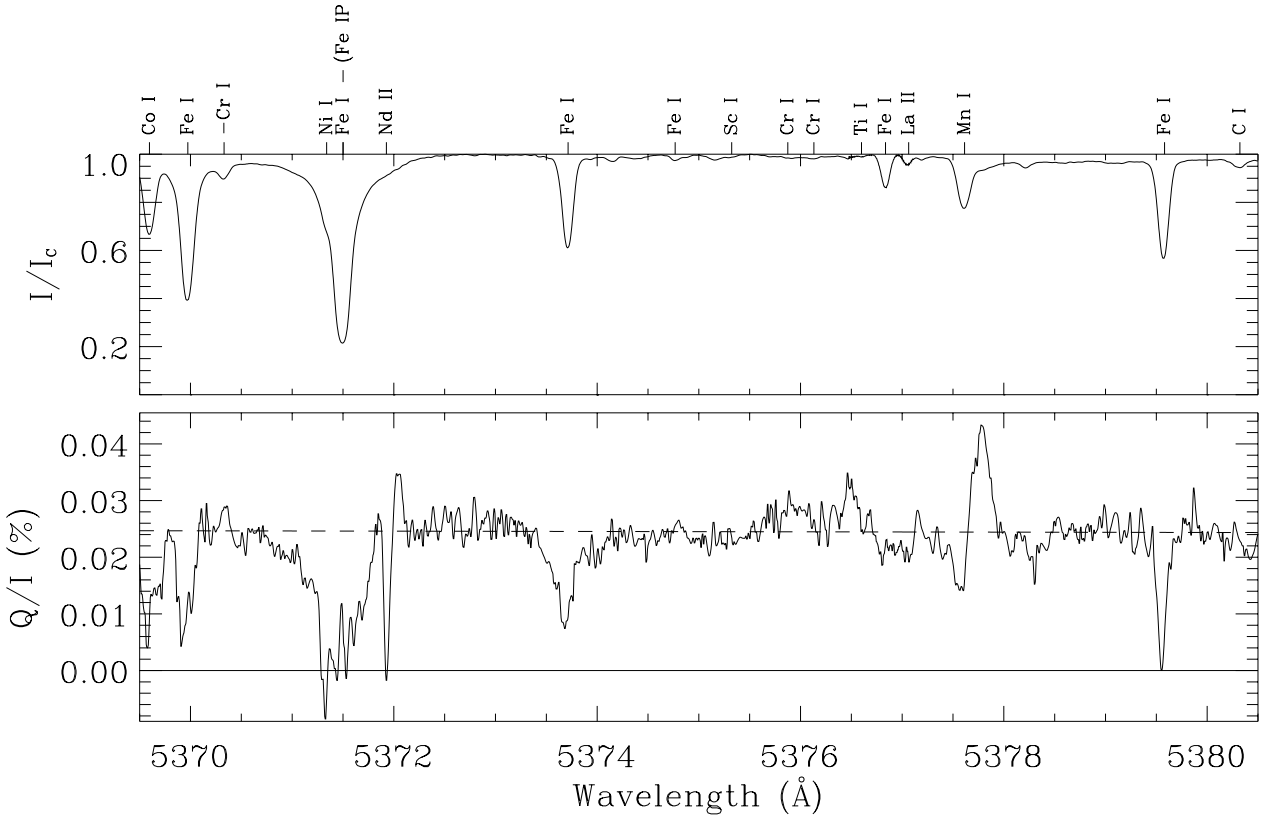

Nd II
Fe I
Y II
Fe I
Fe I
Pr II
Fe I
Ti I
Cr I
Fe I
Dy II
Co I
Fe II
Co I
Fe I
Fe I
Fe I
Fe I
Fe I
Cr I
Fe I
Cr I
Cr I
Fe I
1.0
0.6
0.2
I/I_c
0.04
0.03
0.02
0.01
0.00
Q/I (%)
5320
5322
5324
5326
5328
5330
Wavelength (Å)

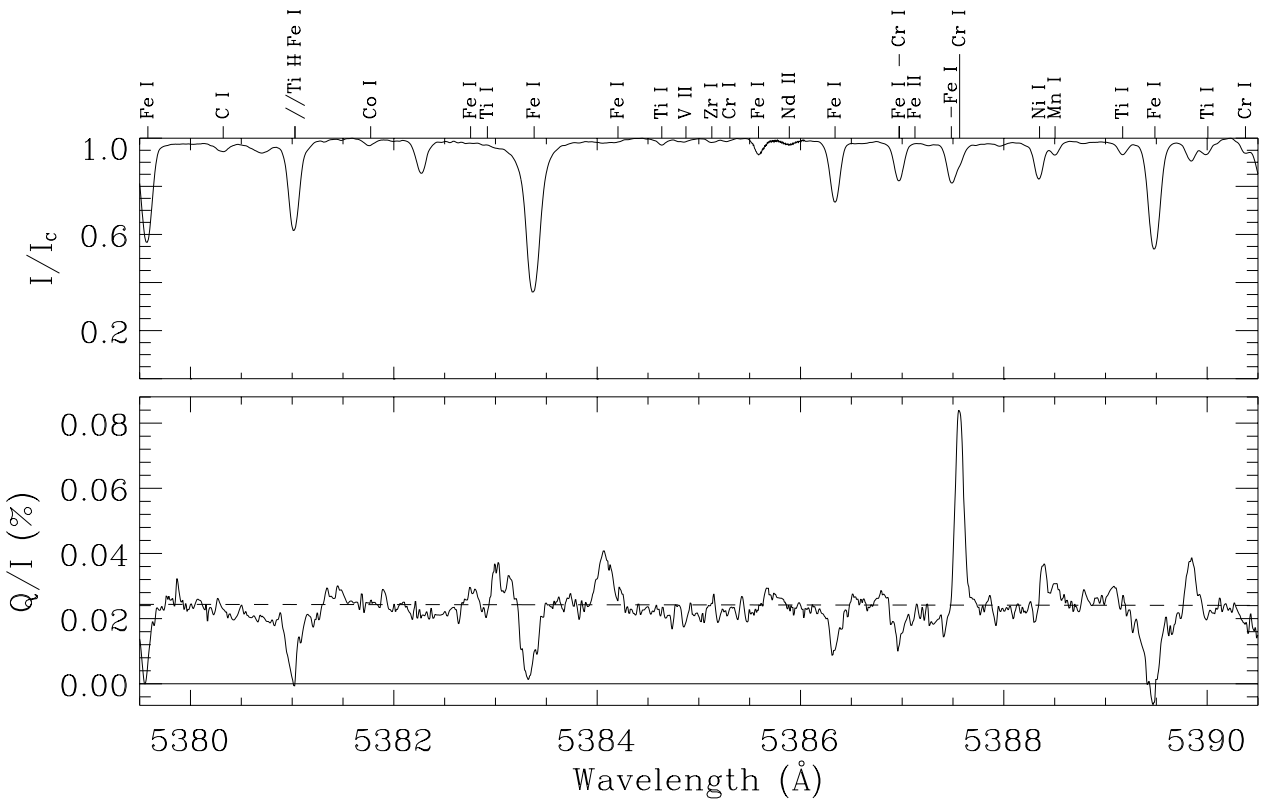

Cr I
Fe I
Ce II
Fe I
Co I – Fe I
V II – Fe I
Fe I
Fe I
Co I
Fe I
Sc II
Fe I
Cr II – (Co I)
Ti I
Co I
Ti II
Fe II – Cr II
Ti I
Ca II
Fe I
Co I
K I
Fe I
Cr I
1.0
0.6
0.2
I/I_c
0.04
0.03
0.02
0.01
0.00
Q/I (%)
5330
5332
5334
5336
5338
5340
Wavelength (Å)

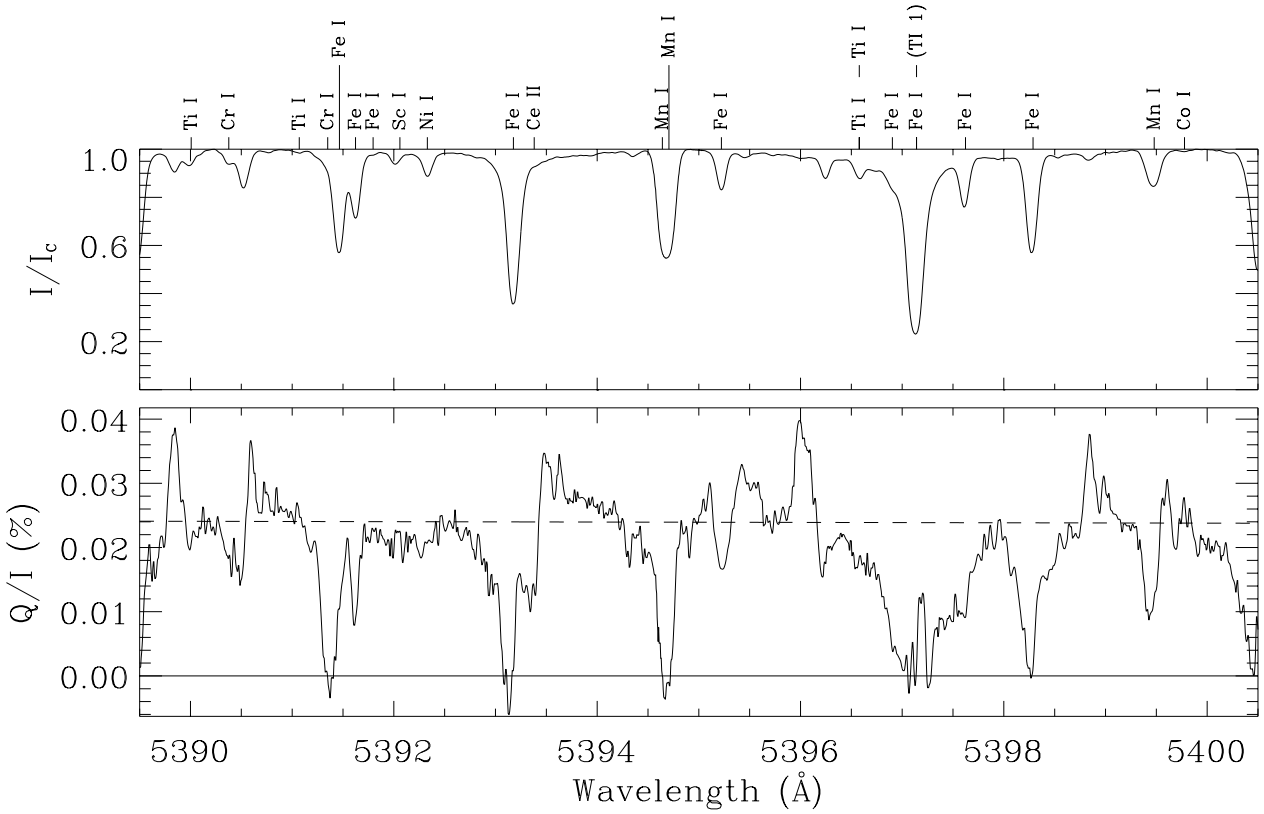

Co I
K I
Fe I
Cr I
Ti I
//Fe + Mn I − (Sc I)
Co I
Ti I
Fe I
Co I
/Sc I − K I
Co I − Fe I
Nb I''
Mn I
Co I
Cr I
Cr I
Cr I
Cr II
Fe I
Cr II − /Fe II
Co I
Ni I
Mn I
Cr I
Co I
Sc I
Ca I
//Fe + Sc I
Mn I
Zr II
Zr II − V II
Fe I
1.0
0.6
0.2
I/I_c
0.05
0.04
0.03
0.02
0.01
0.00
Q/I (%)
5340
5342
5344
5346
5348
5350
Wavelength (Å)

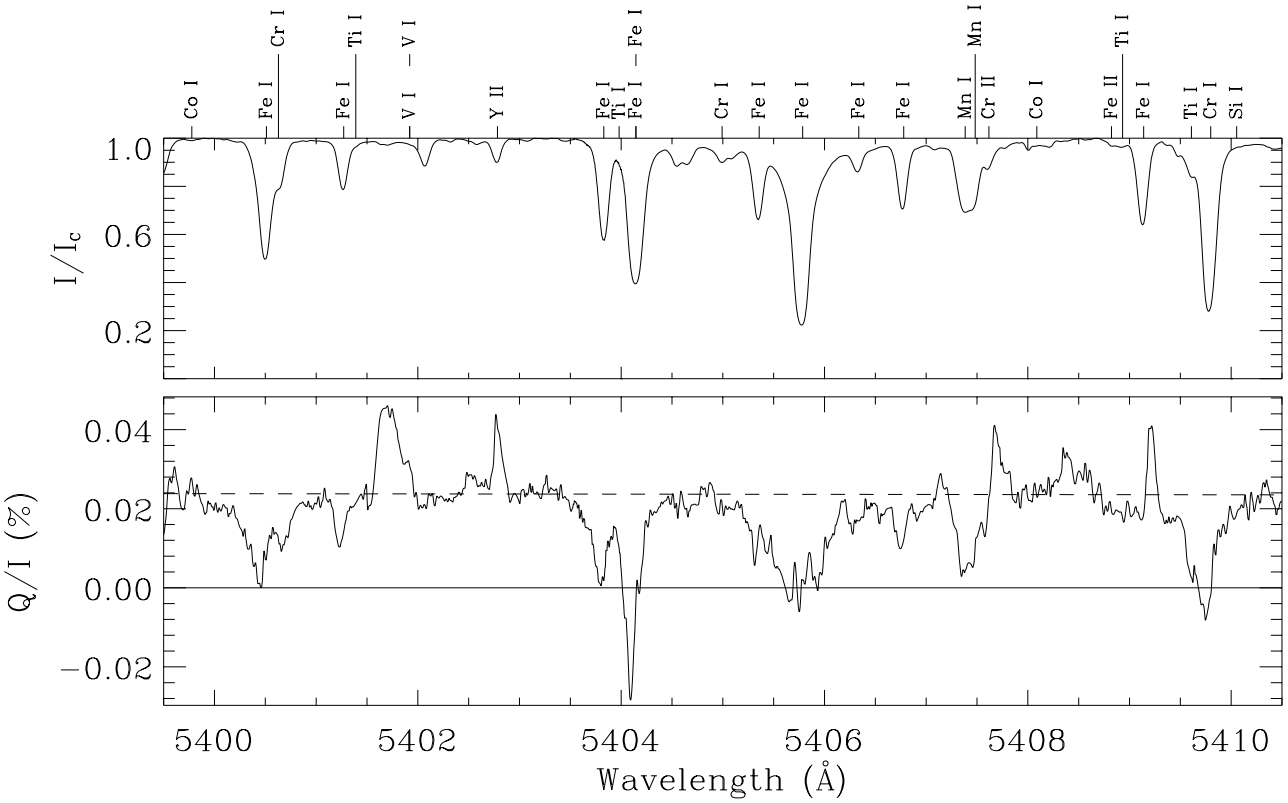

Fe I
Sc I
Fe I
Mn I
Zr II
Zr II – V II
Fe I
Ti I
Cr I
Ni I
Co I
Pr II
Fe I – Ni I
Co I
Sc I
Sc I
Nd II
Sc II
Fe I
Co I
Co I
K I
Cr I
1.0
0.6
0.2
I/I_c
0.05
0.04
0.03
0.02
0.01
0.00
Q/I (%)
5350
5352
5354
5356
5358
5360
Wavelength (Å)

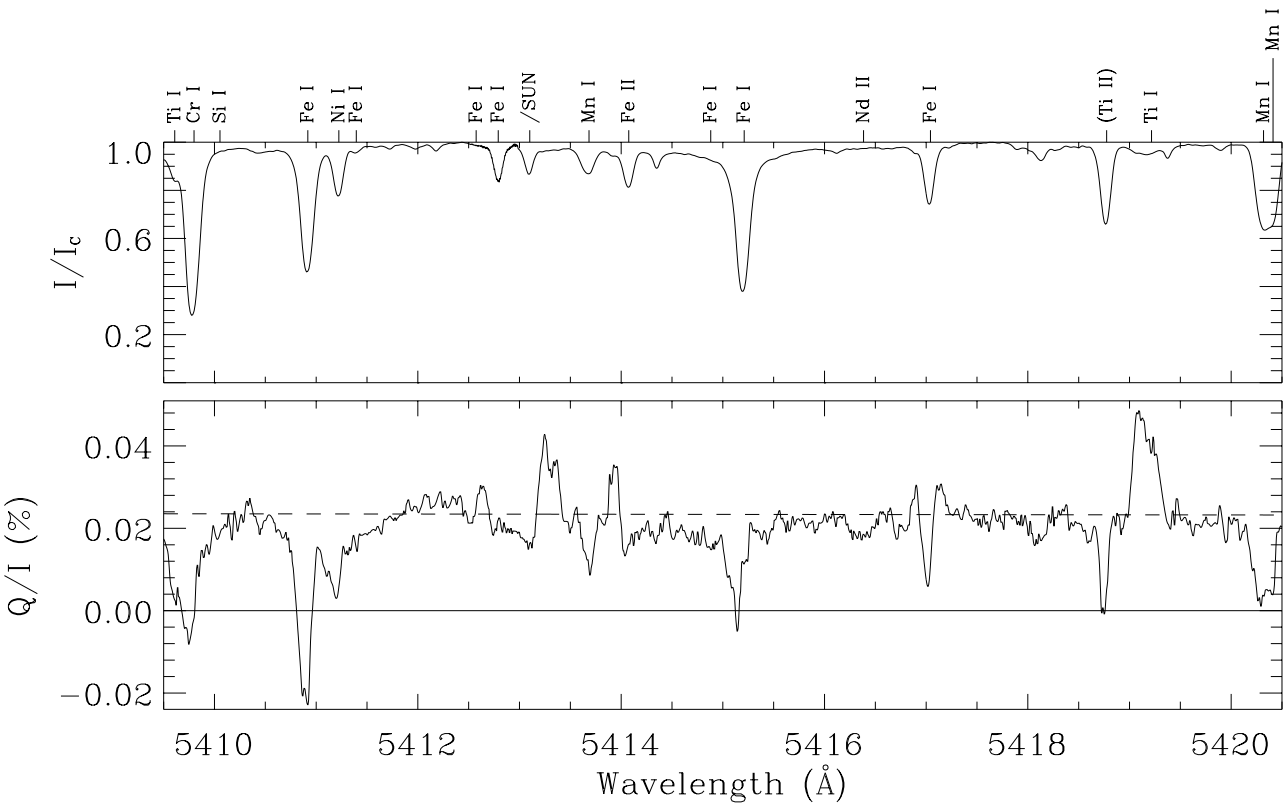

K I
Cr I
Nd II
Fe I
Ti I
Zr I
Fe I
Co I
Fe II
Fe I
Fe I
Ti I
Fe I
Cr I
Co I
Cr II
Co I
Fe I
Cr I
I/I$_c$
1.0
0.6
0.2
Q/I (%)
0.04
0.03
0.02
0.01
0.00
5360
5362
5364
5366
5368
5370
Wavelength (Å)

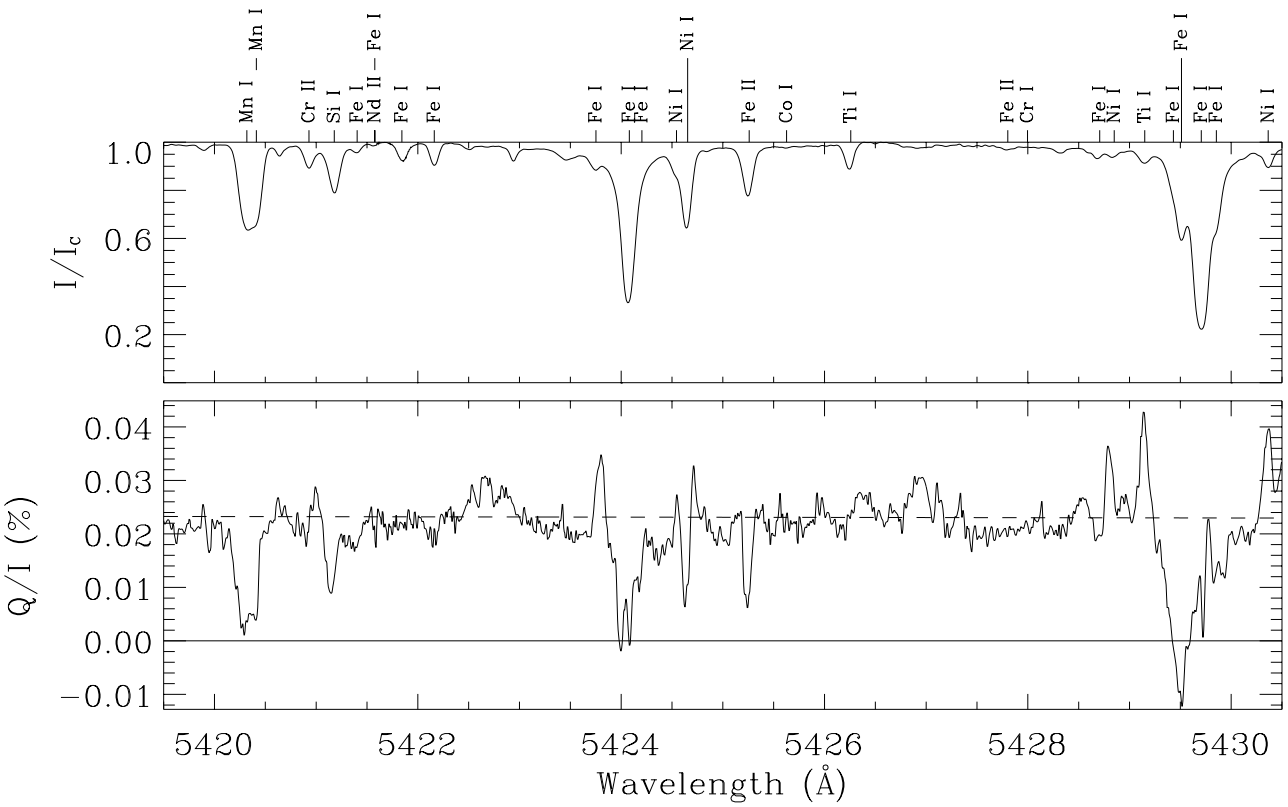

Co I
Fe I
Cr I
Ni I
Fe I
(Fe IP
Nd II
Fe I
Fe I
Sc I
Cr I
Cr I
Ti I
Fe I
La II
Mn I
Fe I
C I
1.0
0.6
0.2
I/I_c
0.04
0.03
0.02
0.01
0.00
Q/I (%)
5370
5372
5374
5376
5378
5380
Wavelength (Å)

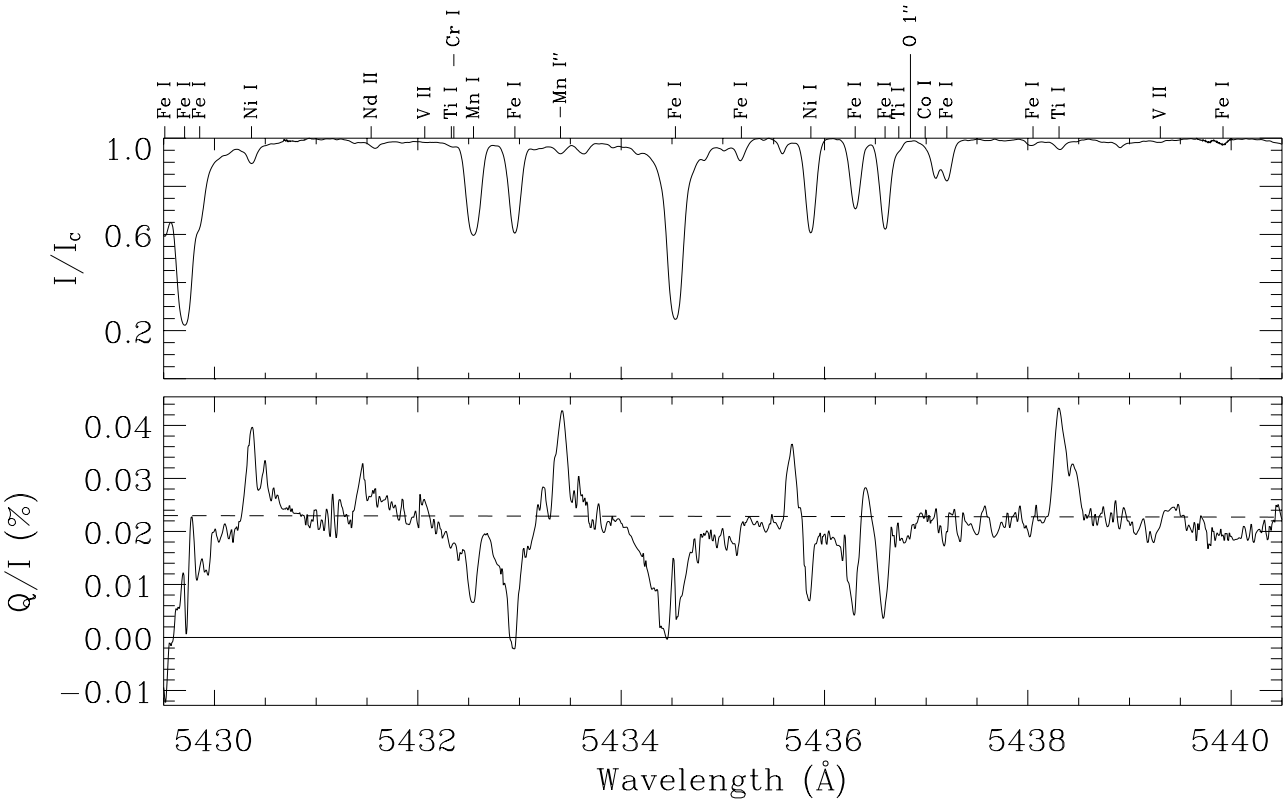

Fe I
C I
//Ti H Fe I
Co I
Fe I
Ti I
Fe I
Fe I
Ti I
V II
Zr I
Cr I
Fe I
Nd II
Fe I
Fe I
Cr I
Fe II
Fe I
Cr I
Ni I
Mn I
Ti I
Fe I
Ti I
Cr I
1.0
0.6
0.2
I/I_c
0.08
0.06
0.04
0.02
0.00
Q/I (%)
5380
5382
5384
5386
5388
5390
Wavelength (Å)

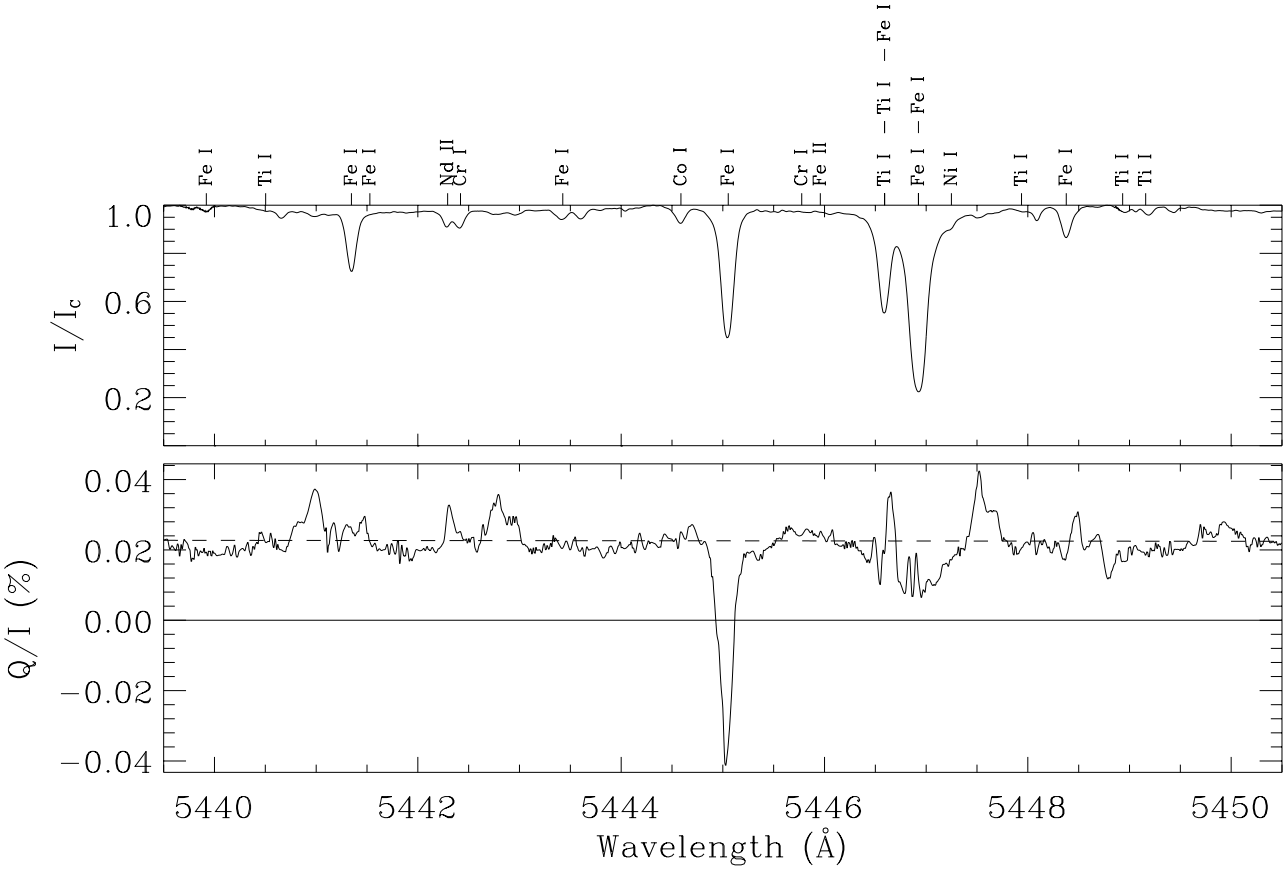

Ti I
Cr I
Ti I
Cr I
Fe I
Fe I
Fe I
Sc I
Ni I
Fe I
Ce II
Mn I
Mn I
Fe I
Ti I
Ti I
Fe I
Fe I
(Ti 1)
Fe I
Fe I
Mn I
Co I
1.0
0.6
0.2
I/I$_c$
0.04
0.03
0.02
0.01
0.00
Q/I (%)
5390
5392
5394
5396
5398
5400
Wavelength (Å)

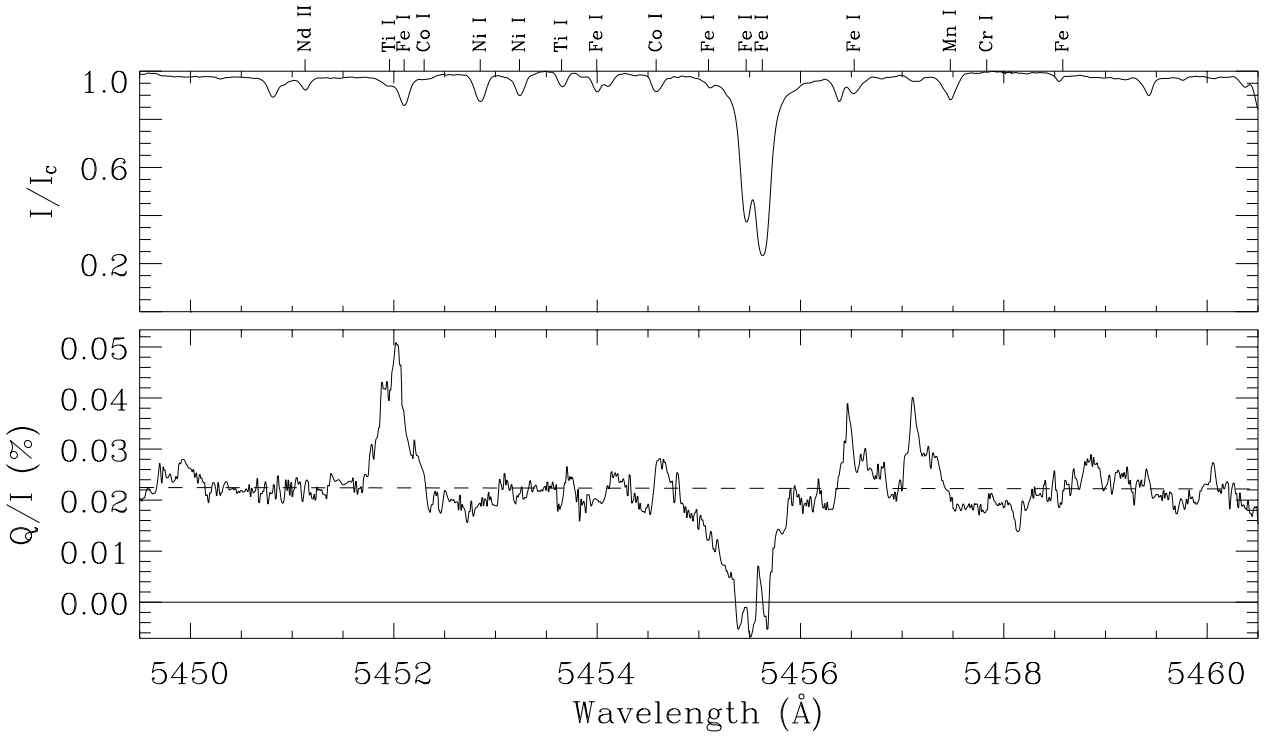

Co I
Fe I
Cr I
Fe I
Ti I
V I
V I
Y II
Fe I
Ti I
Fe I
Fe I
Cr I
Fe I
Fe I
Fe I
Fe I
Mn I
Mn I
Cr II
Co I
Fe II
Ti I
Fe I
Ti I
Cr I
Si I
1.0
0.6
0.2
I/I_c
0.04
0.02
0.00
−0.02
Q/I (%)
5400
5402
5404
5406
5408
5410
Wavelength (Å)

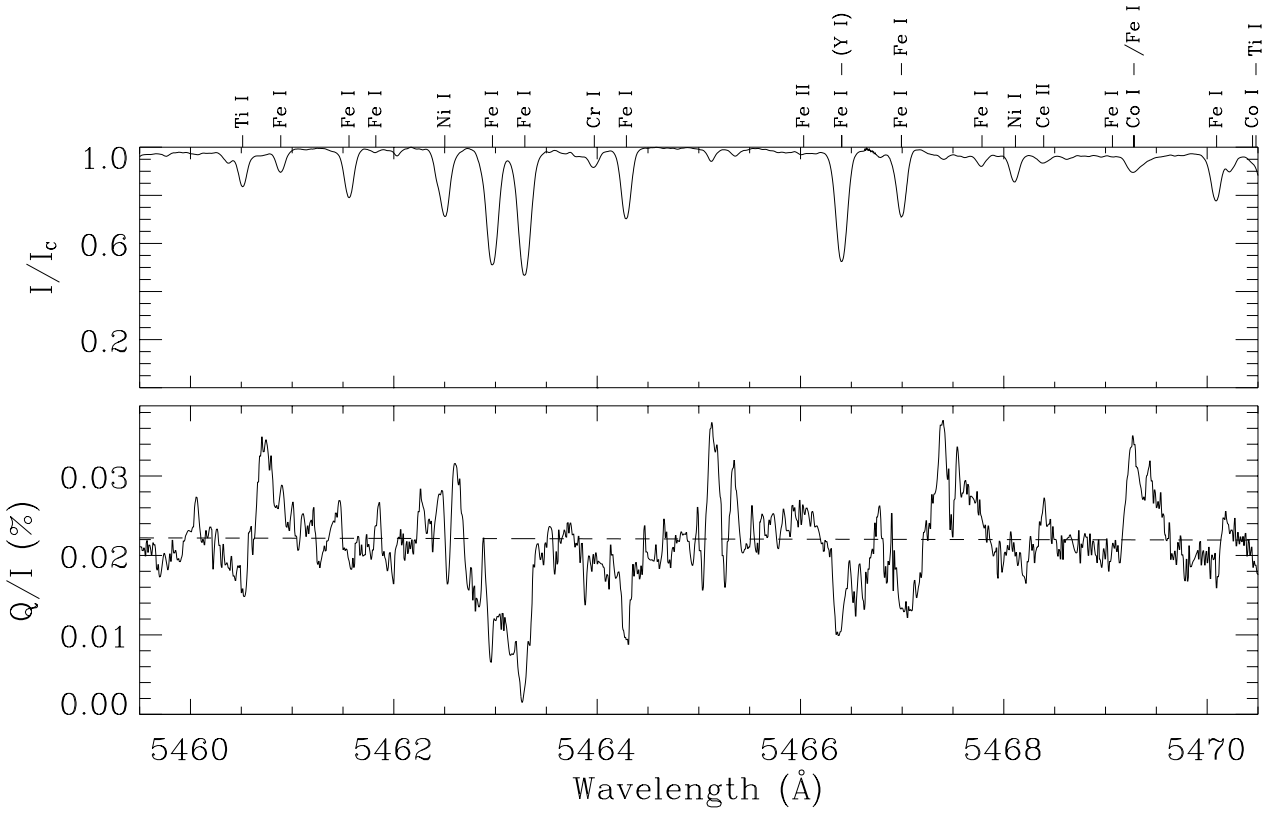

Ti I
Cr I
Si I
Fe I
Ni I
Fe I
Fe I
Fe I
/SUN
Mn I
Fe II
Fe I
Fe I
Nd II
Fe I
(Ti II)
Ti I
Mn I
Mn I
1.0
0.6
0.2
I/I_c
0.04
0.02
0.00
−0.02
Q/I (%)
5410
5412
5414
5416
5418
5420
Wavelength (Å)

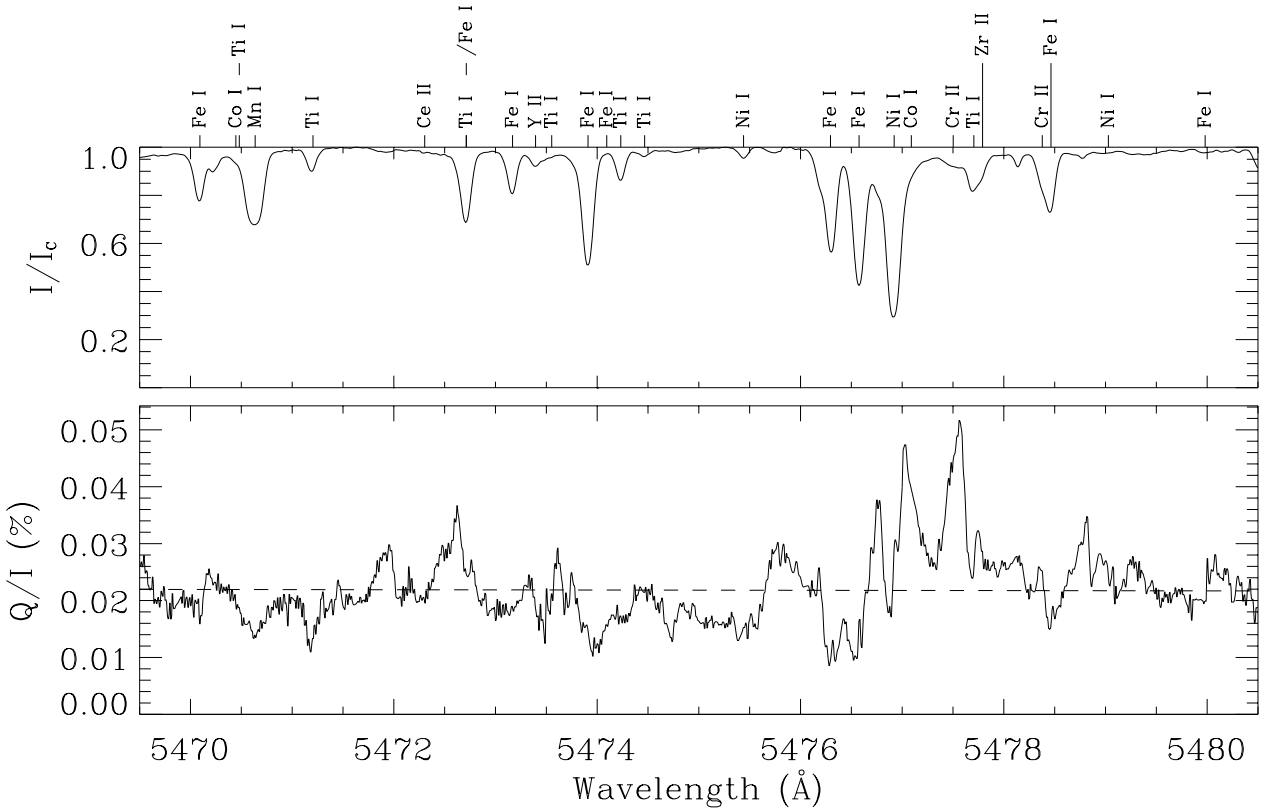

Mn I
Mn I
Cr II
Si I
Fe I
Nd II
Fe I
Fe I
Fe I
Fe I
Fe I
Ni I
Ni I
Fe II
Co I
Ti I
Fe II
Cr I
Fe I
Ni I
Ti I
Fe I
Fe I
Fe I
Ni I
I/I_c
1.0
0.6
0.2
Q/I (%)
0.04
0.03
0.02
0.01
0.00
−0.01
5420
5422
5424
5426
5428
5430
Wavelength (Å)

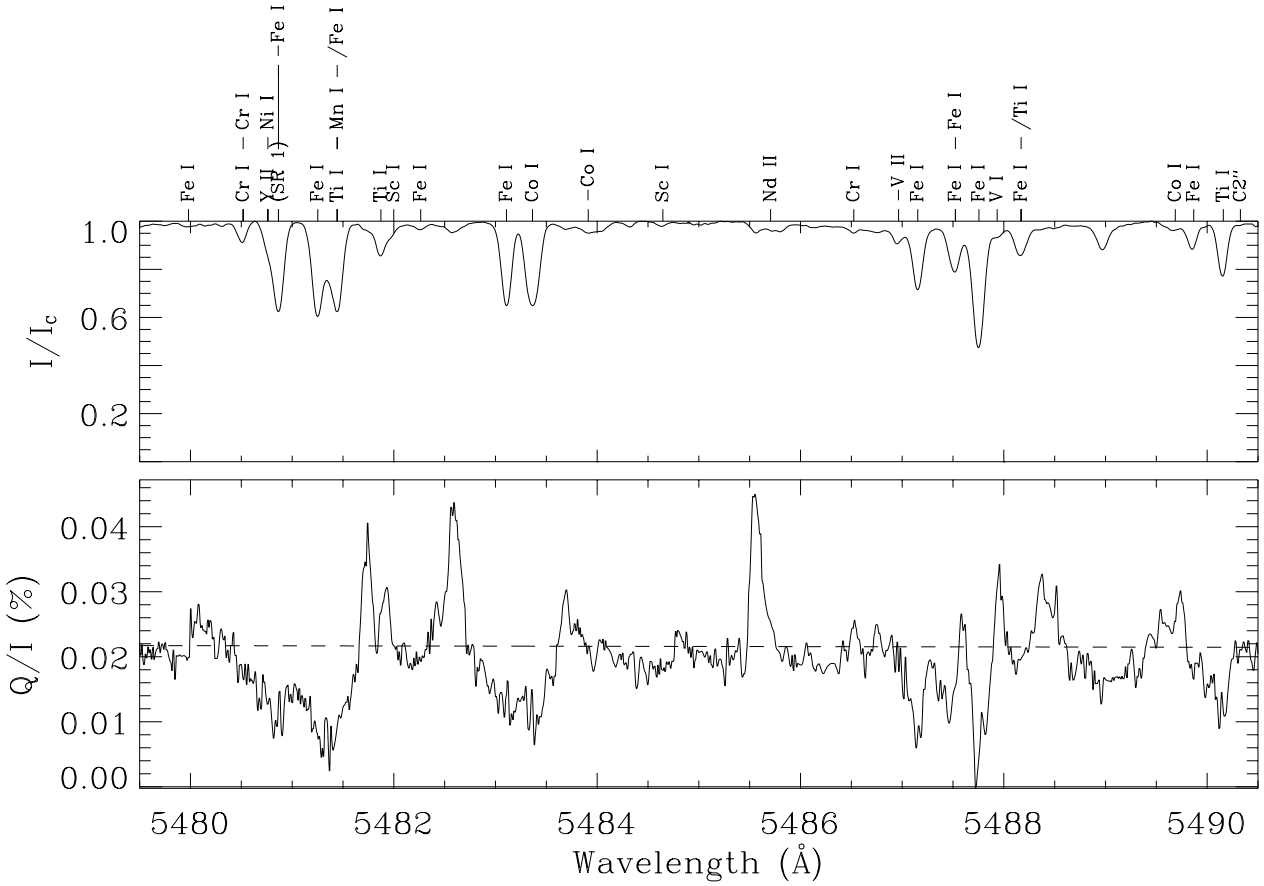

Fe I
Fe I
Fe I
Ni I
Nd II
V II
Ti I
Cr I
Mn I
Fe I
Mn I''
Fe I
Fe I
Ni I
Fe I
Fe I
Ti I
O I''
Co I
Fe I
Fe I
Ti I
V II
Fe I
1.0
0.6
0.2
I/I_c
0.04
0.03
0.02
0.01
0.00
−0.01
Q/I (%)
5430
5432
5434
5436
5438
5440
Wavelength (Å)

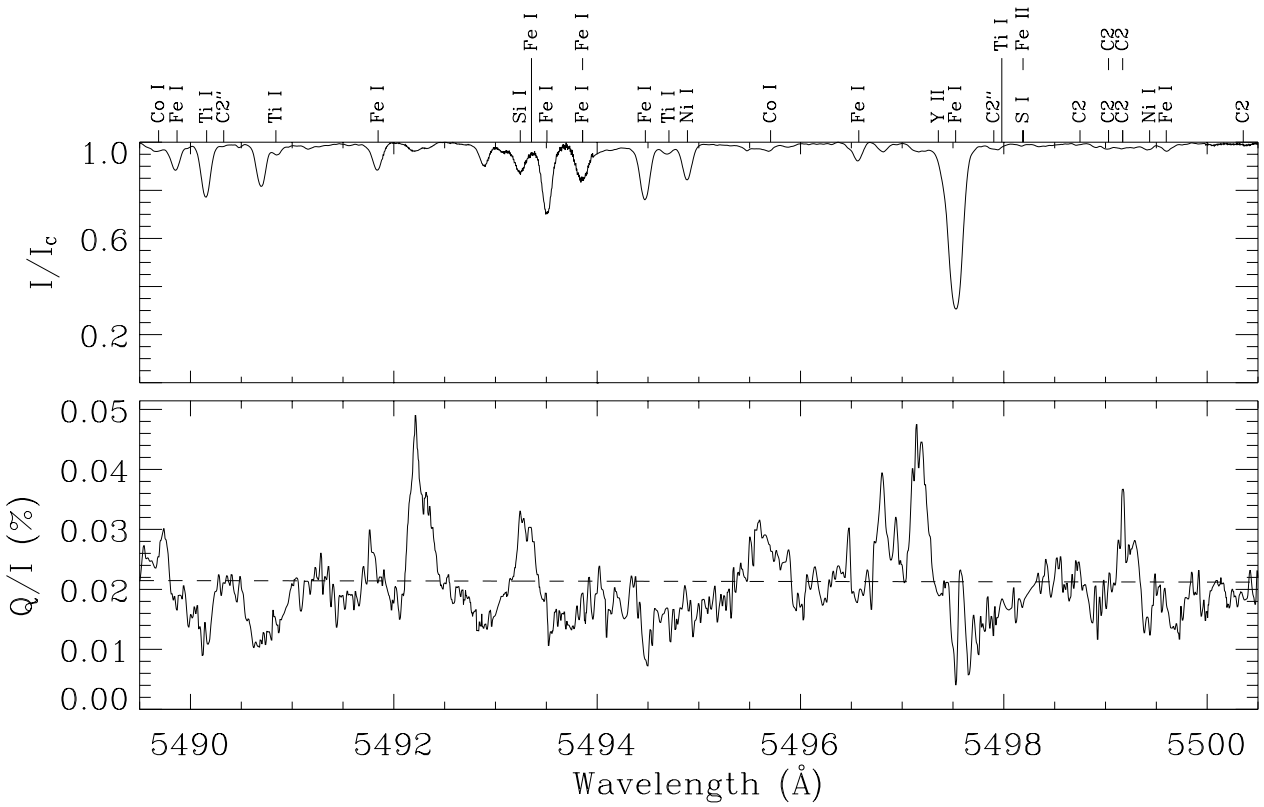

Fe I
Ti I
Fe I
Fe I
Nd II
Cr I
Fe I
Co I
Fe I
Cr I
Fe II
Ti I
Ti I
Fe I
Fe I
Ni I
Ti I
Fe I
Ti I
Ti I
1.0
0.6
0.2
I/I_c
0.04
0.02
0.00
−0.02
−0.04
Q/I (%)
5440
5442
5444
5446
5448
5450
Wavelength (Å)

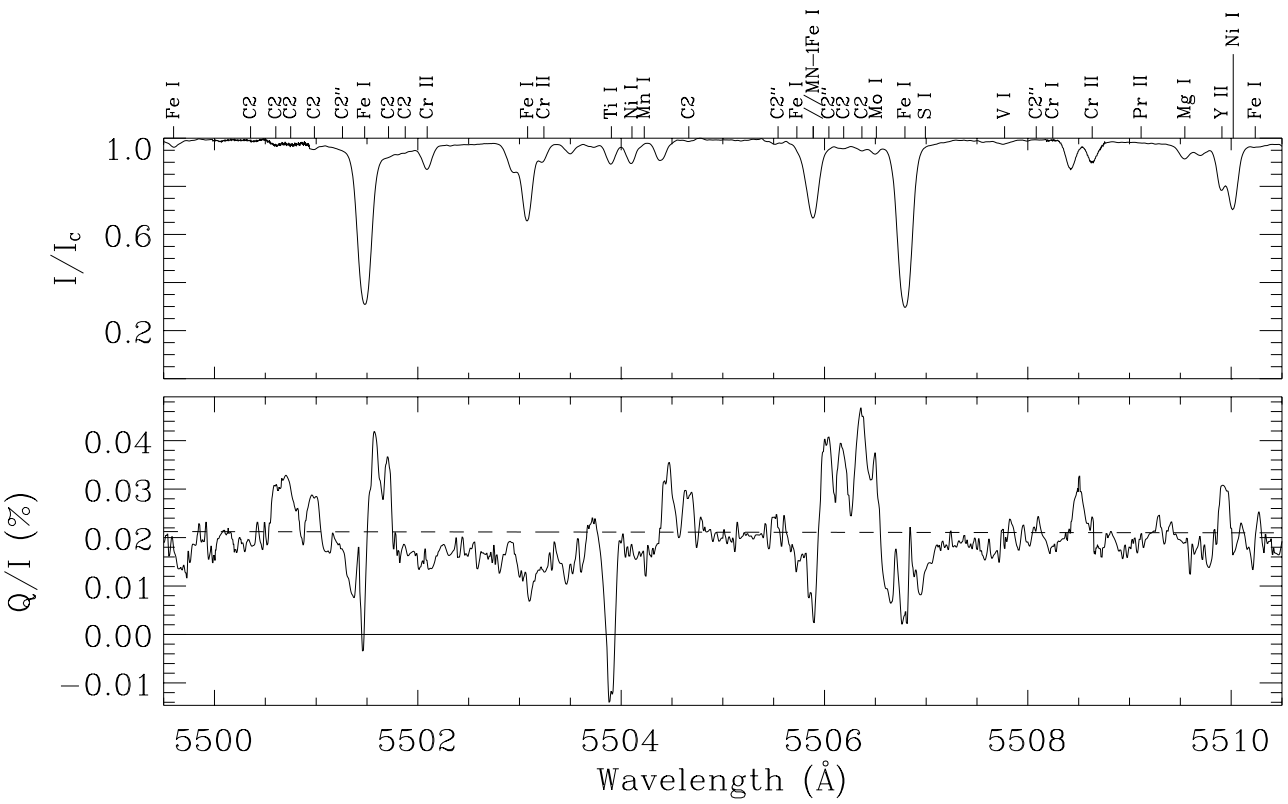

Nd II
Ti I
Fe I
Co I
Ni I
Ni I
Ti I
Fe I
Co I
Fe I
Fe I
Fe I
Fe I
Mn I
Cr I
Fe I
1.0
0.6
0.2
I/I_c
0.05
0.04
0.03
0.02
0.01
0.00
Q/I (%)
5450
5452
5454
5456
5458
5460
Wavelength (Å)

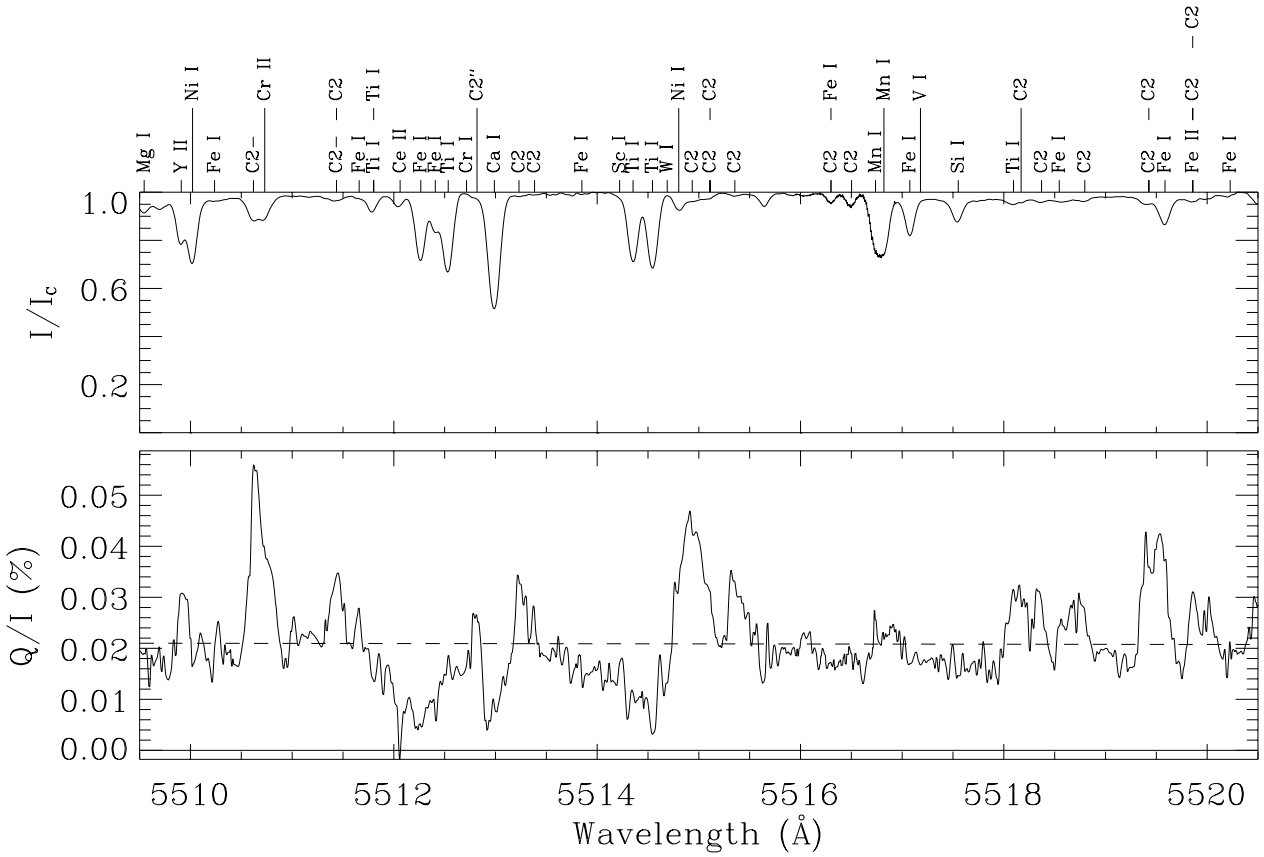

Ti I
Fe I
Fe I
Fe I
Ni I
Fe I
Fe I
Cr I
Fe I
Fe II
Fe I – (Y I)
Fe I – Fe I
Fe I
Ni I
Ce II
Fe I
Co I – /Fe I
Fe I
Co I – Ti I
1.0
0.6
0.2
I/I$_c$
0.03
0.02
0.01
0.00
Q/I (%)
5460
5462
5464
5466
5468
5470
Wavelength (Å)

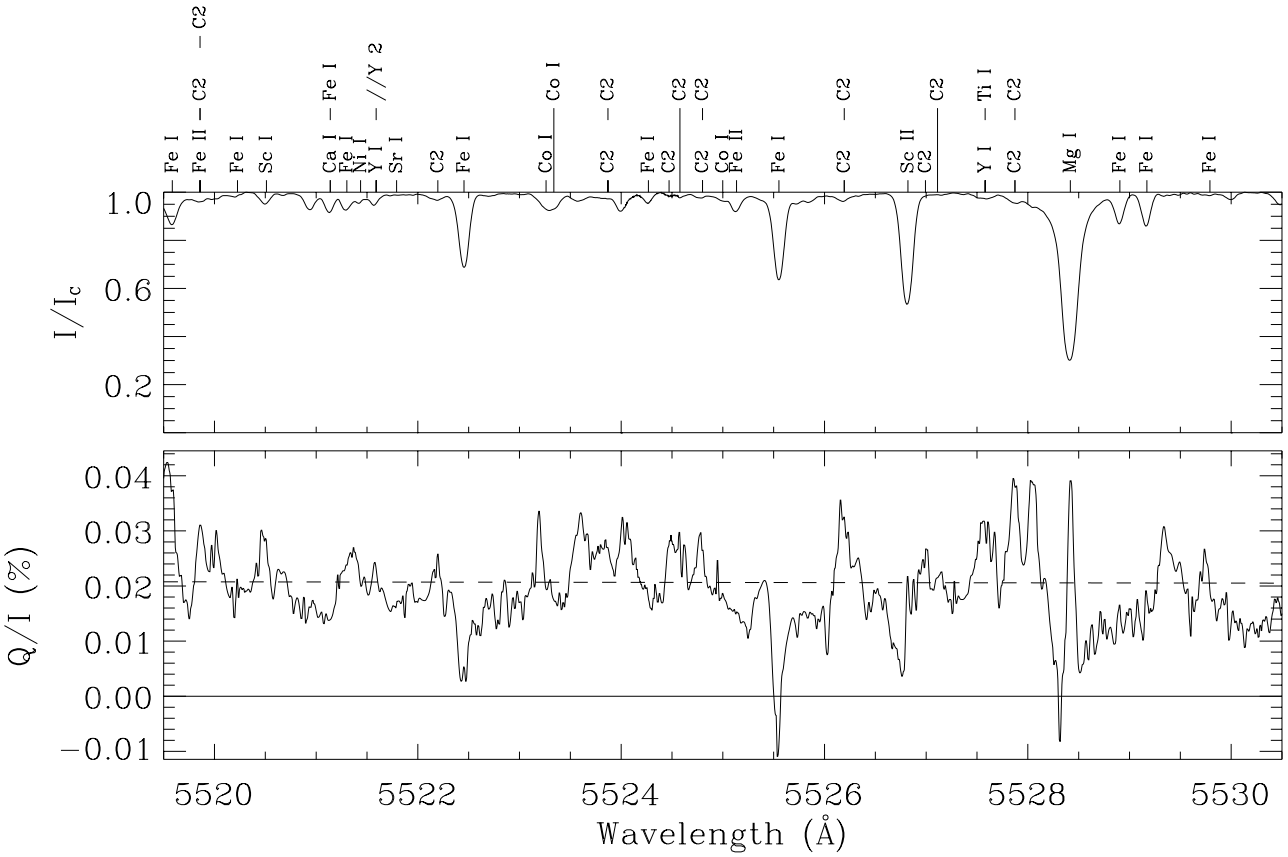

Fe I
Co I
Ti I
Mn I
Ti I
Ce II
Ti I
Fe I
Fe I
Y II
Ti I
Fe I
Fe I
Ti I
Ti I
Ni I
Fe I
Fe I
Ni I
Co I
Cr II
Ti I
Zr II
Cr II
Fe I
Ni I
Fe I
1.0
0.6
0.2
I/I_c
0.05
0.04
0.03
0.02
0.01
0.00
Q/I (%)
5470
5472
5474
5476
5478
5480
Wavelength (Å)

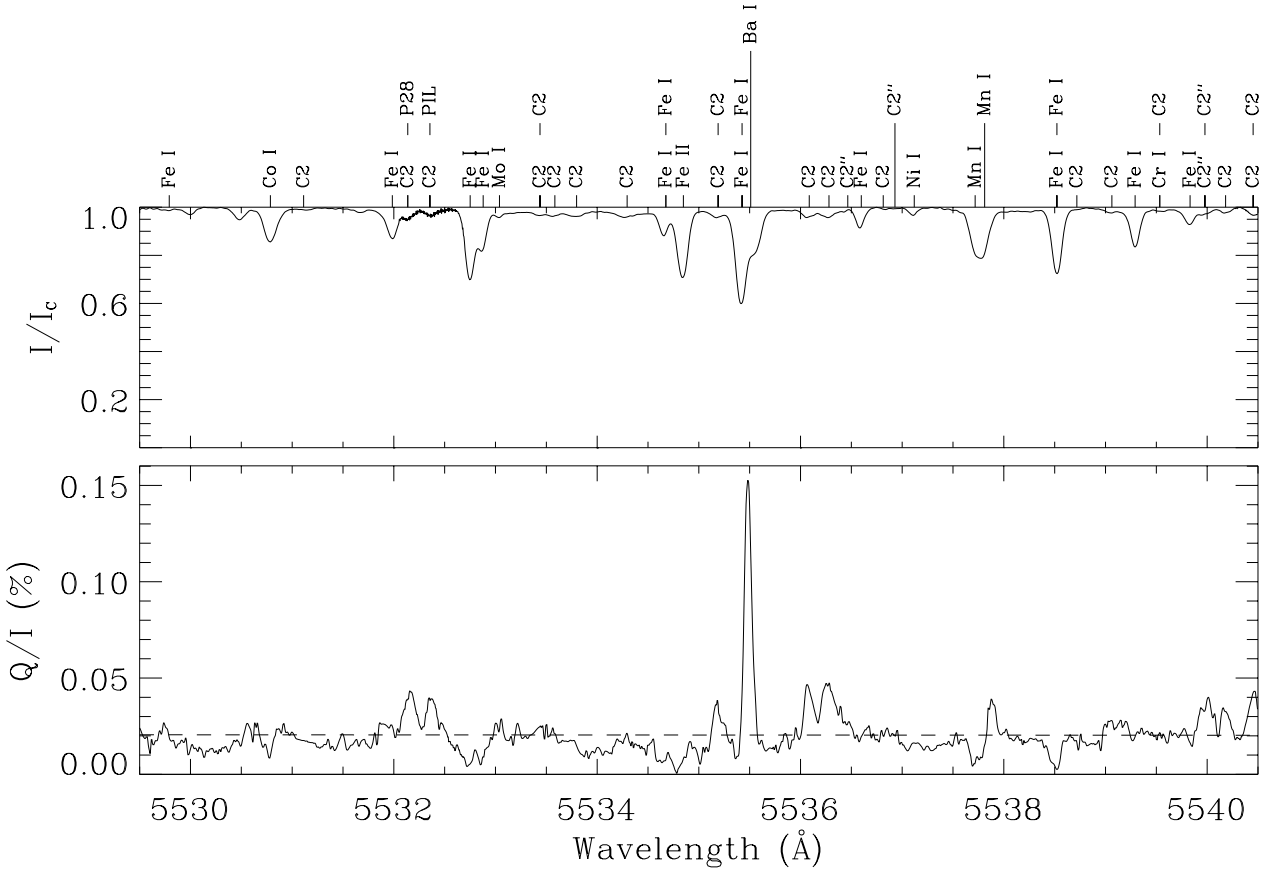

Fe I
Cr I
Y II
(SR 1)
Ni I
Fe I
Fe I
Ti I
Mn I
Fe I
Ti I
Sc I
Fe I
Fe I
Co I
Co I
Sc I
Nd II
Cr I
V II
Fe I
Fe I
Fe I
V I
Fe I
Ti I
Co I
Fe I
Ti I
I/I_c
1.0
0.6
0.2
Q/I (%)
0.04
0.03
0.02
0.01
0.00
5480
5482
5484
5486
5488
5490
Wavelength (Å)

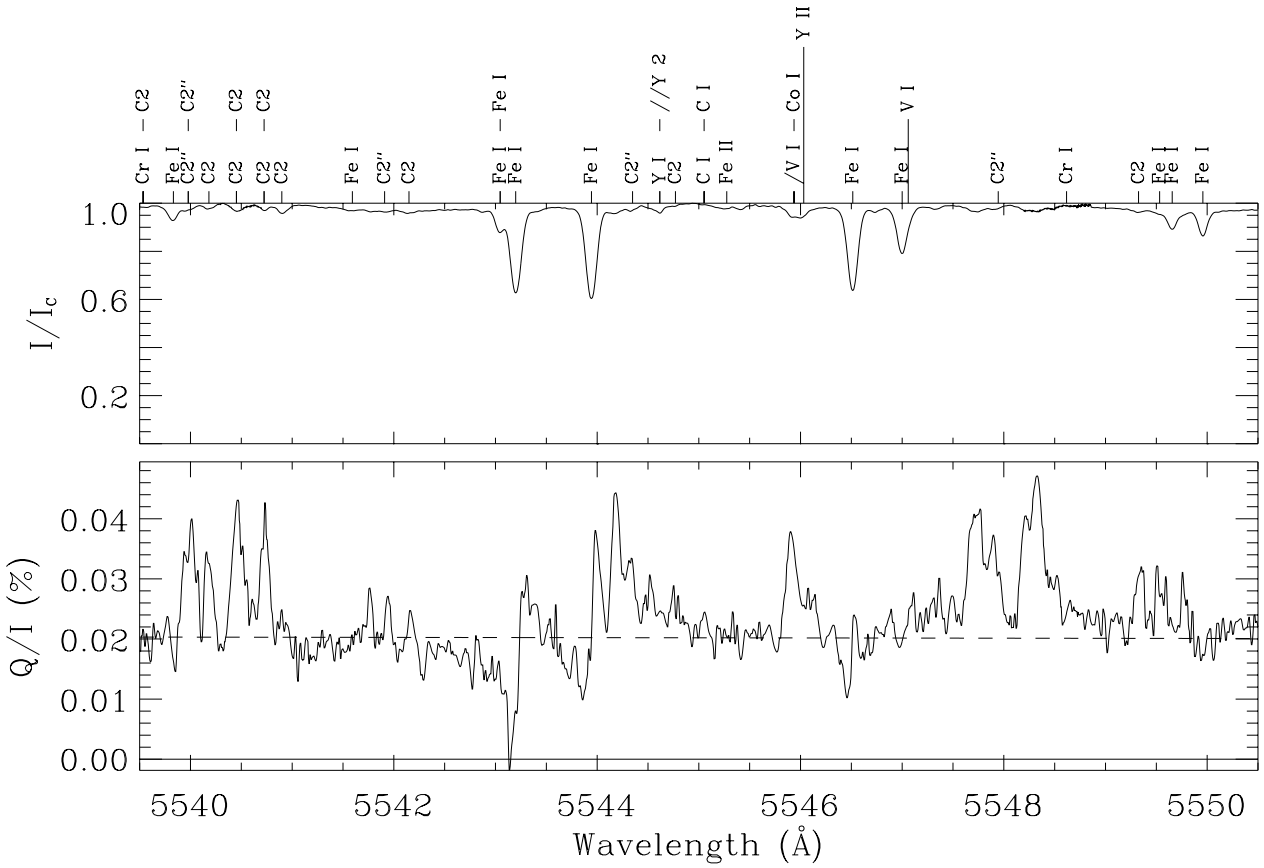

Co I
Fe I
Ti I
C2''
Ti I
Fe I
Si I
Fe I
Fe I
Fe I
Fe I
Ti I
Ni I
Co I
Fe I
Y II
Fe I
C2''
Ti I
S I
Fe II
C2
C2
C2
C2
C2
Ni I
Fe I
C2
1.0
0.6
0.2
I/I_c
0.05
0.04
0.03
0.02
0.01
0.00
Q/I (%)
5490
5492
5494
5496
5498
5500
Wavelength (Å)

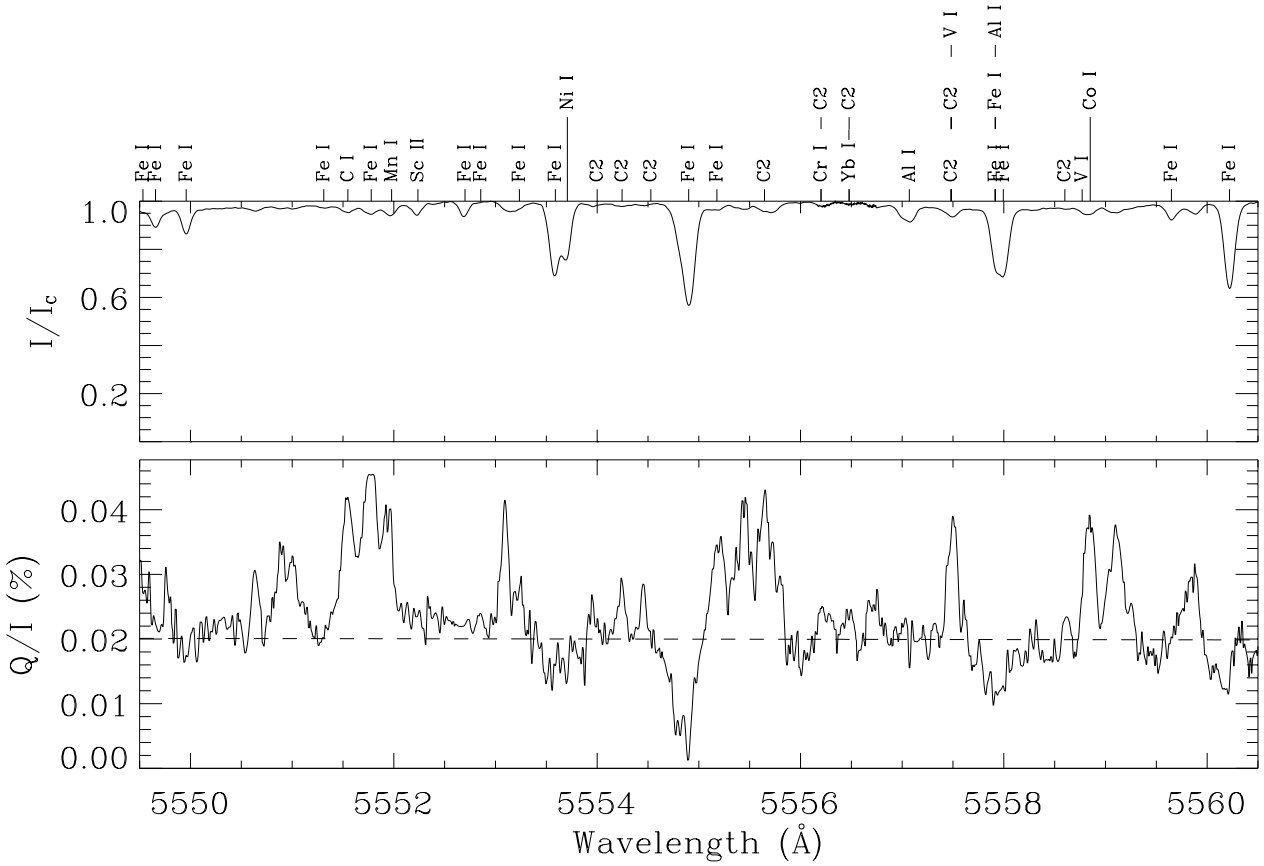

Fe I
C2
C2
C2
C2
C2''
Fe I
C2
C2
Cr II
Fe I
Cr II
Ti I
Ni I
Mn I
C2
C2''
Fe I
/MN-1Fe I
C2''
C2
C2
Mo I
Fe I
S I
V I
C2''
Cr I
Cr II
Pr II
Mg I
Y II
Ni I
Fe I
1.0
0.6
0.2
I/I_c
0.04
0.03
0.02
0.01
0.00
−0.01
Q/I (%)
5500
5502
5504
5506
5508
5510
Wavelength (Å)

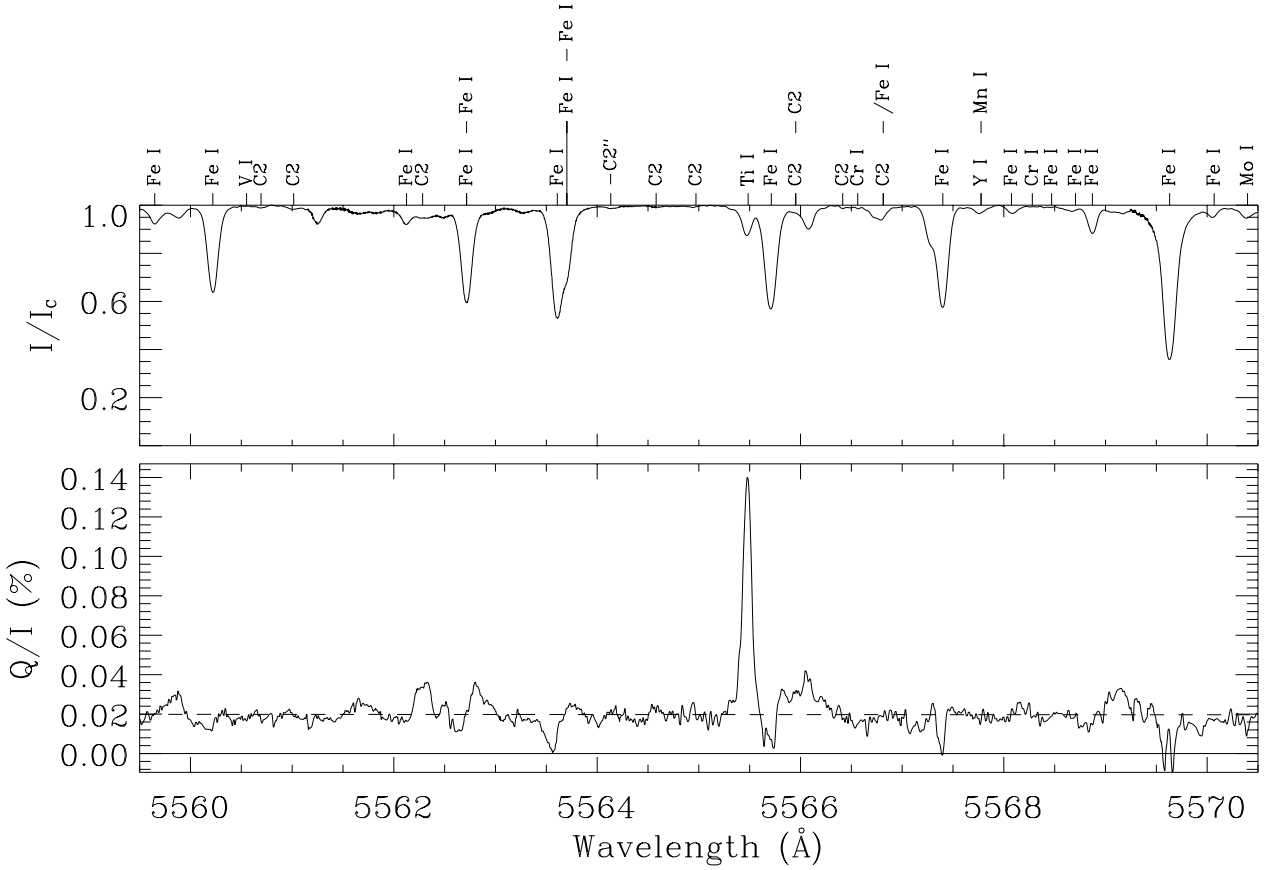

Mg I
Y II
Ni I
Fe I
C2
Cr II
C2
C2
Fe I
Ti I
Ti I
Ce II
Fe I
Fe I
Ti I
Cr I
C2''
Ca I
C2
C2
Fe I
Sc I
Ti I
Ti I
W I
Ni I
C2
C2
C2
C2
C2
Fe I
C2
Mn I
Mn I
Fe I
V I
Si I
Ti I
C2
C2
Fe I
C2
C2
Fe I
Fe II
C2
C2
Fe I
I/I_c
1.0
0.6
0.2
Q/I (%)
0.05
0.04
0.03
0.02
0.01
0.00
5510
5512
5514
5516
5518
5520
Wavelength (Å)

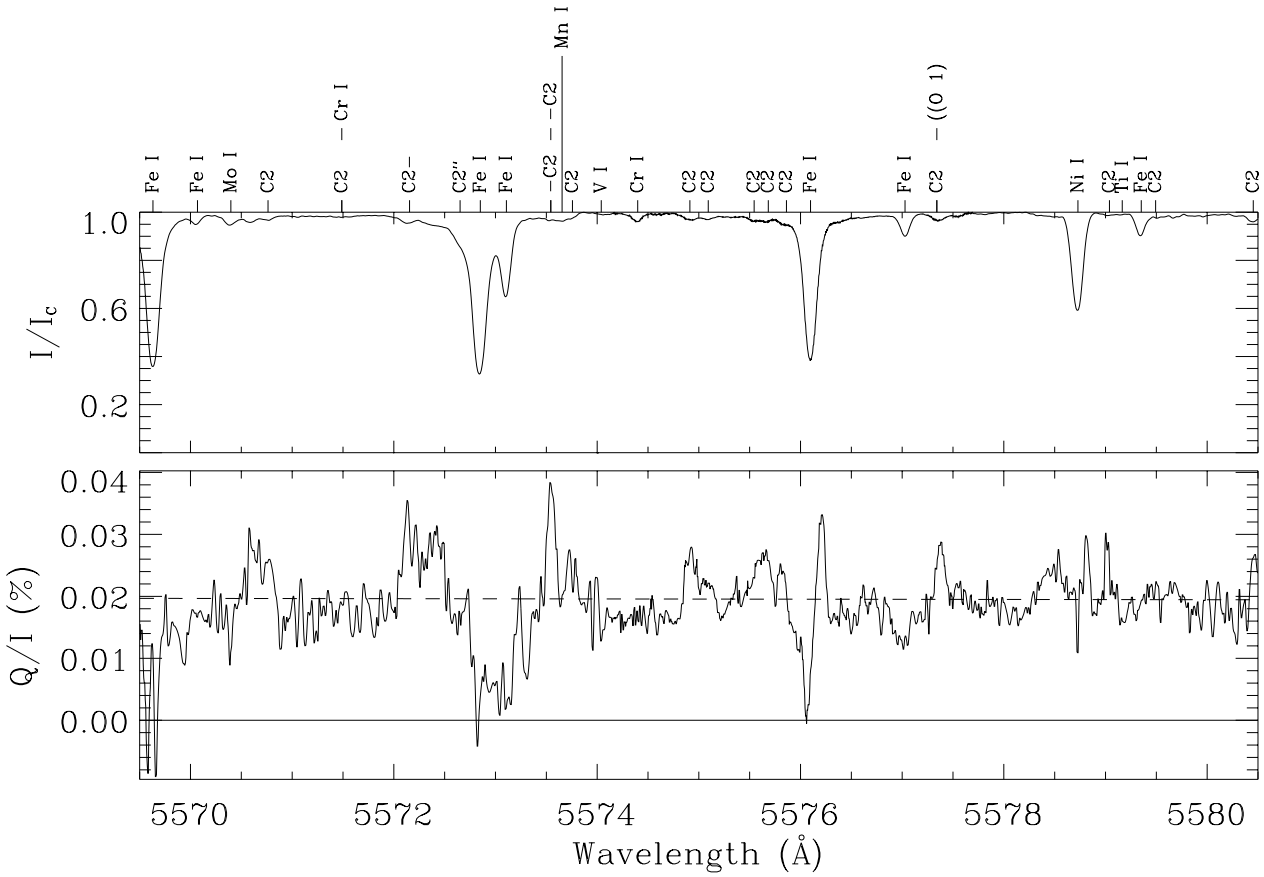

Fe I
Fe II
C2
Fe I
Sc I
Ca I
Fe I
Fe I
Ni I
Y I
//Y 2
Sr I
C2
Fe I
Co I
Co I
C2
Fe I
C2
C2
C2
C2
Co I
Fe II
Fe I
C2
Sc II
C2
C2
Y I
Ti I
C2
C2
Mg I
Fe I
Fe I
Fe I
I/I_c
1.0
0.6
0.2
Q/I (%)
0.04
0.03
0.02
0.01
0.00
−0.01
5520
5522
5524
5526
5528
5530
Wavelength (Å)

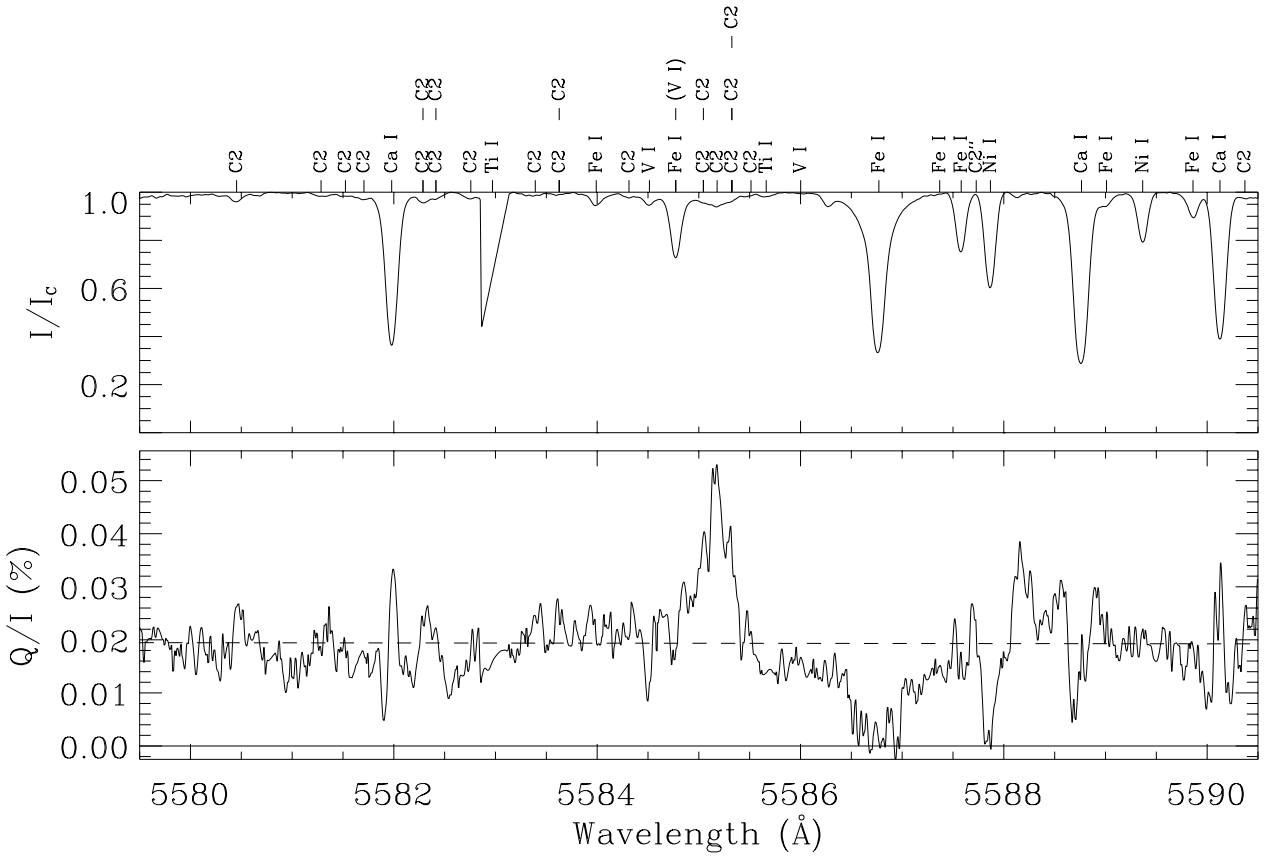

Fe I
Co I
C2
Fe I
C2
C2
P28
PIL
Fe I
Fe I
Mo I
C2
C2
C2
C2
C2
Fe I
Fe II
Fe I
C2
C2
Fe I
Ba I
C2
C2
C2''
Fe I
C2
C2''
Ni I
Mn I
Mn I
Fe I
C2
C2
Fe I
Cr I
C2
Fe I
C2''
C2
C2
1.0
0.6
0.2
I/I_c
0.15
0.10
0.05
0.00
Q/I (%)
5530
5532
5534
5536
5538
5540
Wavelength (Å)

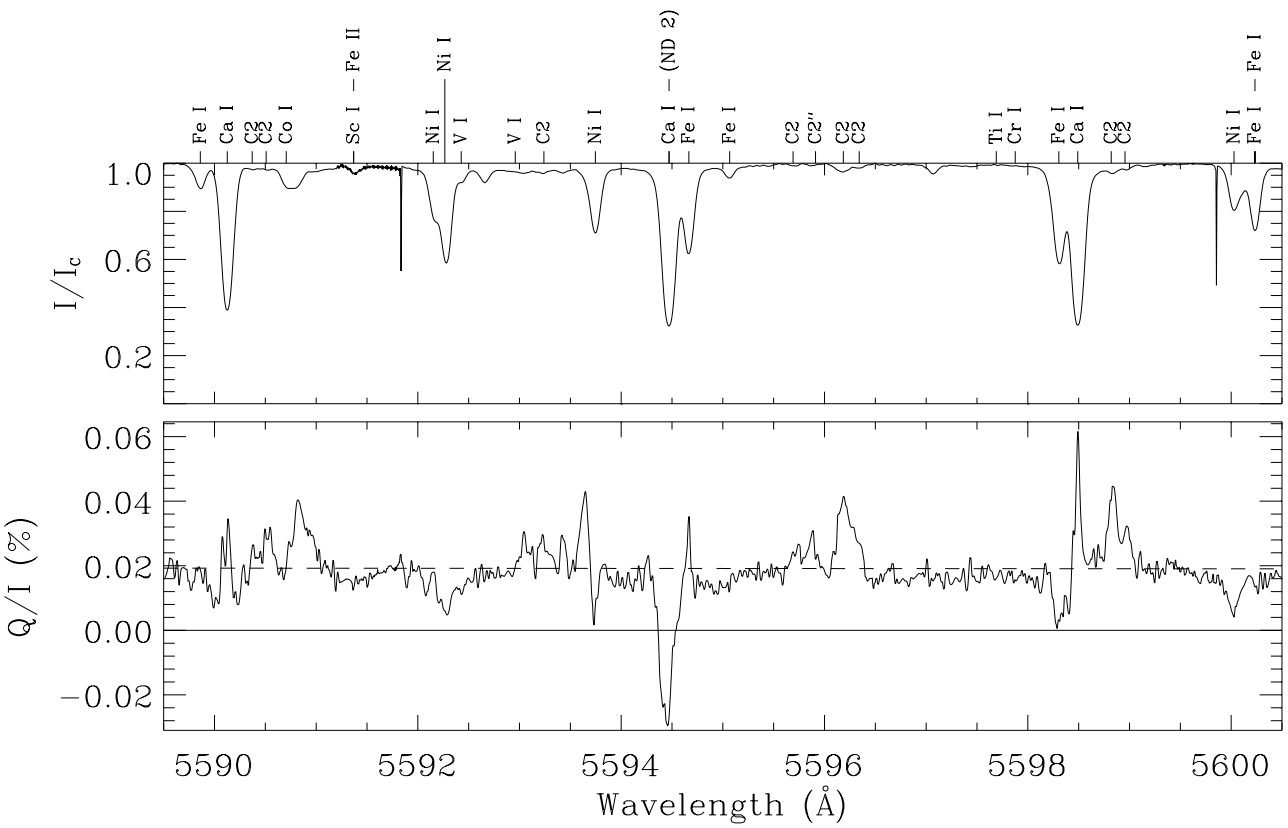

Cr I
C2
Fe I
C2''
C2
C2
C2
C2
C2
Fe I
C2''
C2
Fe I
Fe I
Fe I
Fe I
C2''
Y I
C2
C I
C I
Fe II
V I
Co I
Y II
Fe I
Fe I
V I
C2''
Cr I
C2
Fe I
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.04
0.03
0.02
0.01
0.00
Q/I (%)
5540
5542
5544
5546
5548
5550
Wavelength (Å)

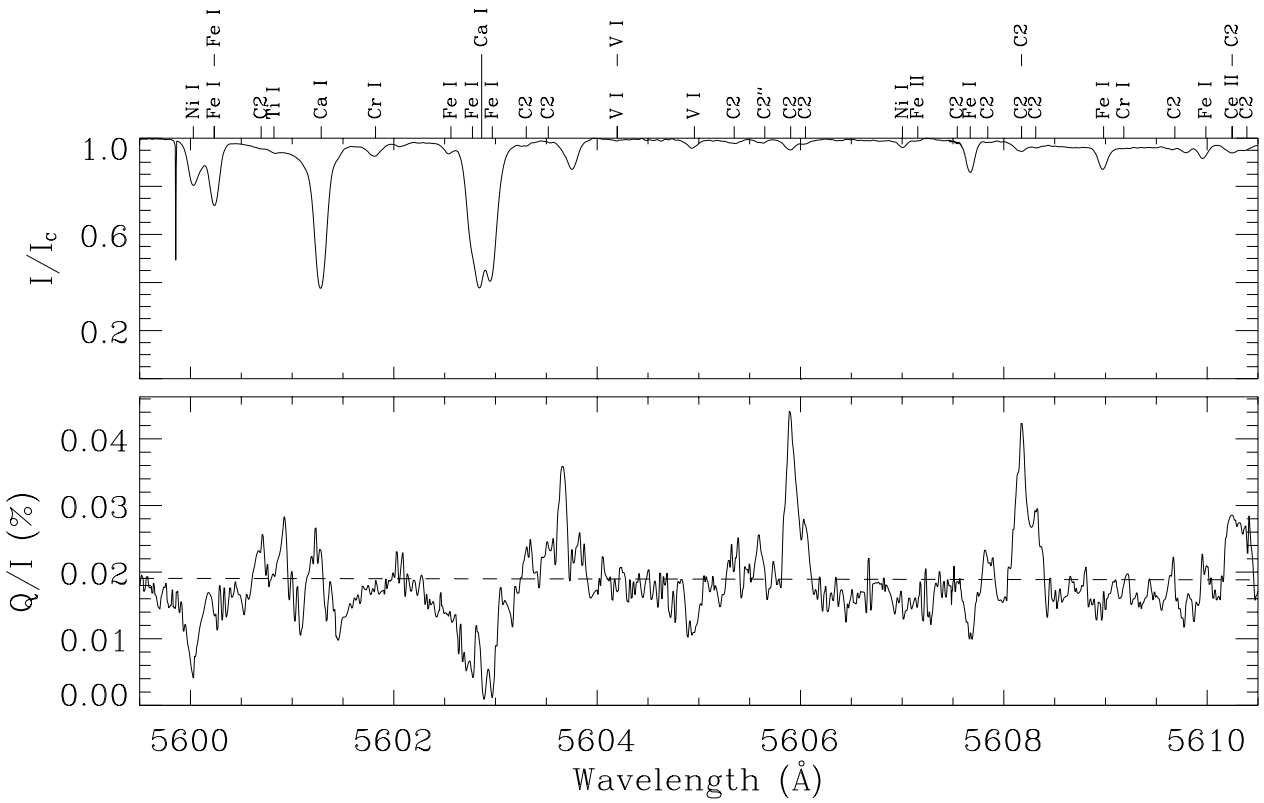

Fe I
Fe I
Fe I
Fe I
C I
Fe I
Mn I
Sc II
Fe I
Fe I
Fe I
Fe I
Ni I
C2
C2
C2
Fe I
Fe I
C2
Cr I
C2
Yb I
C2
Al I
C2
C2
V I
Fe I
Fe I
Al I
C2
V I
Co I
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.04
0.03
0.02
0.01
0.00
Q/I (%)
5550
5552
5554
5556
5558
5560
Wavelength (Å)

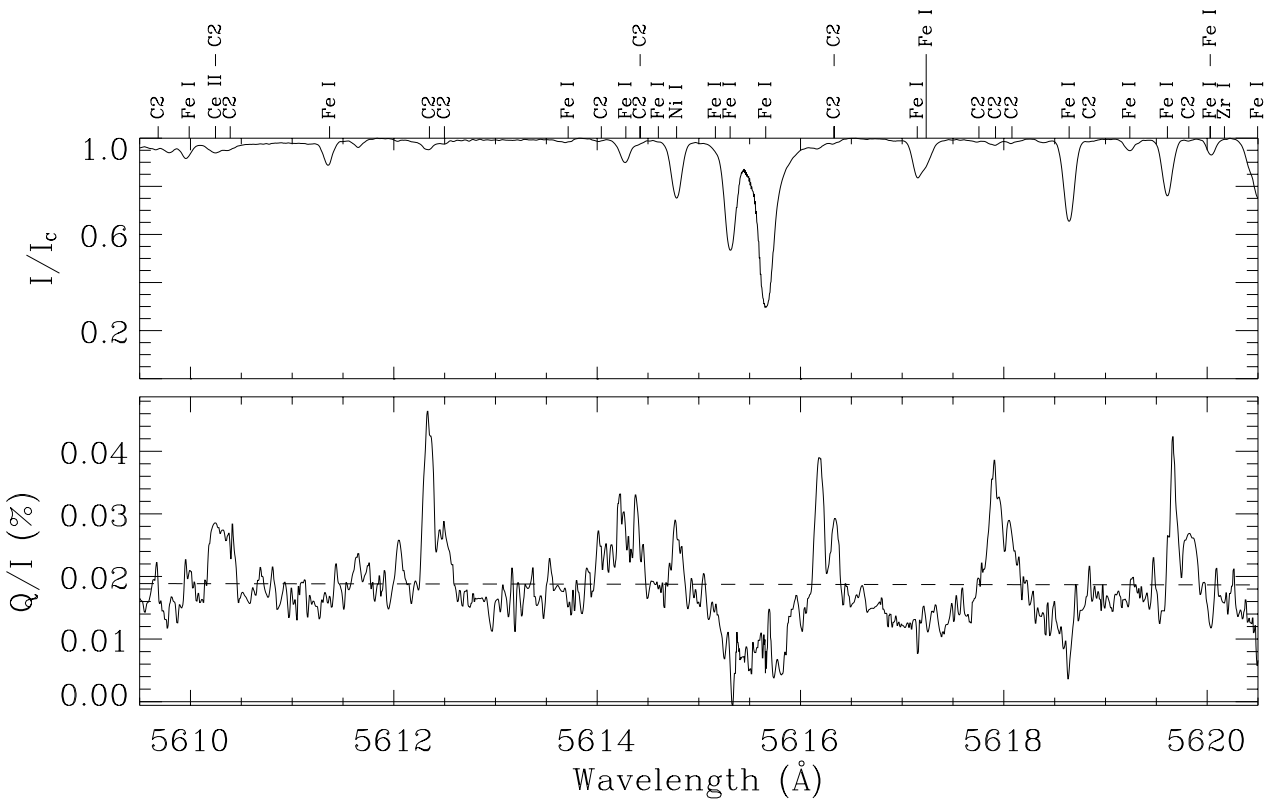

Fe I
Fe I
V I
C2
C2
Fe I
C2
Fe I
Fe I
Fe I
Fe I
C2''
C2
C2
Ti I
Fe I
C2
C2
Cr I
C2
Fe I
Y I
Fe I
Cr I
Fe I
Fe I
Fe I
Fe I
Fe I
Mo I
1.0
0.6
0.2
I/I_c
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Q/I (%)
5560
5562
5564
5566
5568
5570
Wavelength (Å)

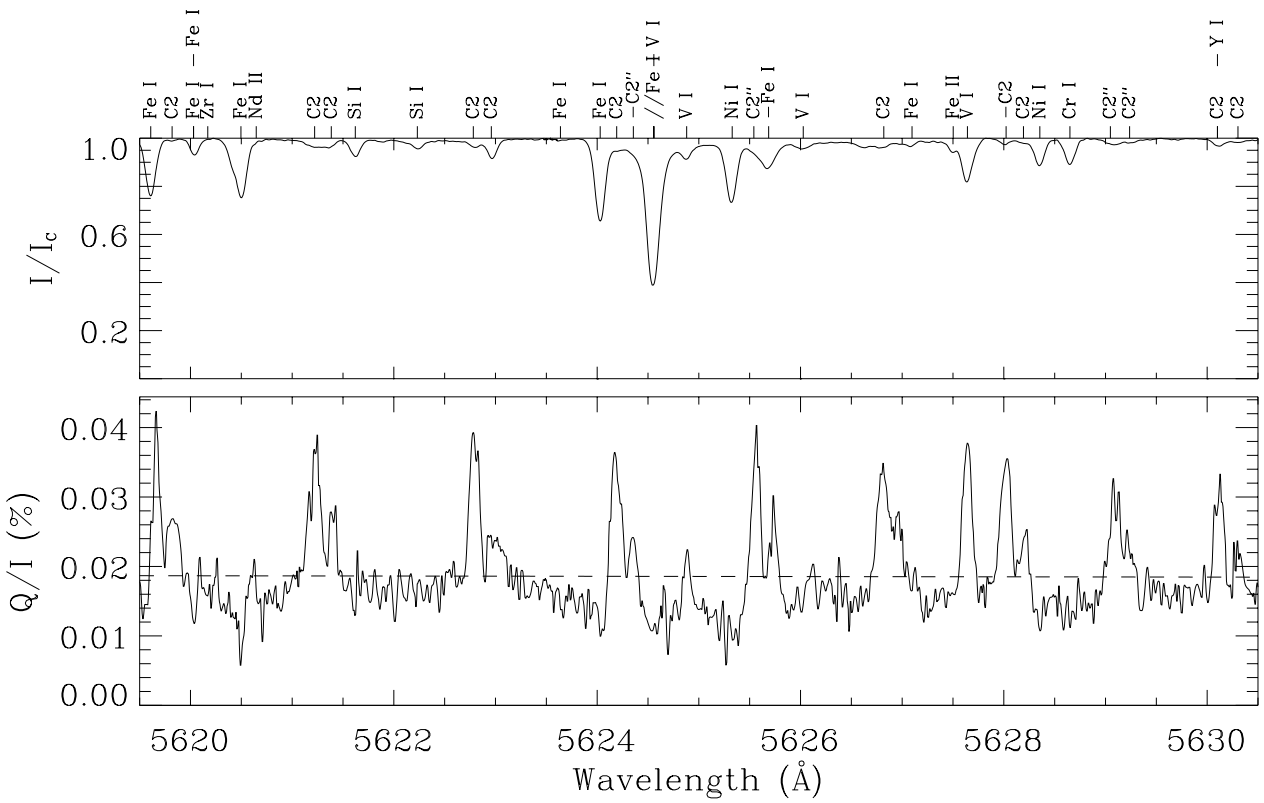

Fe I
Fe I
Mo I
C2
Cr I
C2
C2
C2''
Fe I
Fe I
C2
Mn I
C2
C2
V I
Cr I
C2
C2
C2
C2
C2
Fe I
Fe I
C2
(O I)
Ni I
C2
Ti I
Fe I
C2
C2
1.0
0.6
0.2
I/I_c
0.04
0.03
0.02
0.01
0.00
Q/I (%)
5570
5572
5574
5576
5578
5580
Wavelength (Å)

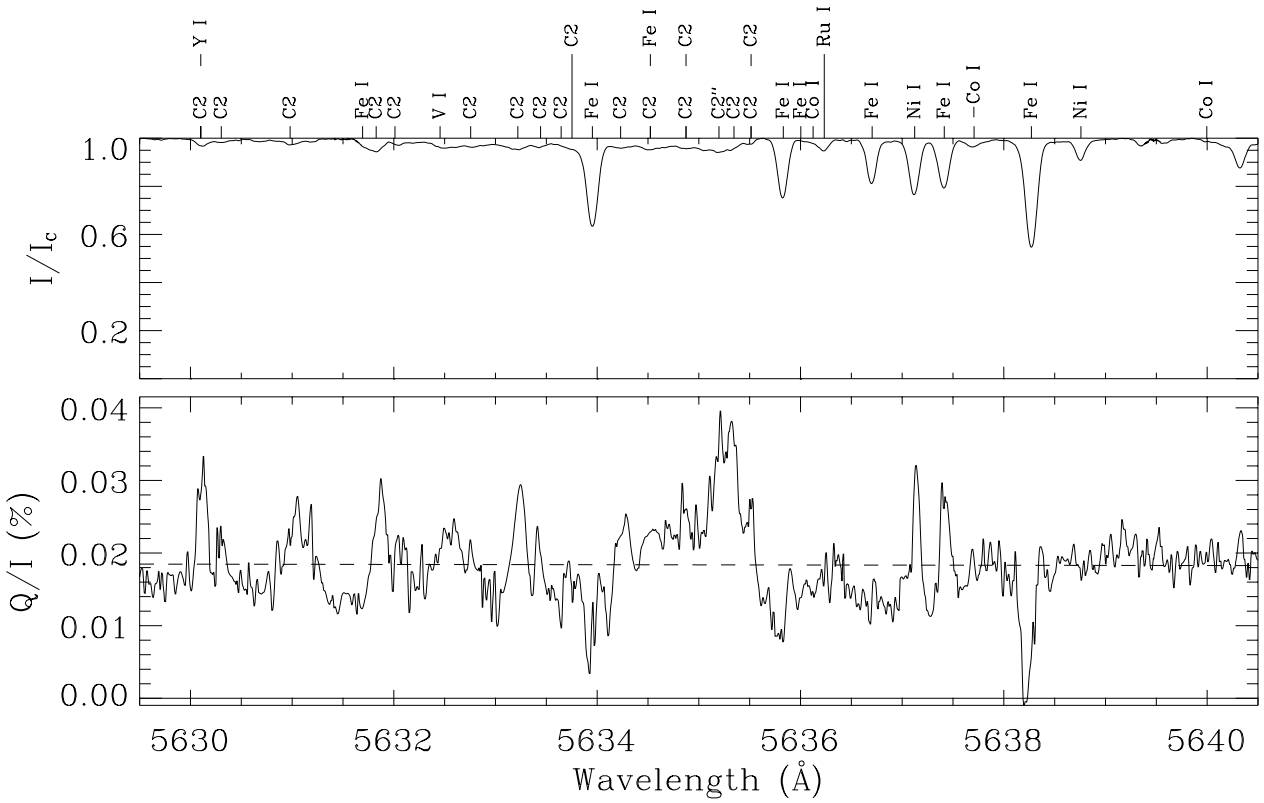

C2
C2
C2
C2
Ca I
C2
C2
C2
C2
Ti I
C2
C2
C2
Fe I
C2
V I
Fe I
(V I)
C2
C2
C2
C2
C2
C2
Ti I
V I
Fe I
Fe I
Fe I
C2
Ni I
Ca I
Fe I
Ni I
Fe I
Ca I
C2
1.0
0.6
0.2
I/I_c
0.05
0.04
0.03
0.02
0.01
0.00
Q/I (%)
5580
5582
5584
5586
5588
5590
Wavelength (Å)

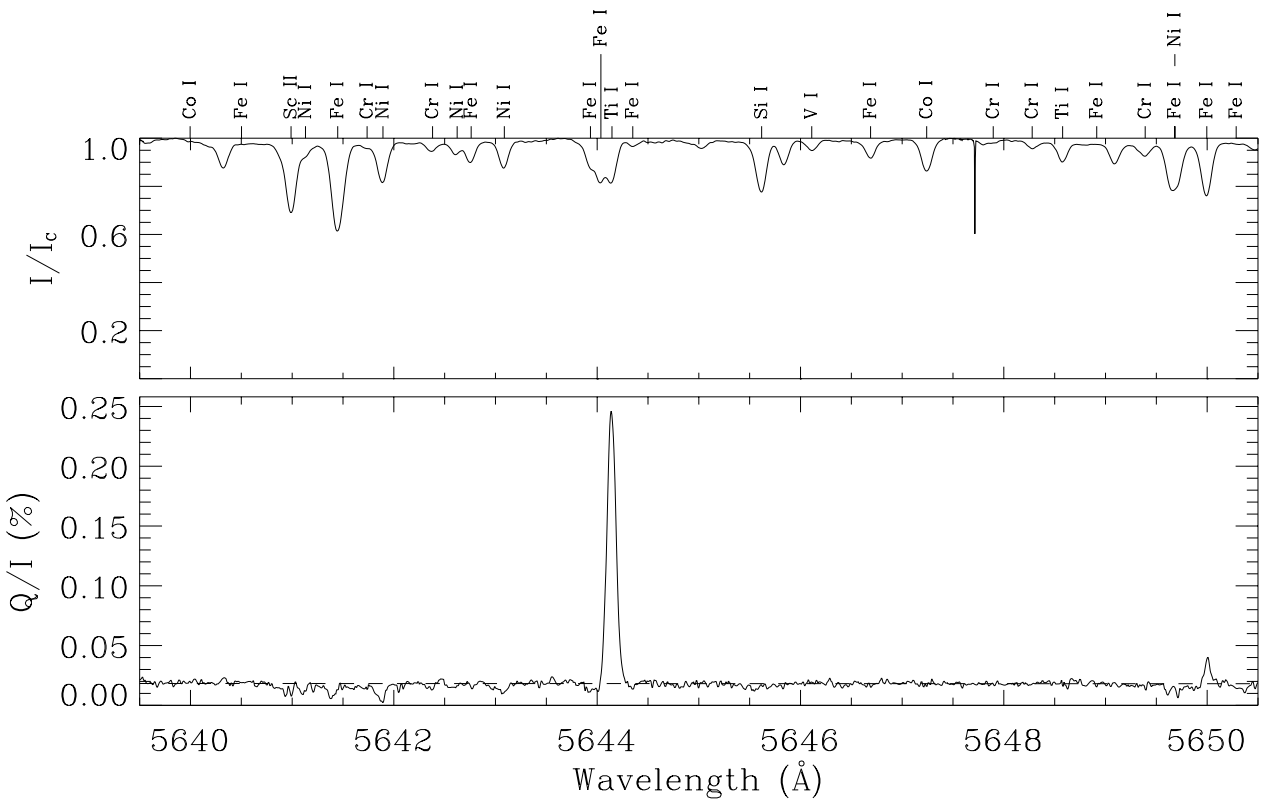

Fe I
Ca I
C2
C2
C2
Co I
Sc I – Fe II
Ni I
Ni I
V I
V I
C2
Ni I
Ca I – (ND 2)
Fe I
Fe I
C2
C2''
C2
C2
Ti I
Cr I
Fe I
Ca I
C2
C2
C2
Ni I
Fe I – Fe I
1.0
0.6
0.2
I/I_c
0.06
0.04
0.02
0.00
−0.02
Q/I (%)
5590
5592
5594
5596
5598
5600
Wavelength (Å)

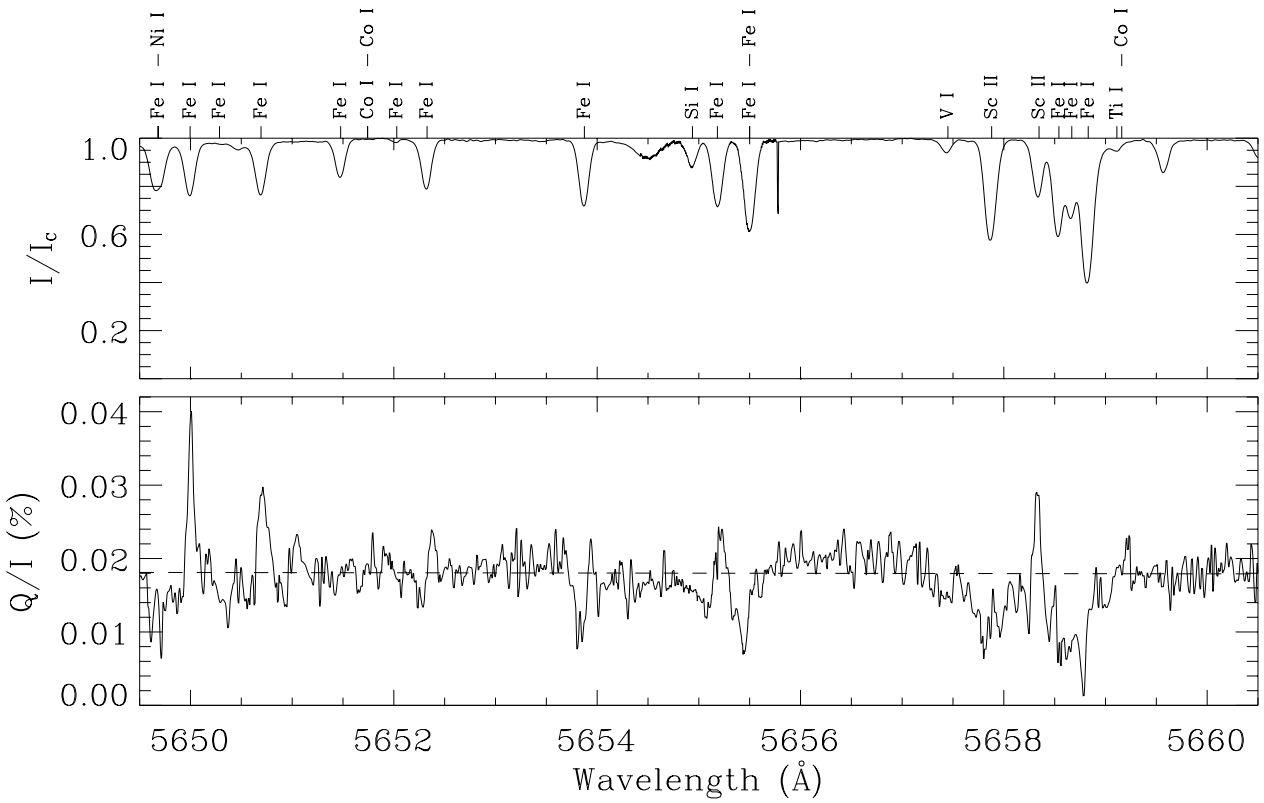

Ni I
Fe I
Fe I
C2
Ti I
Ca I
Cr I
Fe I
Fe I
Ca I
Fe I
C2
C2
V I
V I
V I
C2
C2''
C2
C2
Ni I
Fe II
C2
Fe I
C2
C2
C2
Fe I
Cr I
C2
Fe I
Ce II
C2
C2
1.0
0.6
0.2
I/I_c
0.04
0.03
0.02
0.01
0.00
Q/I (%)
5600
5602
5604
5606
5608
5610
Wavelength (Å)

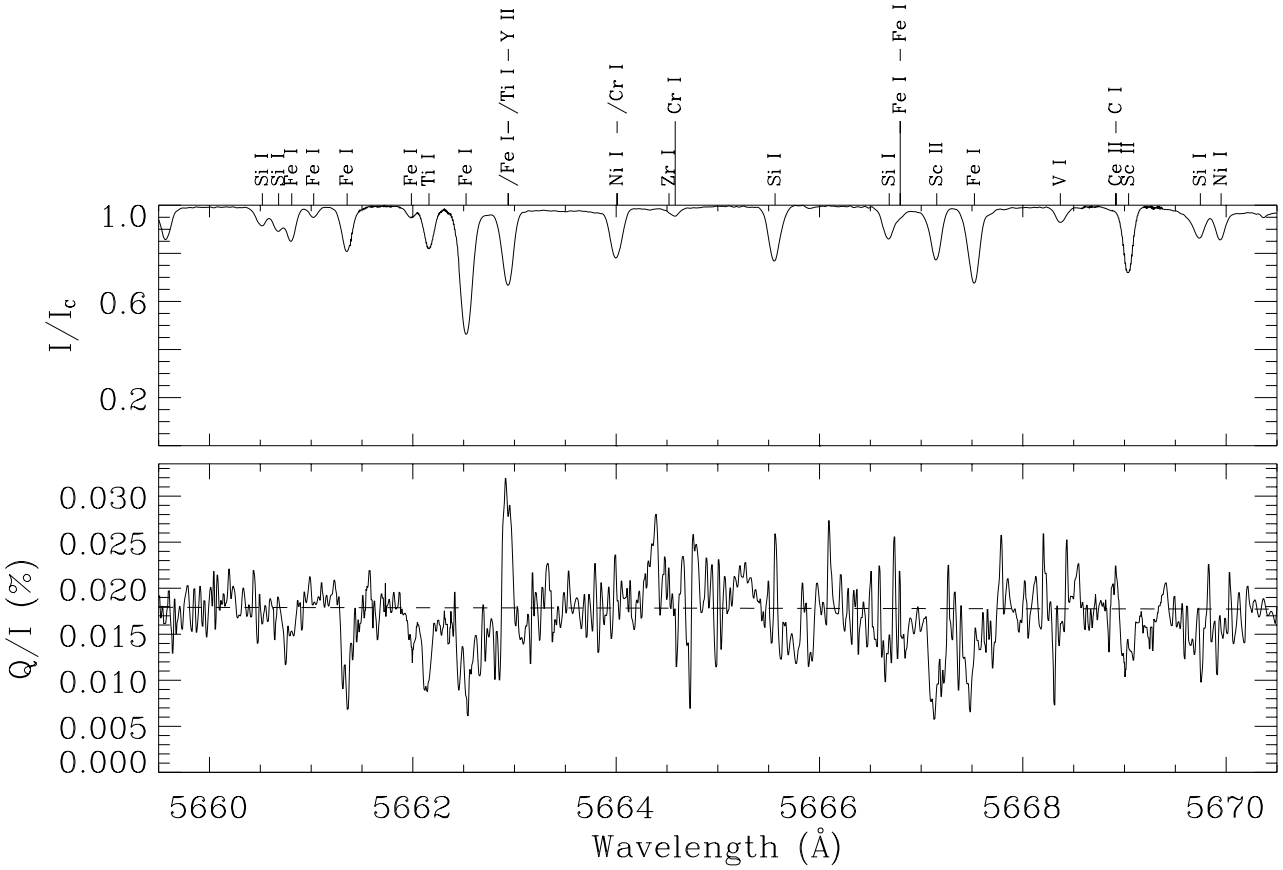

C2
Fe I
Ce II – C2
C2
Fe I
C2
C2
Fe I
C2
Fe I
C2
Fe I
Ni I
Fe I
Fe I
Fe I
C2
Fe I
C2
C2
C2
Fe I
C2
Fe I
Fe I
C2
Fe I
Zr I
Fe I
I/I$_c$
1.0
0.6
0.2
Q/I (%)
0.04
0.03
0.02
0.01
0.00
5610
5612
5614
5616
5618
5620
Wavelength (Å)

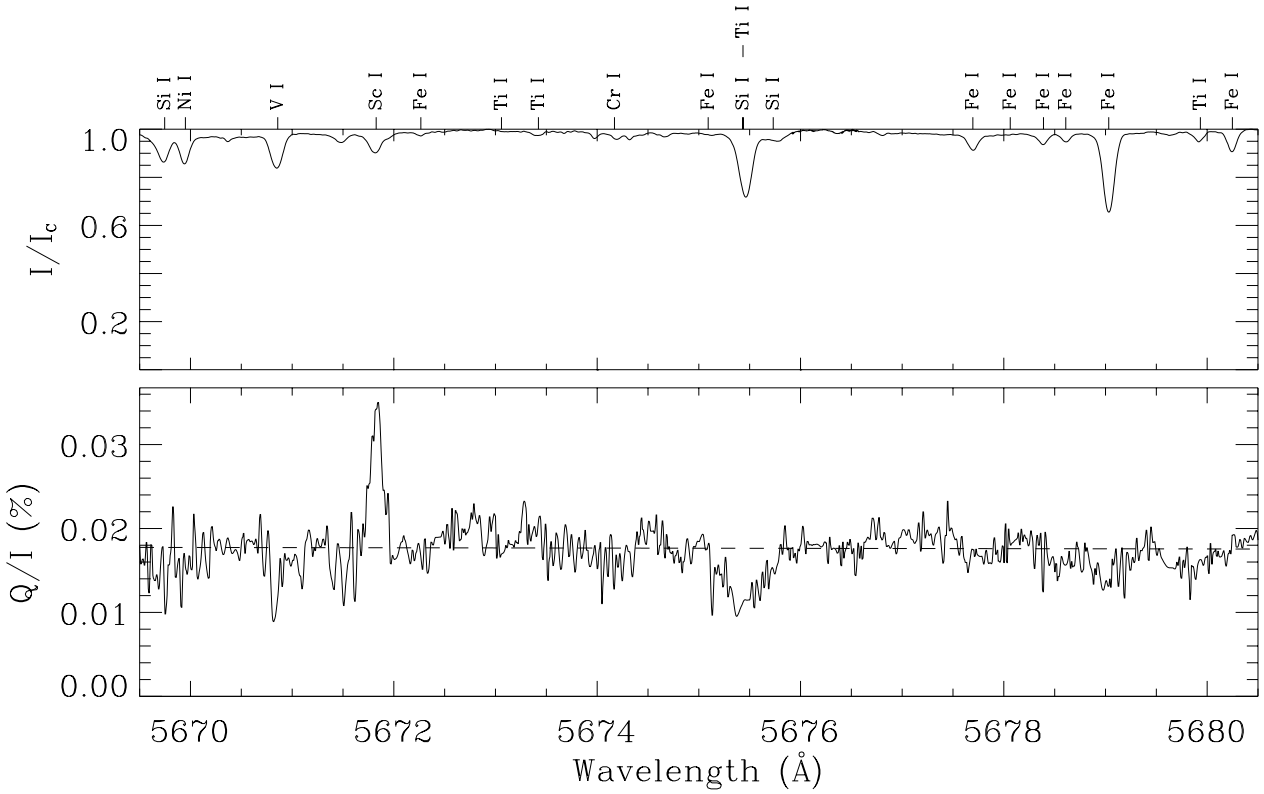

Fe I
C2
Fe I
Zr I
Fe I
Nd II
C2
C2
Si I
Si I
C2
C2
Fe I
Fe I
C2
C2''
Fe + V I
V I
Ni I
C2''
Fe I
V I
C2
Fe I
Fe II
V I
C2
C2
Ni I
Cr I
C2''
C2''
Y I
C2
C2
1.0
0.6
0.2
I/I_c
0.04
0.03
0.02
0.01
0.00
Q/I (%)
5620
5622
5624
5626
5628
5630
Wavelength (Å)

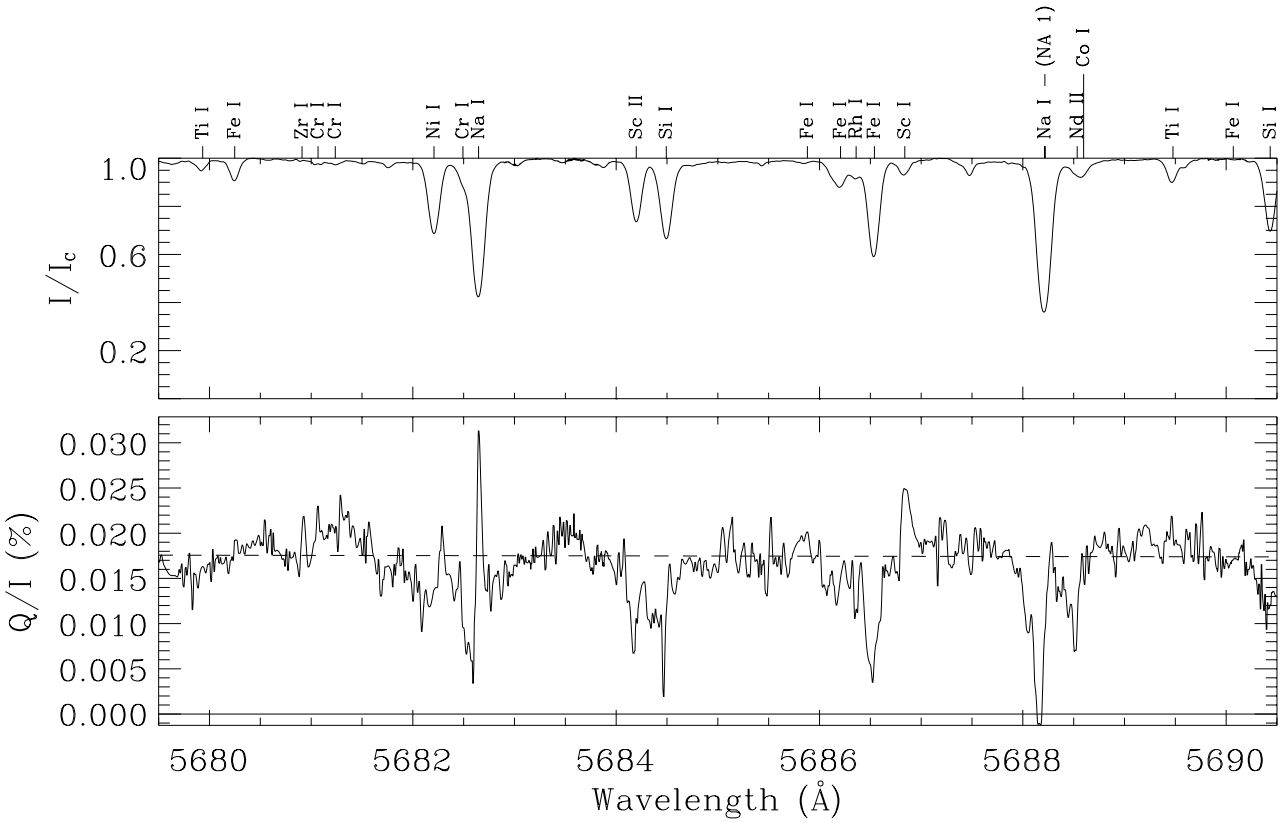

Y I
C2
C2
C2
Fe I
C2
C2
V I
C2
C2
C2
C2
C2
Fe I
C2
C2
C2
C2
C2
C2
C2
Fe I
Fe I
Co I
Ru I
Fe I
Ni I
Fe I
Co I
Fe I
Ni I
Co I
1.0
0.6
0.2
I/I_c
0.04
0.03
0.02
0.01
0.00
Q/I (%)
5630
5632
5634
5636
5638
5640
Wavelength (Å)

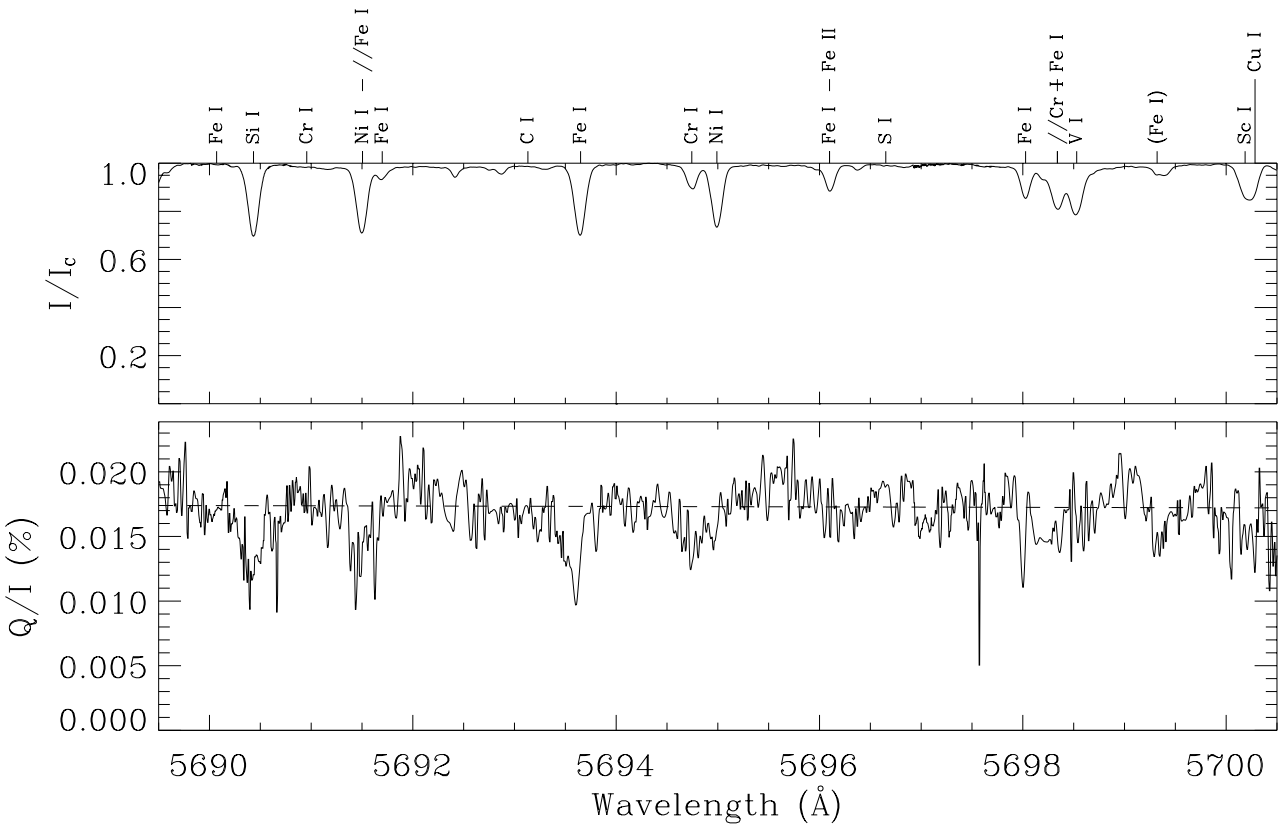

Co I
Fe I
Sc II
Ni I
Fe I
Cr I
Ni I
Cr I
Ni I
Fe I
Ni I
Fe I
Fe I
Ti I
Fe I
Si I
V I
Fe I
Co I
Cr I
Cr I
Ti I
Fe I
Cr I
Fe I – Ni I
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.25
0.20
0.15
0.10
0.05
0.00
Q/I (%)
5640
5642
5644
5646
5648
5650
Wavelength (Å)

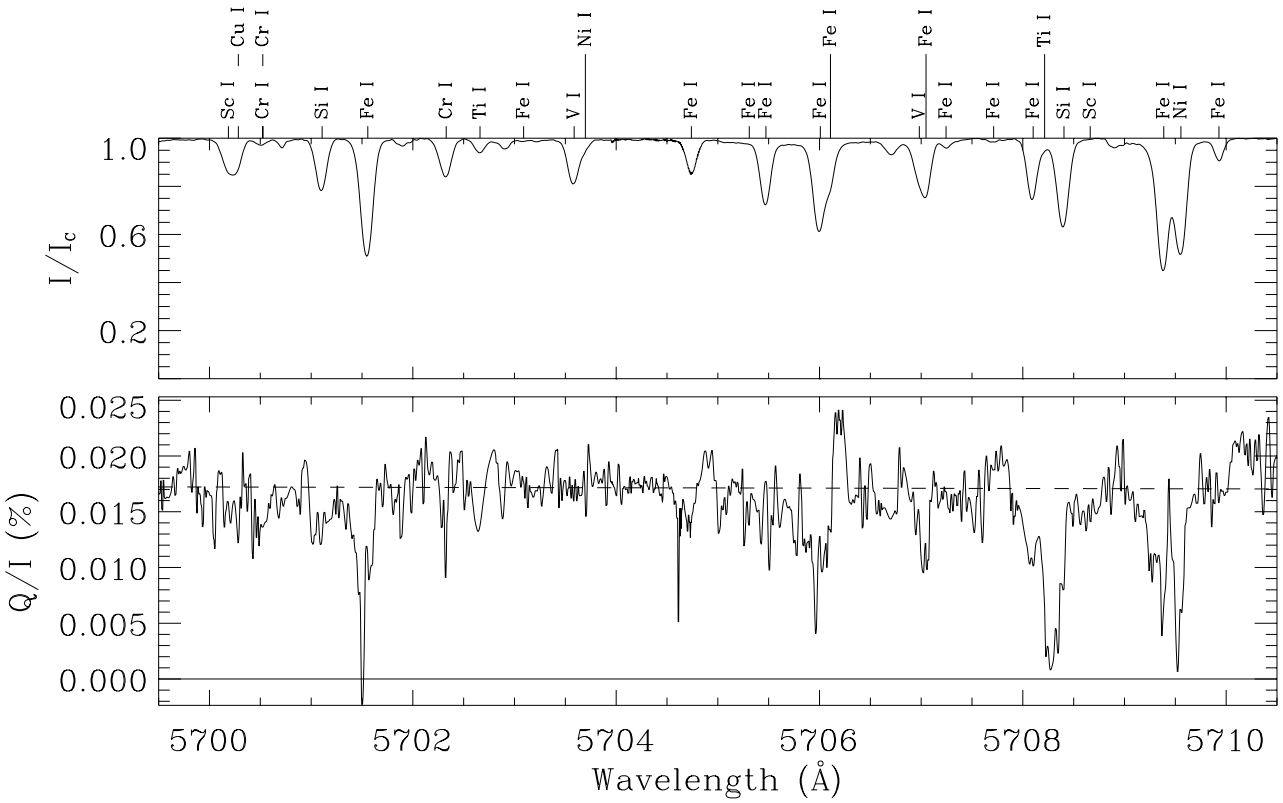

Fe I
Ni I
Fe I
Fe I
Fe I
Fe I
Co I
Co I
Fe I
Fe I
Fe I
Si I
Fe I
Fe I
Fe I
V I
Sc II
Sc II
Fe I
Fe I
Fe I
Ti I
Co I
1.0
0.6
0.2
I/I_c
0.04
0.03
0.02
0.01
0.00
Q/I (%)
5650
5652
5654
5656
5658
5660
Wavelength (Å)

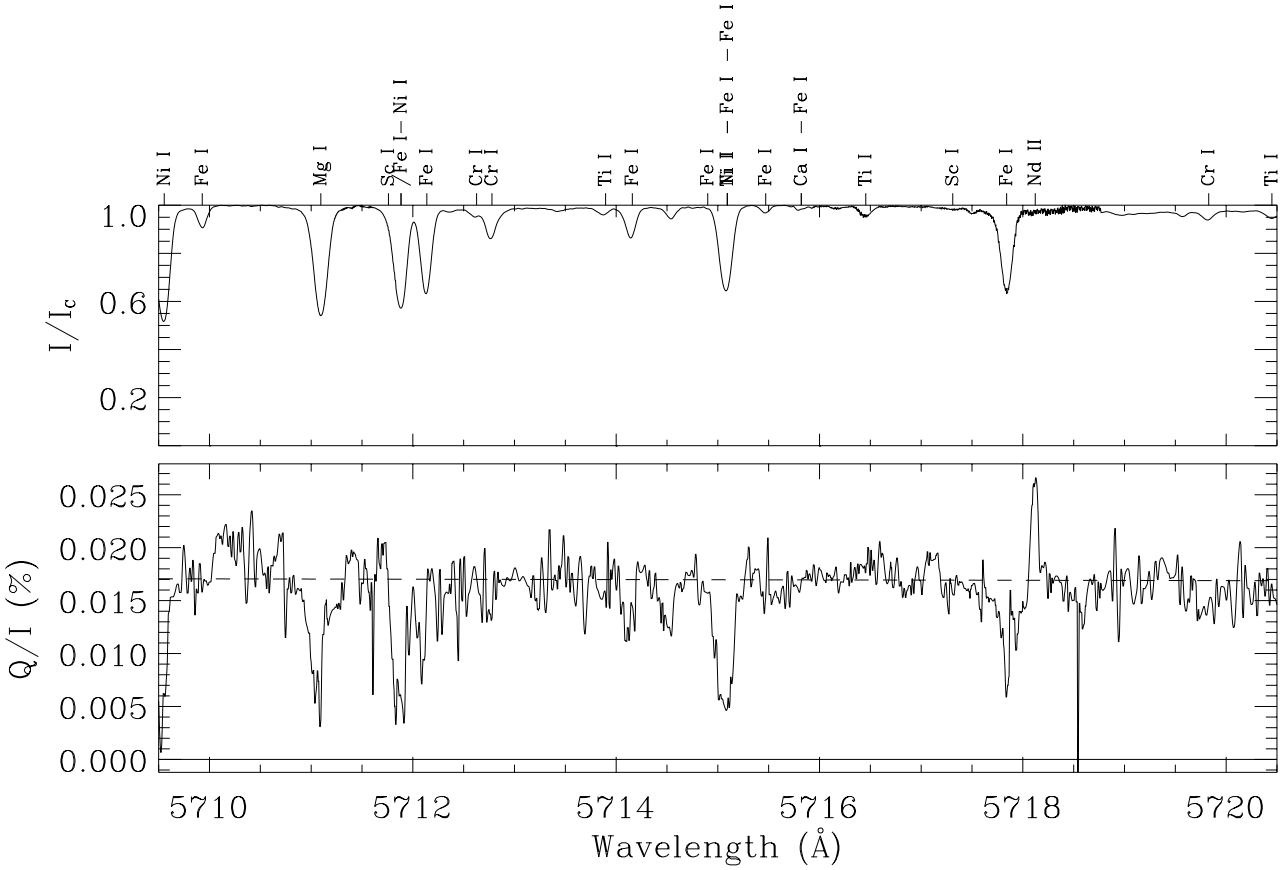

Si I
Si I
Fe I
Fe I
Fe I
Fe I
Ti I
Fe I
/Fe I– /Ti I – Y II
Ni I – /Cr I
Zr I
Cr I
Si I
Si I
Fe I – Fe I
Sc II
Fe I
V I
Ce II – C I
Sc II
Si I
Ni I
1.0
0.6
0.2
I/I_c
0.030
0.025
0.020
0.015
0.010
0.005
0.000
Q/I (%)
5660
5662
5664
5666
5668
5670
Wavelength (Å)

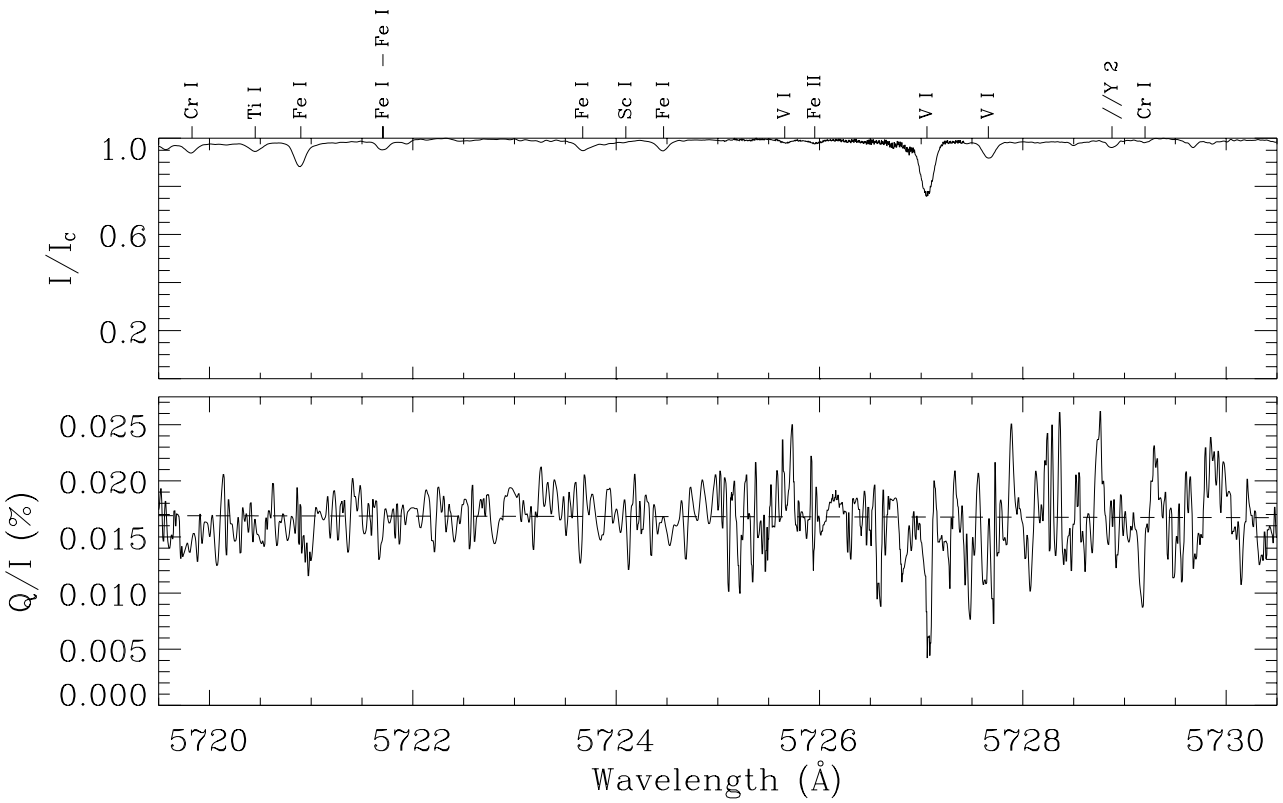

Si I
Ni I
V I
Sc I
Fe I
Ti I
Ti I
Cr I
Fe I
Si I
Ti I
Si I
Fe I
Fe I
Fe I
Fe I
Fe I
Ti I
Fe I
1.0
0.6
0.2
I/I_c
0.03
0.02
0.01
0.00
Q/I (%)
5670
5672
5674
5676
5678
5680
Wavelength (Å)

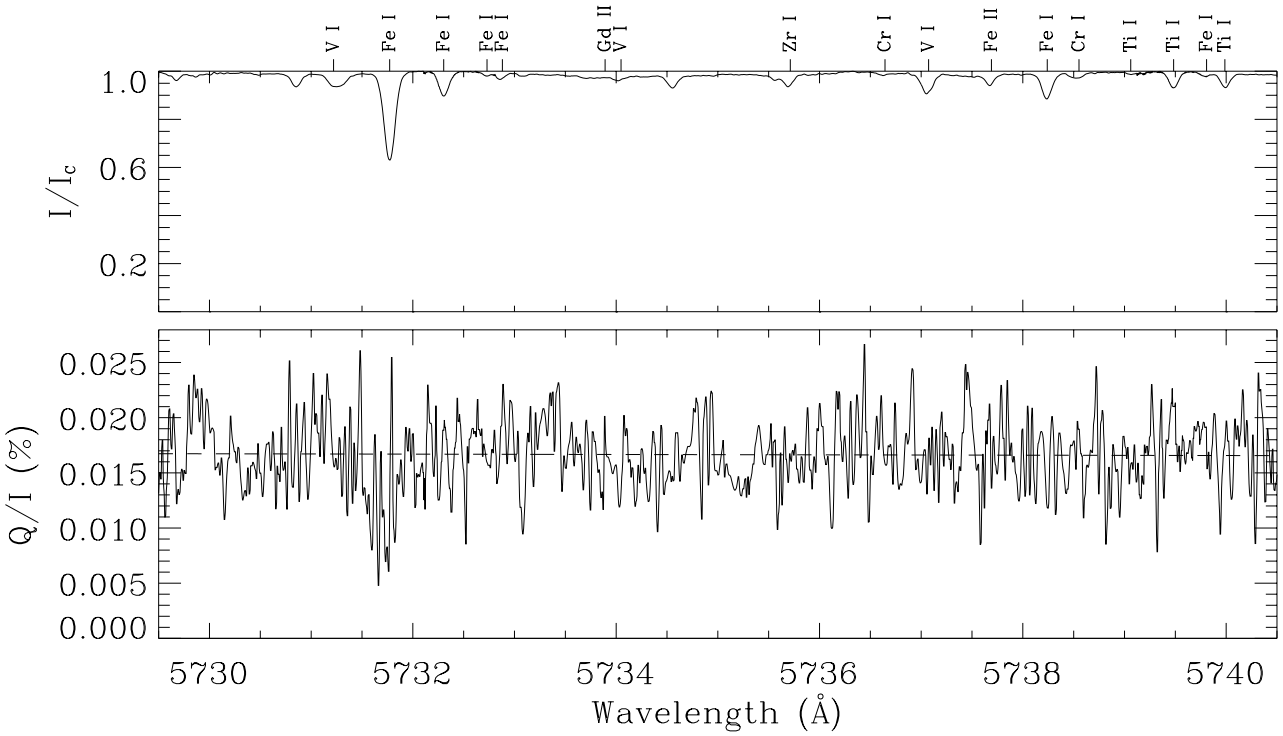

Ti I
Fe I
Zr I
Cr I
Cr I
Ni I
Cr I
Na I
Sc II
Si I
Fe I
Fe I
Rh I
Fe I
Sc I
Na I – (NA 1)
Nd II
Co I
Ti I
Fe I
Si I
1.0
0.6
0.2
I/I_c
0.030
0.025
0.020
0.015
0.010
0.005
0.000
Q/I (%)
5680
5682
5684
5686
5688
5690
Wavelength (Å)

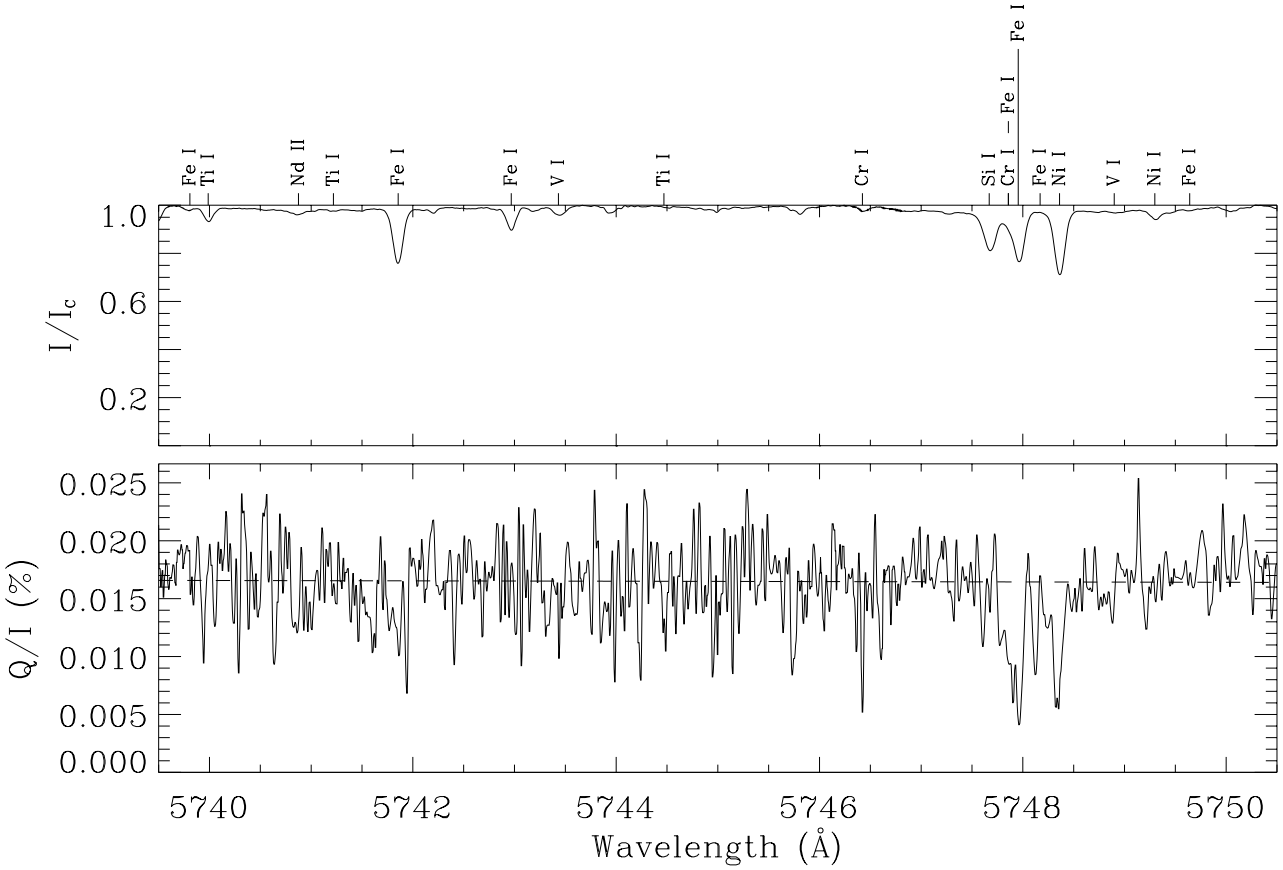

Fe I
Si I
Cr I
Ni I – //Fe I
Fe I
C I
Fe I
Cr I
Ni I
Fe I – Fe II
S I
Fe I
//Cr + Fe I
V I
(Fe I)
Sc I
Cu I
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
Q/I (%)
5690
5692
5694
5696
5698
5700
Wavelength (Å)

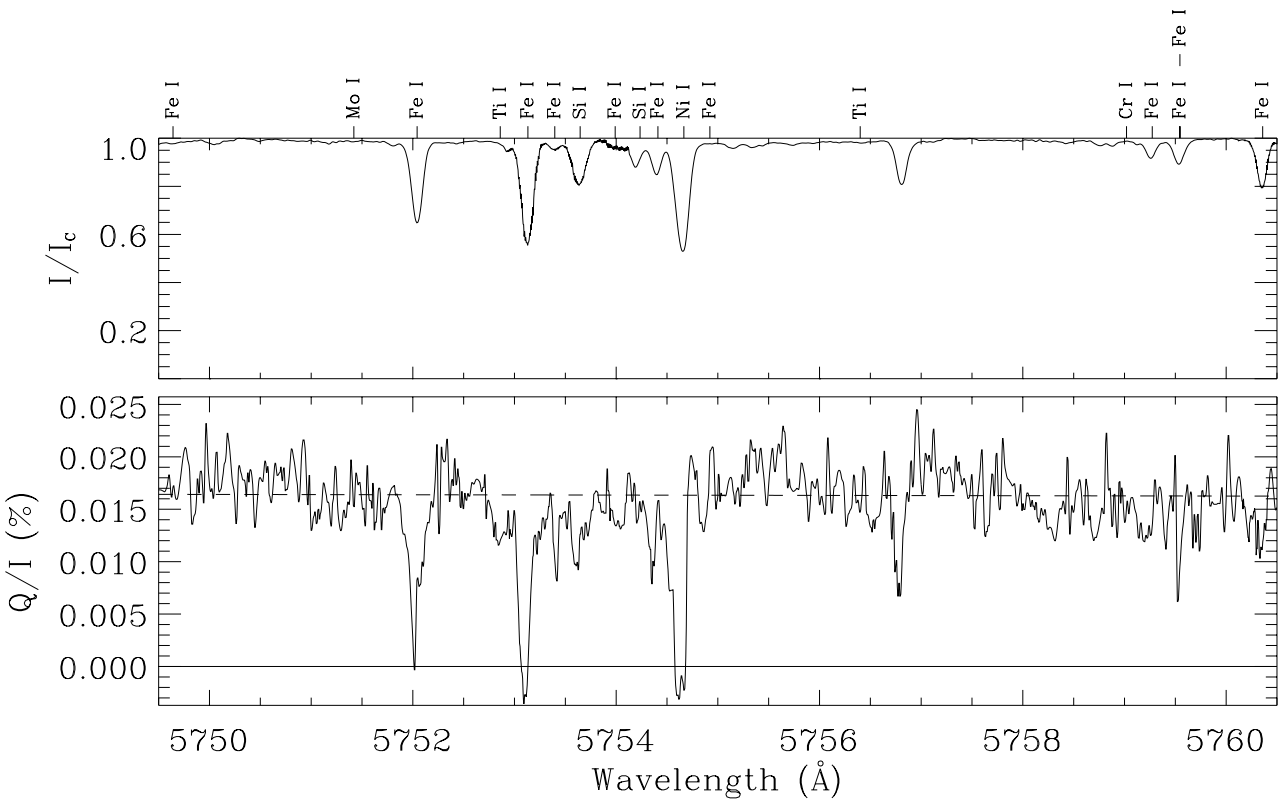

Sc I
Cu I
Cr I
Cr I
Si I
Fe I
Cr I
Ti I
Fe I
V I
Ni I
Fe I
Fe I
Fe I
Fe I
Fe I
V I
Fe I
Fe I
Fe I
Ti I
Si I
Sc I
Fe I
Ni I
Fe I
1.0
0.6
0.2
I/I_c
0.025
0.020
0.015
0.010
0.005
0.000
Q/I (%)
5700
5702
5704
5706
5708
5710
Wavelength (Å)

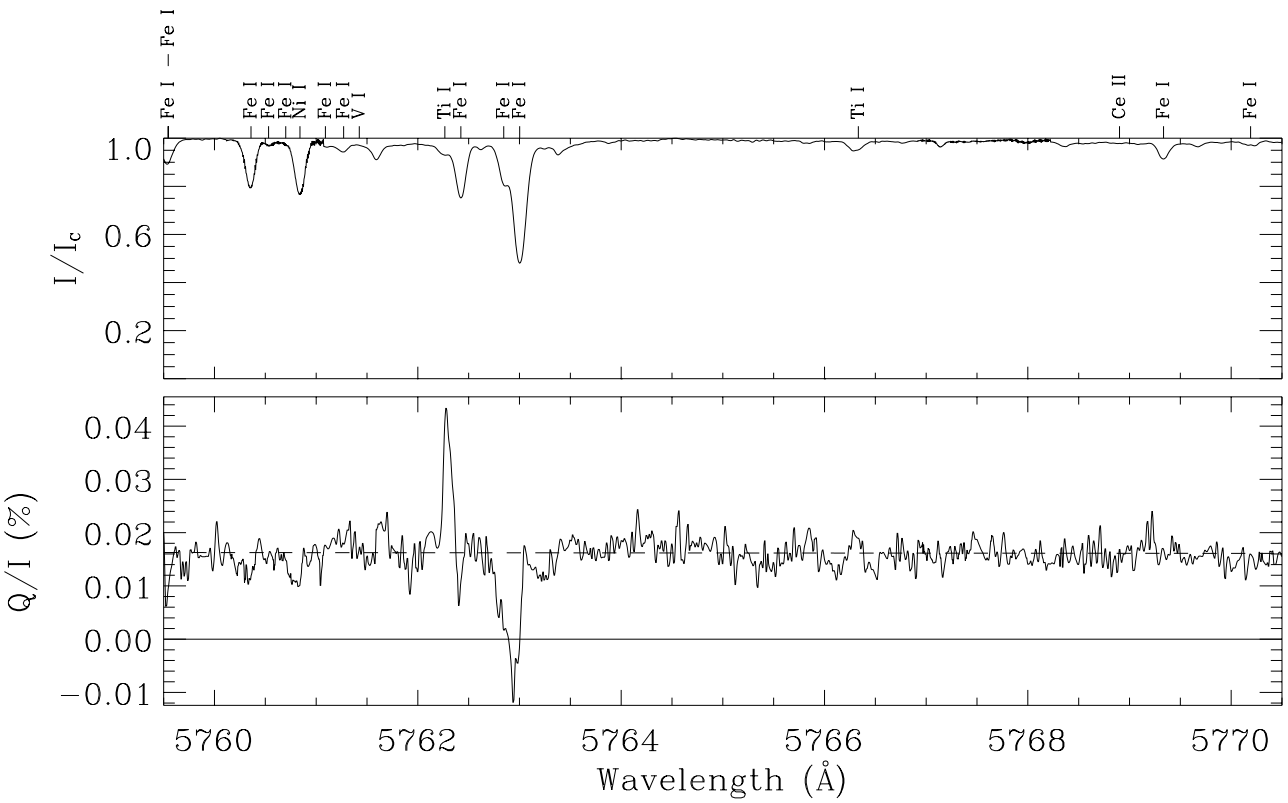

Ni I
Fe I
Mg I
Sc I
Fe I
Ni I
Fe I
Cr I
Cr I
Ti I
Fe I
Fe I
Fe I
Fe I
Fe I
Ca I
Fe I
Ti I
Sc I
Fe I
Nd II
Cr I
Ti I
1.0
0.6
0.2
I/I_c
0.025
0.020
0.015
0.010
0.005
0.000
Q/I (%)
5710
5712
5714
5716
5718
5720
Wavelength (Å)

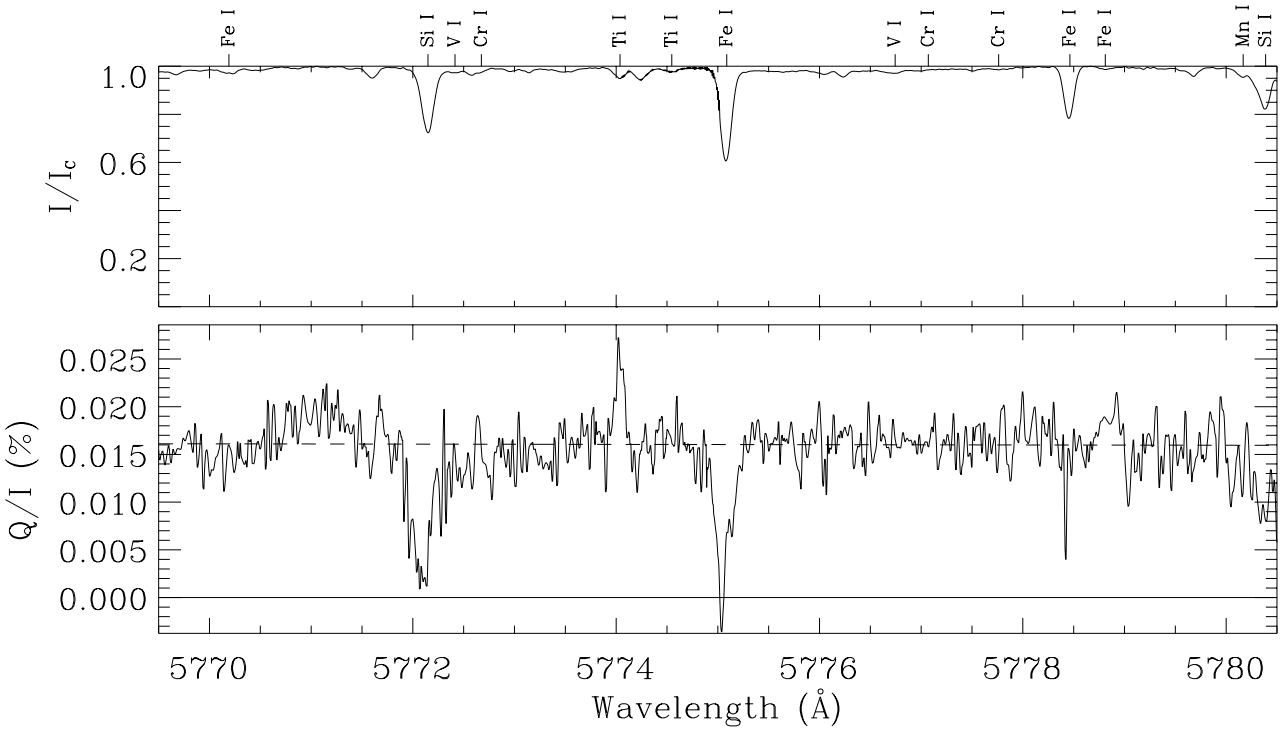

Cr I
Ti I
Fe I
Fe I – Fe I
Fe I
Sc I
Fe I
V I
Fe II
V I
V I
//Y 2
Cr I
1.0
0.6
0.2
I/I$_c$
0.025
0.020
0.015
0.010
0.005
0.000
Q/I (%)
5720
5722
5724
5726
5728
5730
Wavelength (Å)

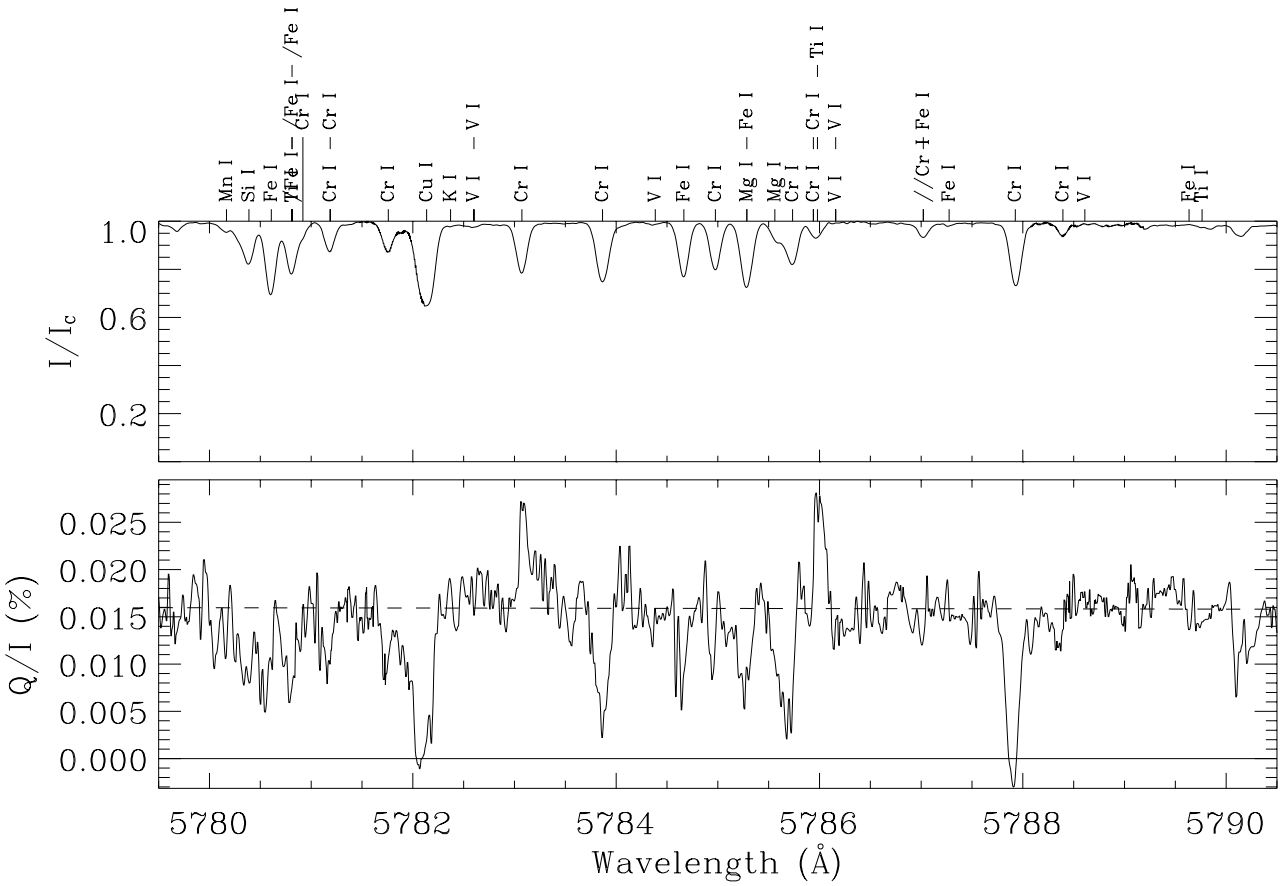

V I
Fe I
Fe I
Fe I
Fe I
Gd II
V I
Zr I
Cr I
V I
Fe II
Fe I
Cr I
Ti I
Ti I
Fe I
Ti I
1.0
0.6
0.2
I/I_c
0.025
0.020
0.015
0.010
0.005
0.000
Q/I (%)
5730
5732
5734
5736
5738
5740
Wavelength (Å)

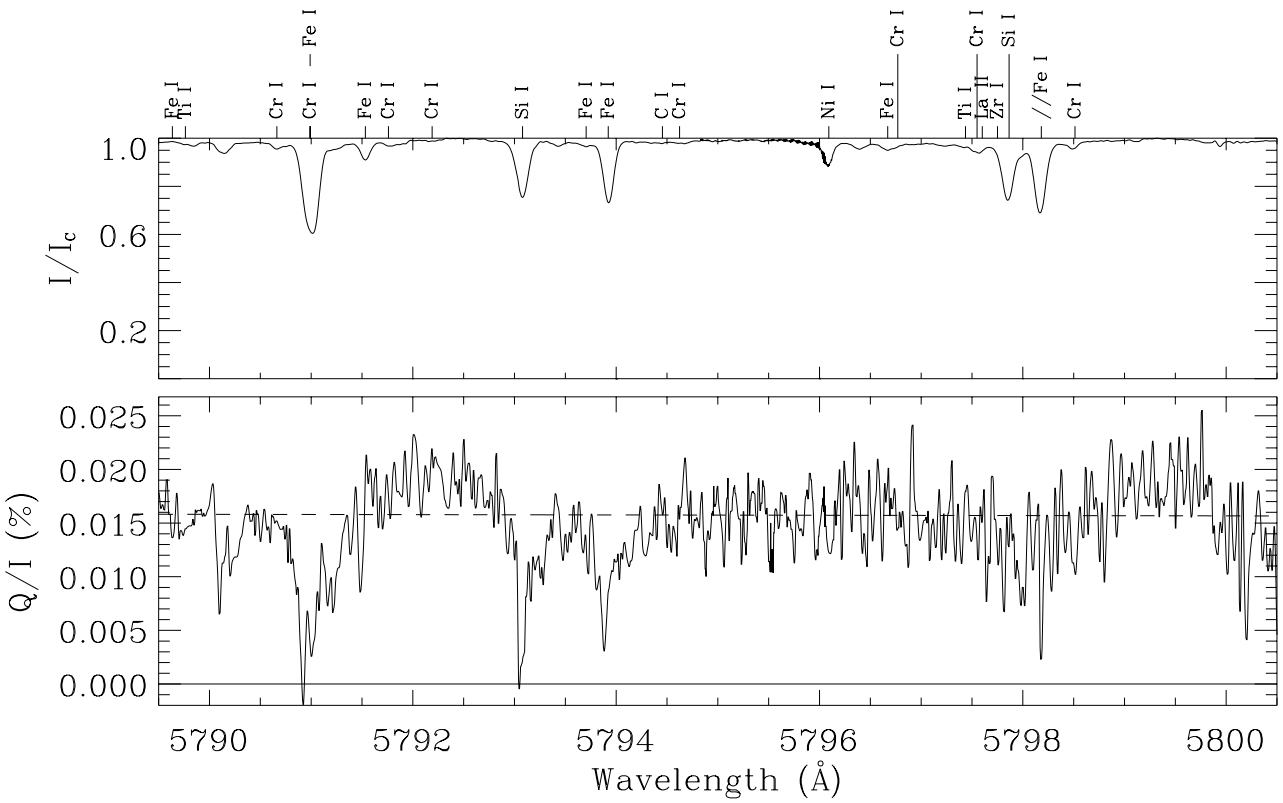

Fe I
Ti I
Nd II
Ti I
Fe I
Fe I
V I
Ti I
Cr I
Si I
Cr I
Fe I
Fe I
Fe I
Ni I
V I
Ni I
Fe I
1.0
0.6
0.2
I/I_c
0.025
0.020
0.015
0.010
0.005
0.000
Q/I (%)
5740
5742
5744
5746
5748
5750
Wavelength (Å)

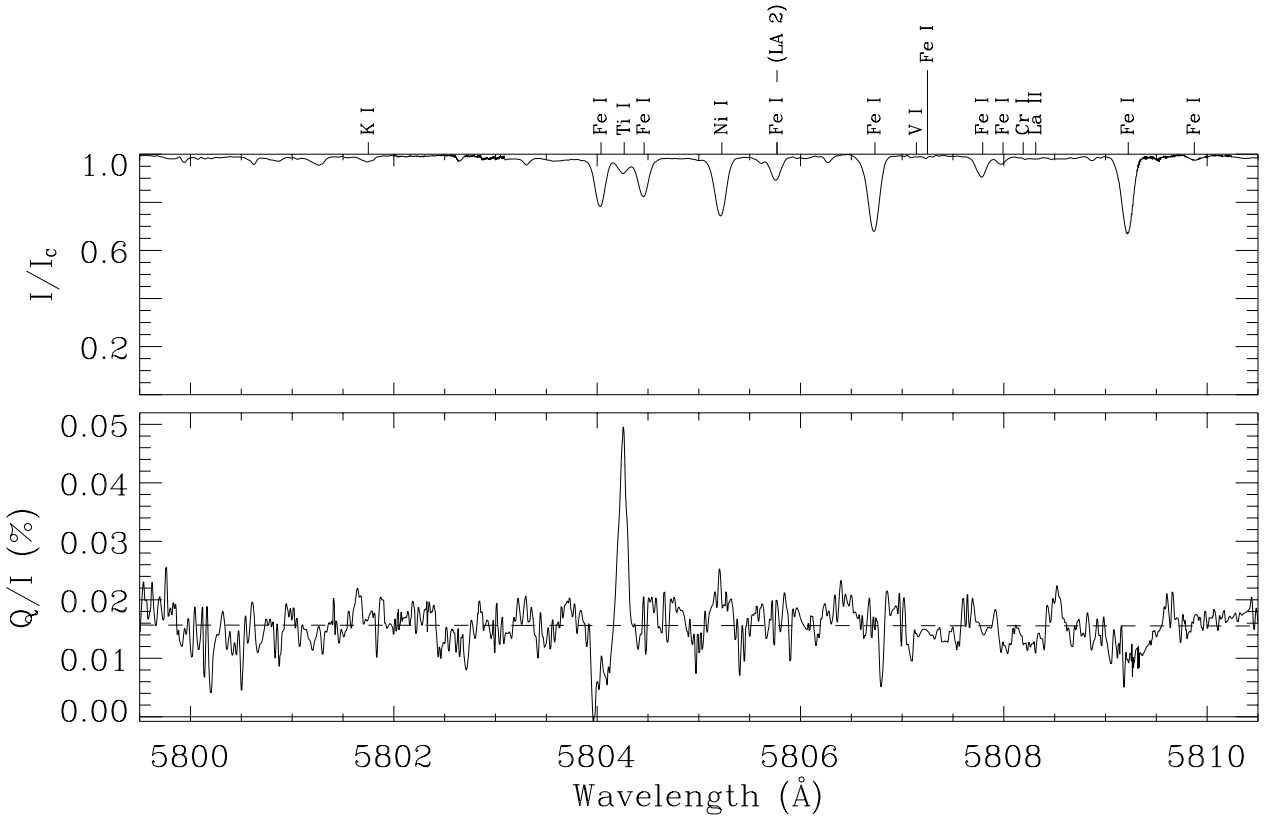

Fe I
Mo I
Fe I
Ti I
Fe I
Fe I
Si I
Fe I
Si I
Fe I
Ni I
Fe I
Ti I
Cr I
Fe I
Fe I
Fe I
I/I$_c$
1.0
0.6
0.2
Q/I (%)
0.025
0.020
0.015
0.010
0.005
0.000
5750
5752
5754
5756
5758
5760
Wavelength (Å)

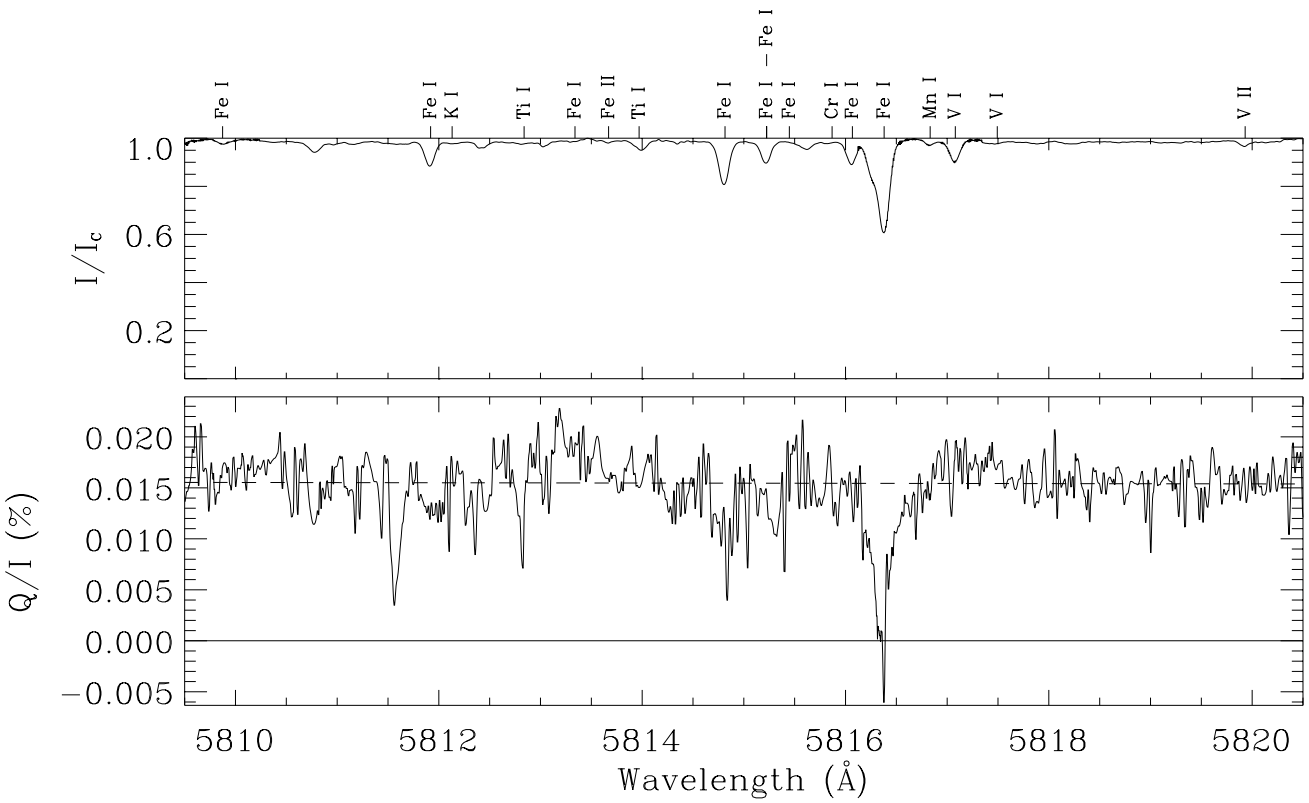

Fe I – Fe I
Fe I
Fe I
Fe I
Ni I
Fe I
Fe I
V I
Ti I
Fe I
Fe I
Fe I
Ti I
Ce II
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.04
0.03
0.02
0.01
0.00
−0.01
Q/I (%)
5760
5762
5764
5766
5768
5770
Wavelength (Å)

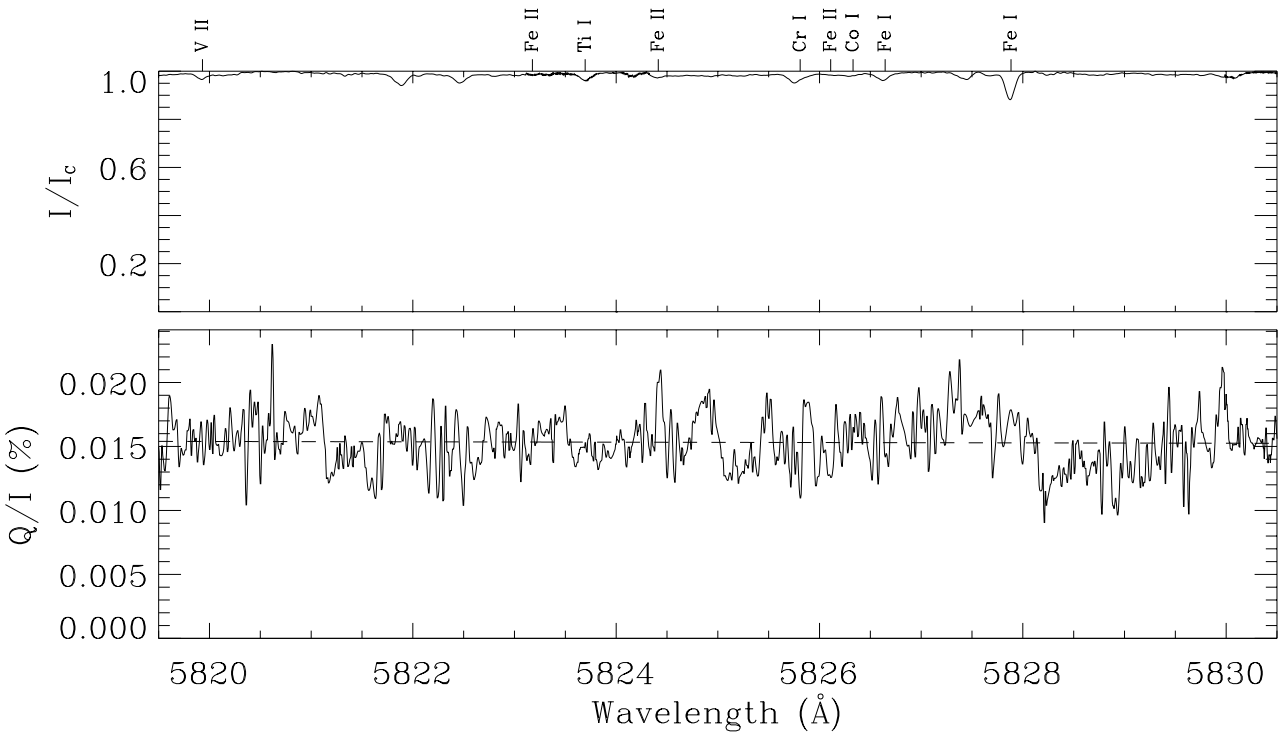

Fe I
Si I
V I
Cr I
Ti I
Ti I
Fe I
V I
Cr I
Cr I
Fe I
Fe I
Mn I
Si I
1.0
0.6
0.2
I/I$_c$
0.025
0.020
0.015
0.010
0.005
0.000
Q/I (%)
5770
5772
5774
5776
5778
5780
Wavelength (Å)

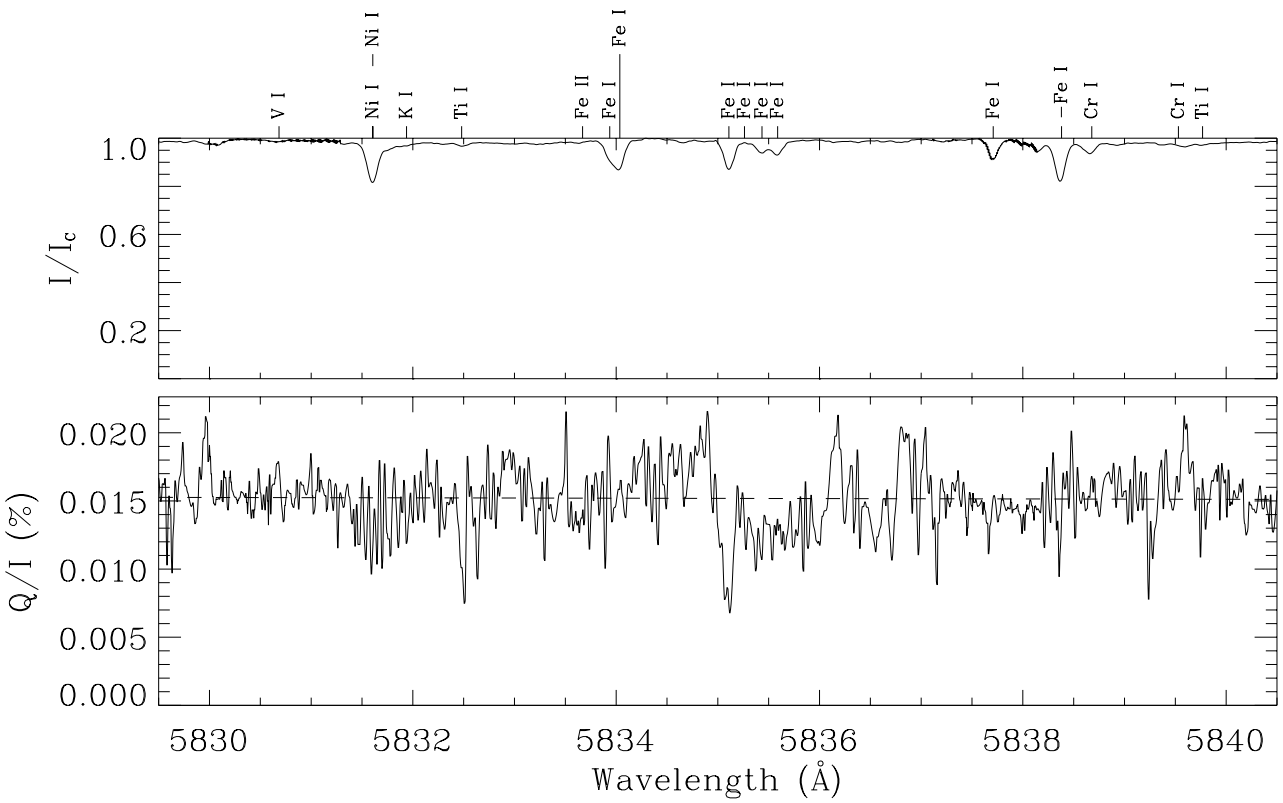

Mn I
Si I
Fe I
Fe I
Fe I
Fe I
Cr I
Cr I
Cr I
Cr I
Cu I
K I
V I
V I
Cr I
Cr I
V I
Fe I
Cr I
Mg I
Fe I
Mg I
Cr I
Cr I
Cr I
Ti I
V I
V I
Fe I
Cr I
Cr I
V I
Fe I
Ti I
1.0
0.6
0.2
I/I_c
0.025
0.020
0.015
0.010
0.005
0.000
Q/I (%)
5780
5782
5784
5786
5788
5790
Wavelength (Å)

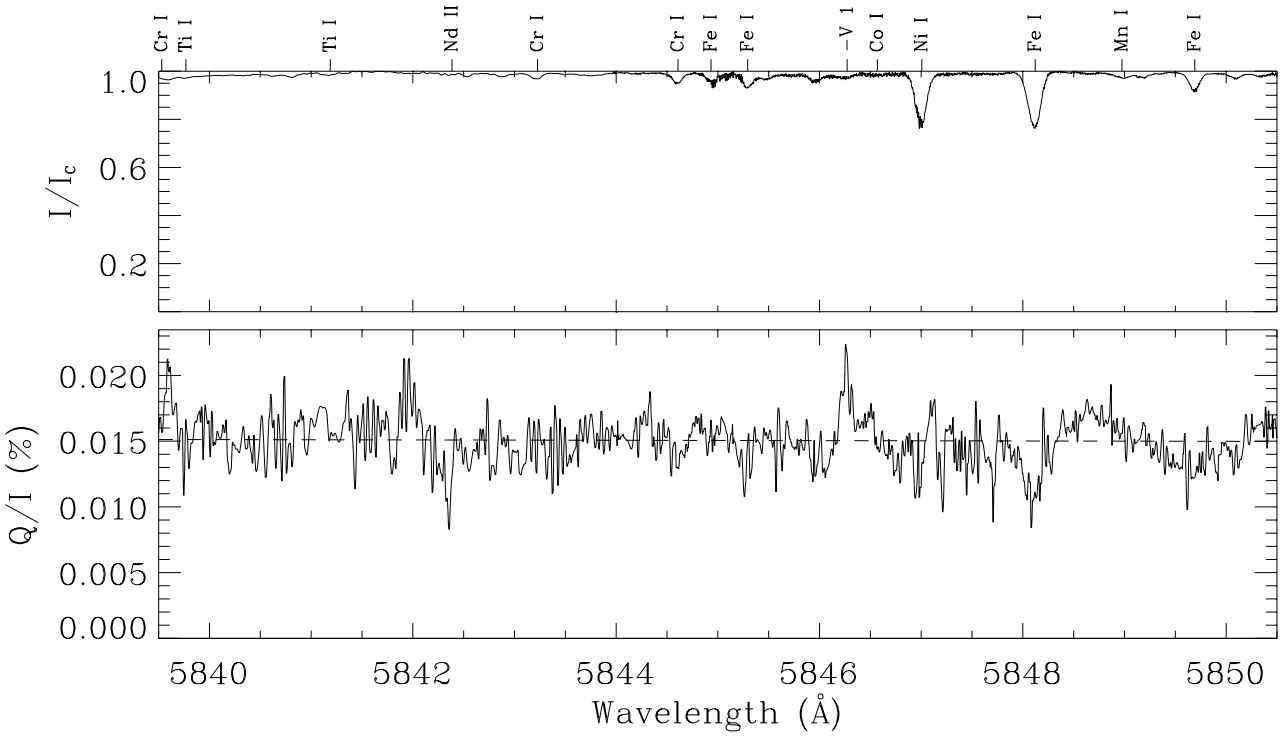

Fe I
Ti I
Cr I
Cr I
Fe I
Fe I
Cr I
Cr I
Si I
Fe I
Fe I
C I
Cr I
Ni I
Fe I
Cr I
Ti I
Cr I
La II
Zr I
Si I
Fe I
Cr I
1.0
0.6
0.2
I/I_c
0.025
0.020
0.015
0.010
0.005
0.000
Q/I (%)
5790
5792
5794
5796
5798
5800
Wavelength (Å)

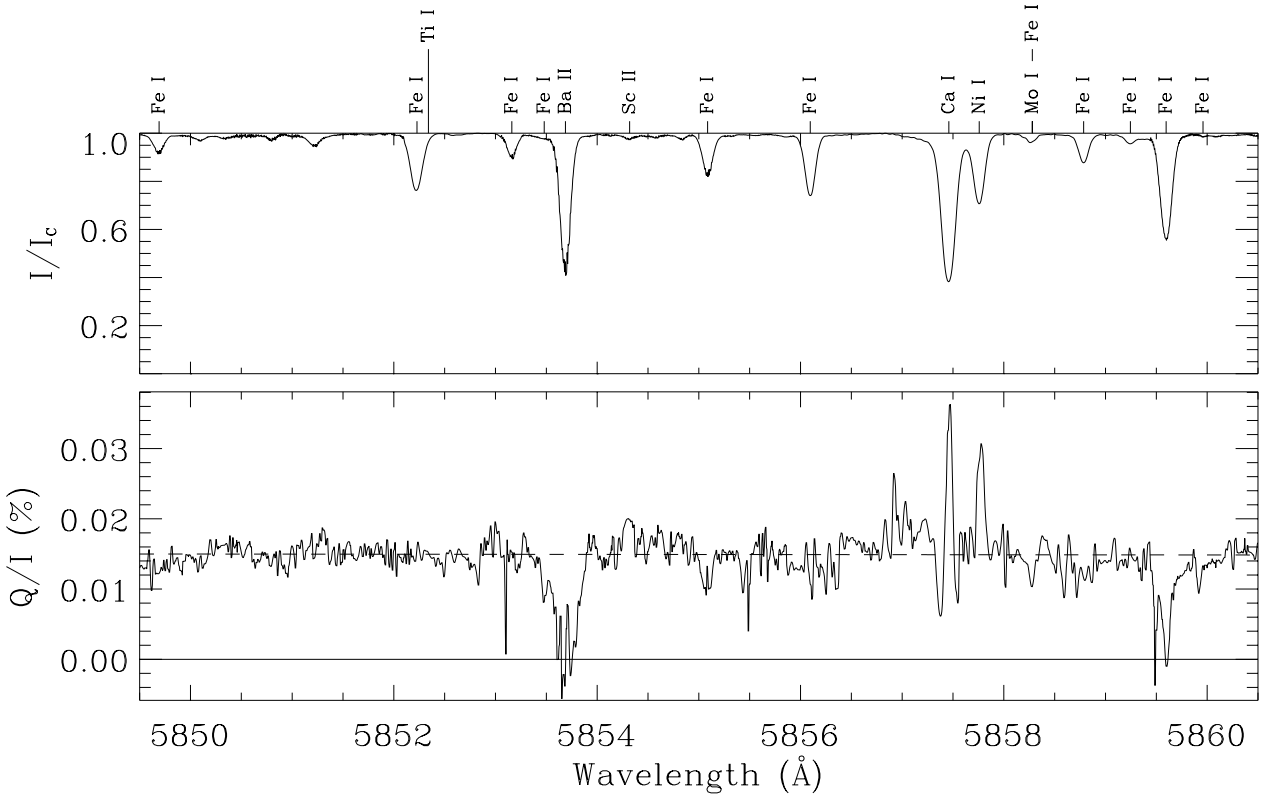

K I
Fe I
Ti I
Fe I
Ni I
Fe I – (LA 2)
Fe I
V I
Fe I
Fe I
Fe I
Cr I
La II
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.05
0.04
0.03
0.02
0.01
0.00
Q/I (%)
5800
5802
5804
5806
5808
5810
Wavelength (Å)

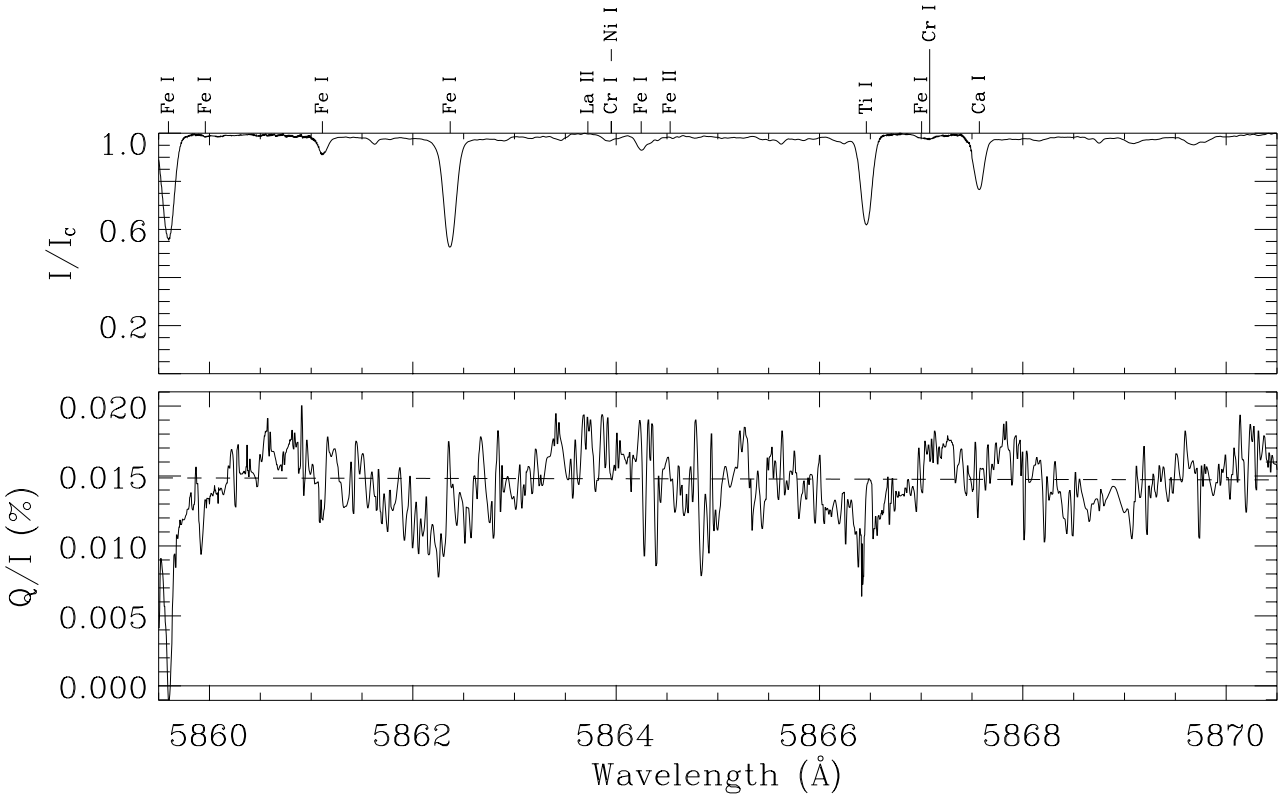

Fe I
Fe I
K I
Ti I
Fe I
Fe II
Ti I
Fe I
Fe I
Fe I
Fe I
Cr I
Fe I
Fe I
Mn I
V I
V I
V II
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
−0.005
Q/I (%)
5810
5812
5814
5816
5818
5820
Wavelength (Å)

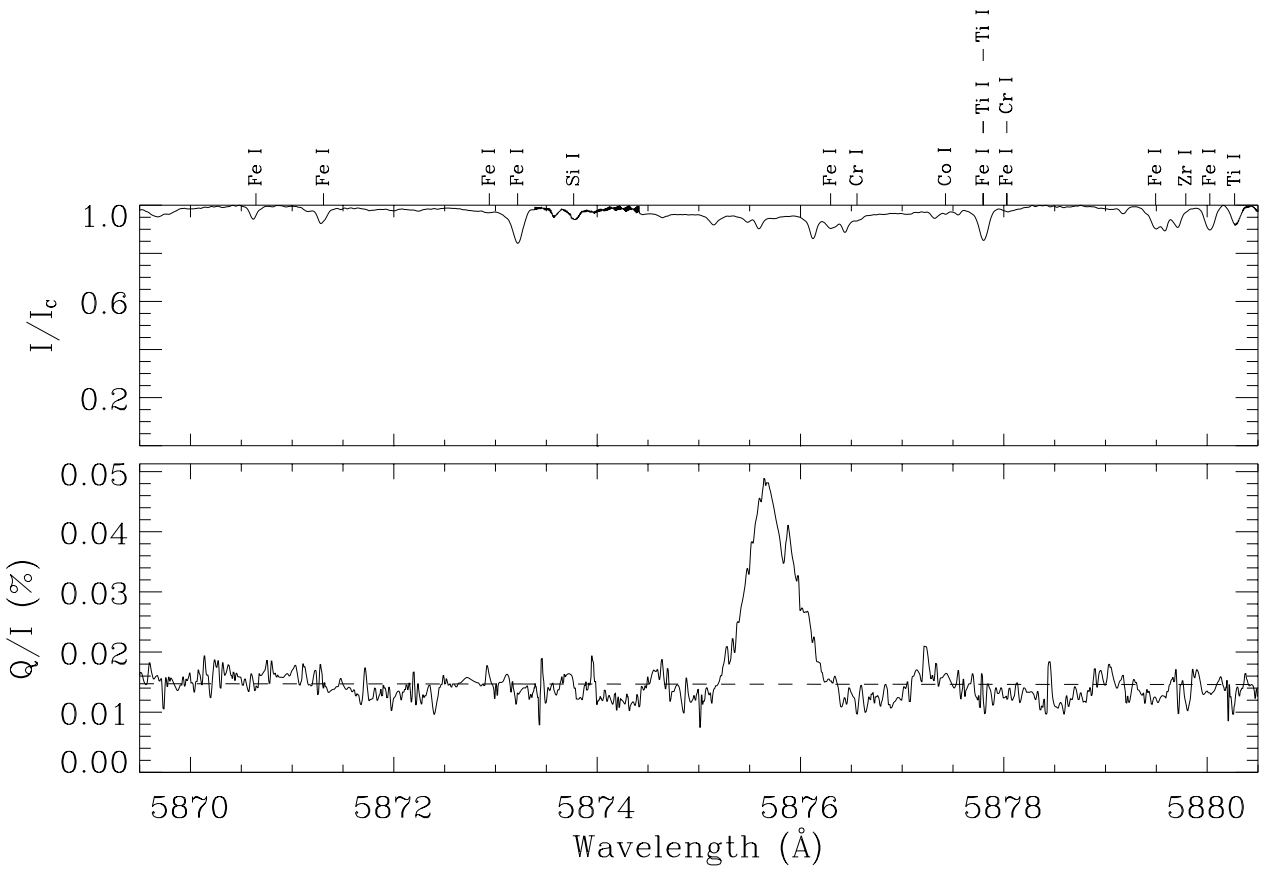

V II
Fe II
Ti I
Fe II
Cr I
Fe II
Co I
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
Q/I (%)
5820
5822
5824
5826
5828
5830
Wavelength (Å)

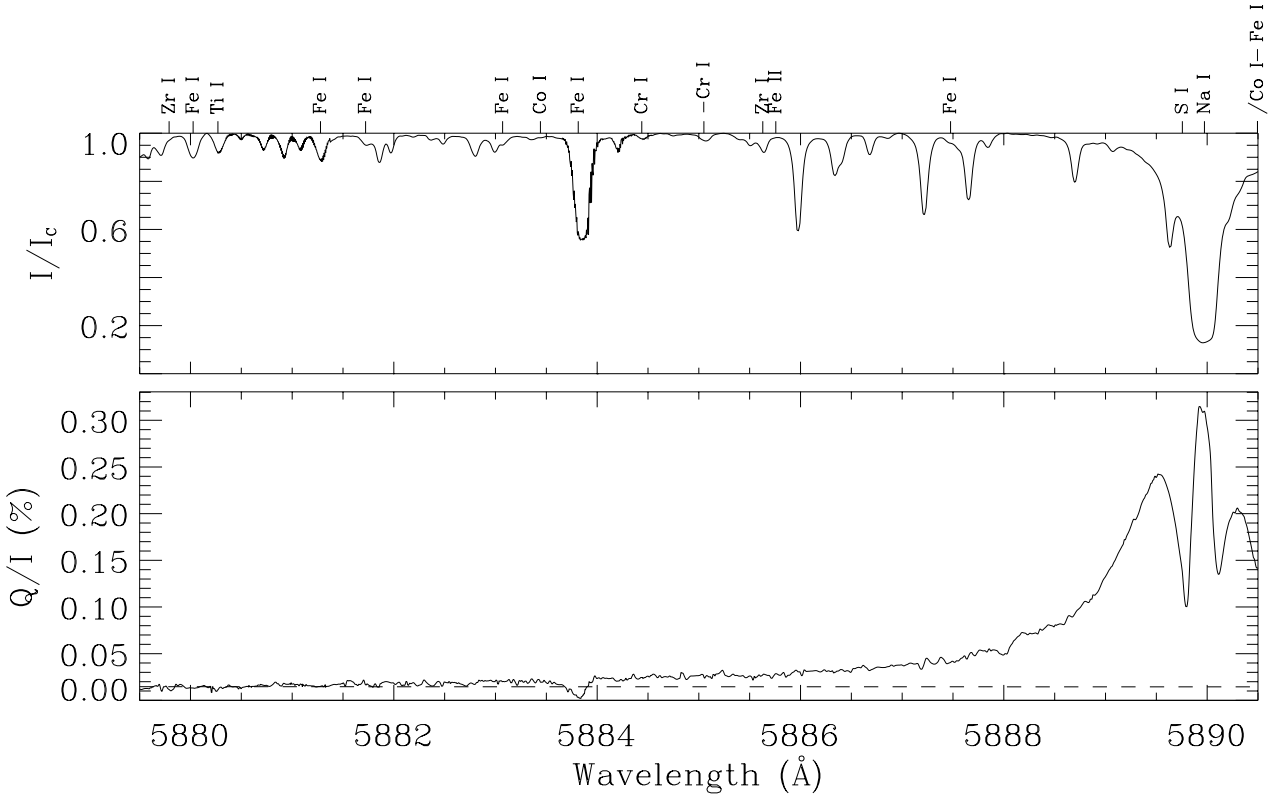

V I
Ni I
Ni I
K I
Ti I
Fe II
Fe I
Fe I
Fe I
Fe I
Fe I
Fe I
Fe I
Fe I
Cr I
Cr I
Ti I
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
Q/I (%)
5830
5832
5834
5836
5838
5840
Wavelength (Å)

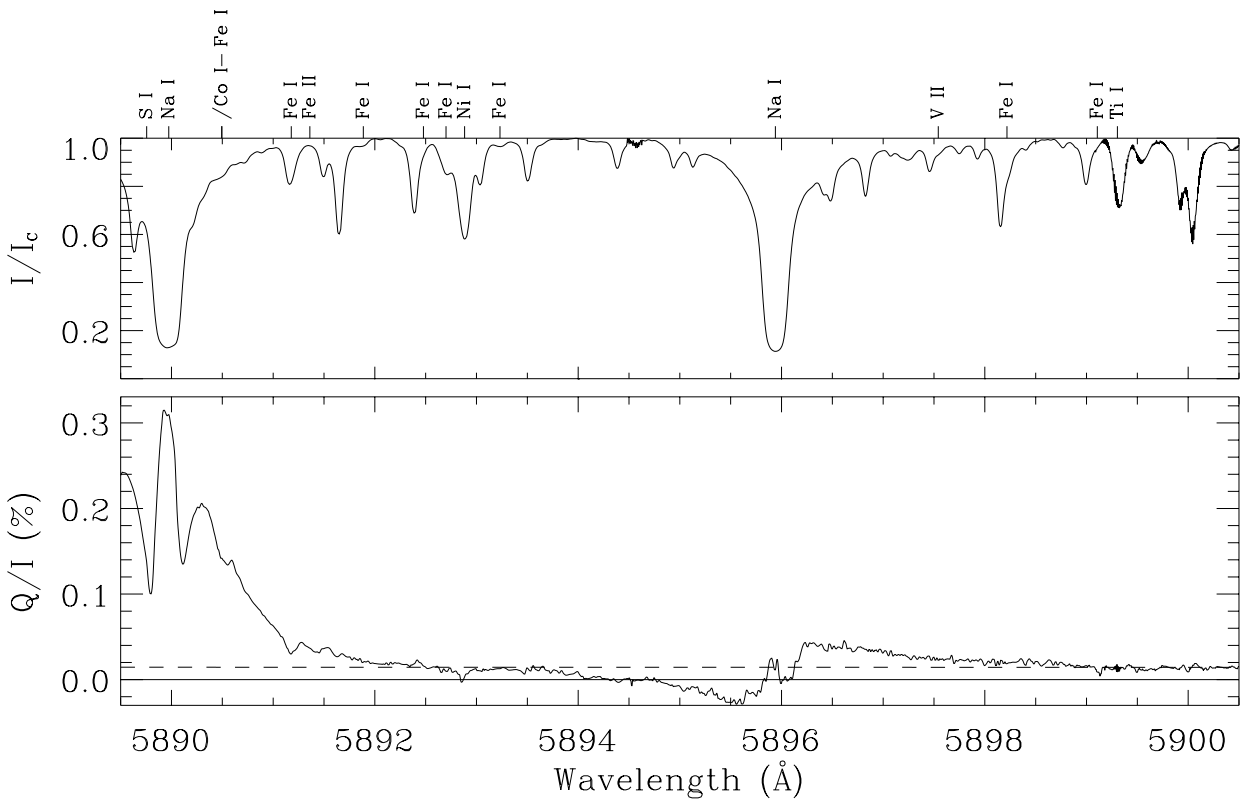

Cr I
Ti I
Ti I
Nd II
Cr I
Cr I
Fe I
Fe I
V I
Co I
Ni I
Fe I
Mn I
Fe I
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
Q/I (%)
5840
5842
5844
5846
5848
5850
Wavelength (Å)

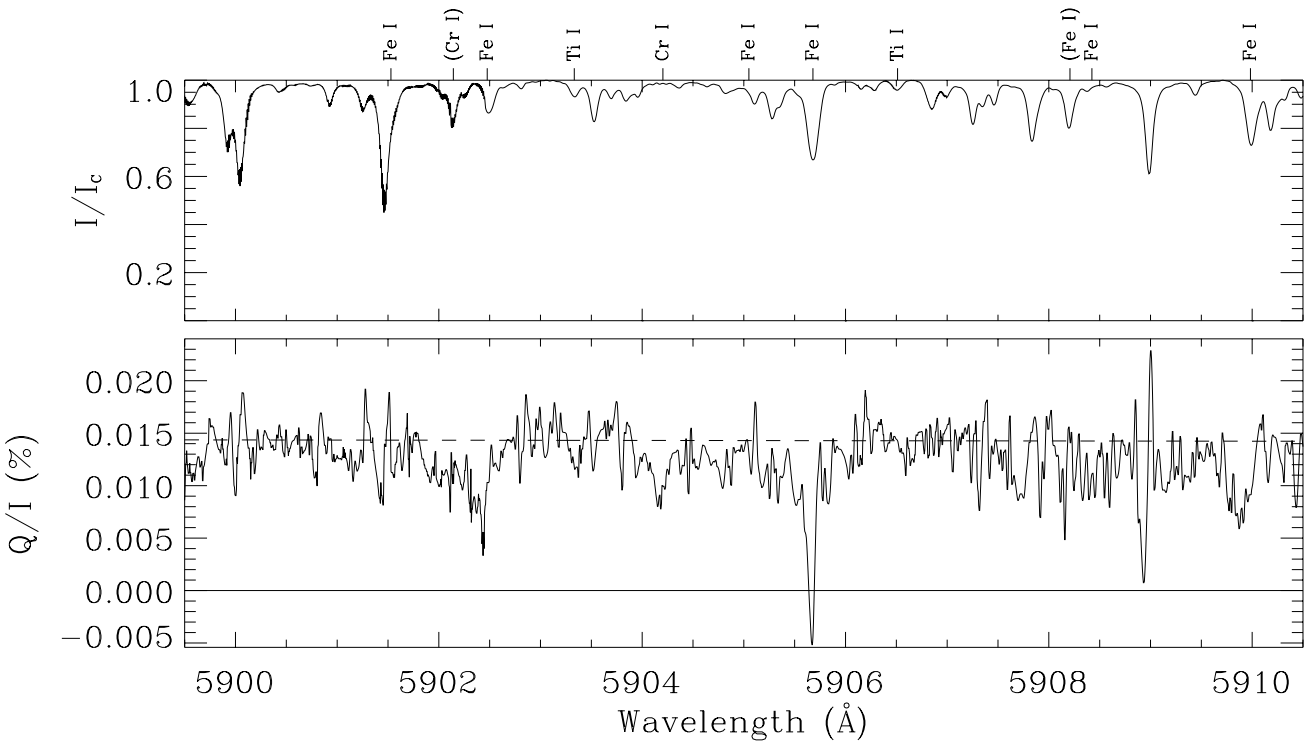

Fe I
Fe I
Ti I
Fe I
Fe I
Ba II
Sc II
Fe I
Fe I
Ca I
Ni I
Mo I – Fe I
Fe I
Fe I
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.03
0.02
0.01
0.00
Q/I (%)
5850
5852
5854
5856
5858
5860
Wavelength (Å)

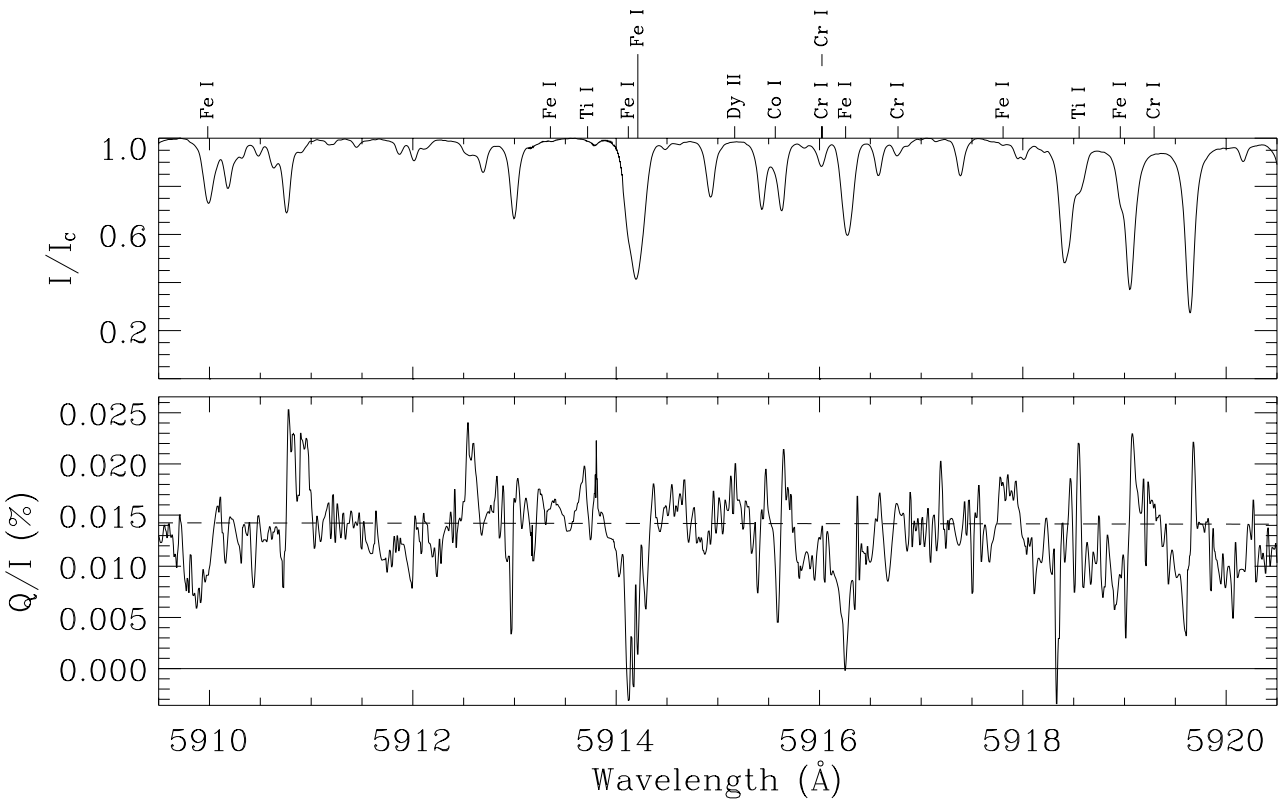

Fe I
Fe I
Fe I
Fe I
La II
Cr I
Ni I
Fe I
Fe II
Ti I
Fe I
Cr I
Ca I
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
Q/I (%)
5860
5862
5864
5866
5868
5870
Wavelength (Å)

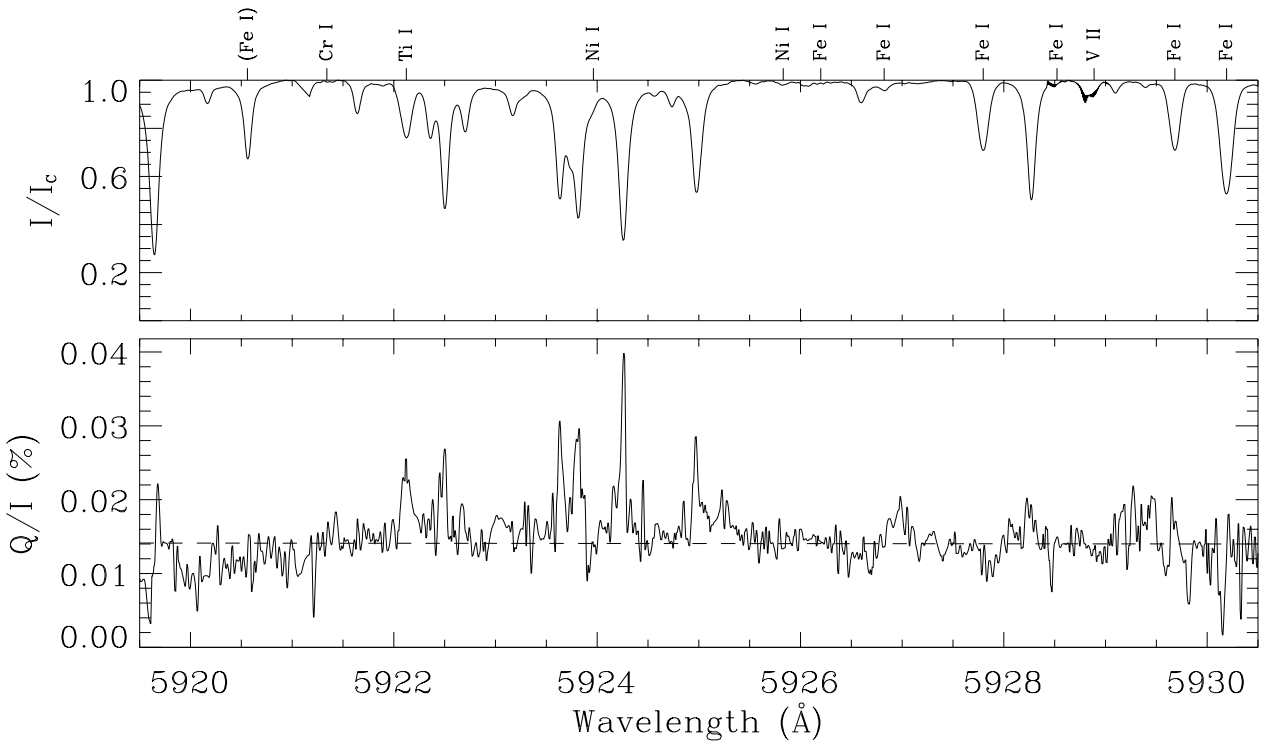

Fe I
Fe I
Fe I
Fe I
Si I
Fe I
Cr I
Co I
Fe I
Ti I
Ti I
Fe I
Cr I
Fe I
Zr I
Fe I
Ti I
1.0
0.6
0.2
I/I_c
0.05
0.04
0.03
0.02
0.01
0.00
Q/I (%)
5870
5872
5874
5876
5878
5880
Wavelength (Å)

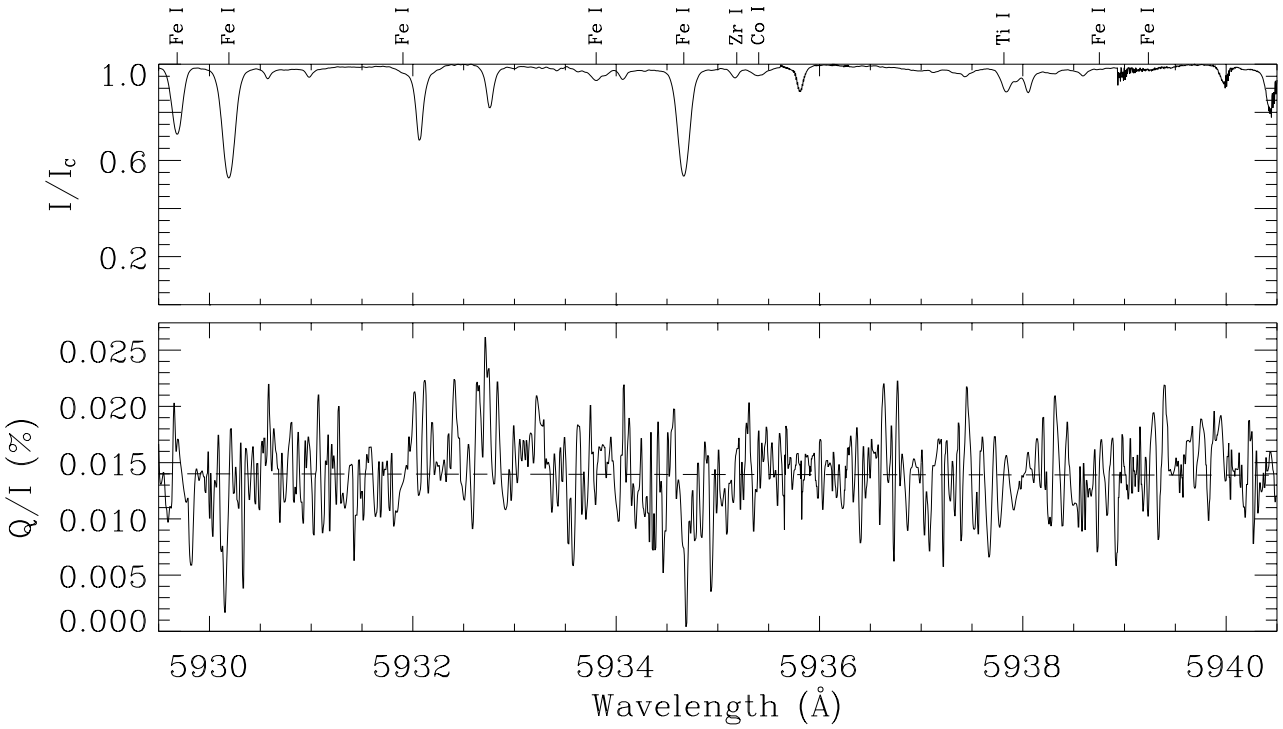

Zr I
Fe I
Ti I
Fe I
Fe I
Fe I
Co I
Fe I
Cr I
Cr I
Zr I
Fe II
Fe I
S I
Na I
Co I
Fe I
1.0
0.6
0.2
I/I_c
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Q/I (%)
5880
5882
5884
5886
5888
5890
Wavelength (Å)

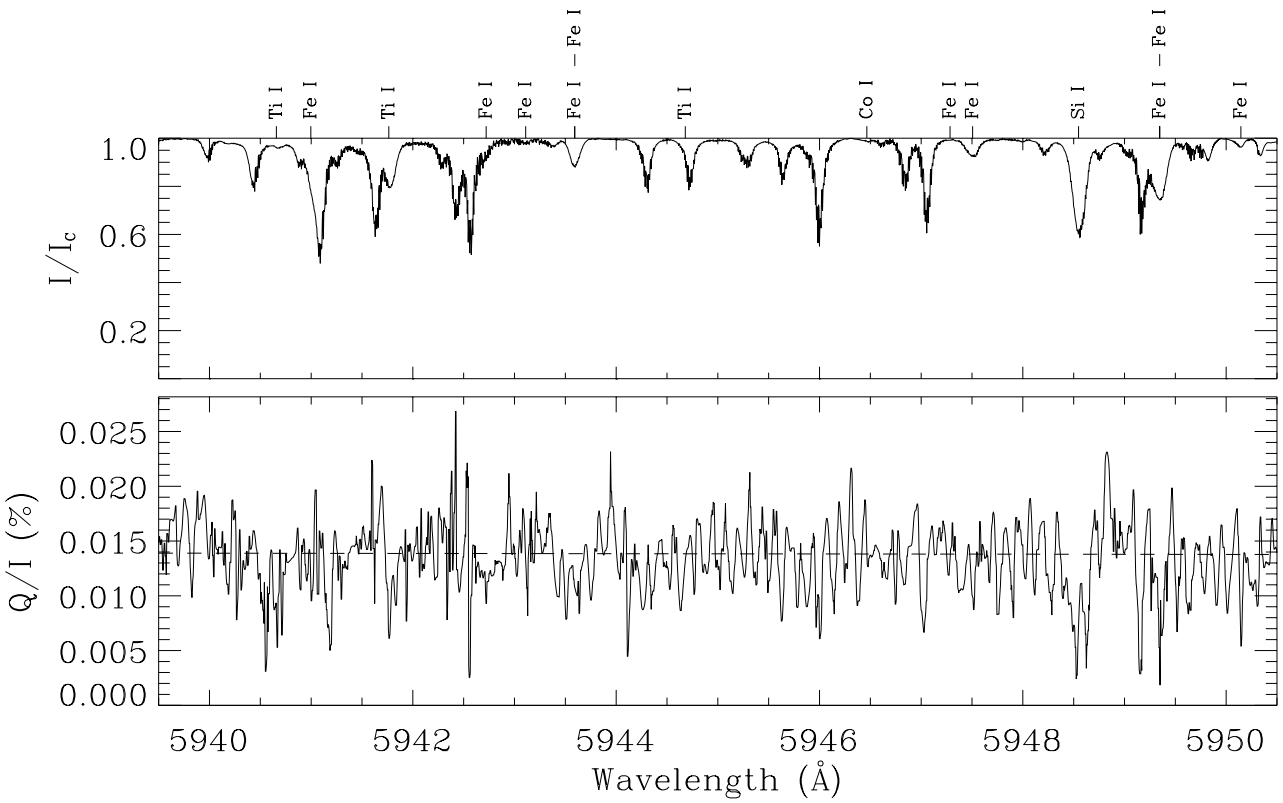

S I
Na I
/Co I– Fe I
Fe I
Fe II
Fe I
Fe I
Fe I
Ni I
Fe I
Na I
V II
Fe I
Fe I
Ti I
1.0
0.6
0.2
I/I$_c$
0.3
0.2
0.1
0.0
Q/I (%)
5890
5892
5894
5896
5898
5900
Wavelength (Å)

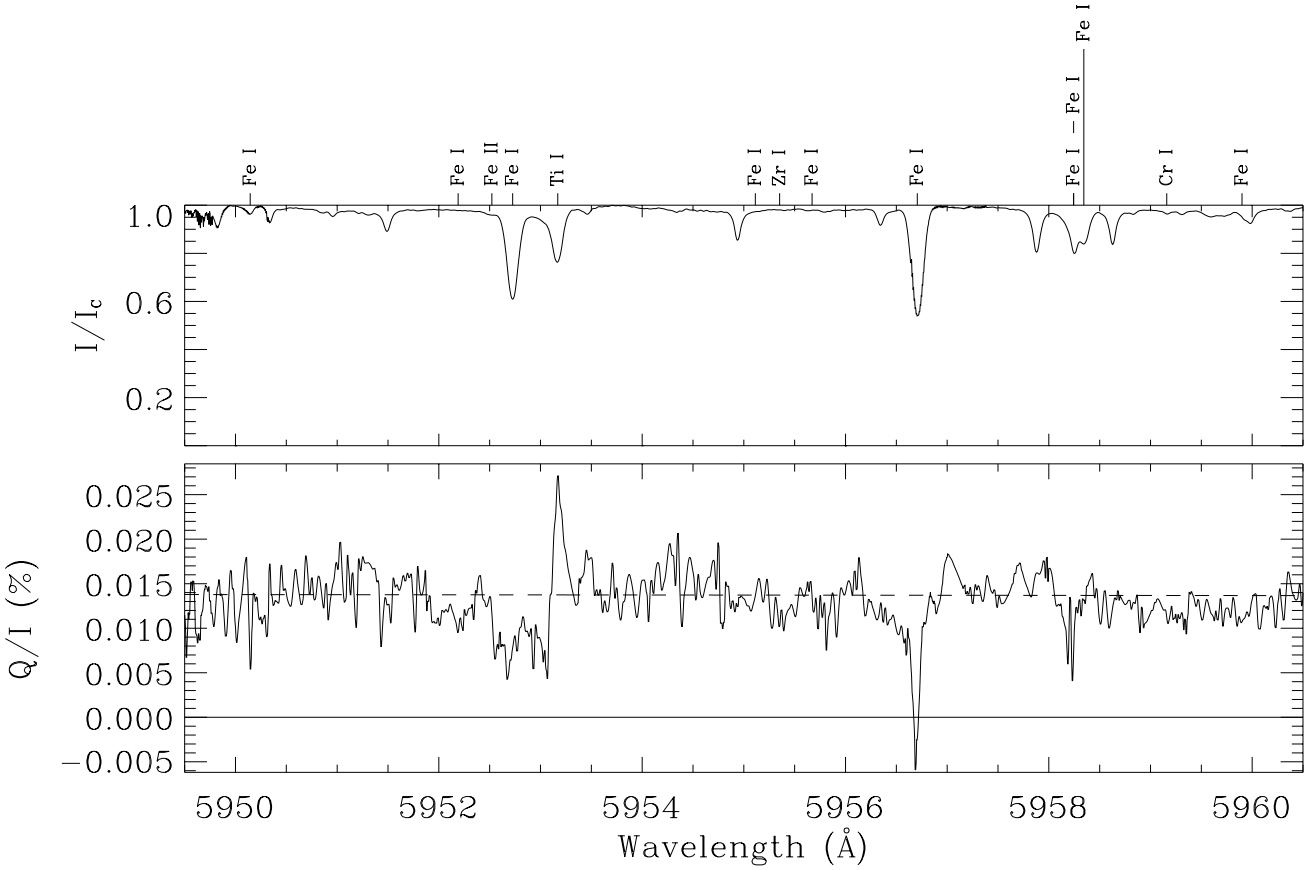

Fe I
(Cr I)
Fe I
Ti I
Cr I
Fe I
Fe I
Ti I
(Fe I)
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
−0.005
Q/I (%)
5900
5902
5904
5906
5908
5910
Wavelength (Å)

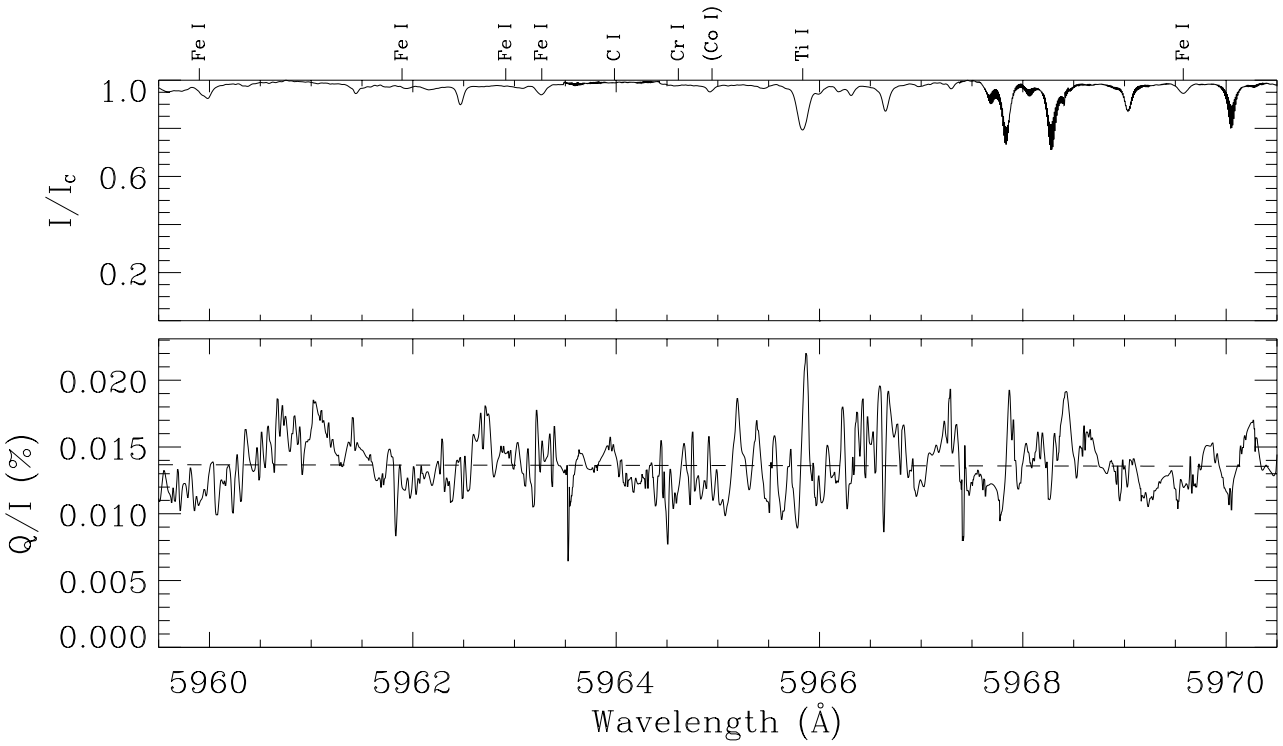

Fe I
Fe I
Ti I
Fe I
Fe I
Dy II
Co I
Cr I
Cr I
Fe I
Cr I
Fe I
Ti I
Fe I
Cr I
1.0
0.6
0.2
I/I_c
0.025
0.020
0.015
0.010
0.005
0.000
Q/I (%)
5910
5912
5914
5916
5918
5920
Wavelength (Å)

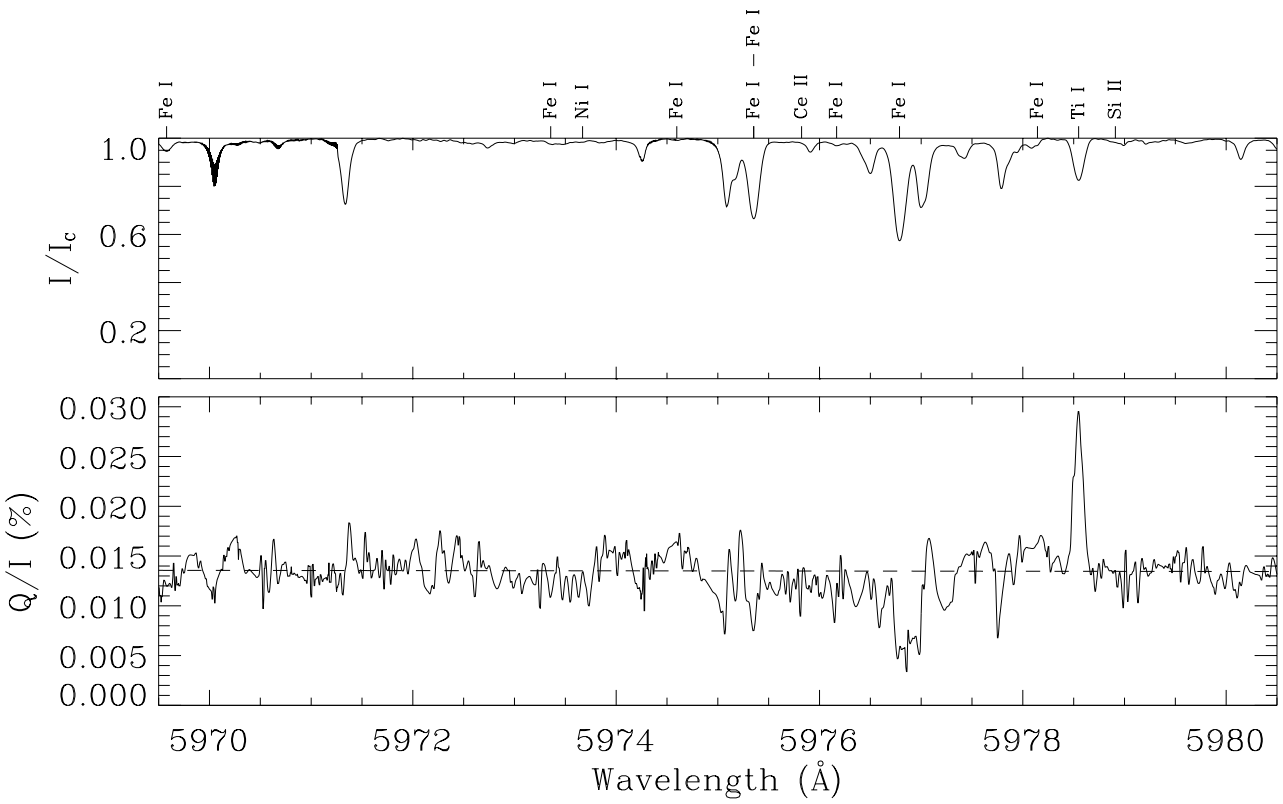

(Fe I)
Cr I
Ti I
Ni I
Ni I
Fe I
Fe I
Fe I
Fe I
V II
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.04
0.03
0.02
0.01
0.00
Q/I (%)
5920
5922
5924
5926
5928
5930
Wavelength (Å)

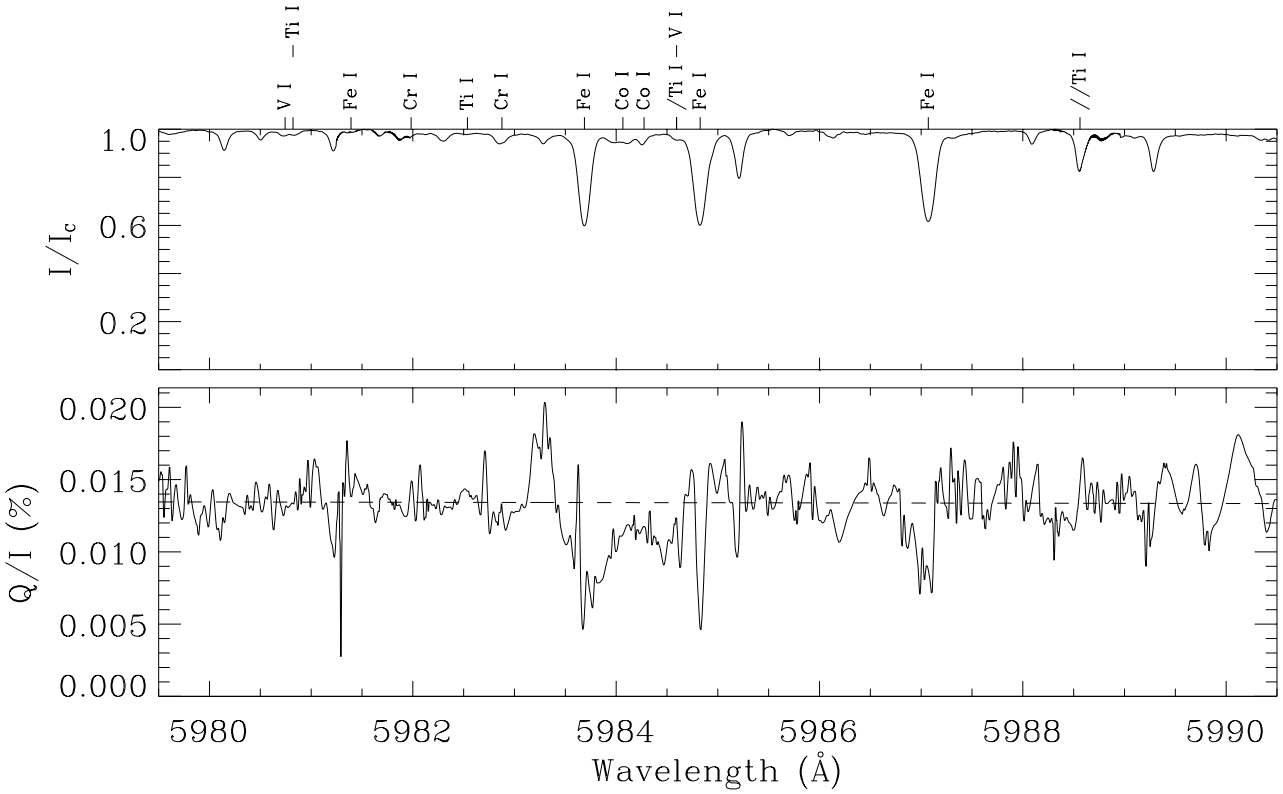

Fe I
Fe I
Fe I
Fe I
Fe I
Zr I
Co I
Ti I
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.025
0.020
0.015
0.010
0.005
0.000
Q/I (%)
5930
5932
5934
5936
5938
5940
Wavelength (Å)

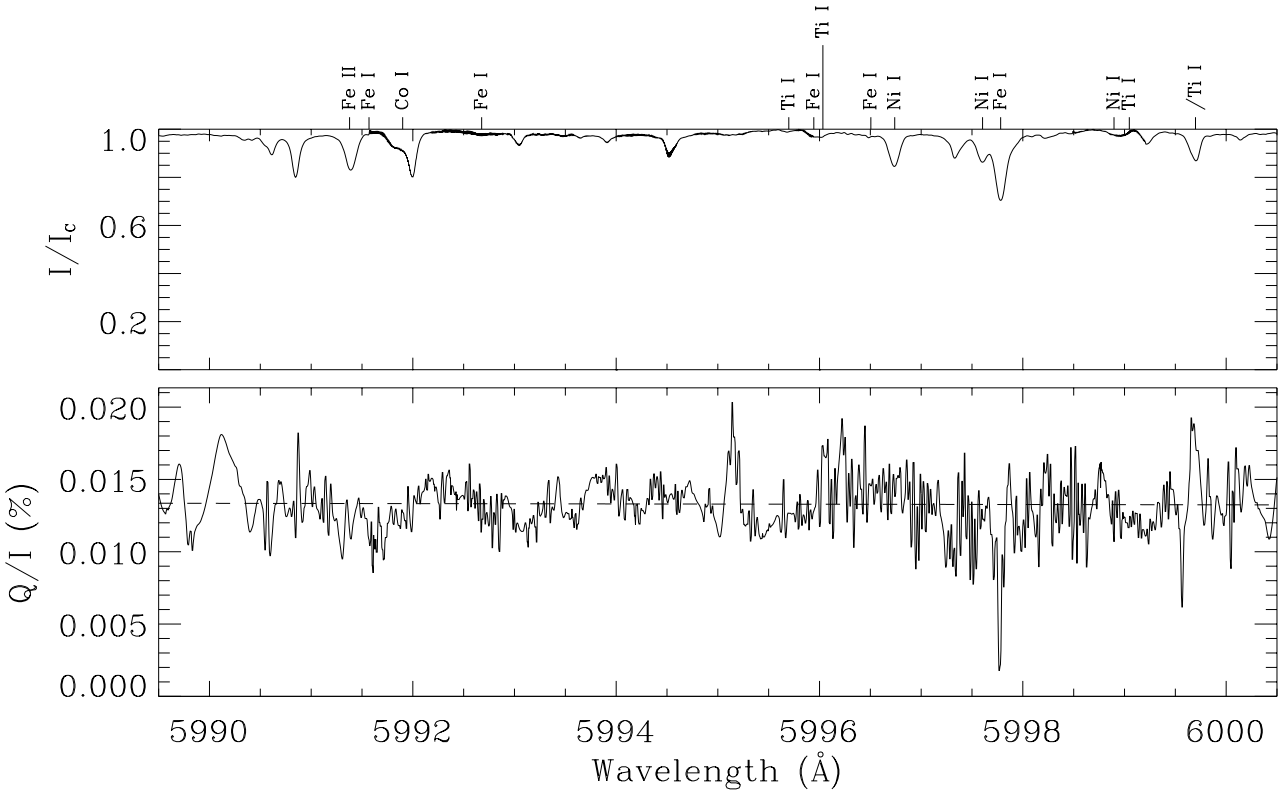

Ti I
Fe I
Ti I
Fe I
Fe I
Fe I – Fe I
Ti I
Co I
Fe I
Fe I
Si I
Fe I – Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.025
0.020
0.015
0.010
0.005
0.000
Q/I (%)
5940
5942
5944
5946
5948
5950
Wavelength (Å)

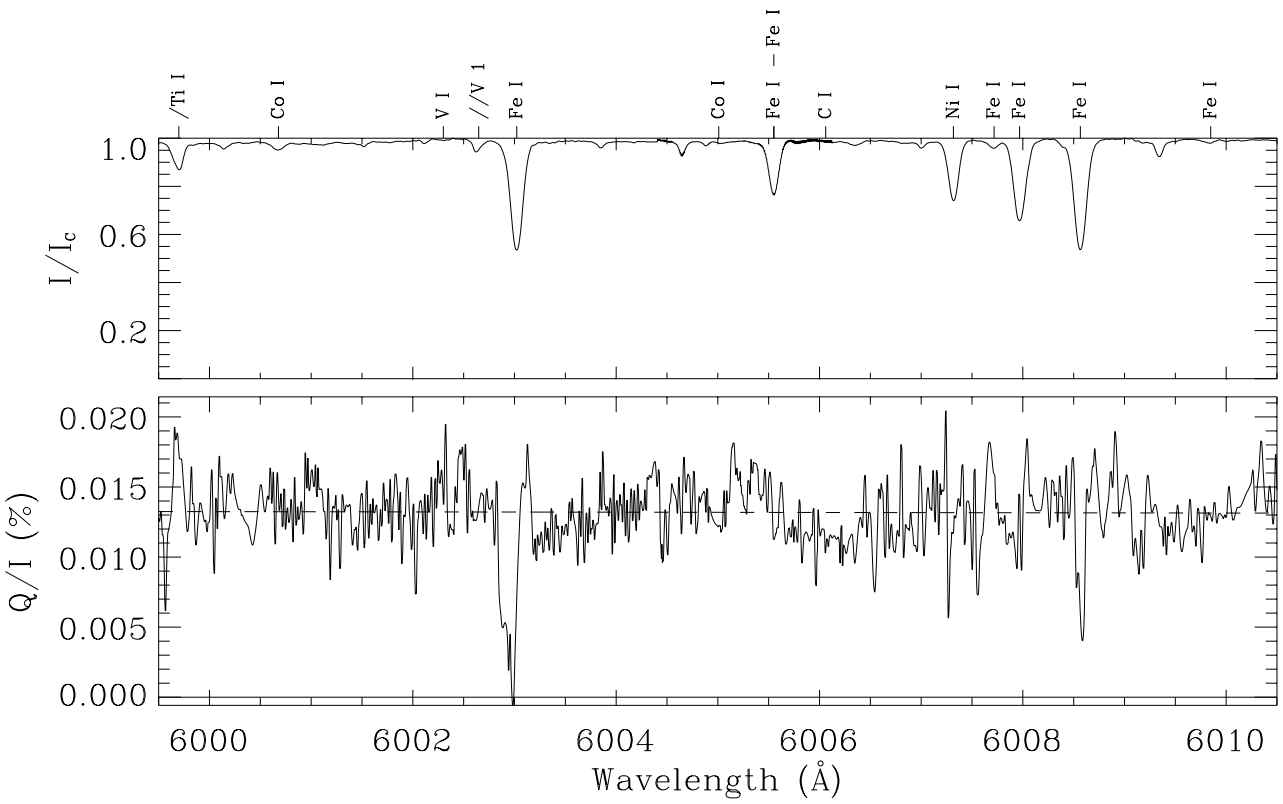

Fe I
Fe I
Fe II
Fe I
Ti I
Fe I
Zr I
Fe I
Fe I
Fe I
Fe I
Fe I
Cr I
Fe I
1.0
0.6
0.2
I/I_c
0.025
0.020
0.015
0.010
0.005
0.000
−0.005
Q/I (%)
5950
5952
5954
5956
5958
5960
Wavelength (Å)

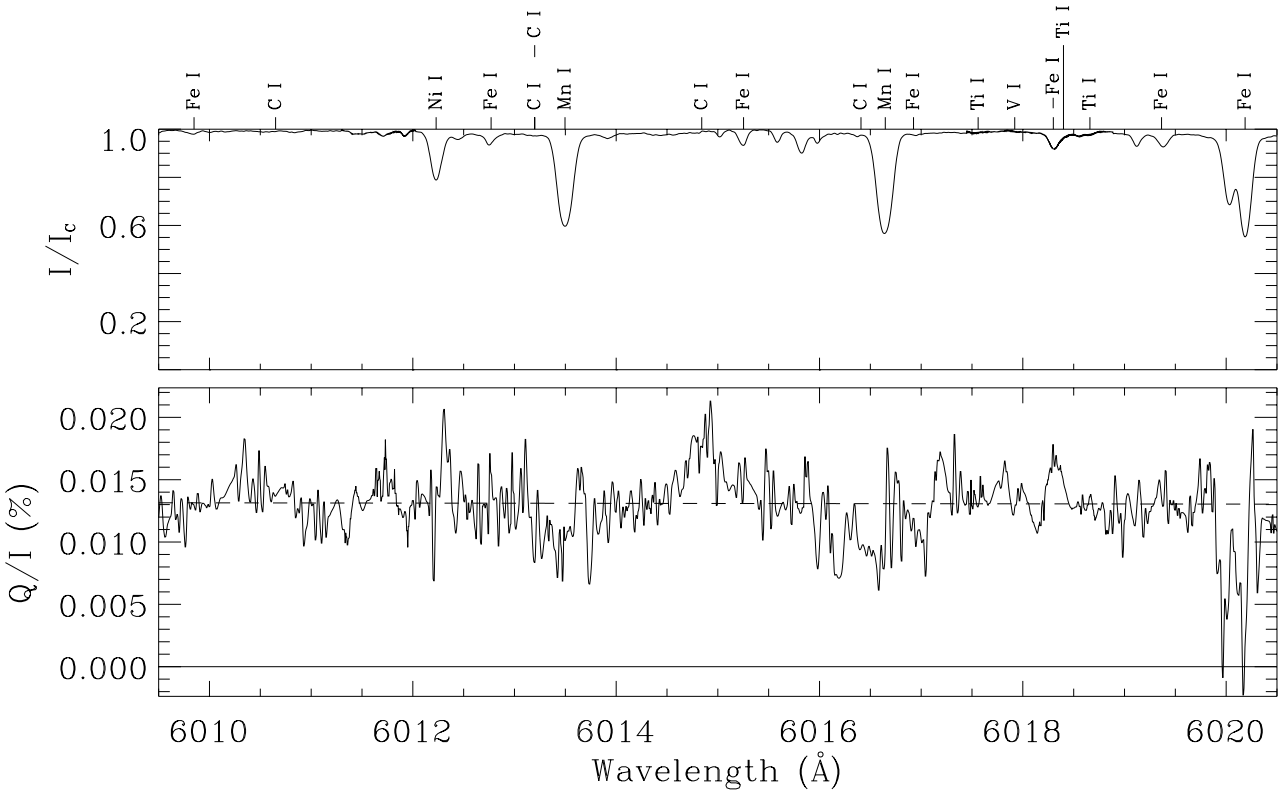

Fe I
Fe I
Fe I
Fe I
C I
Cr I
(Co I)
Ti I
Fe I
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
Q/I (%)
5960
5962
5964
5966
5968
5970
Wavelength (Å)

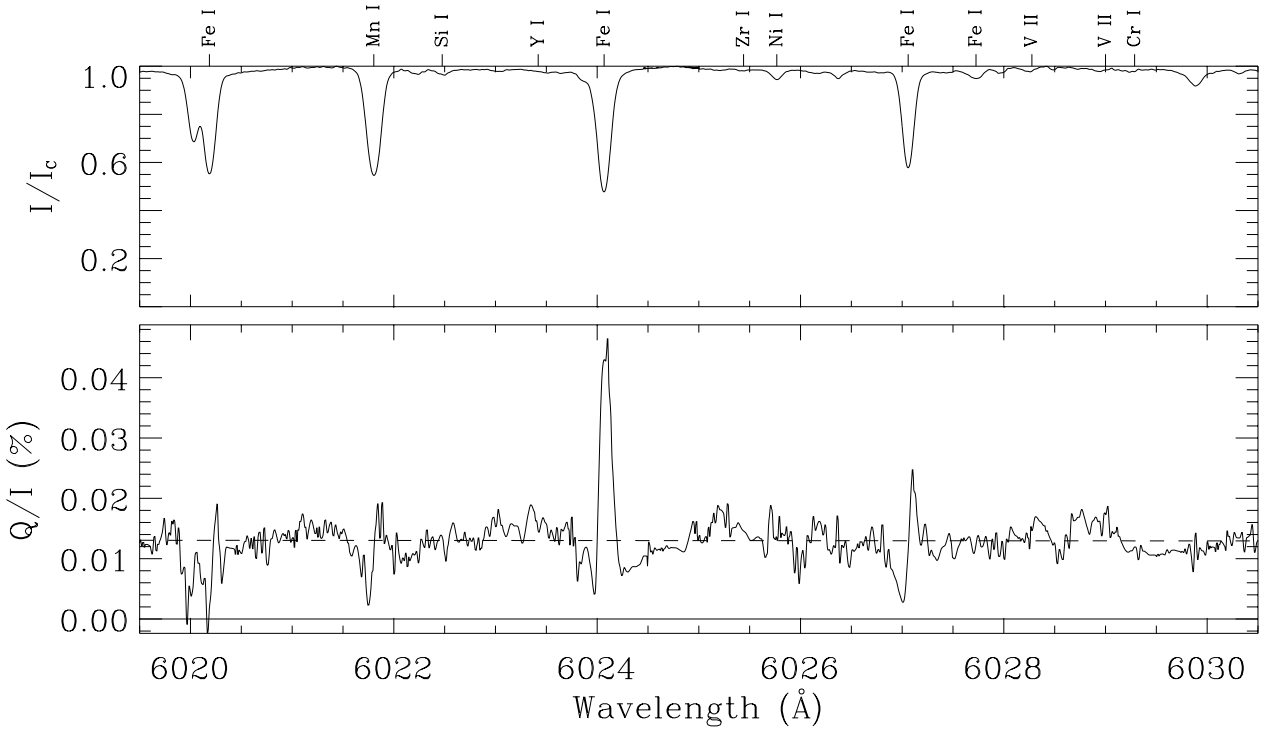

Fe I
Fe I
Ni I
Fe I
Fe I – Fe I
Ce II
Fe I
Fe I
Fe I
Ti I
Si II
1.0
0.6
0.2
I/I$_c$
0.030
0.025
0.020
0.015
0.010
0.005
0.000
Q/I (%)
5970
5972
5974
5976
5978
5980
Wavelength (Å)

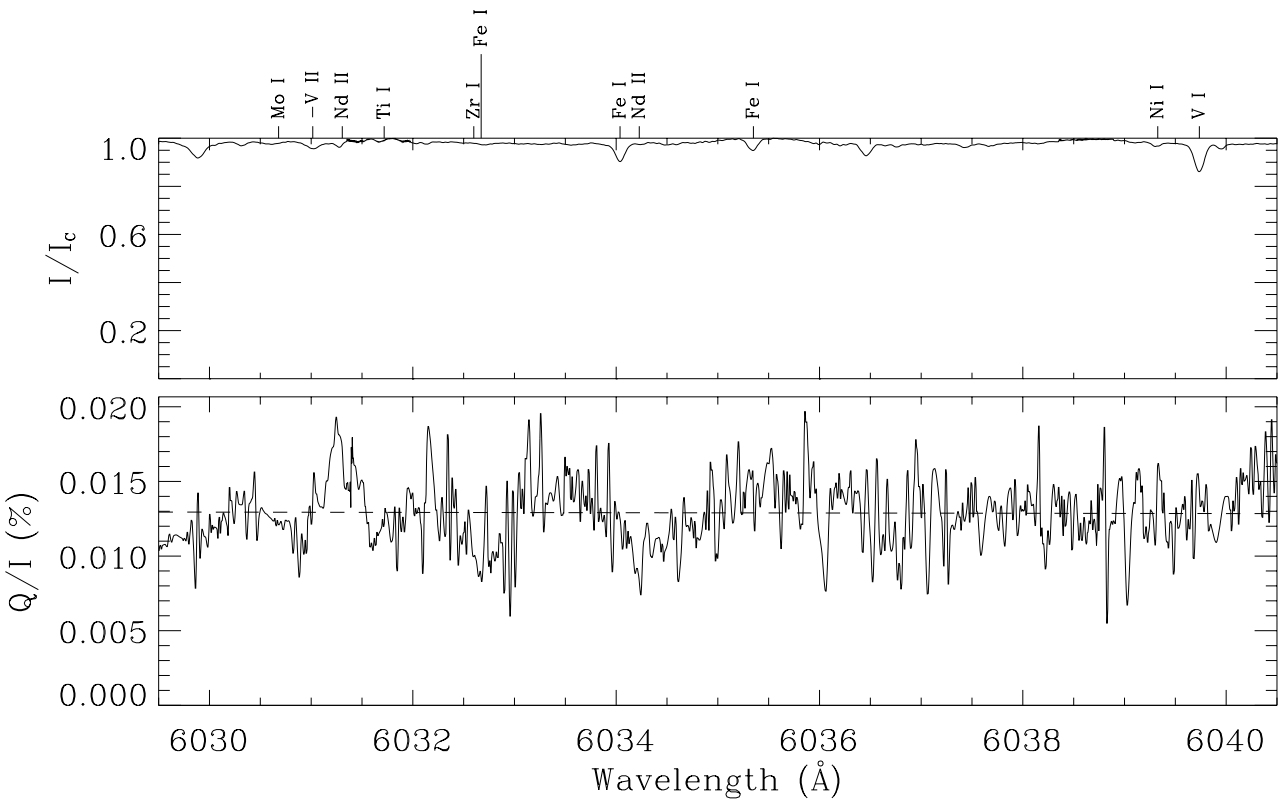

V I
Ti I
Fe I
Cr I
Ti I
Cr I
Fe I
Co I
Co I
Ti I
V I
Fe I
Fe I
Ti I
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
Q/I (%)
5980
5982
5984
5986
5988
5990
Wavelength (Å)

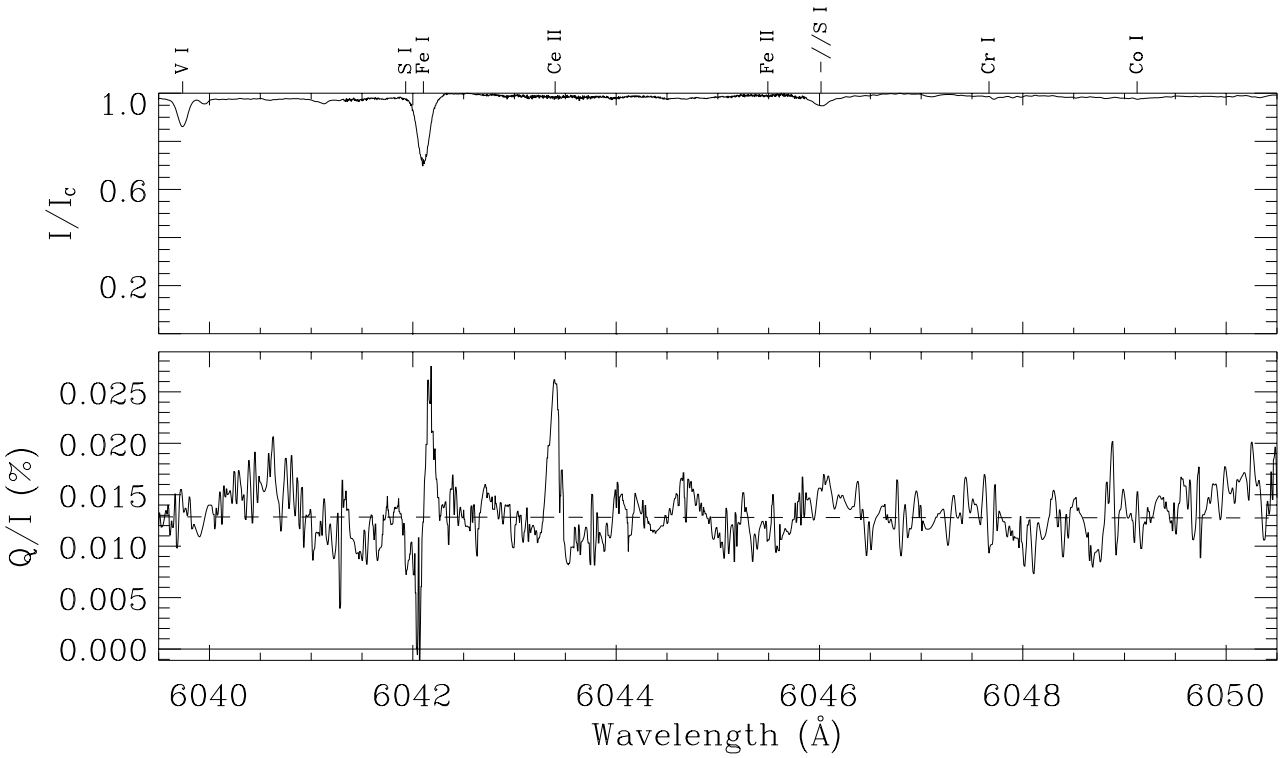

Fe II
Fe I
Co I
Fe I
Ti I
Fe I
Ti I
Fe I
Ni I
Ni I
Fe I
Ni I
Ti I
/Ti I
1.0
0.6
0.2
I/I$_c$
0.020
0.015
0.010
0.005
0.000
Q/I (%)
5990
5992
5994
5996
5998
6000
Wavelength (Å)

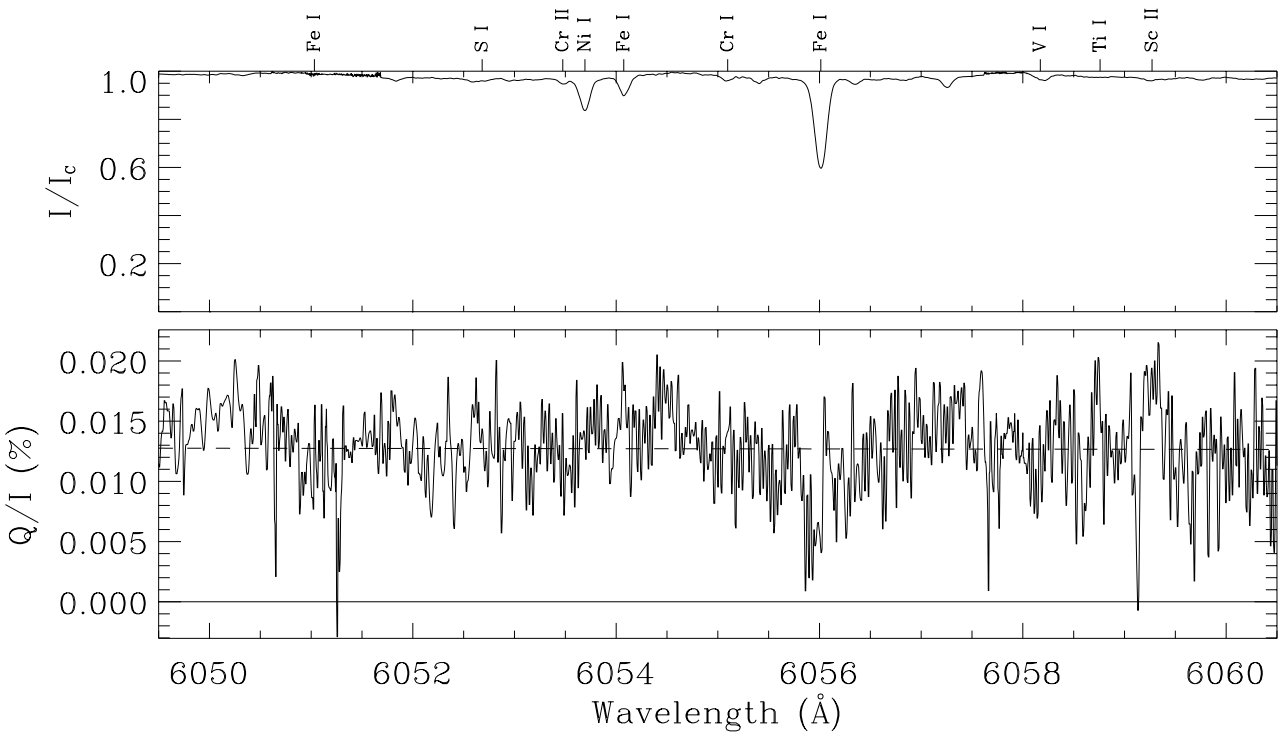

/Ti I
Co I
V I
//V 1
Fe I
Co I
Fe I – Fe I
C I
Ni I
Fe I
Fe I
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6000
6002
6004
6006
6008
6010
Wavelength (Å)

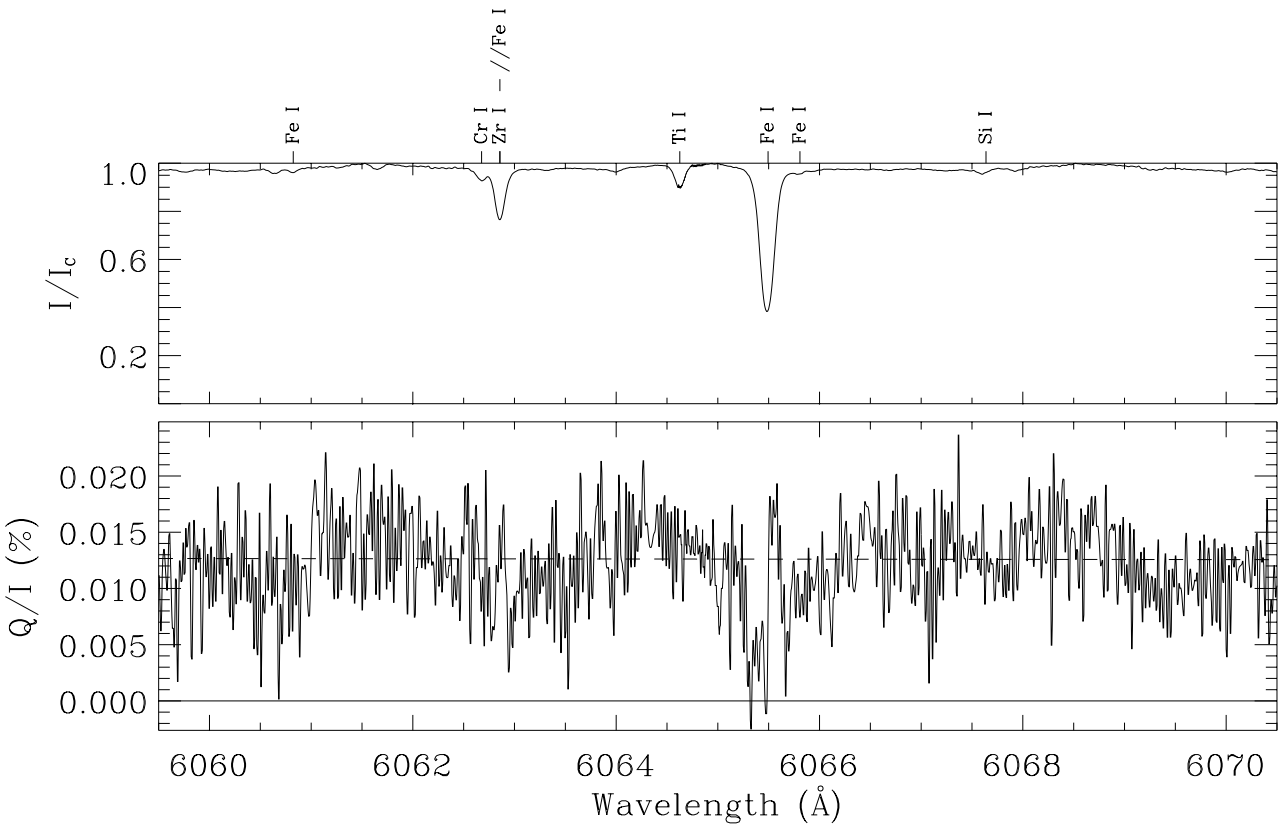

Fe I
C I
Ni I
Fe I
C I
C I
Mn I
C I
Fe I
C I
Mn I
Fe I
Ti I
V I
Fe I
Ti I
Ti I
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6010
6012
6014
6016
6018
6020
Wavelength (Å)

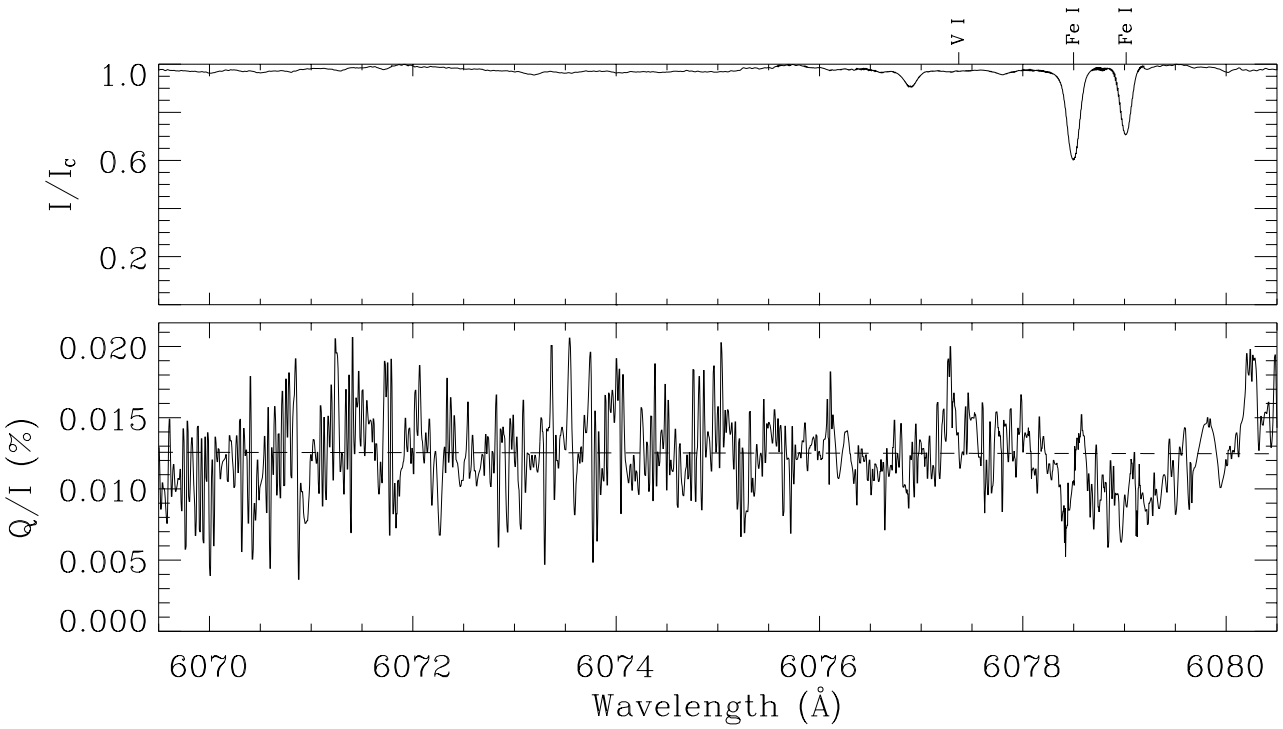

Fe I
Mn I
Si I
Y I
Fe I
Zr I
Ni I
Fe I
Fe I
V II
V II
Cr I
1.0
0.6
0.2
I/I_c
0.04
0.03
0.02
0.01
0.00
Q/I (%)
6020
6022
6024
6026
6028
6030
Wavelength (Å)

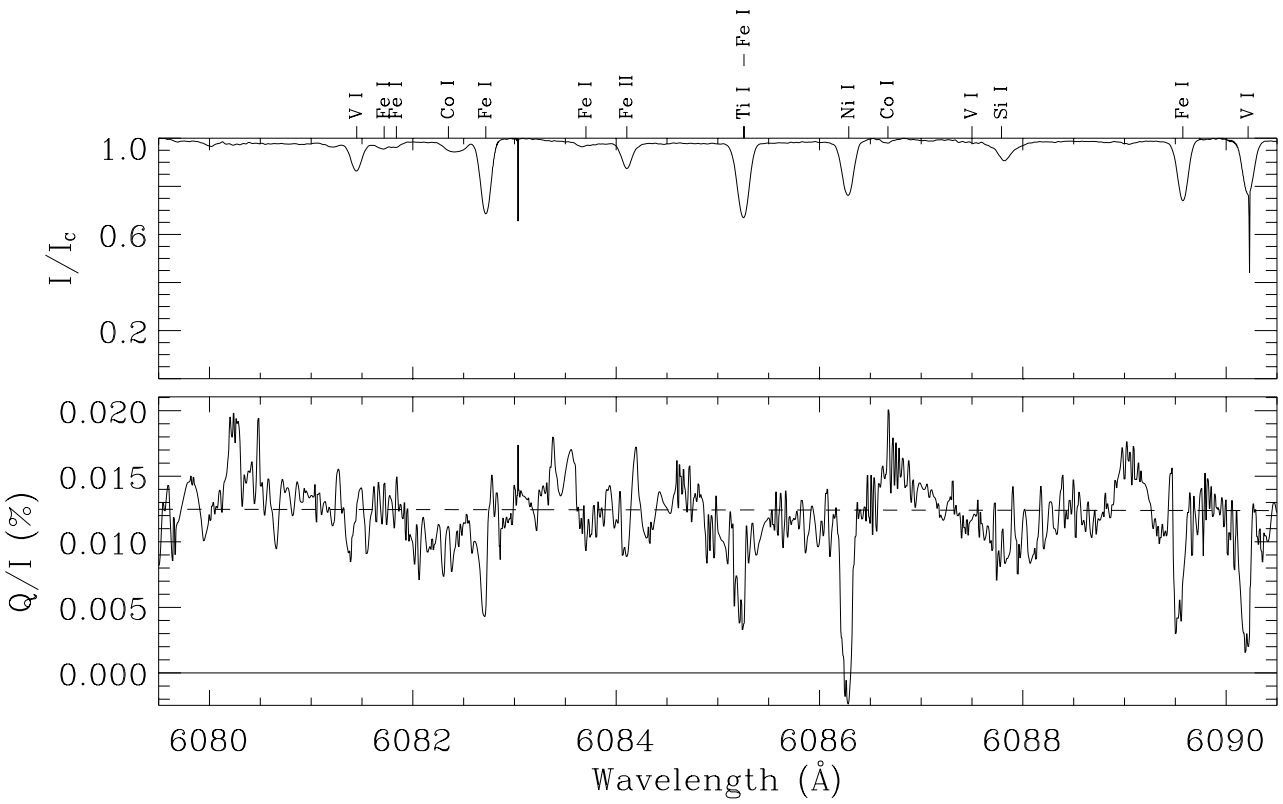

Mo I
V II
Nd II
Ti I
Zr I
Fe I
Fe I
Nd II
Fe I
Ni I
V I
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6030
6032
6034
6036
6038
6040
Wavelength (Å)

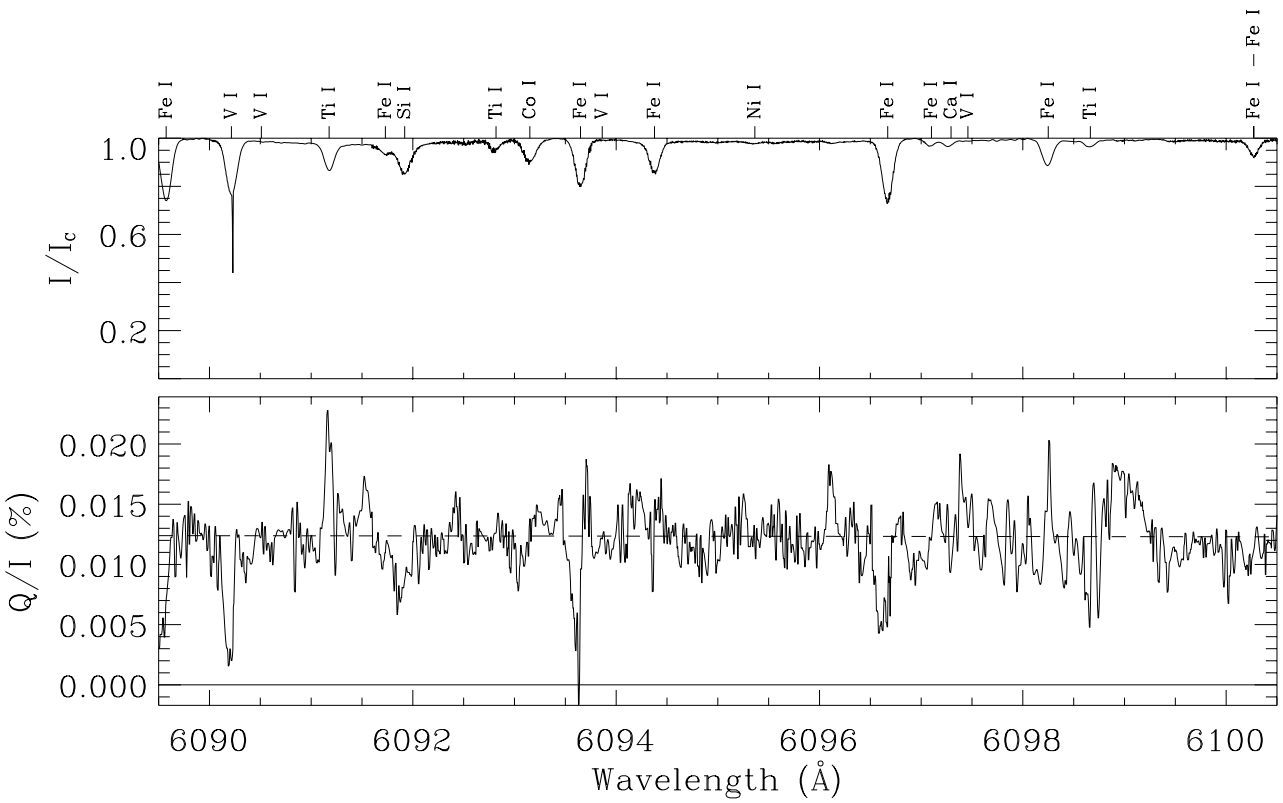

V I
S I
Fe I
Ce II
Fe II
–//S I
Cr I
Co I
1.0
0.6
0.2
I/I$_c$
0.025
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6040
6042
6044
6046
6048
6050
Wavelength (Å)

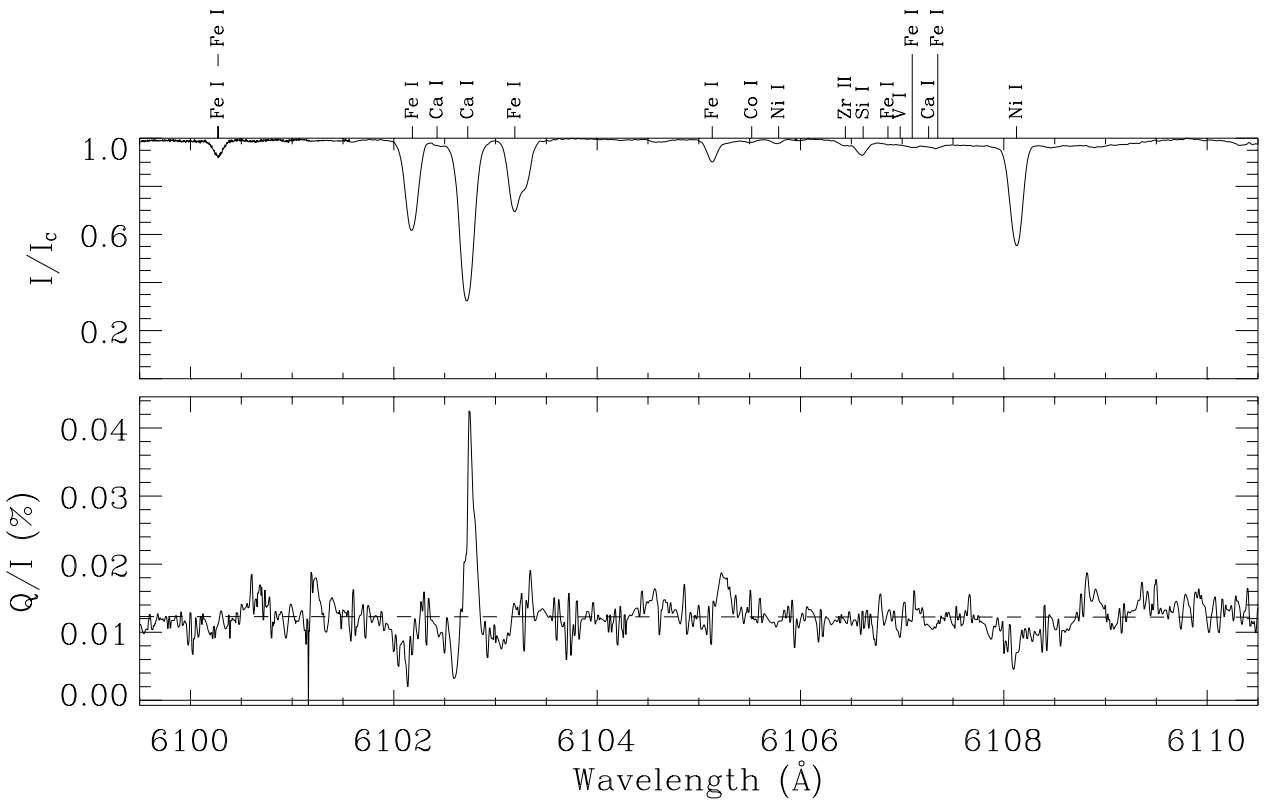

Fe I
S I
Cr II
Ni I
Fe I
Cr I
Fe I
V I
Ti I
Sc II
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6050
6052
6054
6056
6058
6060
Wavelength (Å)

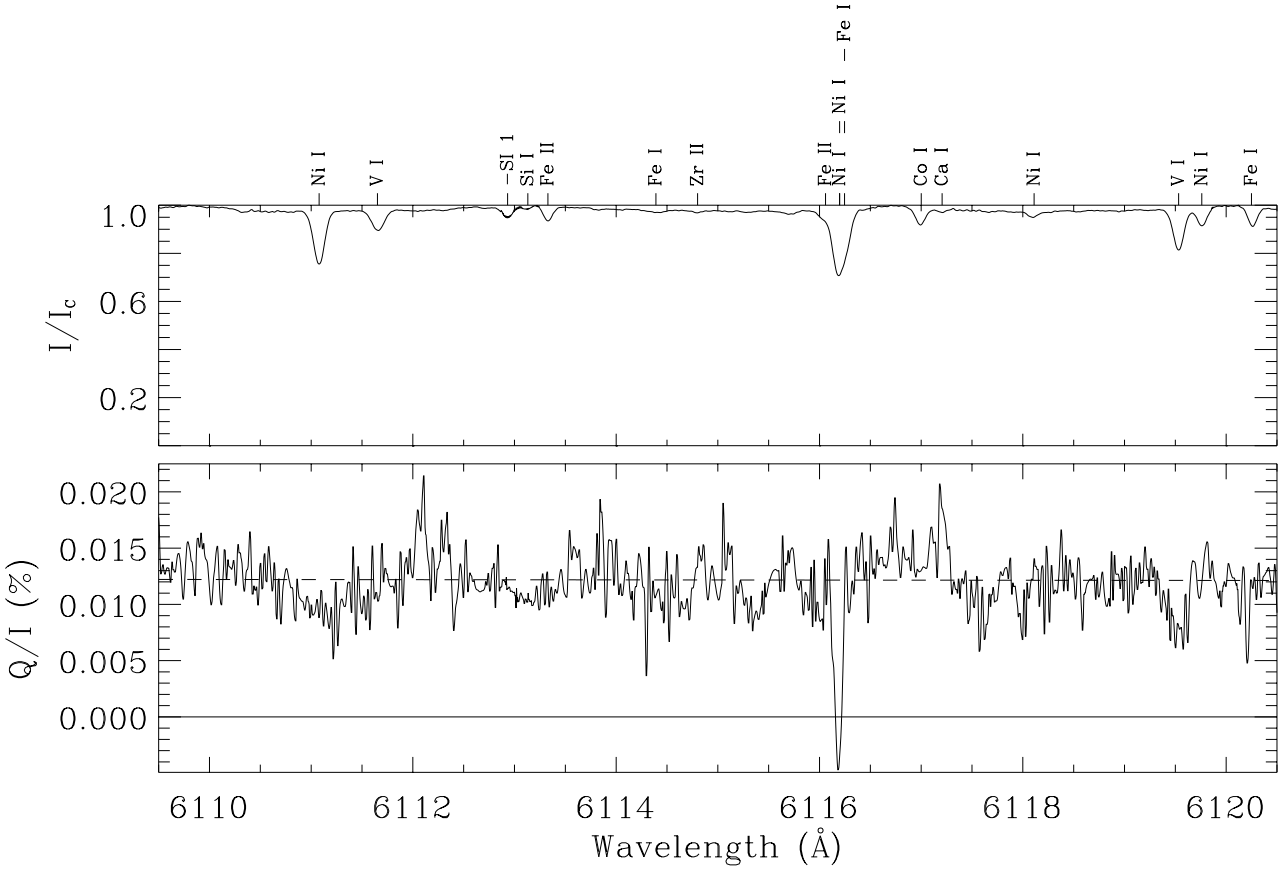

Fe I
Cr I
Zr I
– //Fe I
Ti I
Fe I
Fe I
Si I
1.0
0.6
0.2
I/I$_c$
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6060
6062
6064
6066
6068
6070
Wavelength (Å)

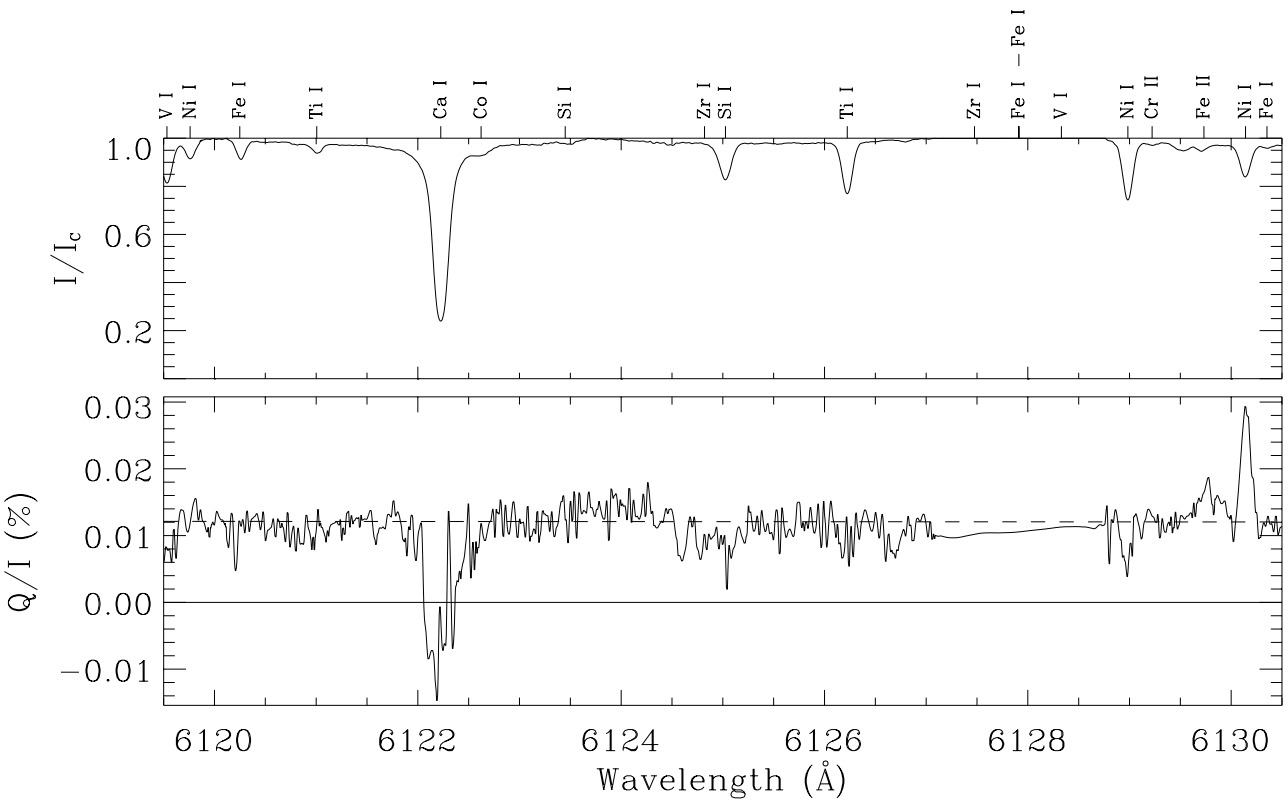

V I
Fe I
Fe I
1.0
0.6
0.2
I/I$_c$
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6070
6072
6074
6076
6078
6080
Wavelength (Å)

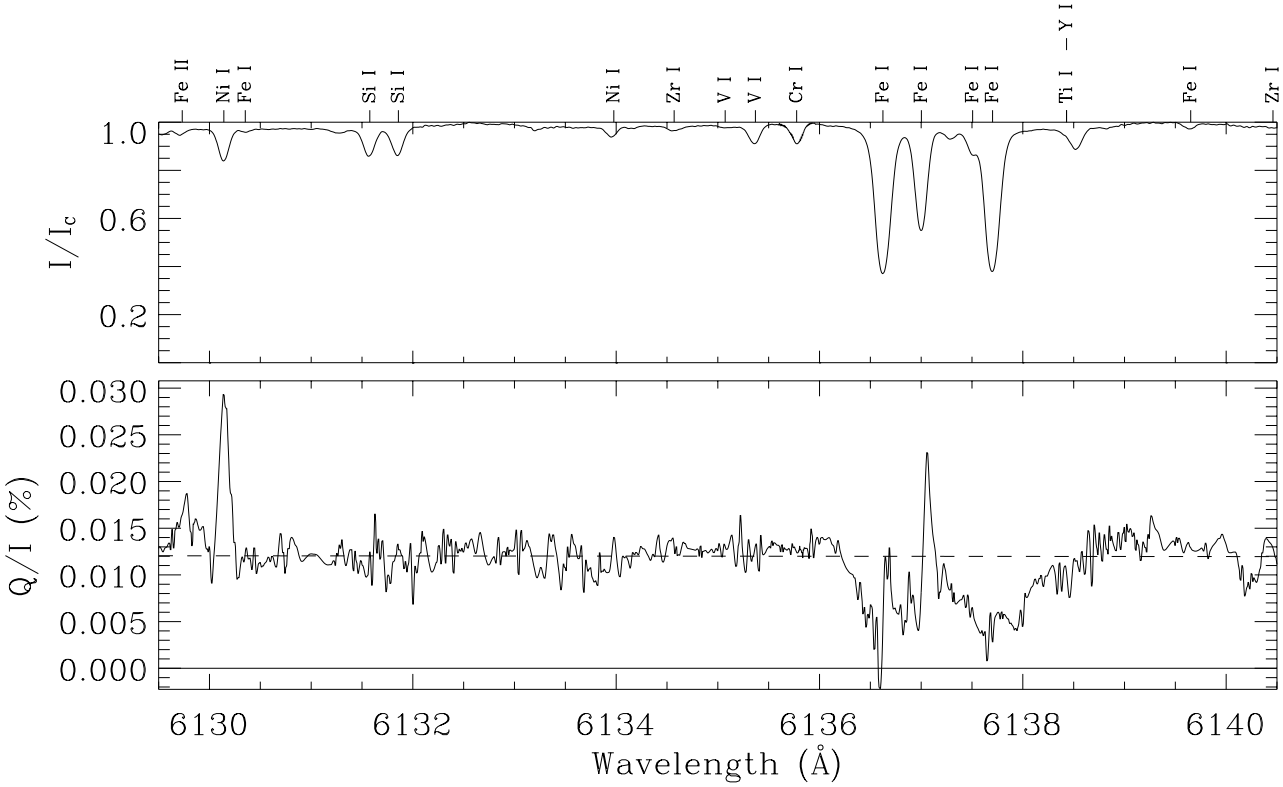

V I
Fe I
Fe I
Co I
Fe I
Fe I
Fe II
Ti I
Fe I
Ni I
Co I
V I
Si I
Fe I
V I
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6080
6082
6084
6086
6088
6090
Wavelength (Å)

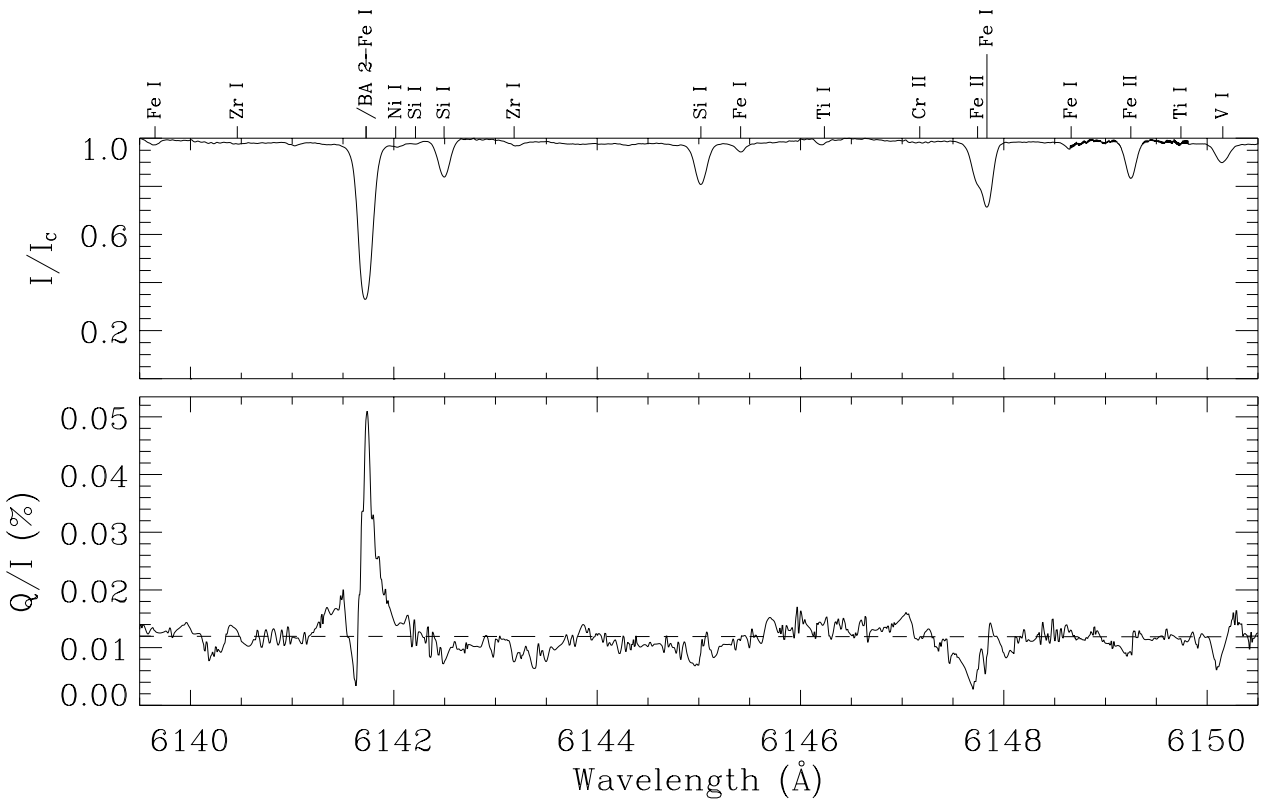

Fe I
V I
V I
Ti I
Fe I
Si I
Ti I
Co I
Fe I
V I
Fe I
Ni I
Fe I
Fe I
Ca I
V I
Fe I
Ti I
Fe I – Fe I
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6090
6092
6094
6096
6098
6100
Wavelength (Å)

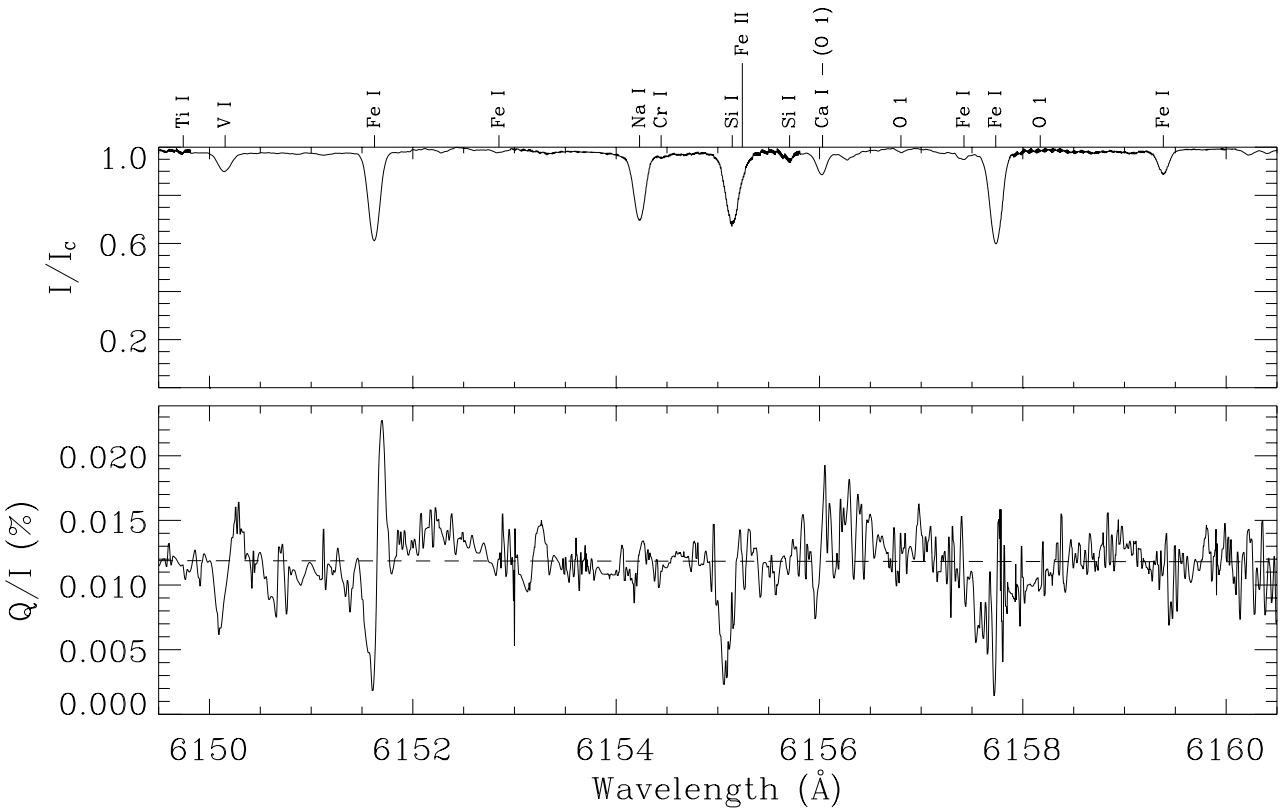

Fe I
Fe I
Fe I
Ca I
Ca I
Fe I
Fe I
Co I
Ni I
Zr II
Si I
Fe I
V I
Fe I
Ca I
Fe I
Ni I
1.0
0.6
0.2
I/I_c
0.04
0.03
0.02
0.01
0.00
Q/I (%)
6100
6102
6104
6106
6108
6110
Wavelength (Å)

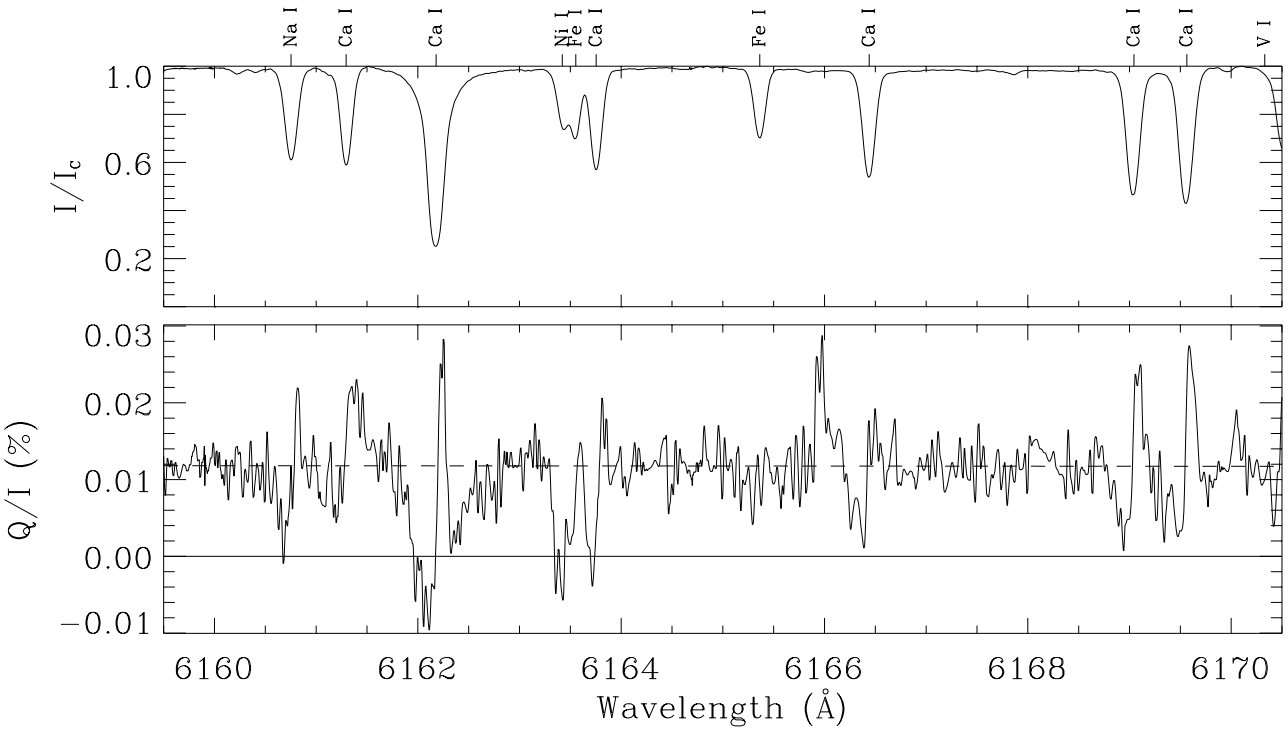

Ni I
V I
SI I
Si I
Fe II
Fe I
Zr II
Fe II
Ni I
Ni I
Fe I
Co I
Ca I
Ni I
V I
Ni I
Fe I
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6110
6112
6114
6116
6118
6120
Wavelength (Å)

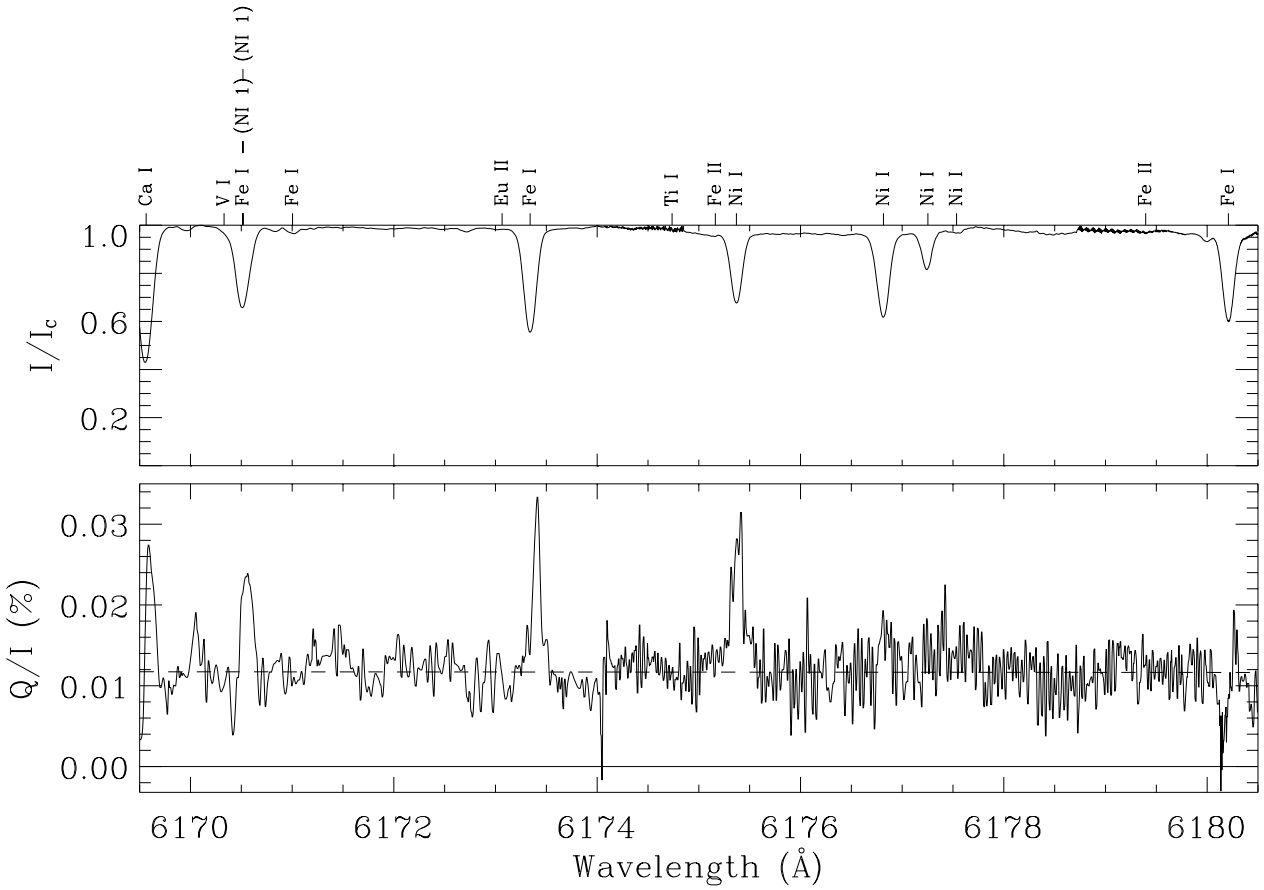

V I
Ni I
Fe I
Ti I
Ca I
Co I
Si I
Zr I
Si I
Ti I
Zr I
Fe I – Fe I
V I
Ni I
Cr II
Fe II
Ni I
Fe I
1.0
0.6
0.2
I/I_c
0.03
0.02
0.01
0.00
−0.01
Q/I (%)
6120
6122
6124
6126
6128
6130
Wavelength (Å)

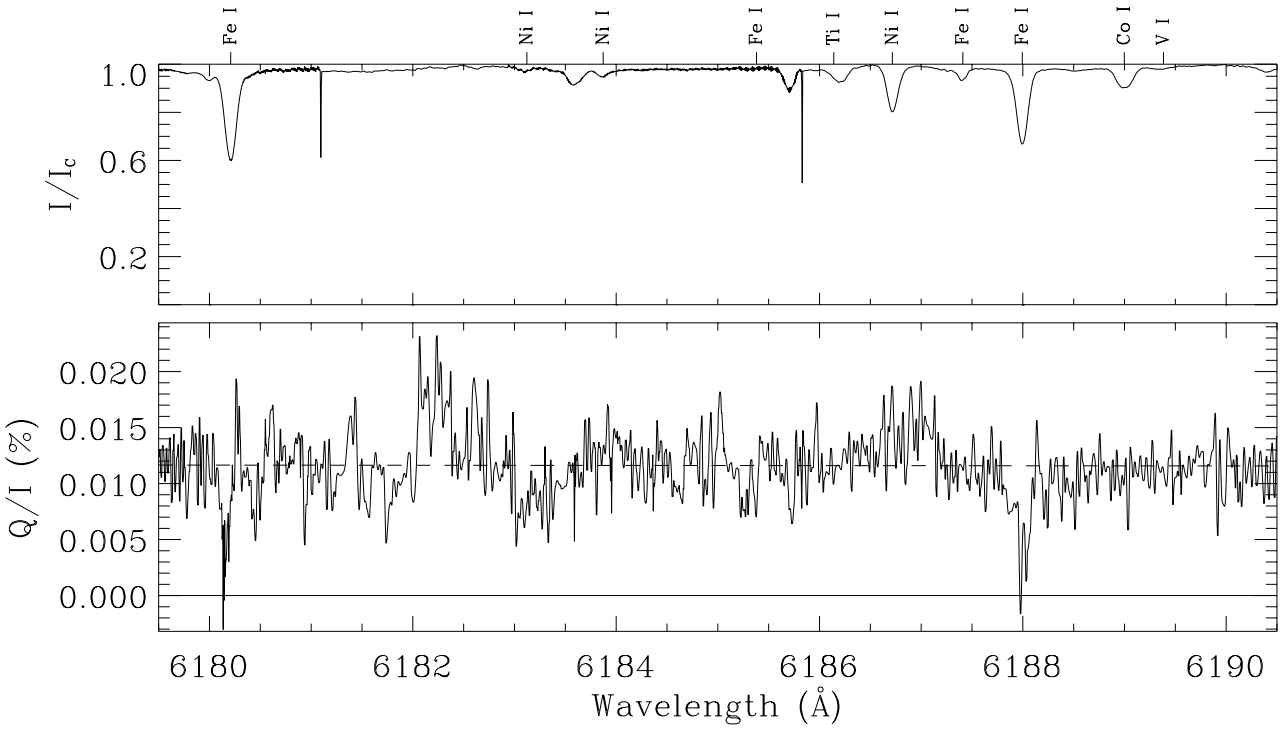

Fe II
Ni I
Fe I
Si I
Si I
Ni I
Zr I
V I
V I
Cr I
Fe I
Fe I
Fe I
Fe I
Ti I – Y I
Fe I
Zr I
1.0
0.6
0.2
I/I_c
0.030
0.025
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6130
6132
6134
6136
6138
6140
Wavelength (Å)

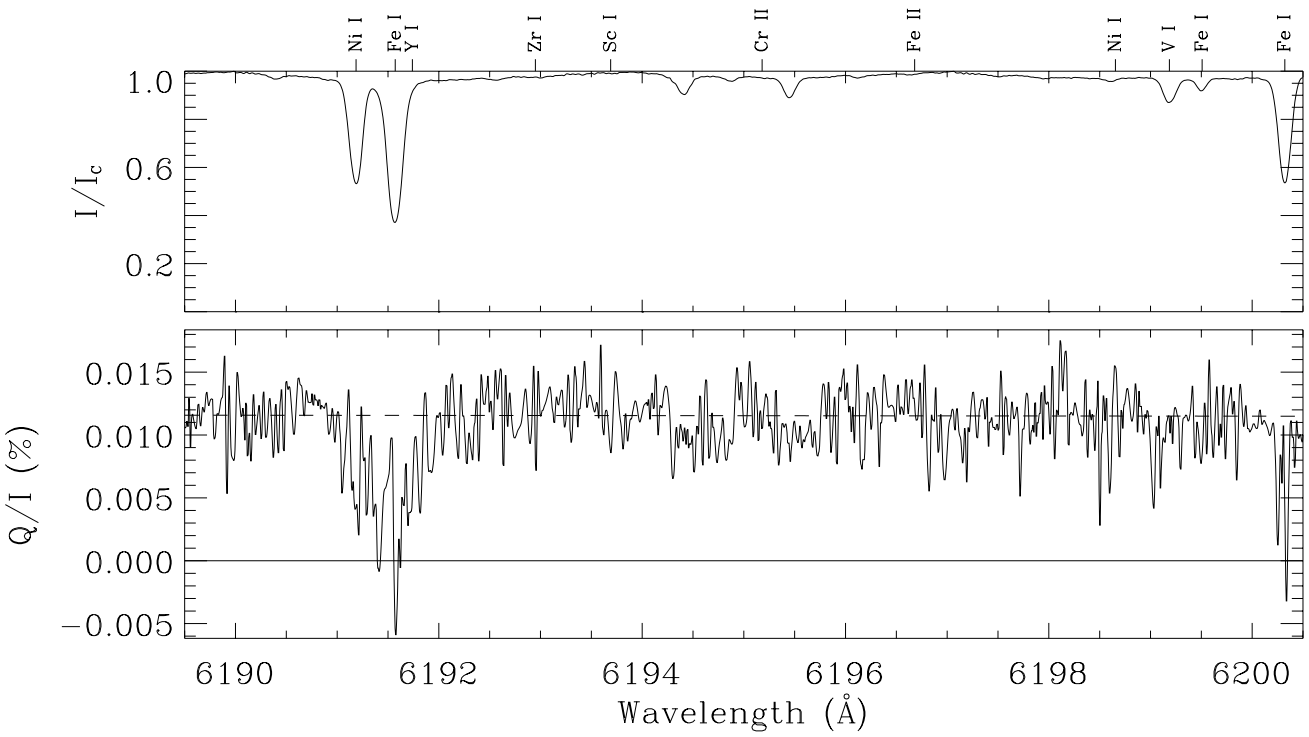

Fe I
Zr I
/BA 2
Fe I
Ni I
Si I
Si I
Zr I
Si I
Fe I
Ti I
Cr II
Fe II
Fe I
Fe I
Fe II
Ti I
V I
1.0
0.6
0.2
I/I_c
0.05
0.04
0.03
0.02
0.01
0.00
Q/I (%)
6140
6142
6144
6146
6148
6150
Wavelength (Å)

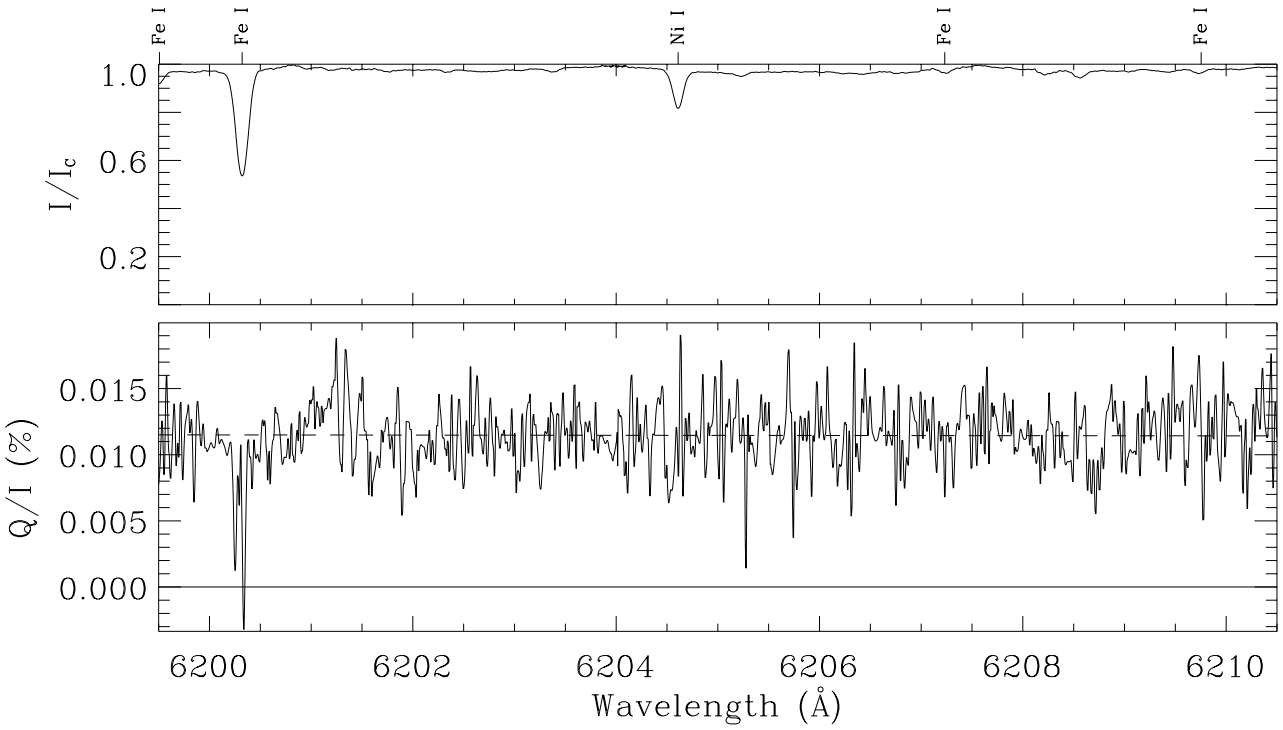

Ti I
V I
Fe I
Fe I
Na I
Cr I
Si I
Fe II
Si I
Ca I – (O 1)
O 1
Fe I
Fe I
O 1
Fe I
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6150
6152
6154
6156
6158
6160
Wavelength (Å)

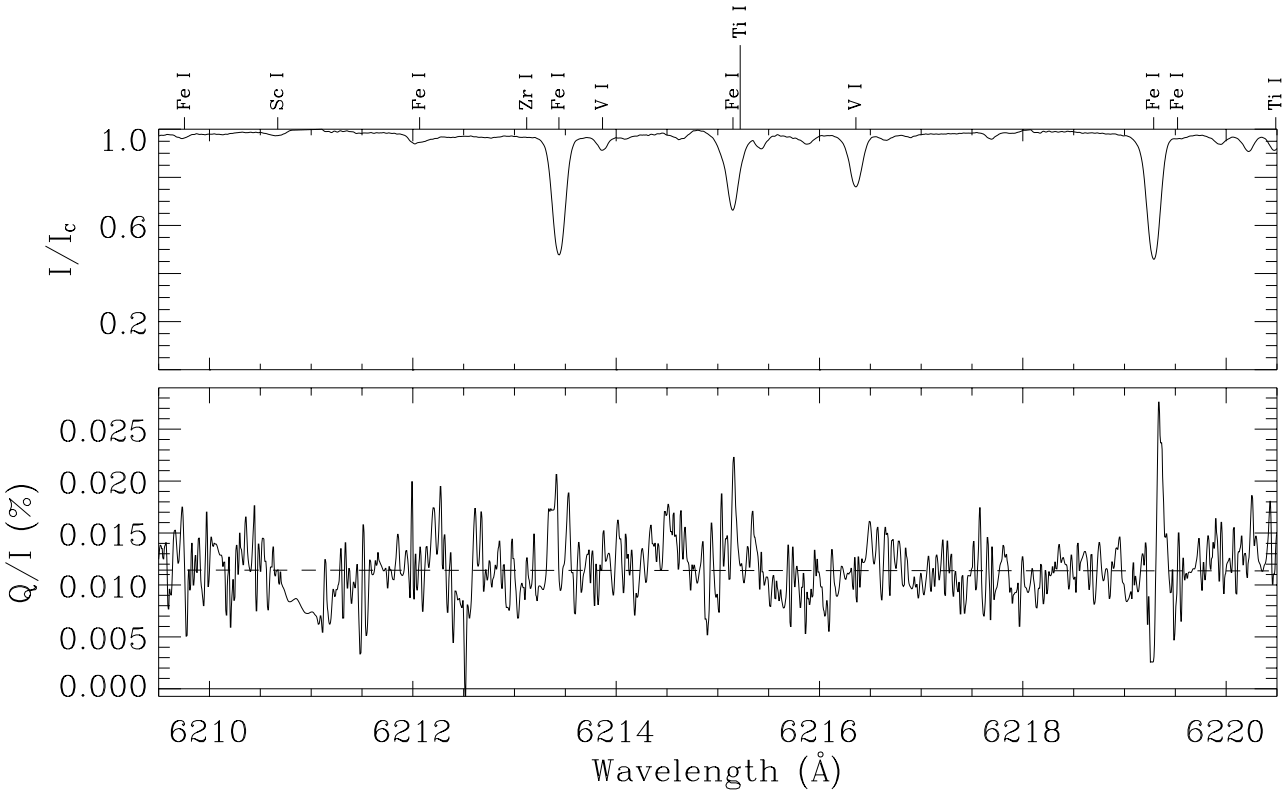

Na I
Ca I
Ca I
Ni I
Fe I
Ca I
Fe I
Ca I
Ca I
Ca I
V I
1.0
0.6
0.2
I/I_c
0.03
0.02
0.01
0.00
−0.01
Q/I (%)
6160
6162
6164
6166
6168
6170
Wavelength (Å)

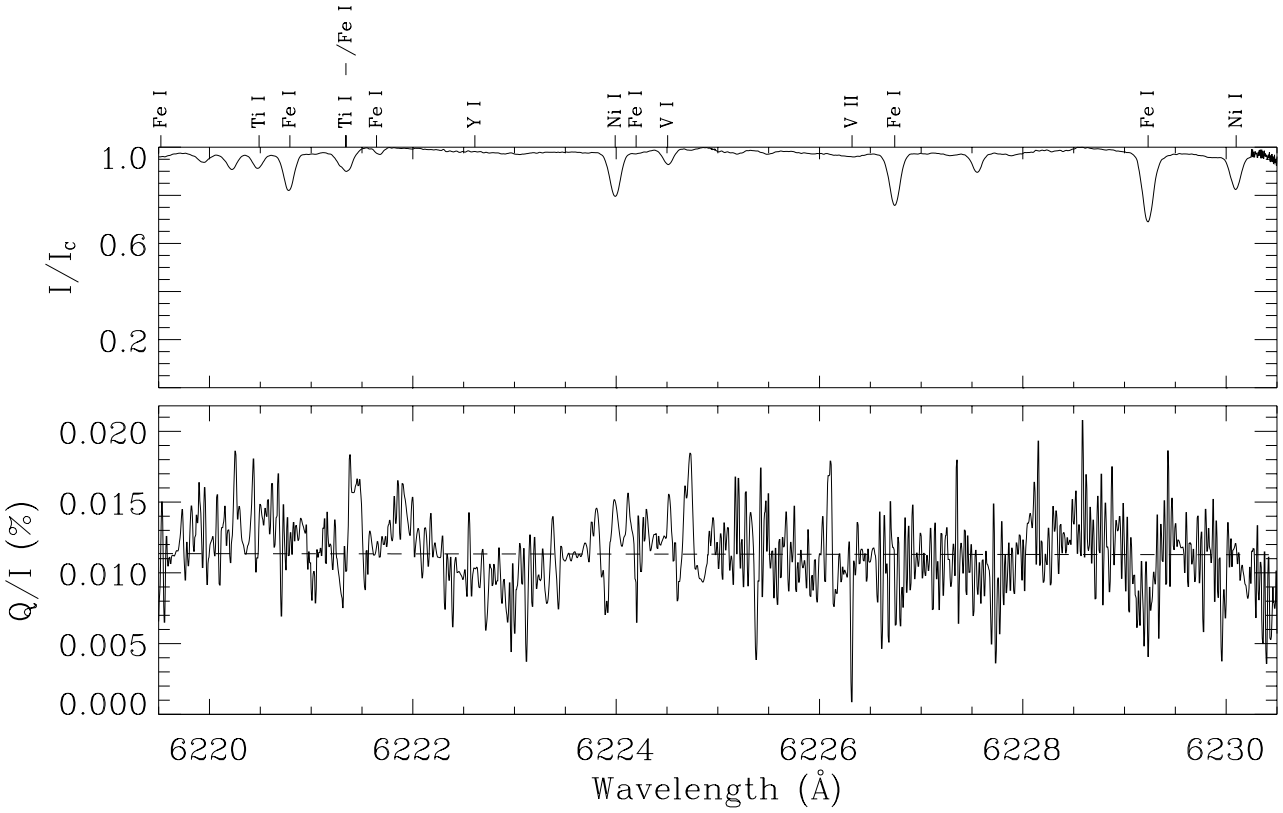

Ca I
V I
Fe I
(NI 1)
(NI 1)
Fe I
Eu II
Fe I
Ti I
Fe II
Ni I
Ni I
Ni I
Ni I
Fe II
Fe I
1.0
0.6
0.2
I/I_c
0.03
0.02
0.01
0.00
Q/I (%)
6170
6172
6174
6176
6178
6180
Wavelength (Å)

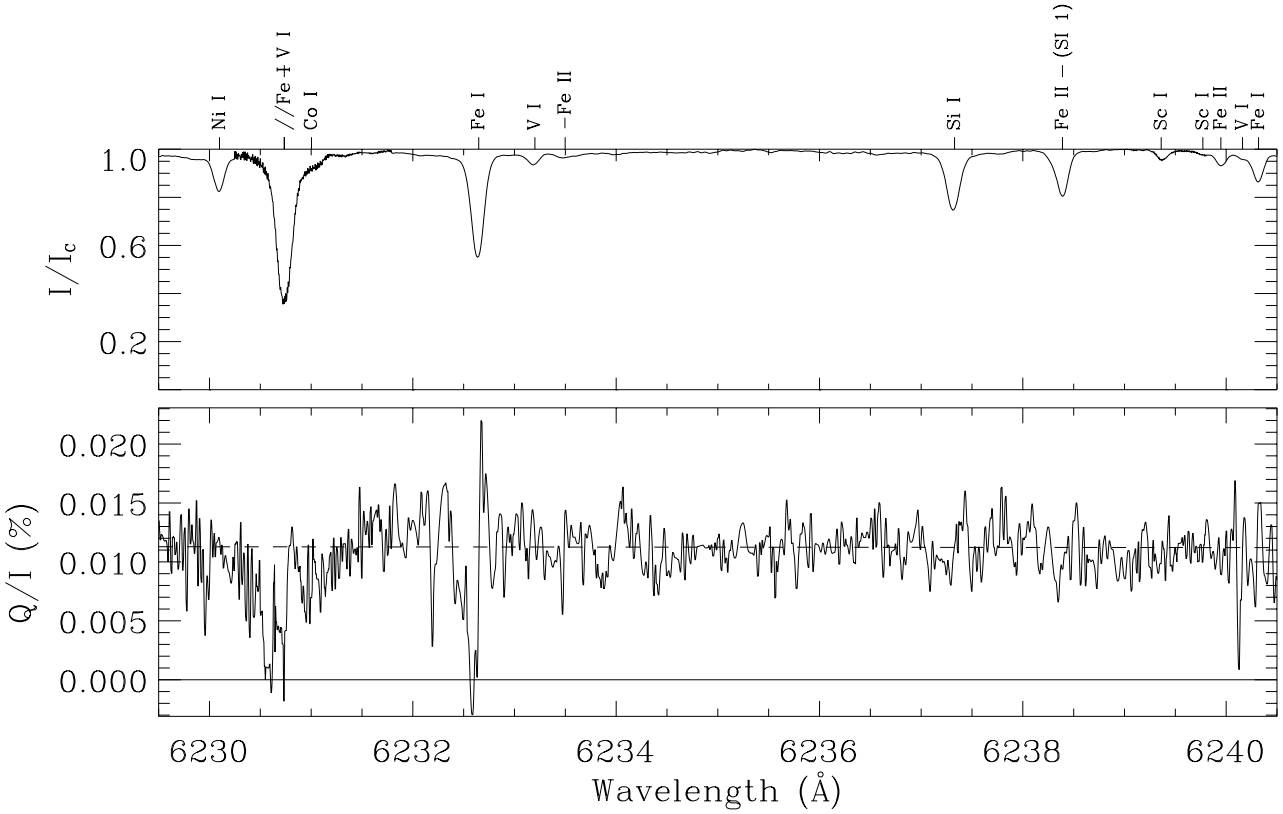

Fe I
Ni I
Ni I
Fe I
Ti I
Ni I
Fe I
Fe I
Co I
V I
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6180
6182
6184
6186
6188
6190
Wavelength (Å)

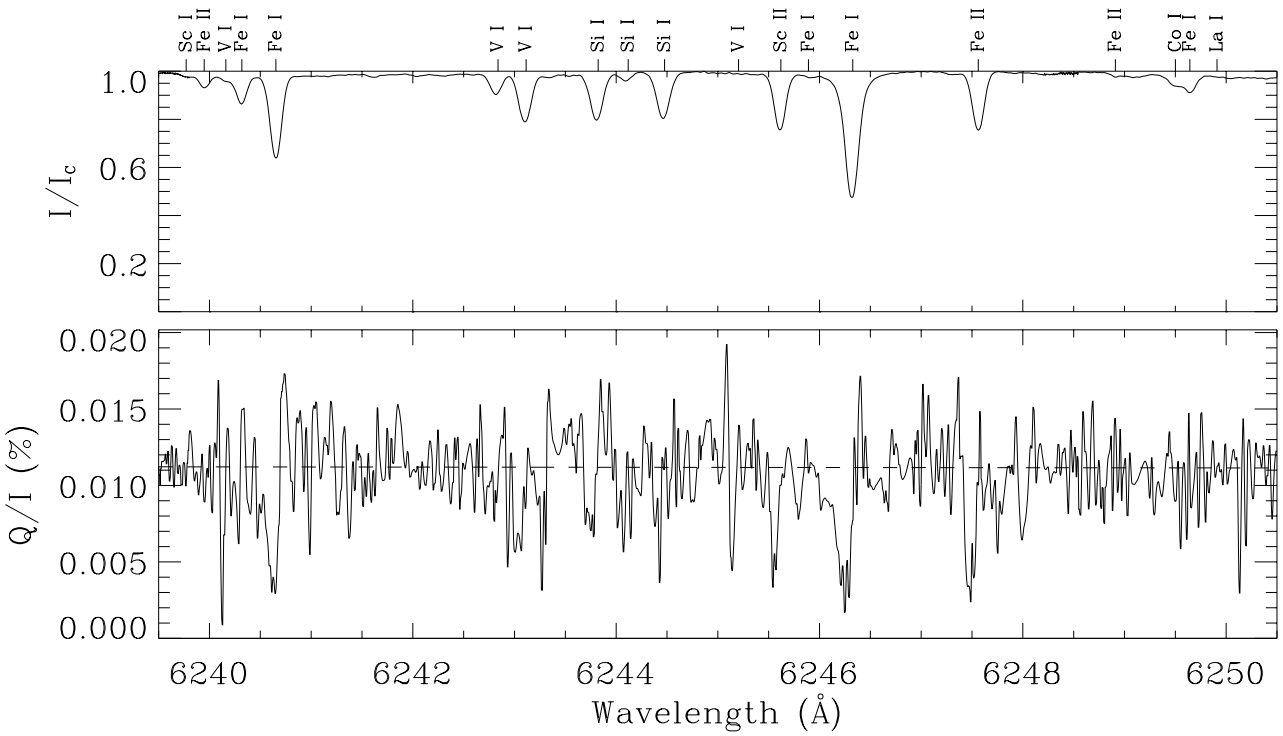

Ni I
Fe I
Y I
Zr I
Sc I
Cr II
Fe II
Ni I
V I
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
−0.005
Q/I (%)
6190
6192
6194
6196
6198
6200
Wavelength (Å)

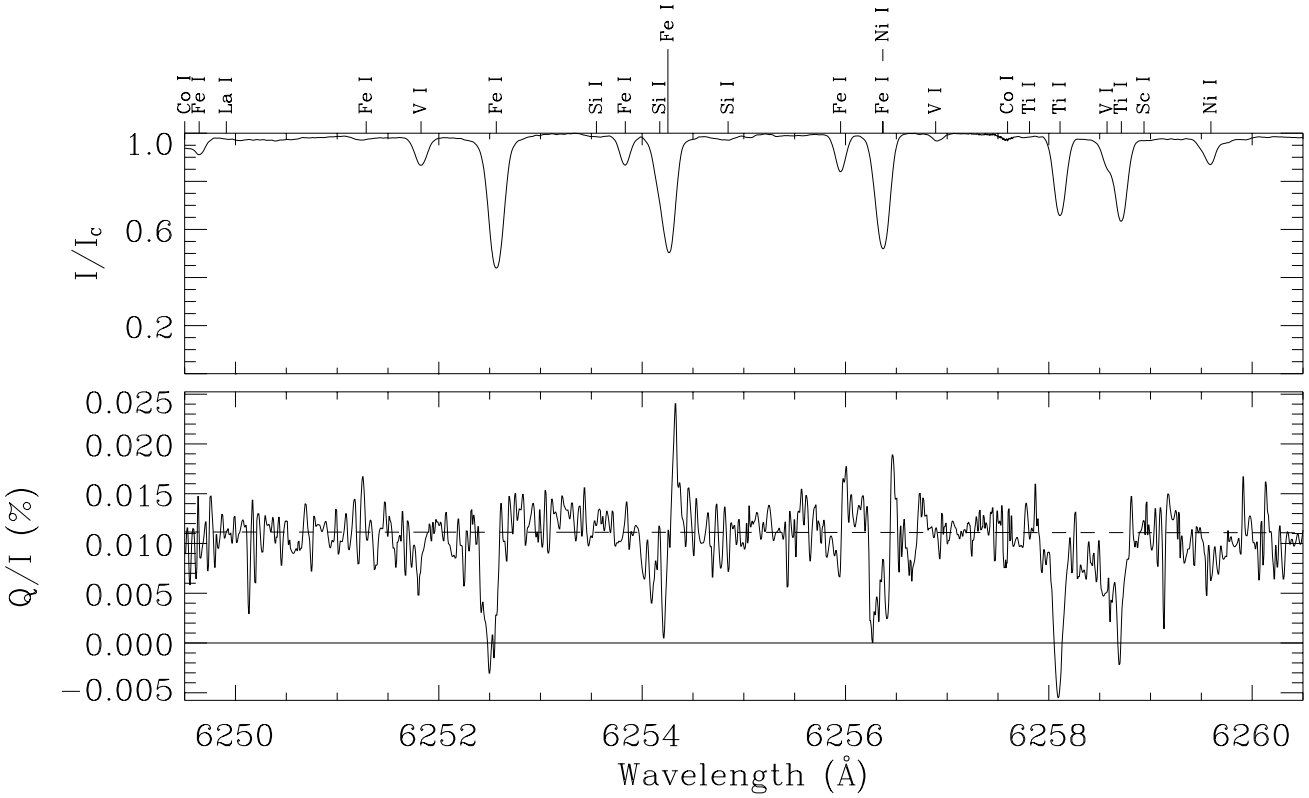

Fe I
Fe I
Ni I
Fe I
Fe I
1.0
0.6
0.2
I/I$_c$
0.015
0.010
0.005
0.000
Q/I (%)
6200
6202
6204
6206
6208
6210
Wavelength (Å)

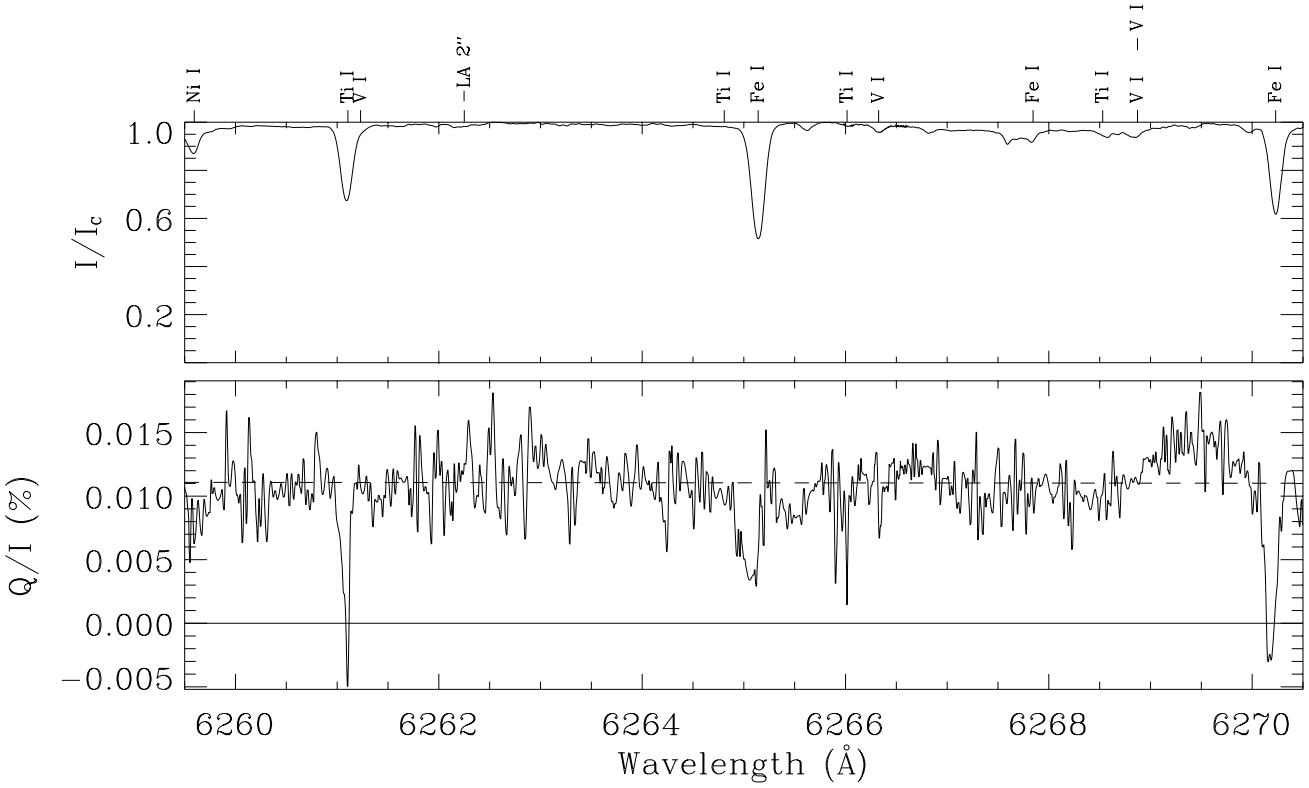

Fe I
Sc I
Fe I
Zr I
Fe I
V I
Fe I
Ti I
V I
Fe I
Fe I
Ti I
1.0
0.6
0.2
I/I_c
0.025
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6210
6212
6214
6216
6218
6220
Wavelength (Å)

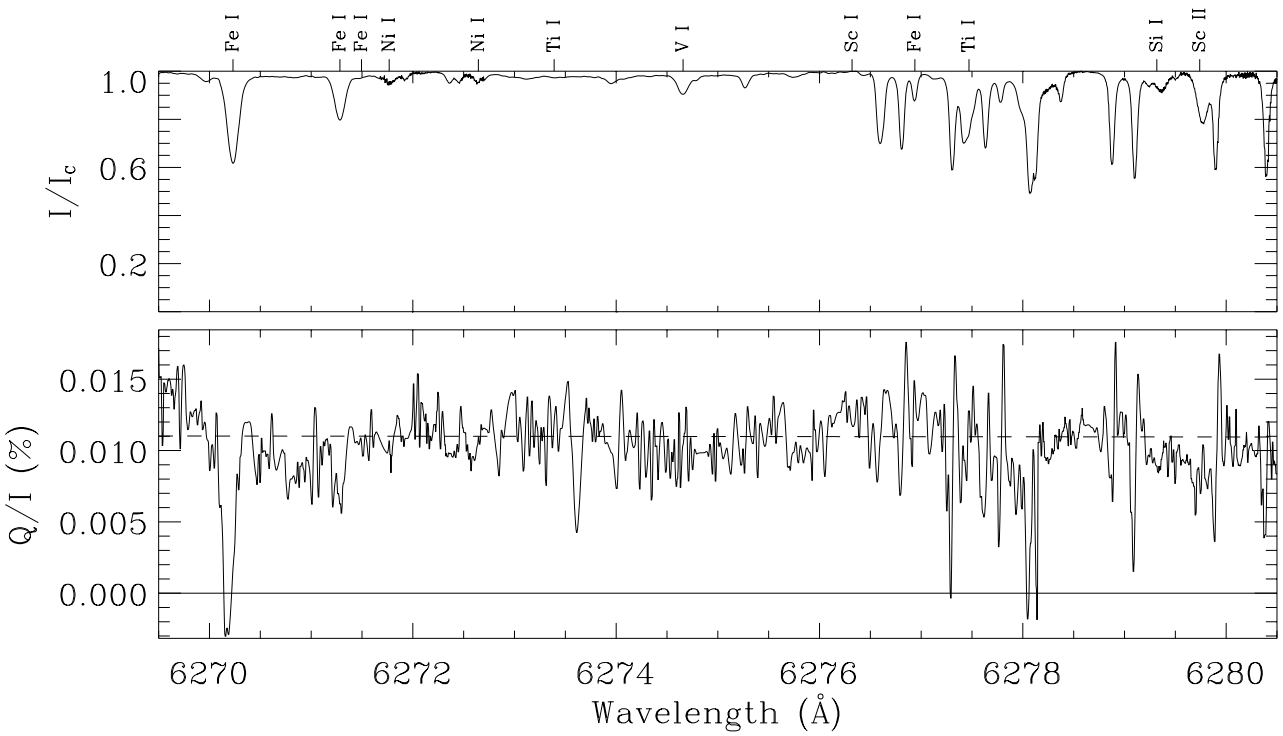

Fe I
Ti I
Fe I
Ti I
– /Fe I
Fe I
Y I
Ni I
Fe I
V I
V II
Fe I
Fe I
Ni I
1.0
0.6
0.2
I/I$_c$
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6220
6222
6224
6226
6228
6230
Wavelength (Å)

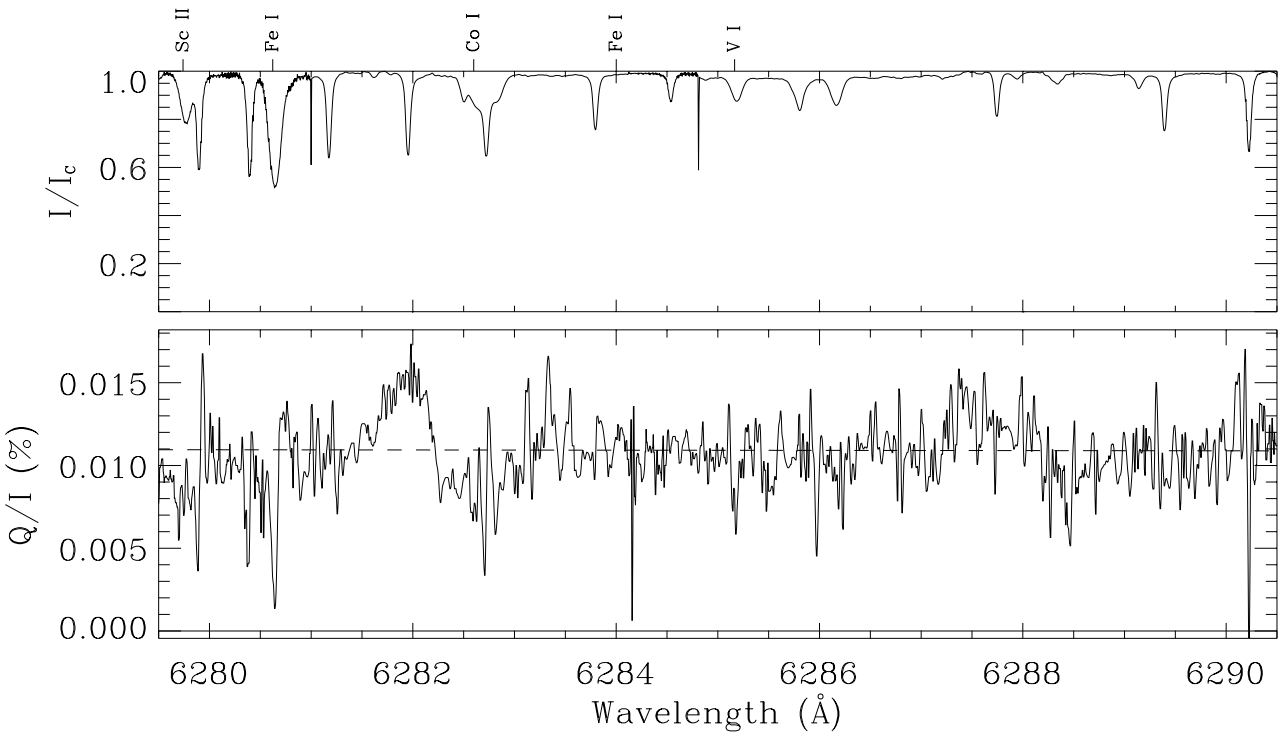

Ni I
//Fe + V I
Co I
Fe I
V I
-Fe II
Si I
Fe II – (Si 1)
Sc I
Sc I
Fe II
V I
Fe I
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6230
6232
6234
6236
6238
6240
Wavelength (Å)

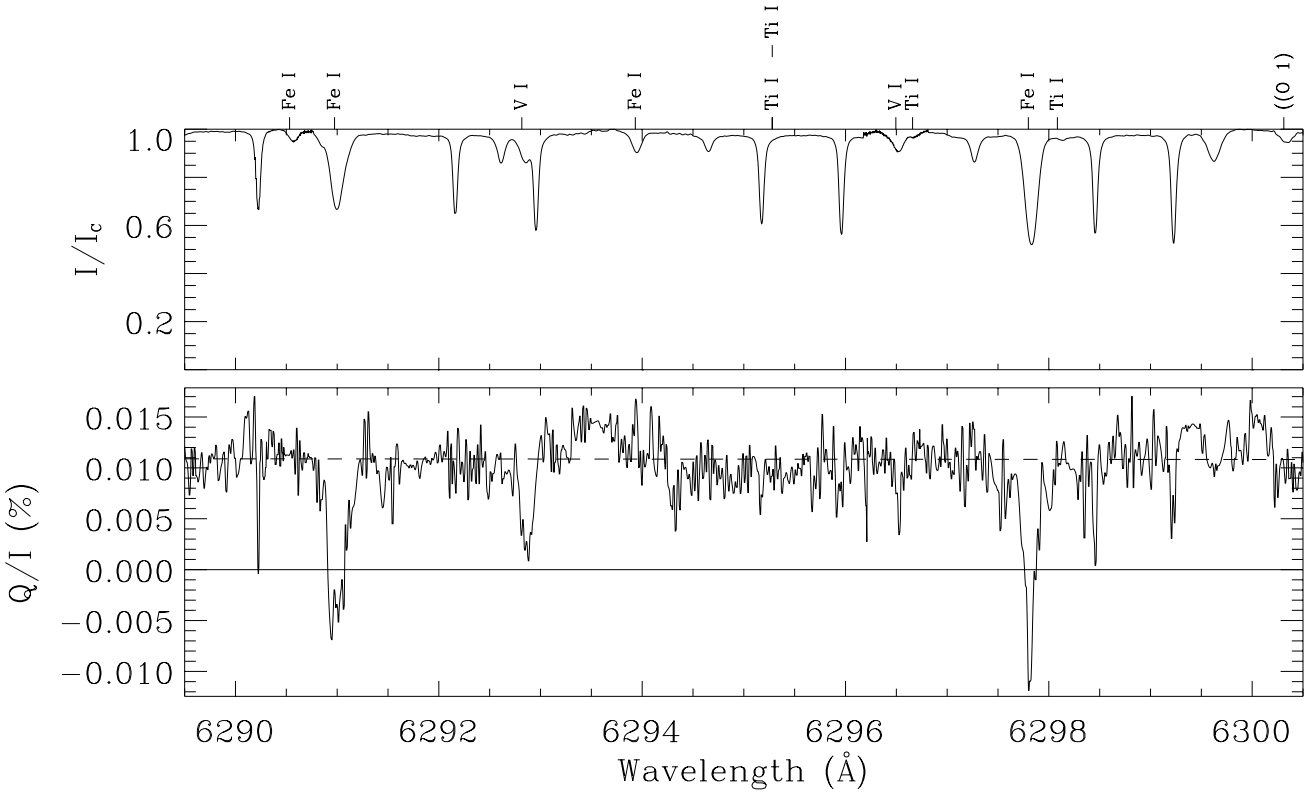

Sc I
Fe II
V I
Fe I
Fe I
V I
V I
Si I
Si I
Si I
V I
Sc II
Fe I
Fe I
Fe II
Fe II
Co I
Fe I
La I
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6240
6242
6244
6246
6248
6250
Wavelength (Å)

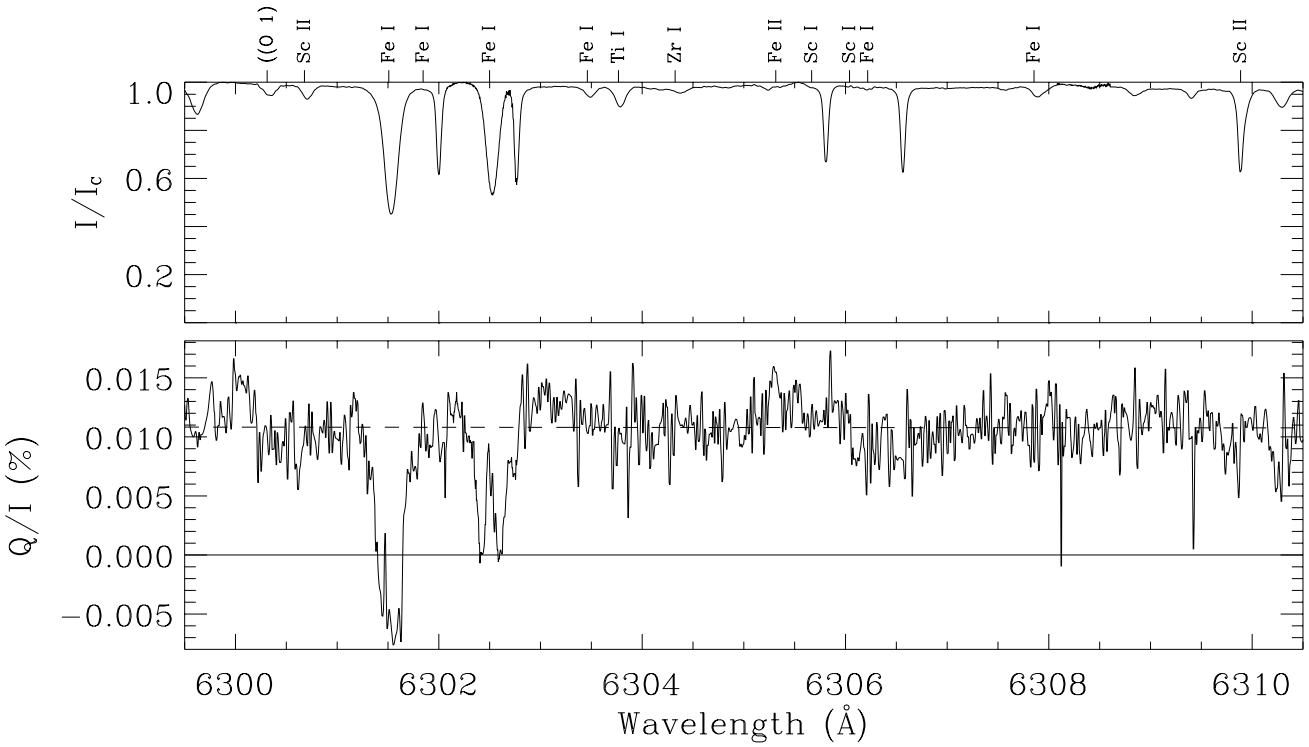

Co I
Fe I
La I
Fe I
V I
Fe I
Si I
Fe I
Si I
Fe I
Si I
Fe I
Fe I
Ni I
V I
Co I
Ti I
Ti I
V I
Ti I
Sc I
Ni I
1.0
0.6
0.2
I/I_c
0.025
0.020
0.015
0.010
0.005
0.000
−0.005
Q/I (%)
6250
6252
6254
6256
6258
6260
Wavelength (Å)

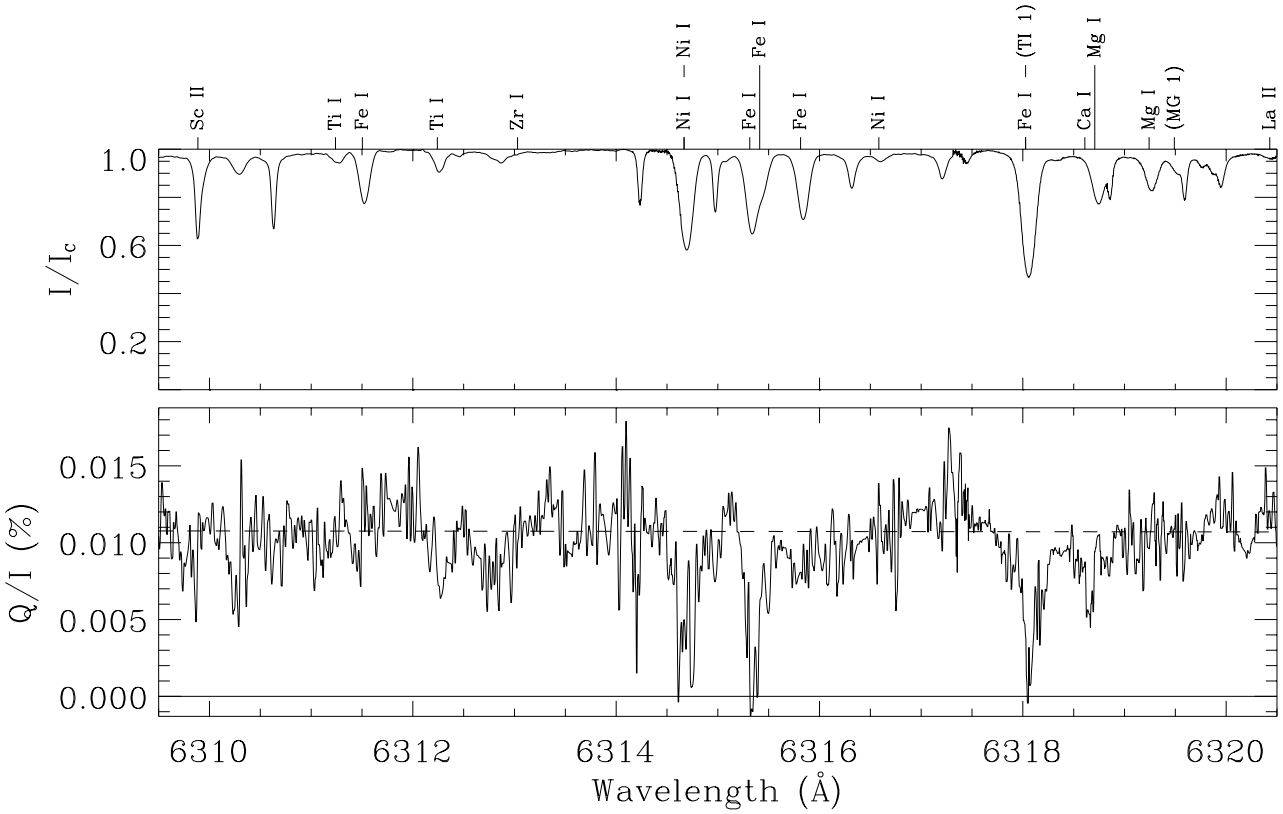

Ni I
Ti I
V I
LA 2"
Ti I
Fe I
Ti I
V I
Fe I
Ti I
V I
V I
Fe I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
−0.005
Q/I (%)
6260
6262
6264
6266
6268
6270
Wavelength (Å)

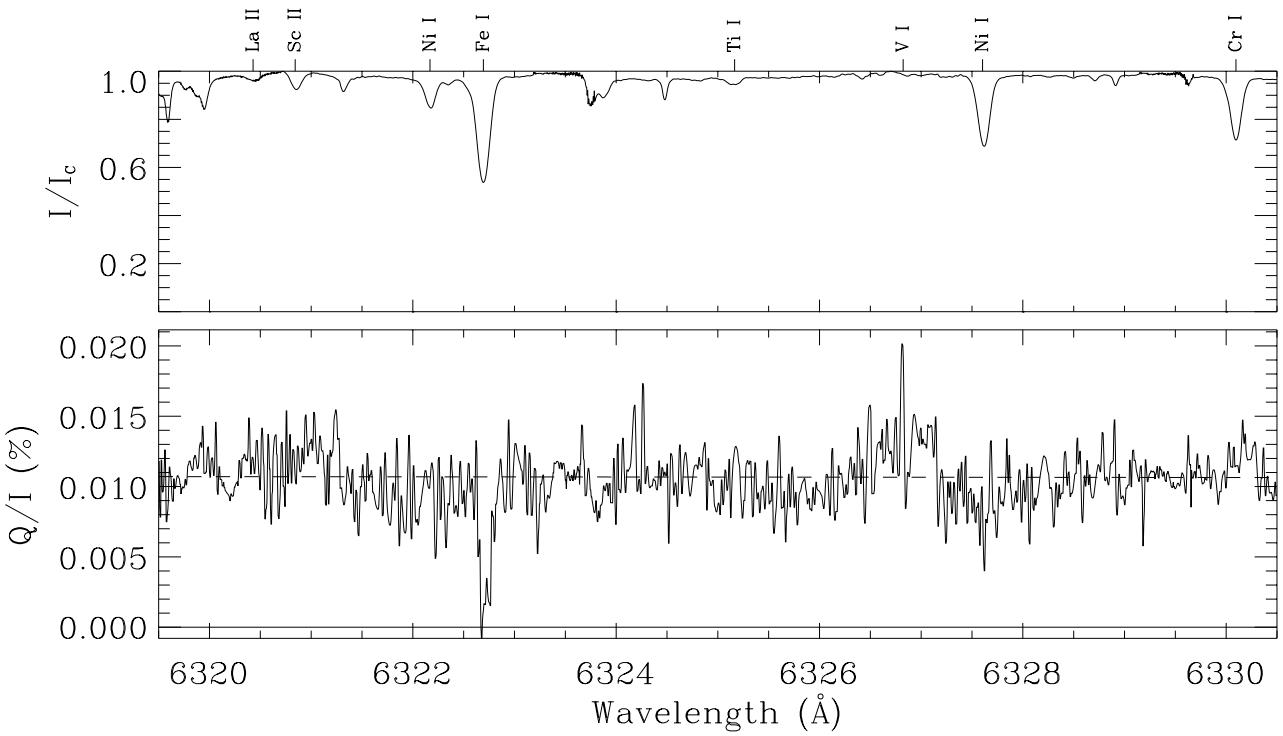

Fe I
Fe I
Fe I
Ni I
Ni I
Ti I
V I
Sc I
Fe I
Ti I
Si I
Sc II
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
Q/I (%)
6270
6272
6274
6276
6278
6280
Wavelength (Å)

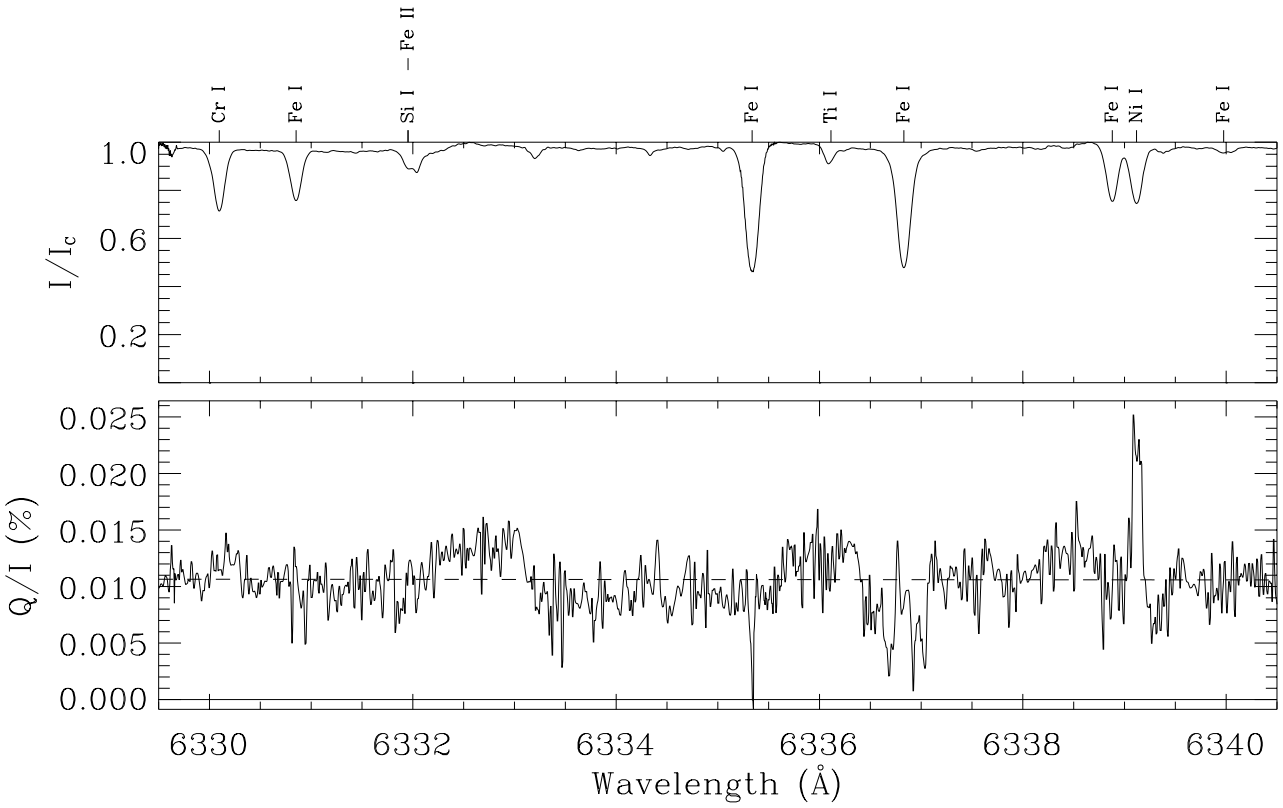

Sc II
Fe I
Co I
Fe I
V I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
Q/I (%)
6280
6282
6284
6286
6288
6290
Wavelength (Å)

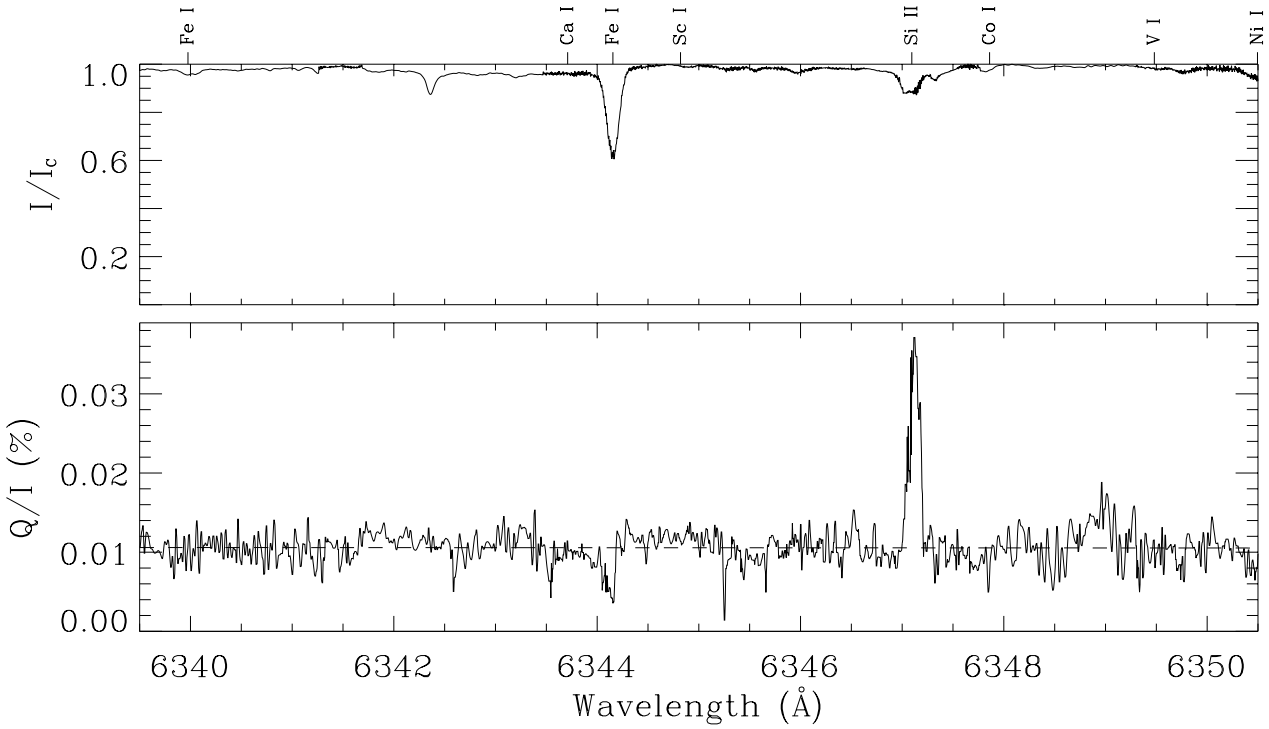

Fe I
Fe I
V I
Fe I
Ti I
Ti I
V I
Ti I
Fe I
Ti I
(O I)
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
−0.005
−0.010
Q/I (%)
6290
6292
6294
6296
6298
6300
Wavelength (Å)

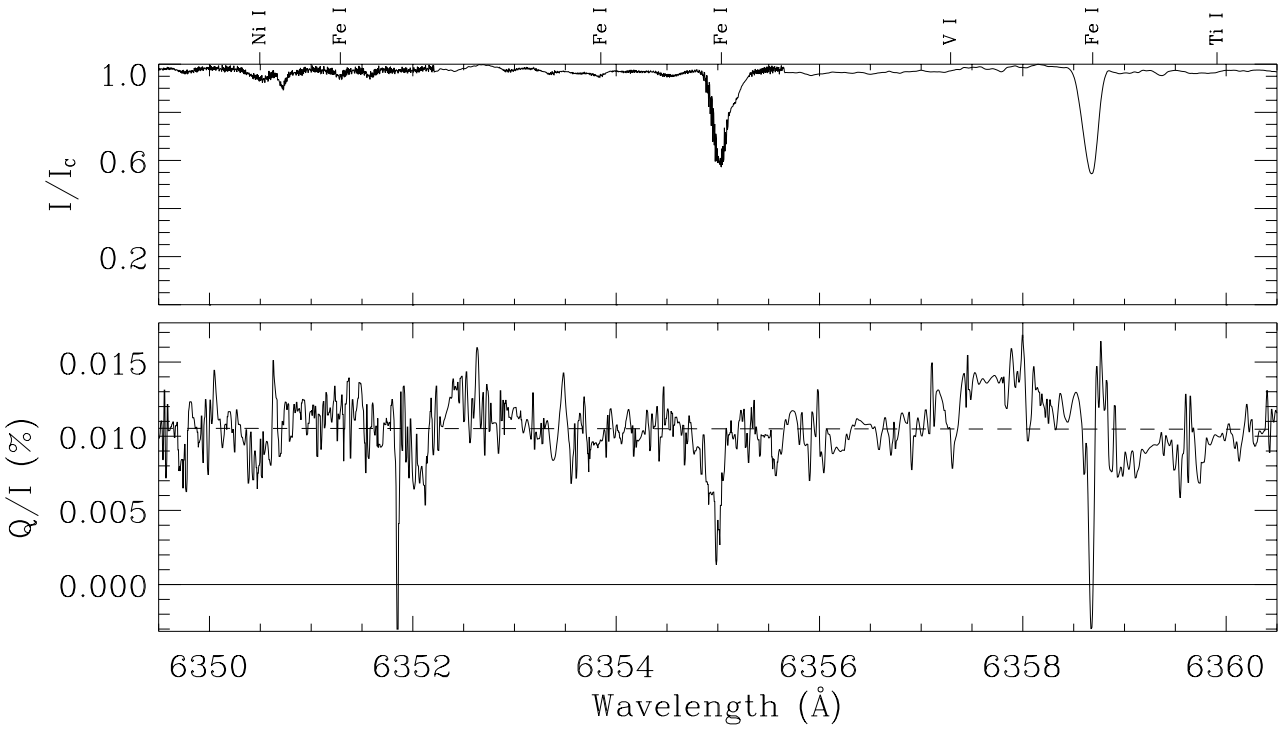

(O I)
Sc II
Fe I
Fe I
Fe I
Fe I
Ti I
Zr I
Fe II
Sc I
Sc I
Fe I
Fe I
Sc II
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
−0.005
Q/I (%)
6300
6302
6304
6306
6308
6310
Wavelength (Å)

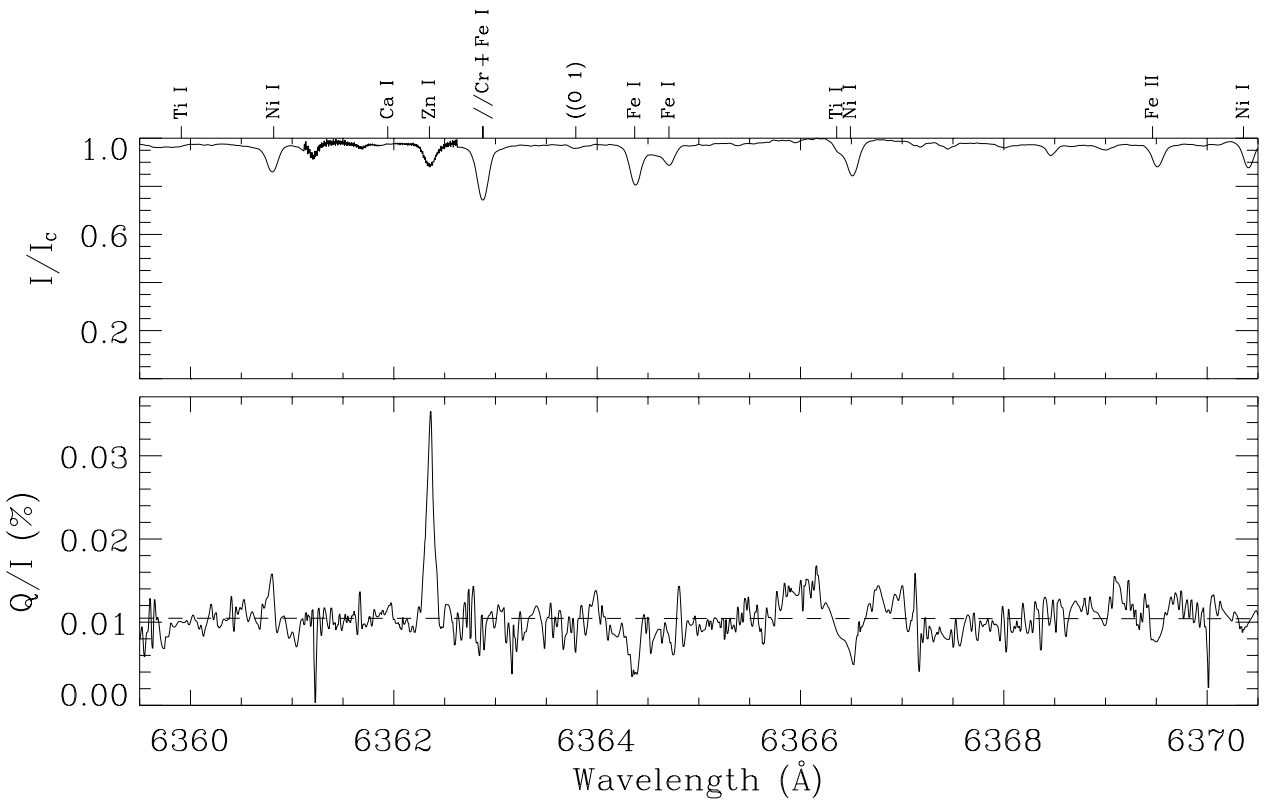

Sc II
Ti I
Fe I
Ti I
Zr I
Ni I – Ni I
Fe I
Fe I
Ni I
Fe I – (Ti 1)
Ca I
Mg I
Mg I
(MG 1)
La II
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
Q/I (%)
6310
6312
6314
6316
6318
6320
Wavelength (Å)

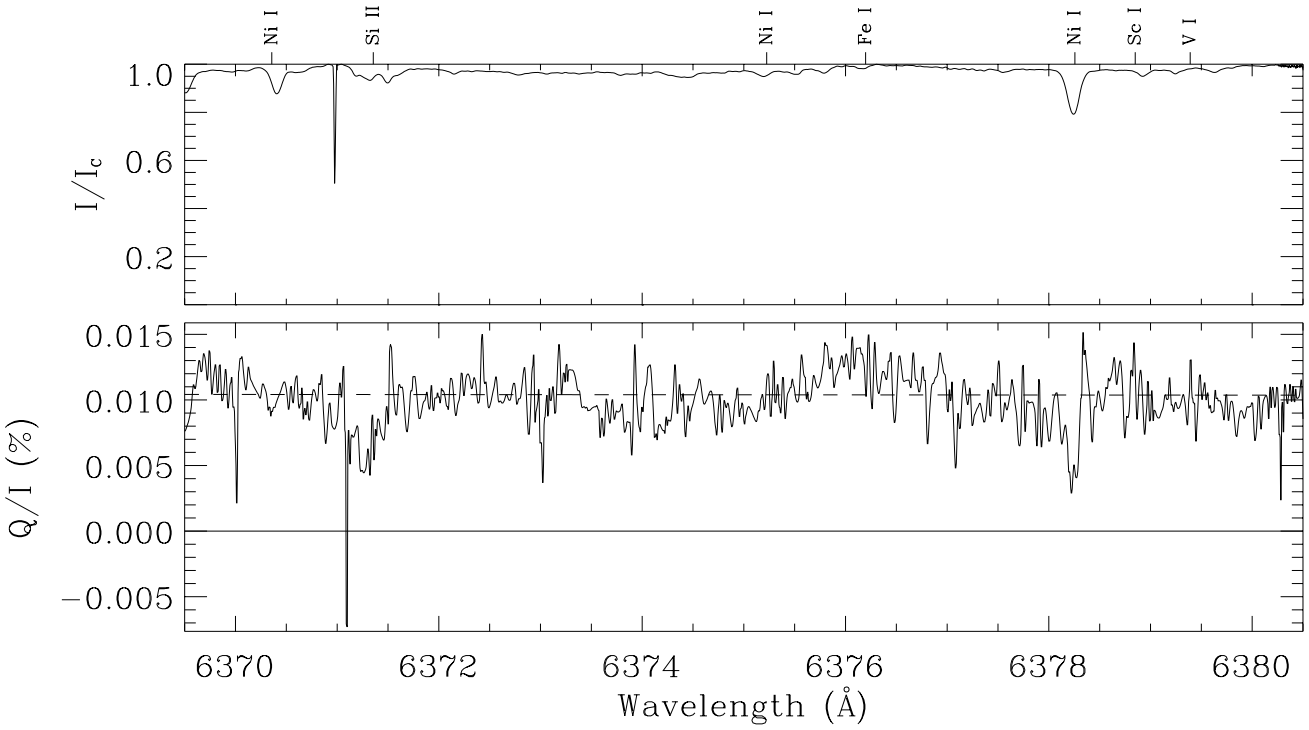

La II
Sc II
Ni I
Fe I
Ti I
V I
Ni I
Cr I
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6320
6322
6324
6326
6328
6330
Wavelength (Å)

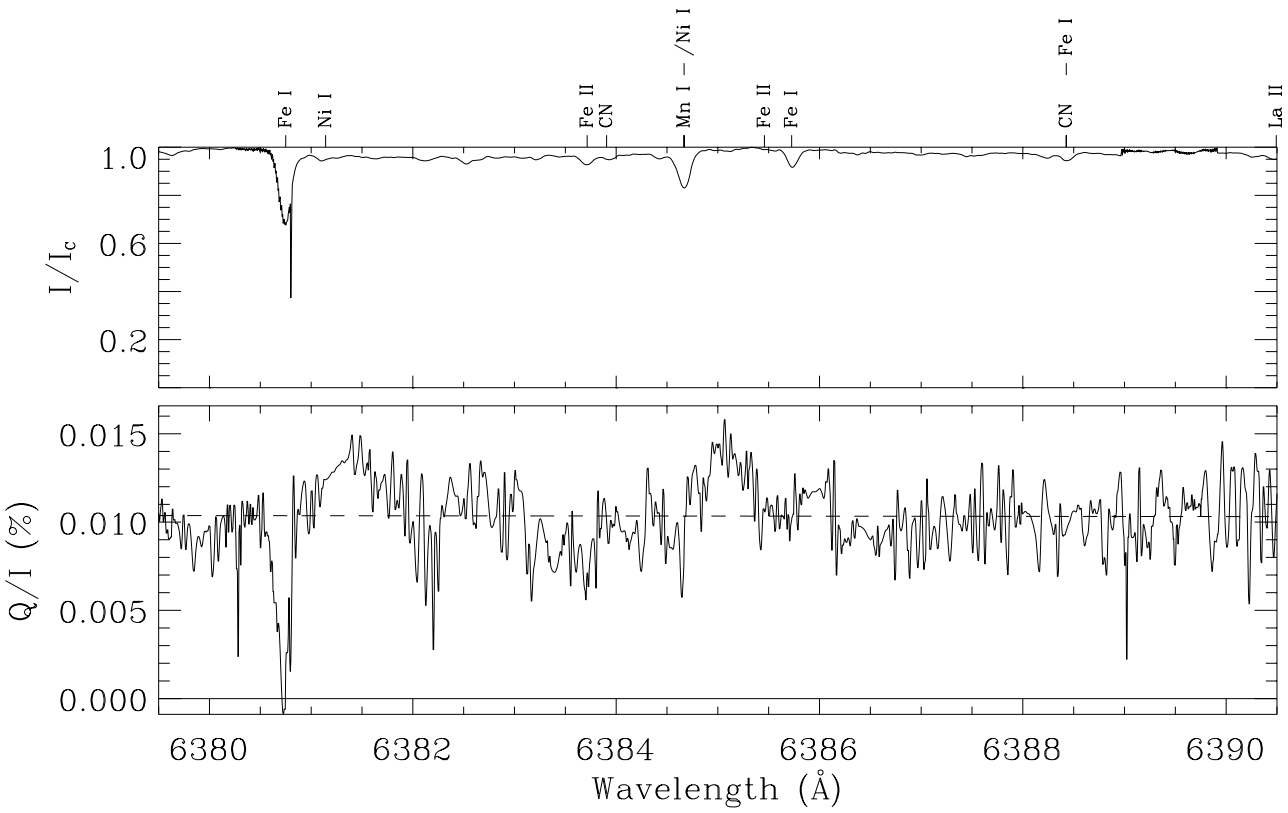

Cr I
Fe I
Si I
Fe II
Fe I
Ti I
Fe I
Fe I
Ni I
Fe I
1.0
0.6
0.2
I/I_c
0.025
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6330
6332
6334
6336
6338
6340
Wavelength (Å)

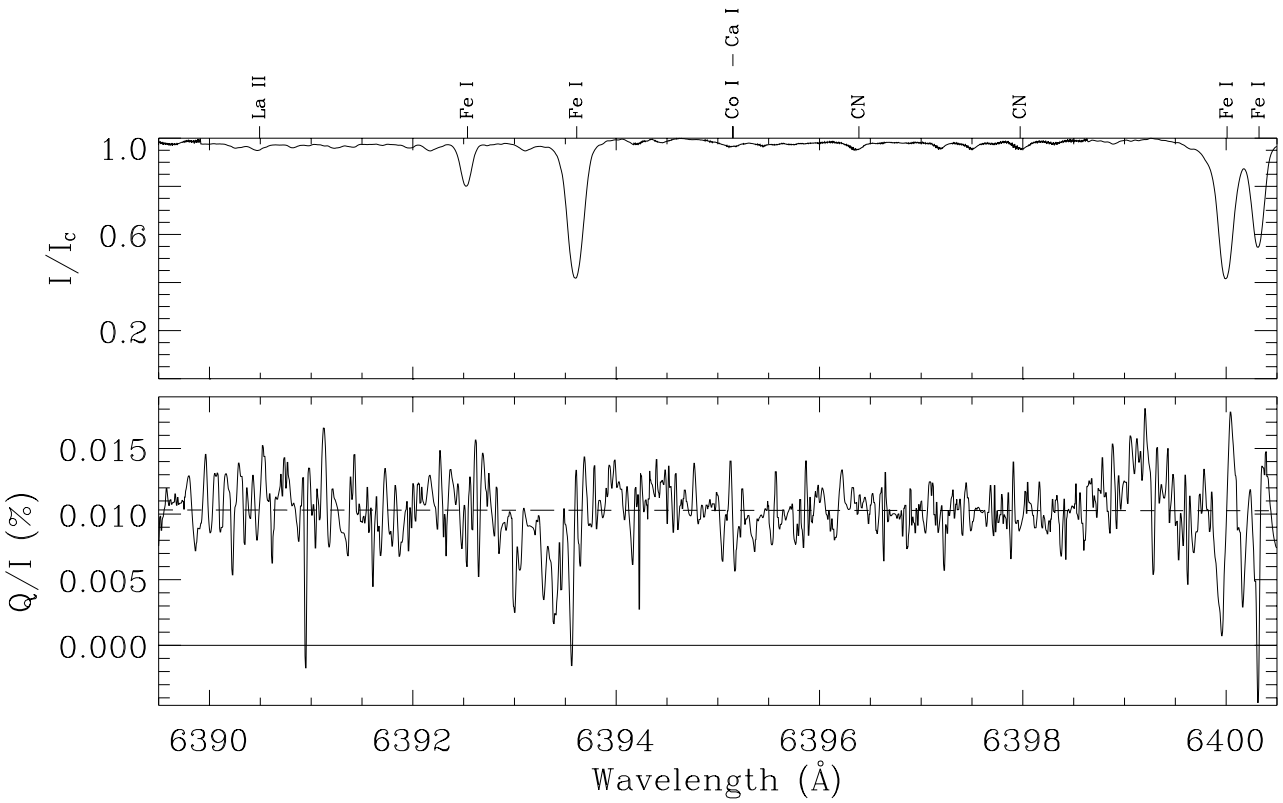

Fe I
Ca I
Fe I
Sc I
Si II
Co I
V I
Ni I
1.0
0.6
0.2
I/I_c
0.03
0.02
0.01
0.00
Q/I (%)
6340
6342
6344
6346
6348
6350
Wavelength (Å)

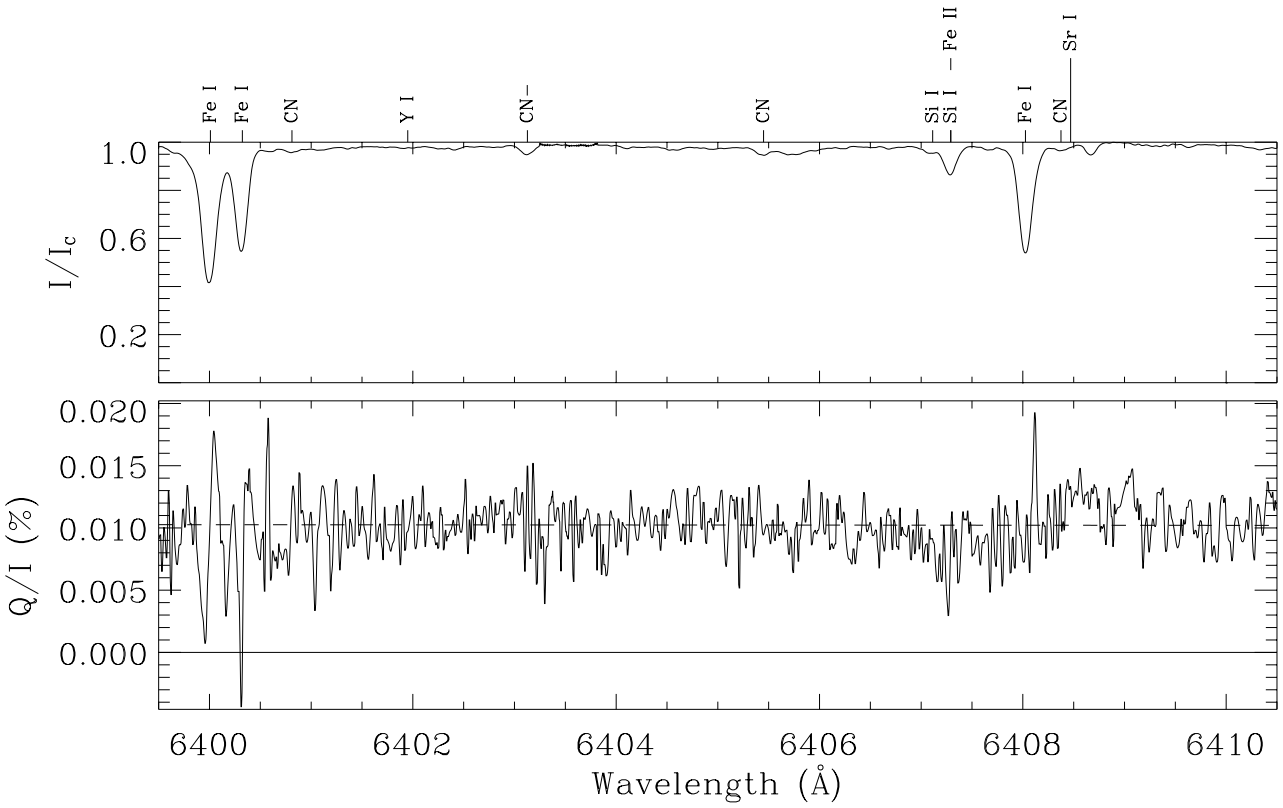

Ni I
Fe I
Fe I
Fe I
V I
Fe I
Ti I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
Q/I (%)
6350
6352
6354
6356
6358
6360
Wavelength (Å)

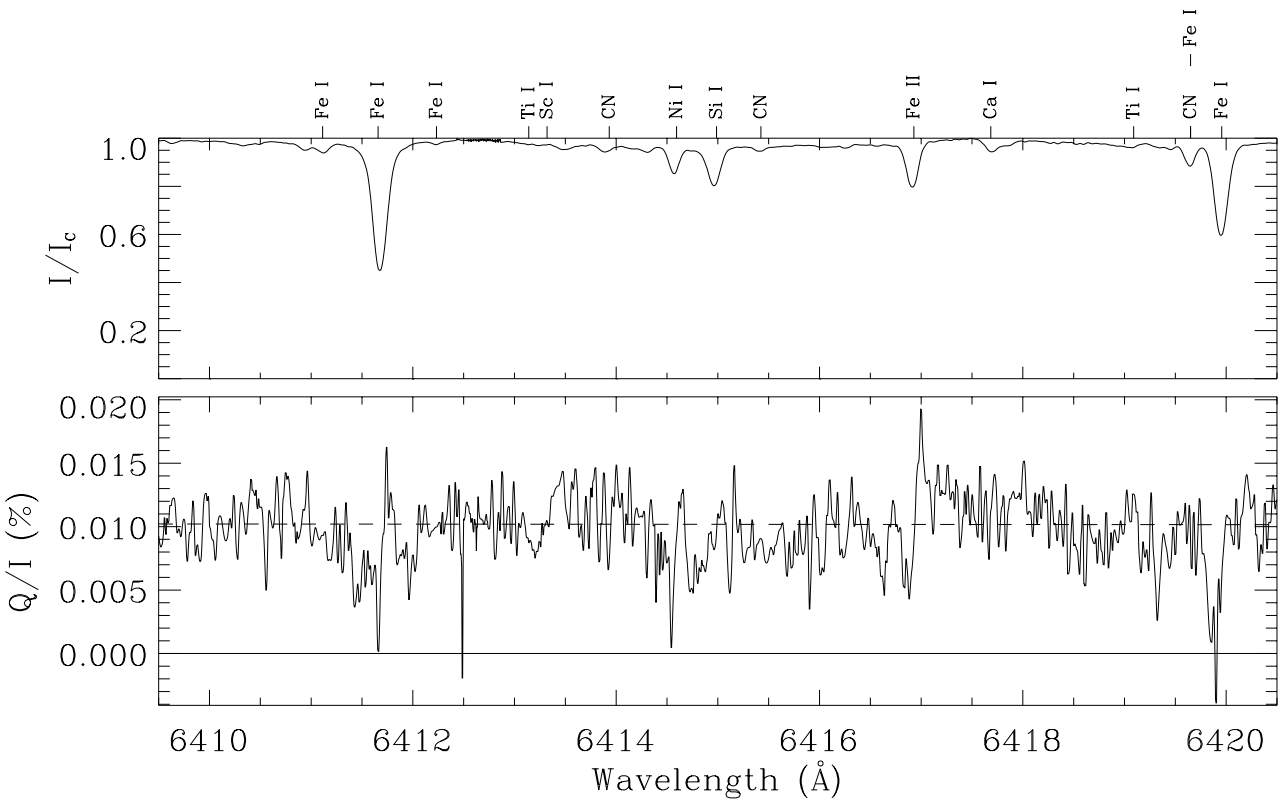

Ti I
Ni I
Ca I
Zn I
//Cr + Fe I
((O I)
Fe I
Fe I
Ti I
Ni I
Fe II
Ni I
1.0
0.6
0.2
I/I_c
0.03
0.02
0.01
0.00
Q/I (%)
6360
6362
6364
6366
6368
6370
Wavelength (Å)

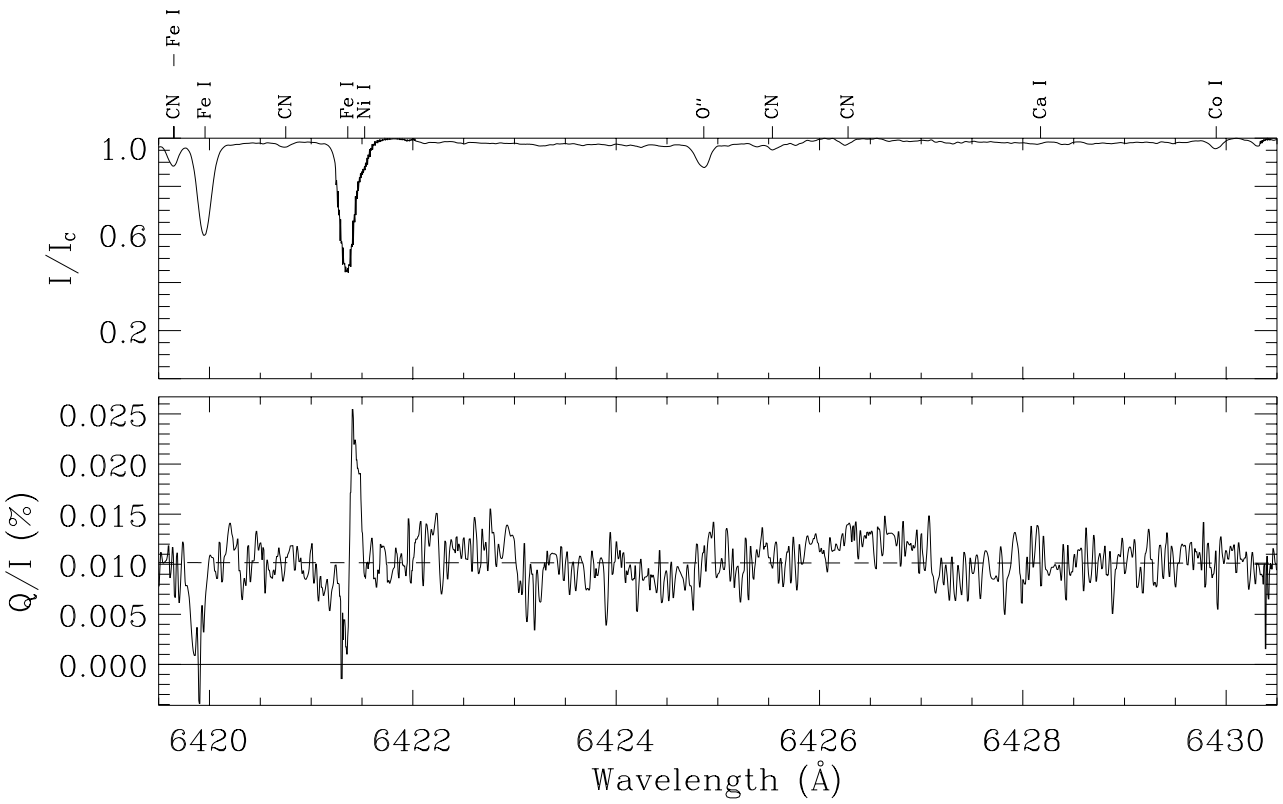

Ni I
Si II
Ni I
Fe I
Ni I
Sc I
V I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
−0.005
Q/I (%)
6370
6372
6374
6376
6378
6380
Wavelength (Å)

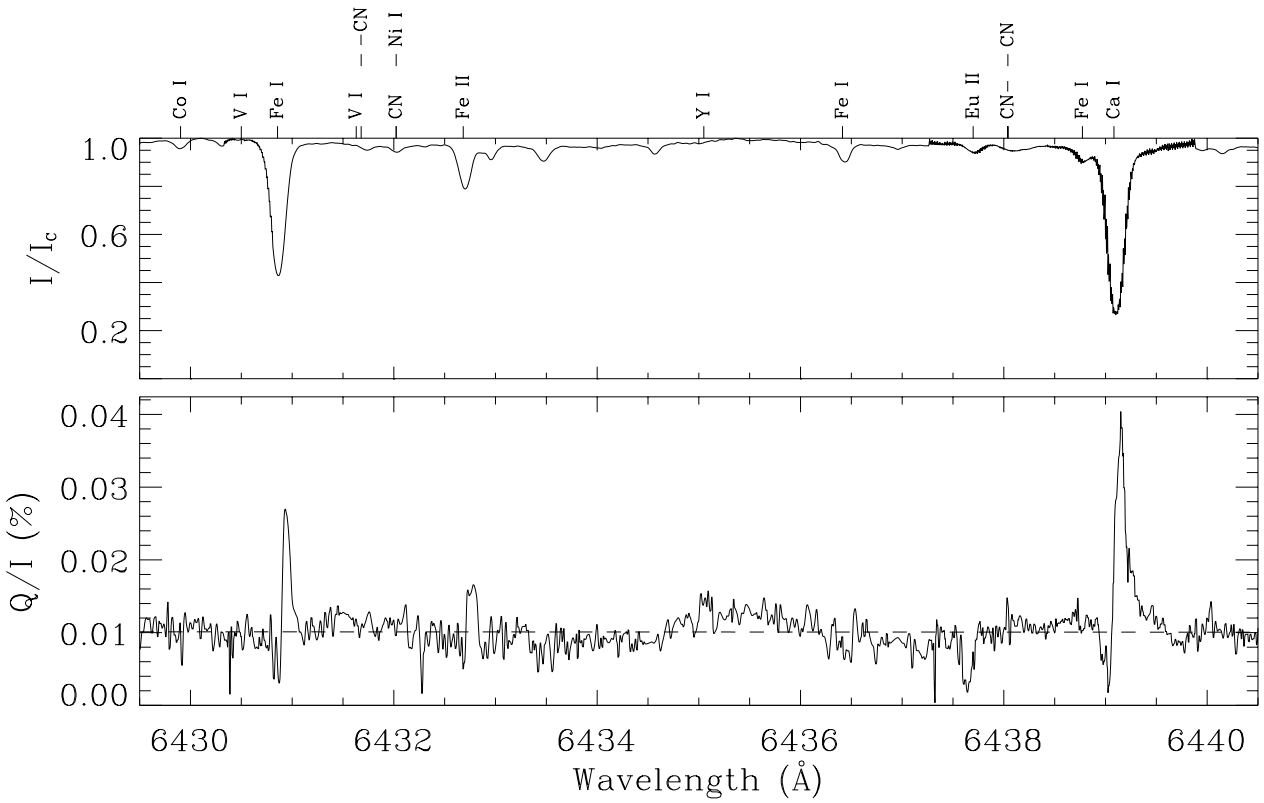

Fe I
Ni I
Fe II
CN
Mn I – /Ni I
Fe II
Fe I
CN – Fe I
La II
1.0
0.6
0.2
I/I$_c$
0.015
0.010
0.005
0.000
Q/I (%)
6380
6382
6384
6386
6388
6390
Wavelength (Å)

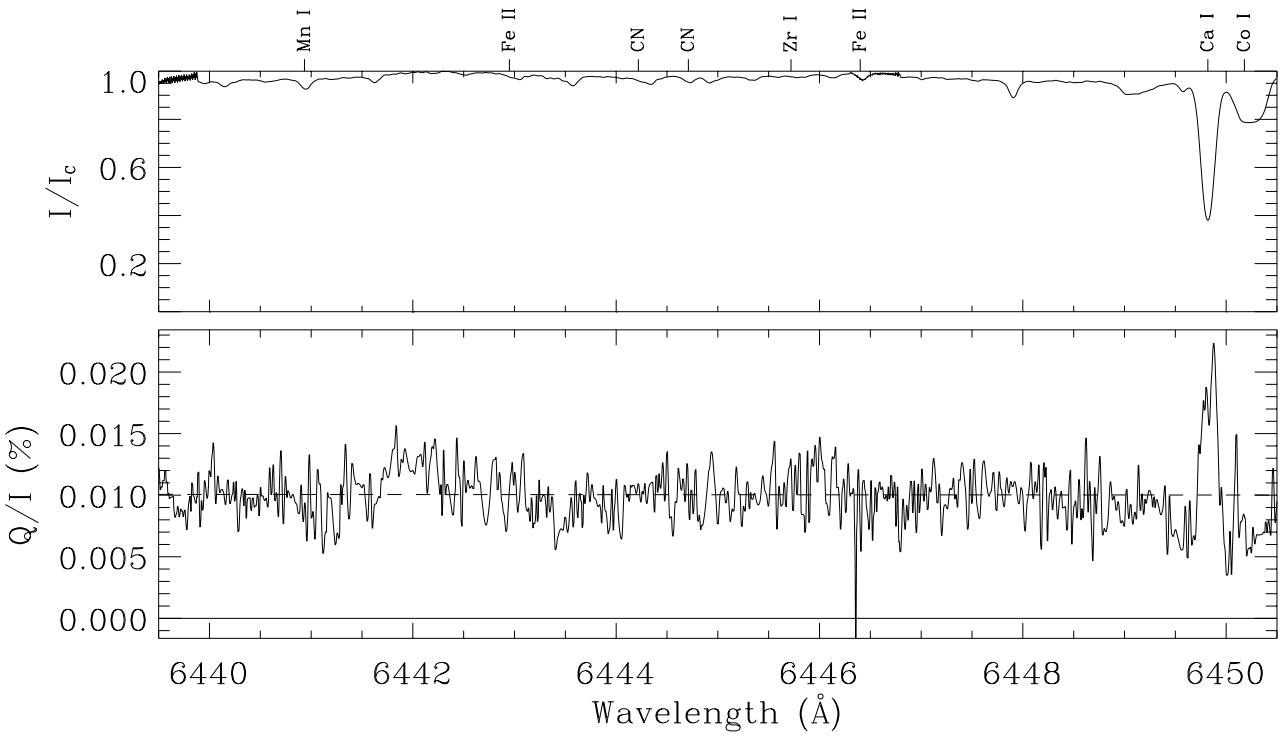

La II
Fe I
Fe I
Co I – Ca I
CN
CN
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
Q/I (%)
6390
6392
6394
6396
6398
6400
Wavelength (Å)

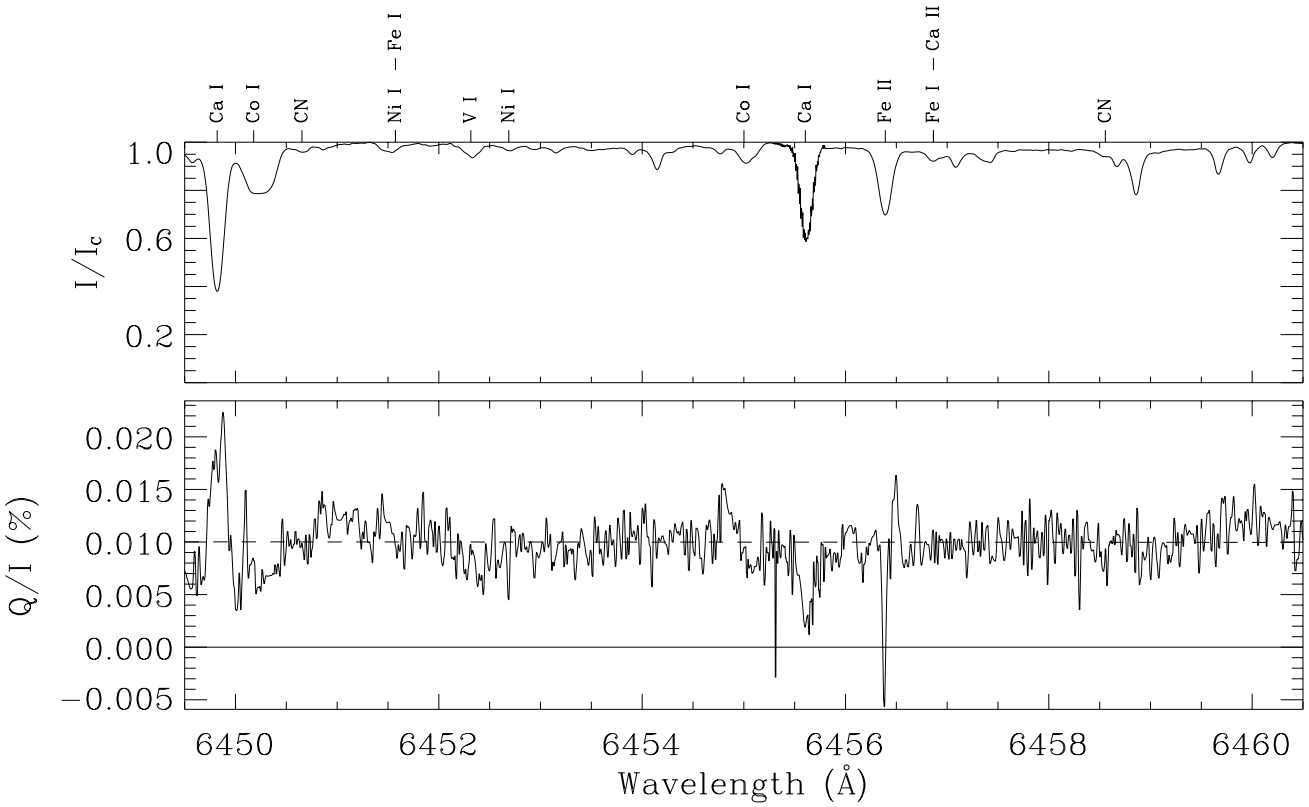

Fe I
Fe I
CN
Y I
CN
CN
Si I
Si I
Fe II
Fe I
CN
Sr I
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6400
6402
6404
6406
6408
6410
Wavelength (Å)

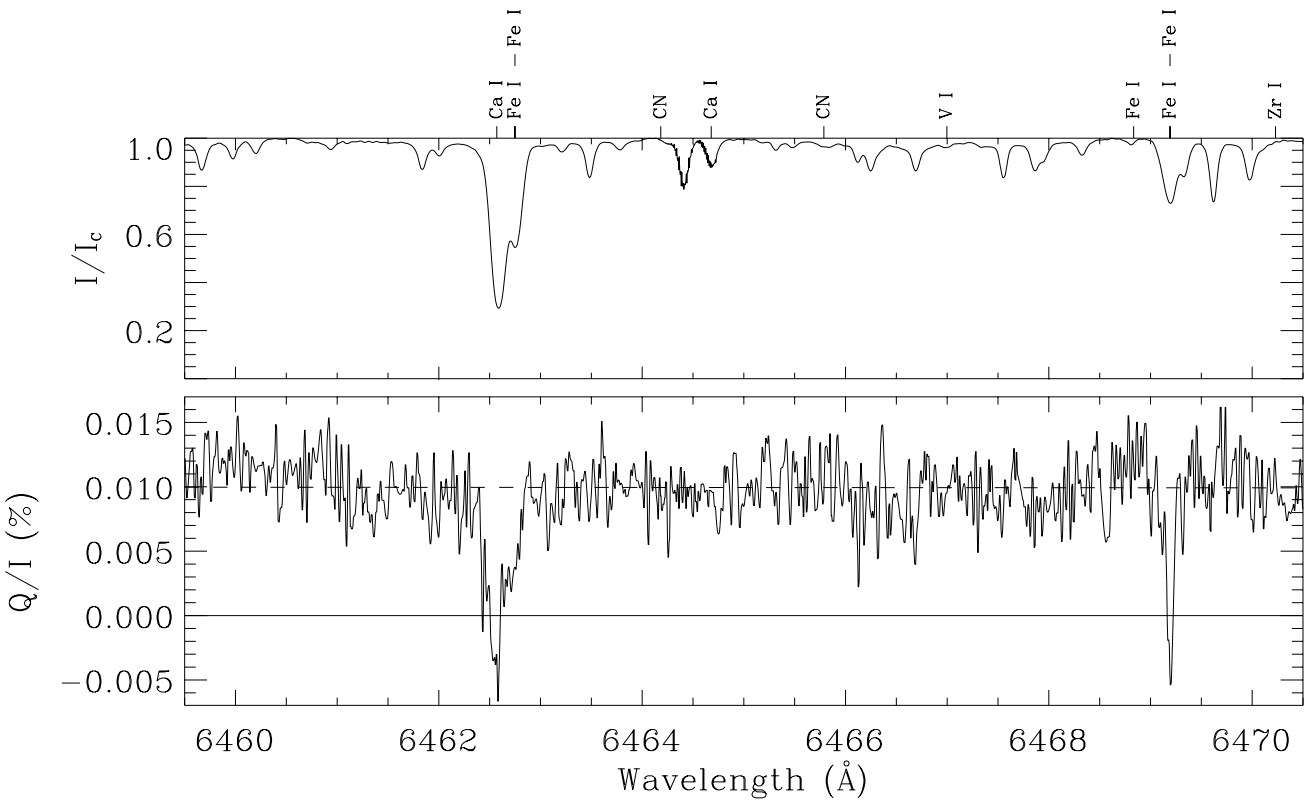

Fe I
Fe I
Fe I
Ti I
Sc I
CN
Ni I
Si I
CN
Fe II
Ca I
Ti I
CN
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6410
6412
6414
6416
6418
6420
Wavelength (Å)

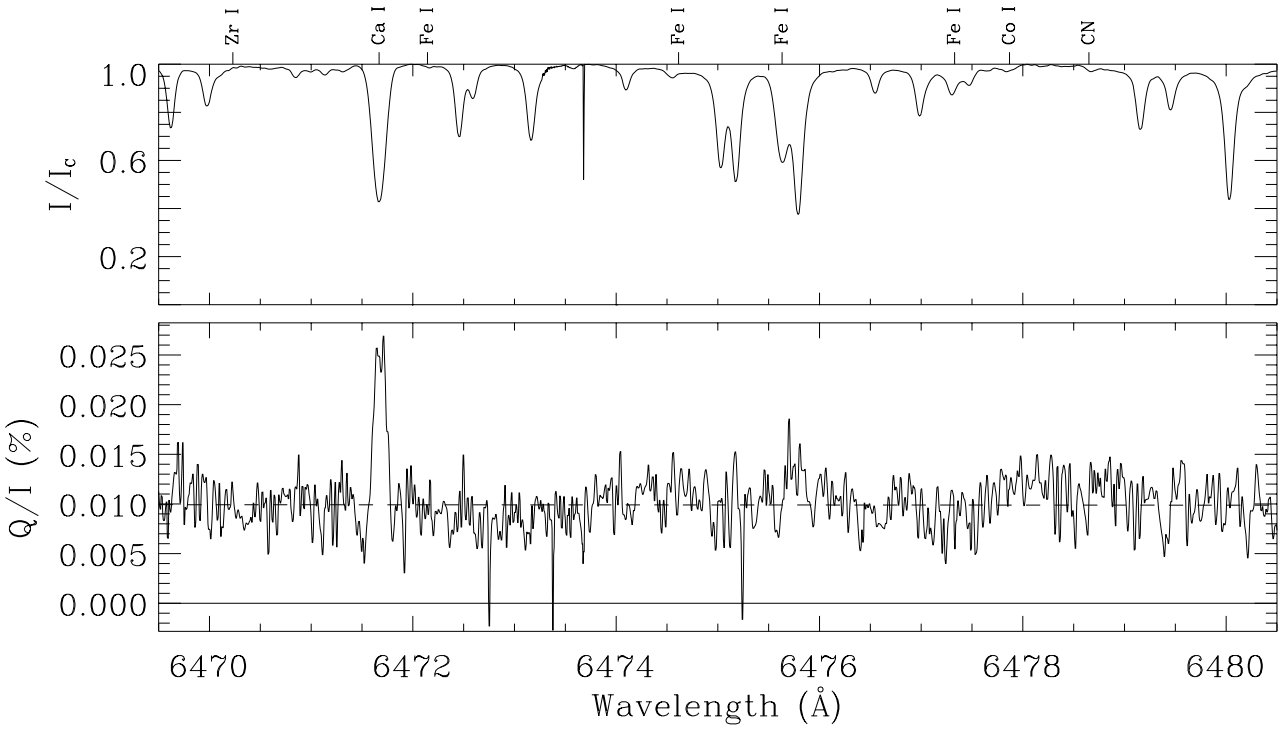

Fe I
CN
Fe I
CN
Fe I
Ni I
O''
CN
CN
Ca I
Co I
1.0
0.6
0.2
I/I_c
0.025
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6420
6422
6424
6426
6428
6430
Wavelength (Å)

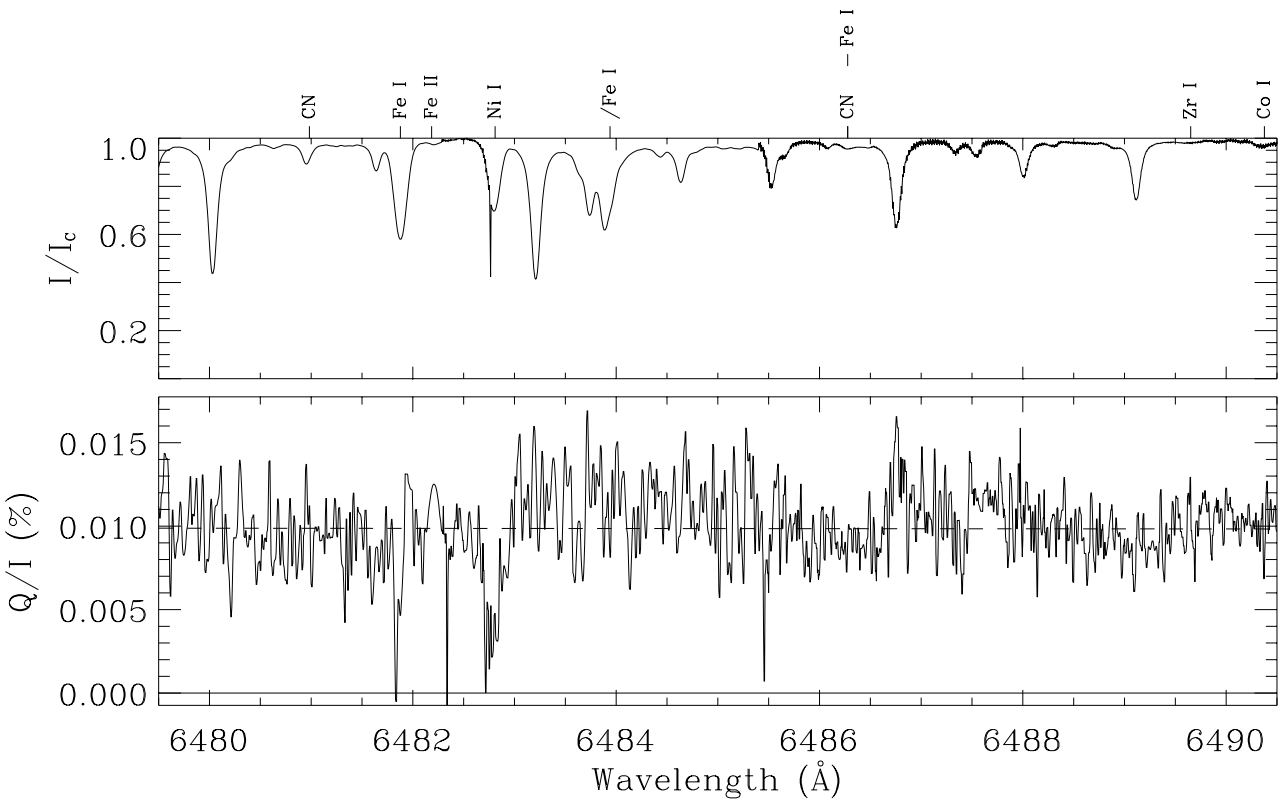

Co I
V I
Fe I
V I
CN
Ni I
Fe II
Y I
Fe I
Eu II
CN
CN
Fe I
Ca I
1.0
0.6
0.2
I/I_c
0.04
0.03
0.02
0.01
0.00
Q/I (%)
6430
6432
6434
6436
6438
6440
Wavelength (Å)

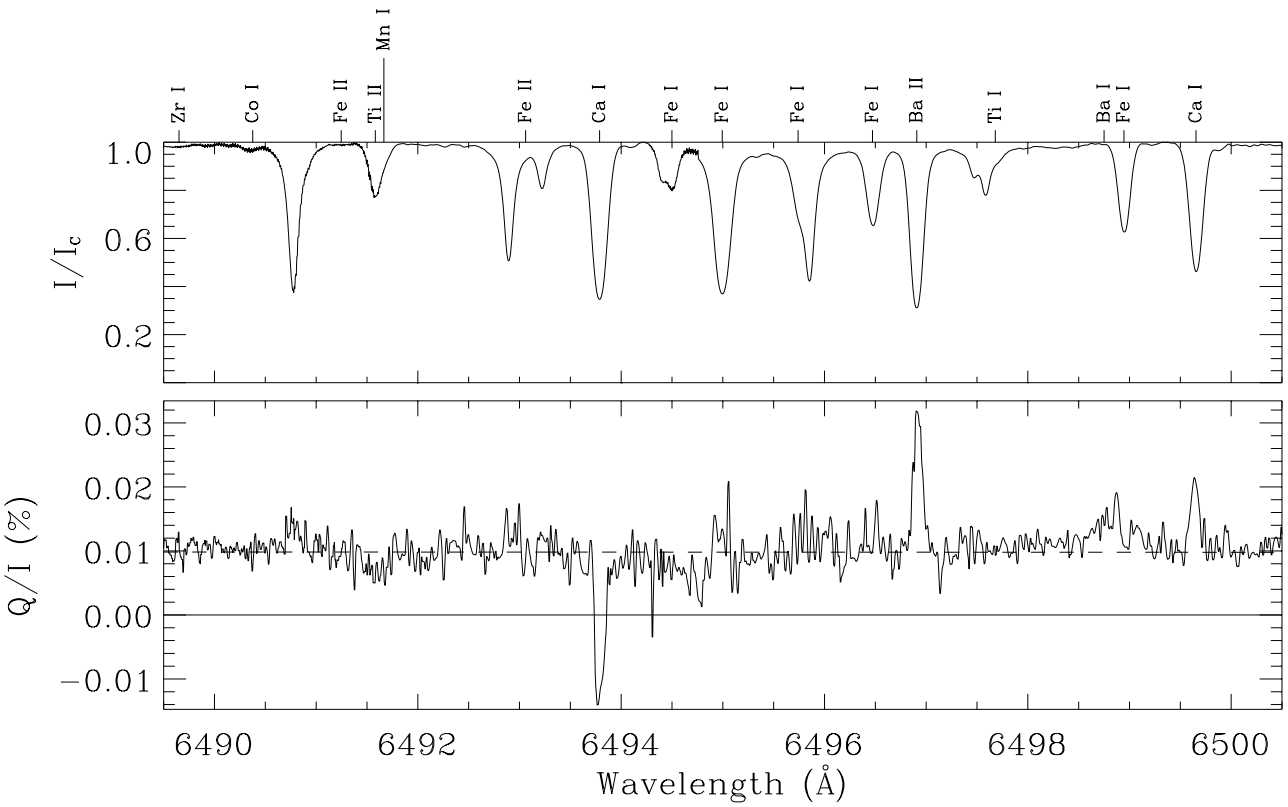

Mn I
Fe II
CN
CN
Zr I
Fe II
Ca I
Co I
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6440
6442
6444
6446
6448
6450
Wavelength (Å)

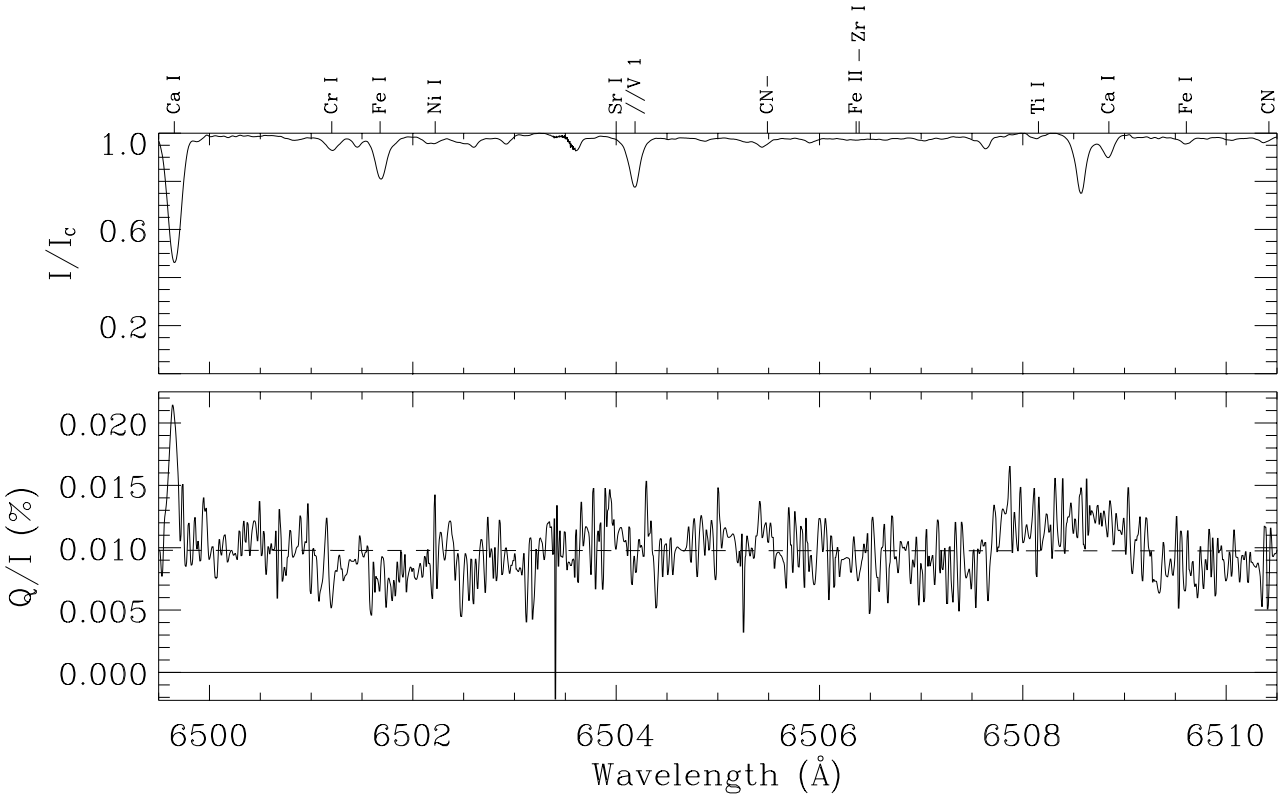

Ca I
Co I
CN
Ni I – Fe I
V I
Ni I
Co I
Ca I
Fe II
Fe I – Ca II
CN
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
−0.005
Q/I (%)
6450
6452
6454
6456
6458
6460
Wavelength (Å)

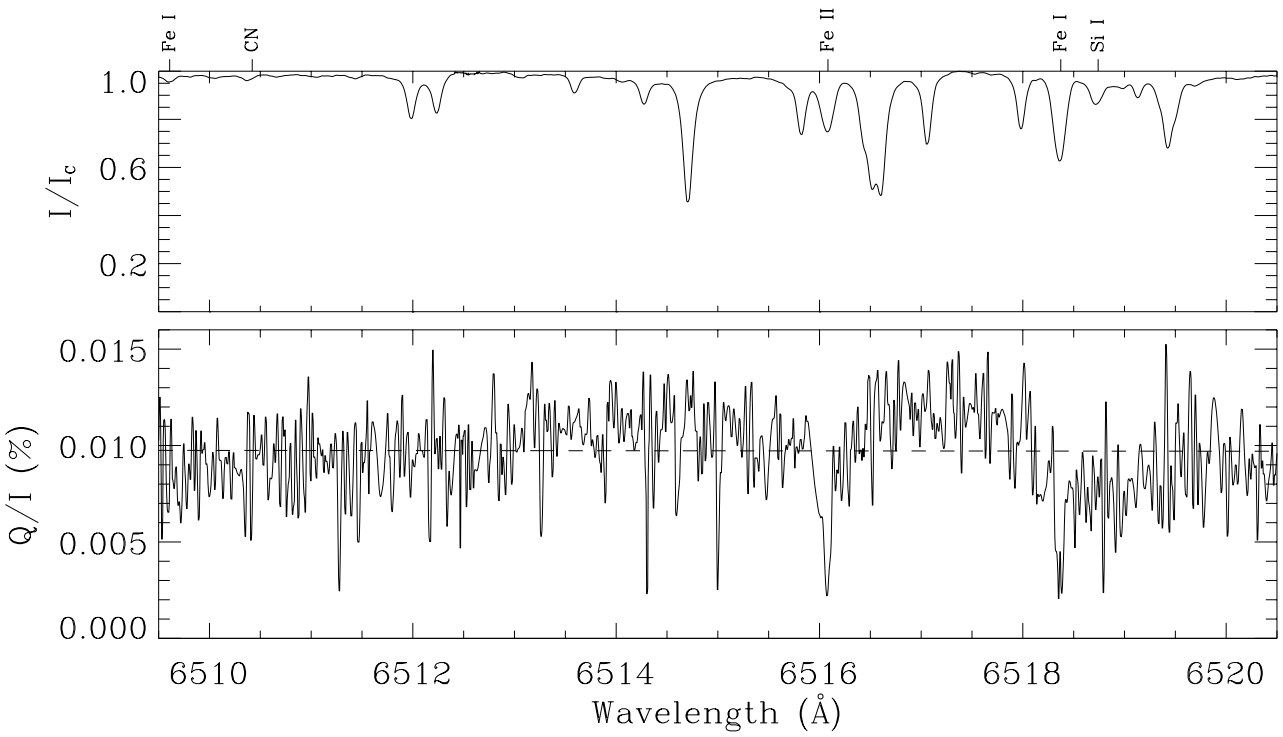

Ca I
Fe I
Fe I
CN
Ca I
CN
V I
Fe I
Fe I
Fe I
Zr I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
−0.005
Q/I (%)
6460
6462
6464
6466
6468
6470
Wavelength (Å)

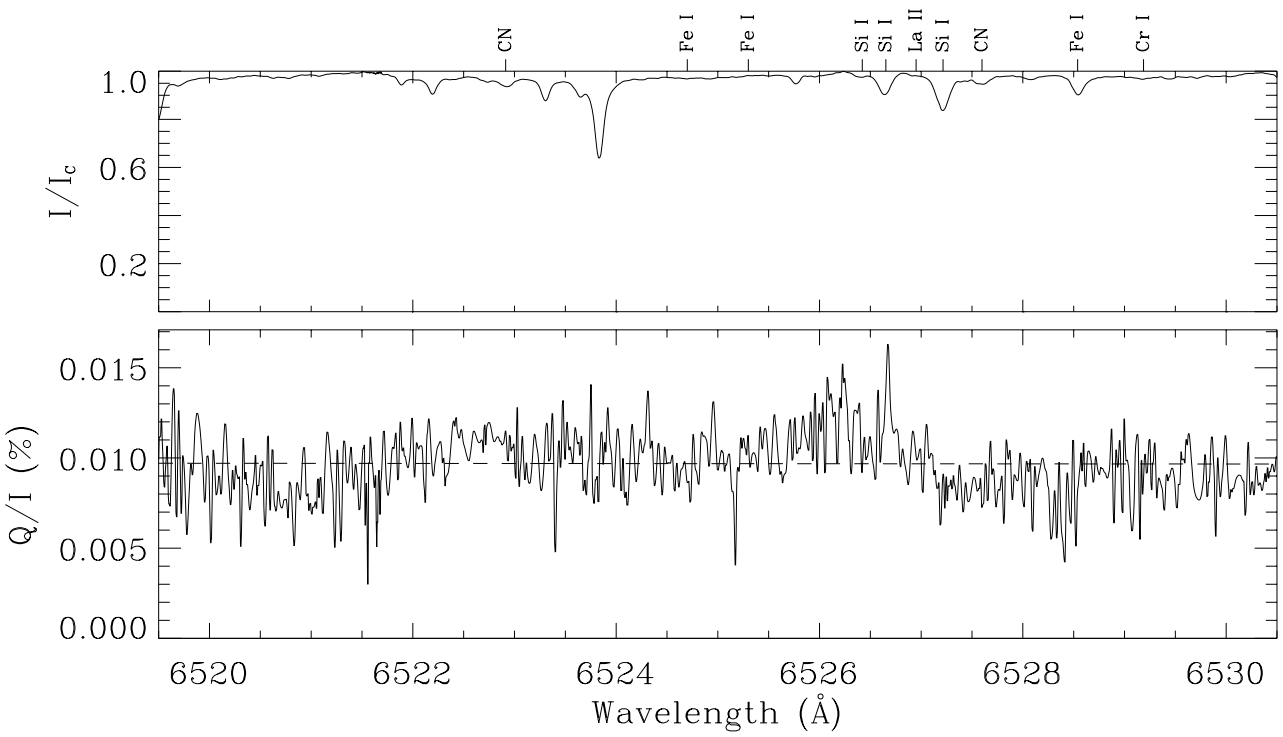

Zr I
Ca I
Fe I
Fe I
Fe I
Fe I
Co I
CN
1.0
0.6
0.2
I/I_c
0.025
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6470
6472
6474
6476
6478
6480
Wavelength (Å)

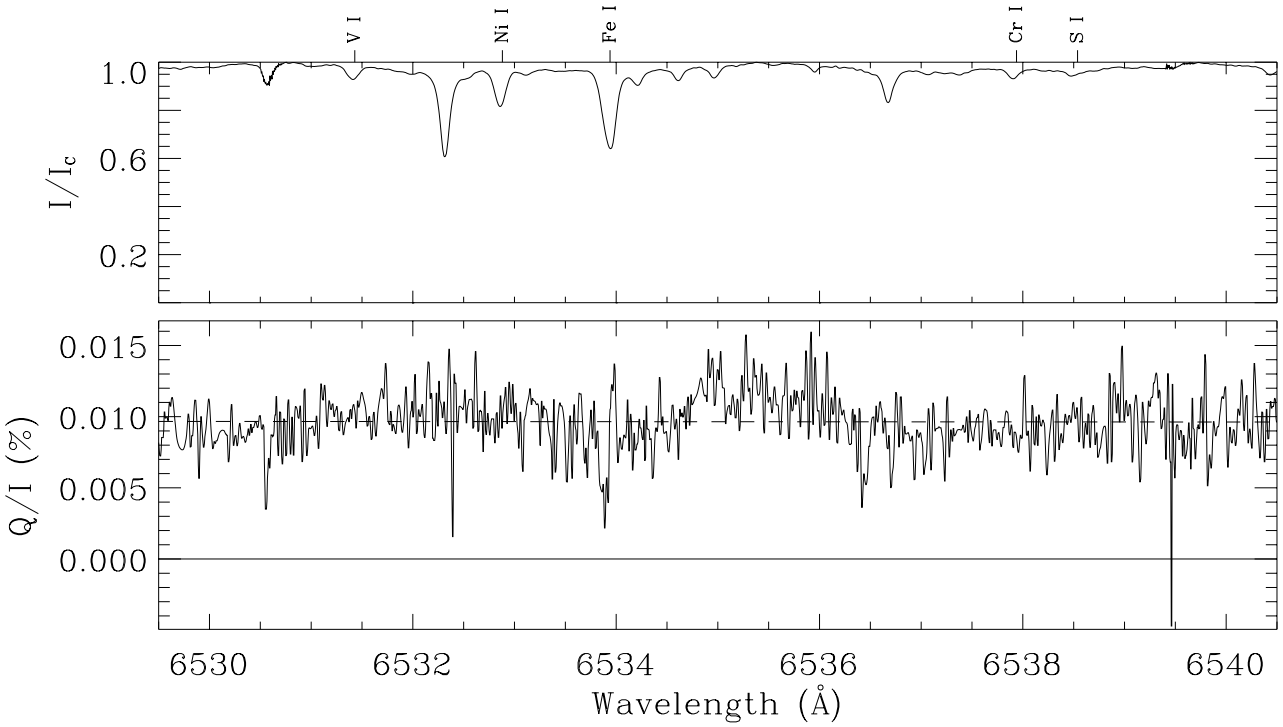

CN
Fe I
Fe II
Ni I
/Fe I
CN
Fe I
Zr I
Co I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
Q/I (%)
6480
6482
6484
6486
6488
6490
Wavelength (Å)

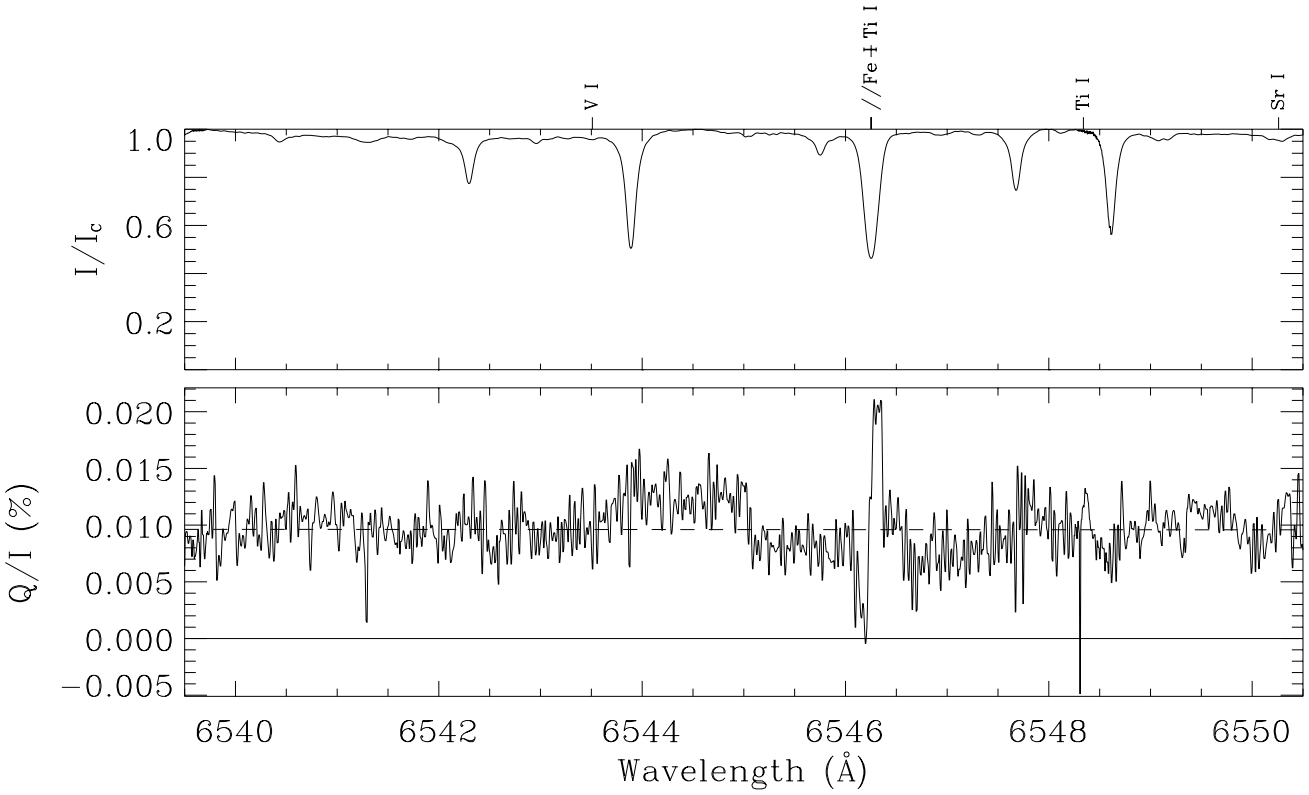

Zr I
Co I
Fe II
Ti II
Mn I
Fe II
Ca I
Fe I
Fe I
Fe I
Fe I
Ba II
Ti I
Ba I
Fe I
Ca I
1.0
0.6
0.2
I/I_c
0.03
0.02
0.01
0.00
−0.01
Q/I (%)
6490
6492
6494
6496
6498
6500
Wavelength (Å)

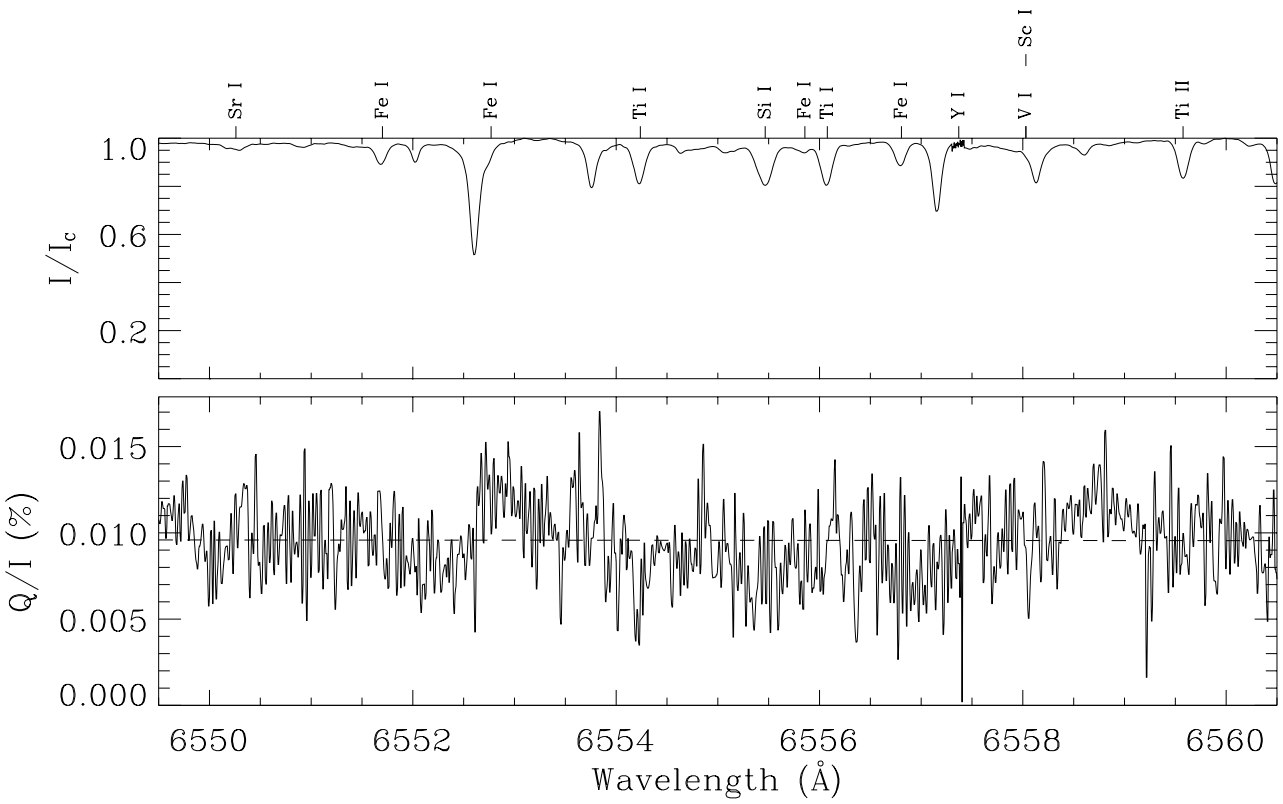

Ca I
Cr I
Fe I
Ni I
Sr I
//V 1
CN−
Fe II − Zr I
Ti I
Ca I
Fe I
CN
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6500
6502
6504
6506
6508
6510
Wavelength (Å)

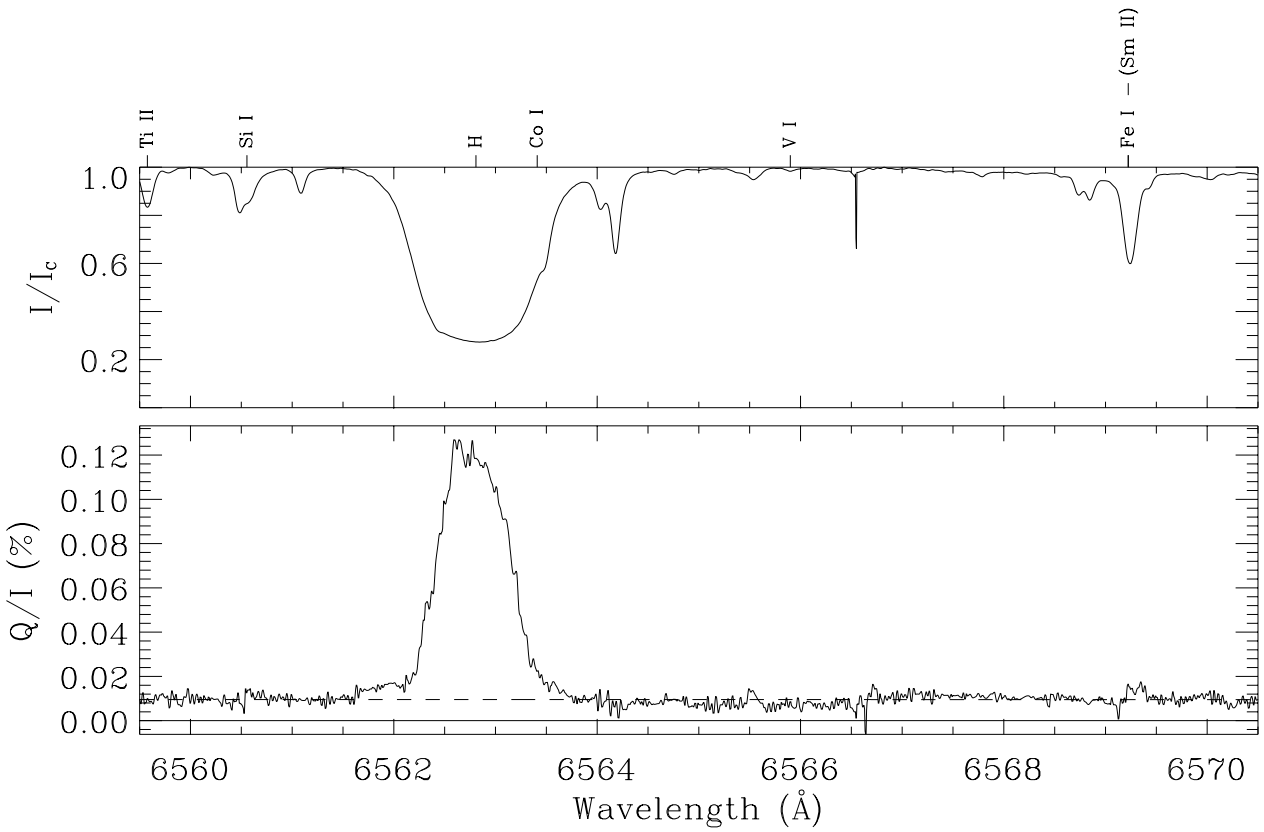

Fe I
CN
Fe II
Fe I
Si I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
Q/I (%)
6510
6512
6514
6516
6518
6520
Wavelength (Å)

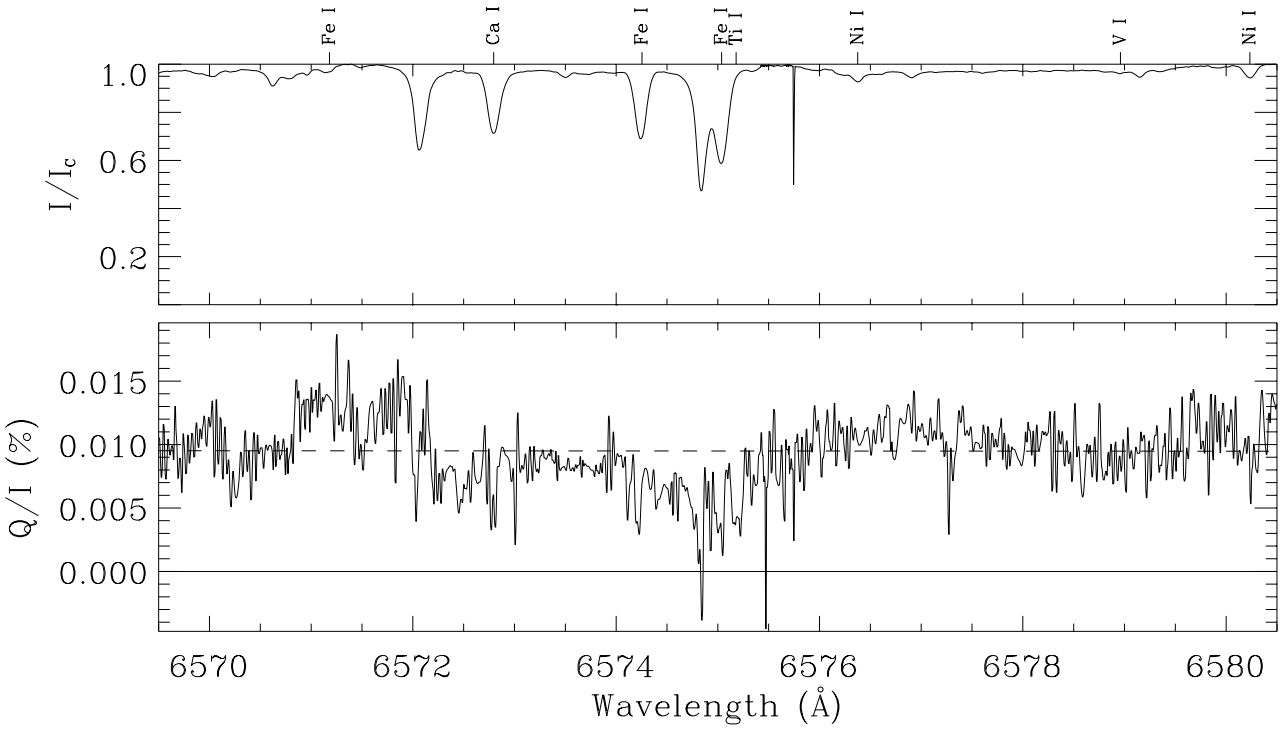

CN
Fe I
Fe I
Si I
Si I
La II
Si I
CN
Fe I
Cr I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
Q/I (%)
6520
6522
6524
6526
6528
6530
Wavelength (Å)

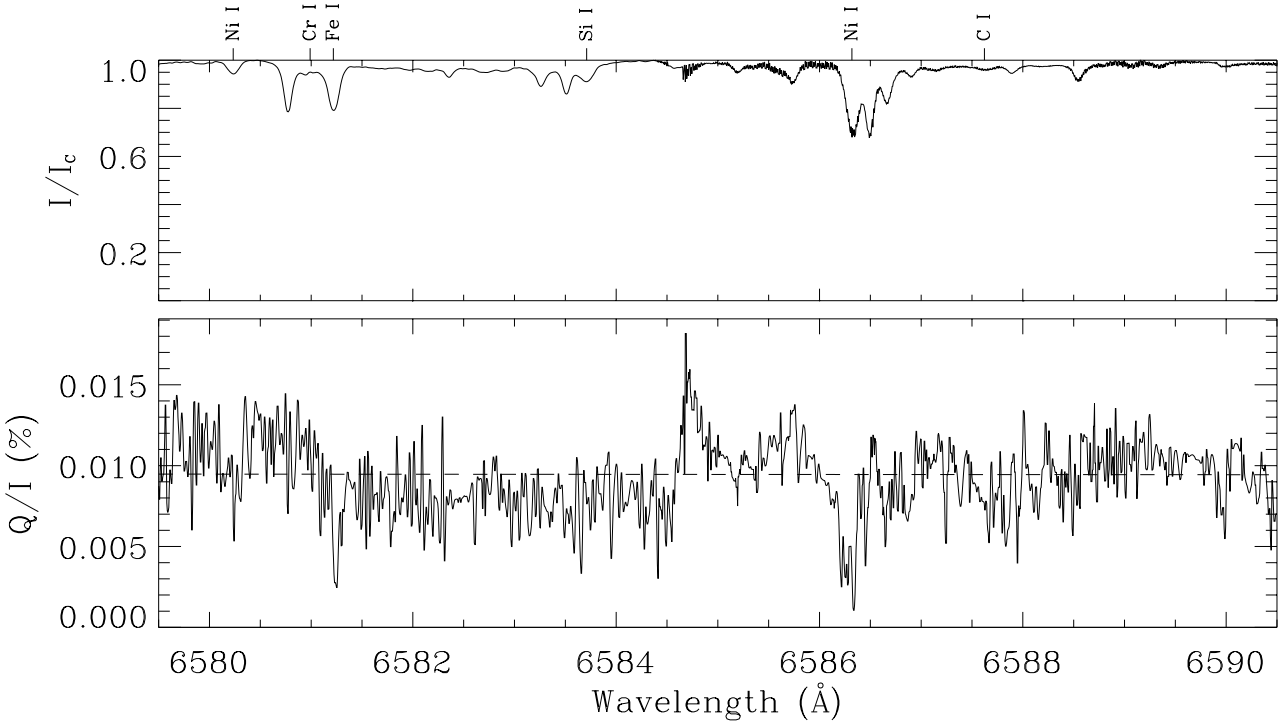

V I
Ni I
Fe I
Cr I
S I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
Q/I (%)
6530
6532
6534
6536
6538
6540
Wavelength (Å)

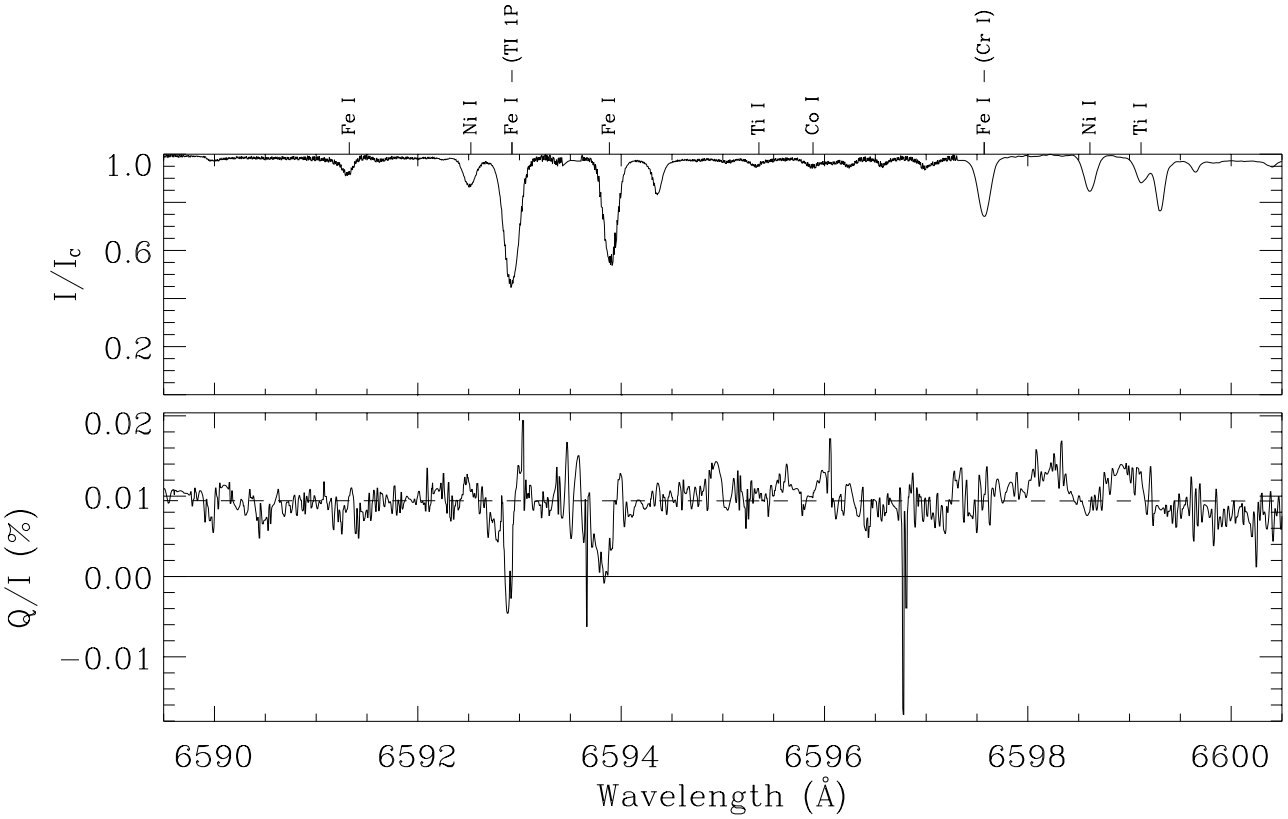

V I
//Fe + Ti I
Ti I
Sr I
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
−0.005
Q/I (%)
6540
6542
6544
6546
6548
6550
Wavelength (Å)

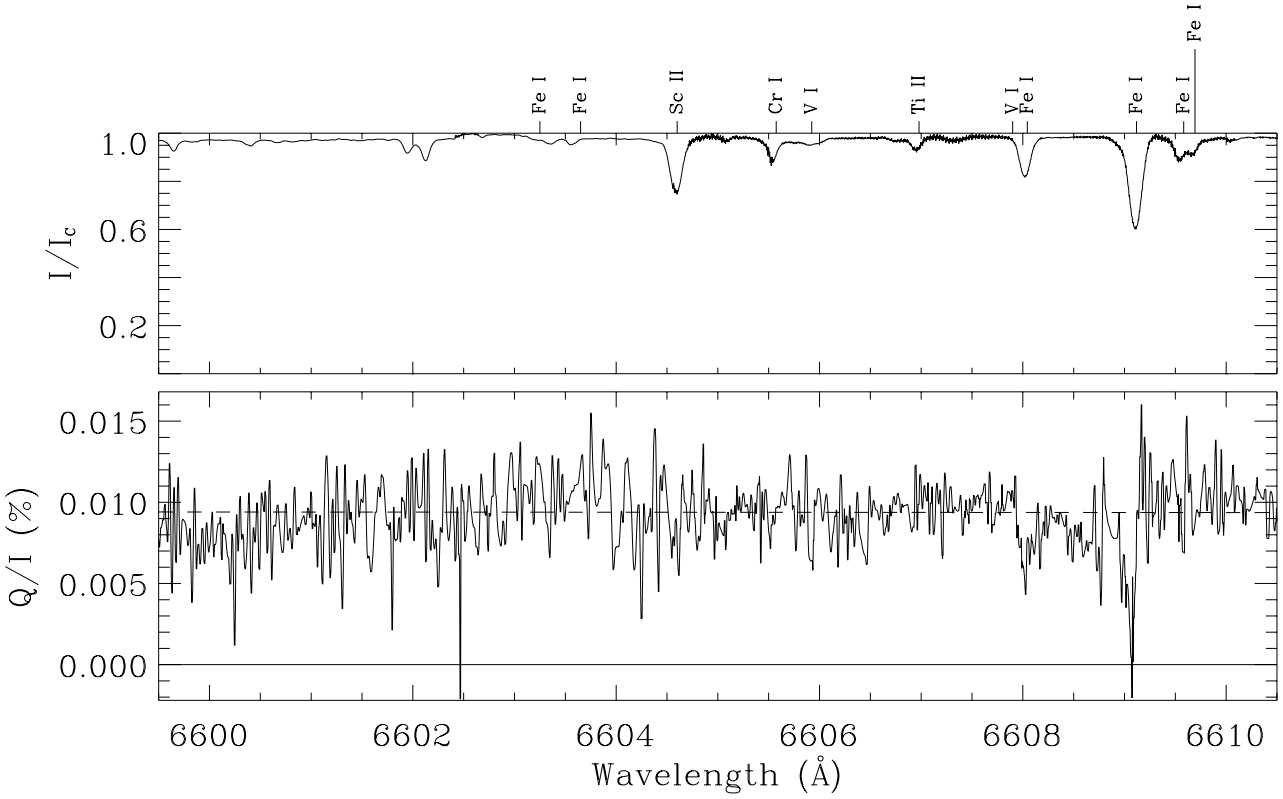

Sr I
Fe I
Fe I
Ti I
Si I
Fe I
Ti I
Fe I
Y I
V I
Sc I
Ti II
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
Q/I (%)
6550
6552
6554
6556
6558
6560
Wavelength (Å)

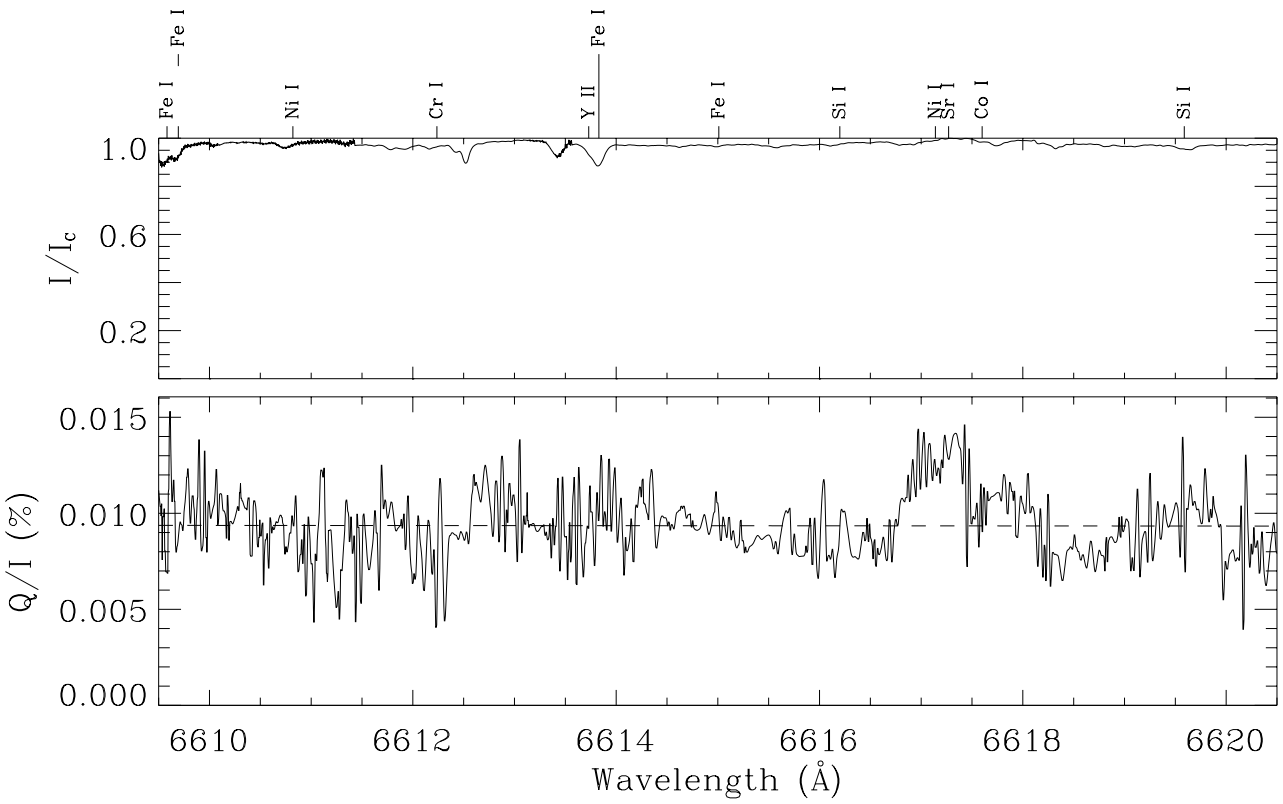

Ti II
Si I
H
Co I
V I
Fe I – (Sm II)
1.0
0.6
0.2
I/I_c
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Q/I (%)
6560
6562
6564
6566
6568
6570
Wavelength (Å)

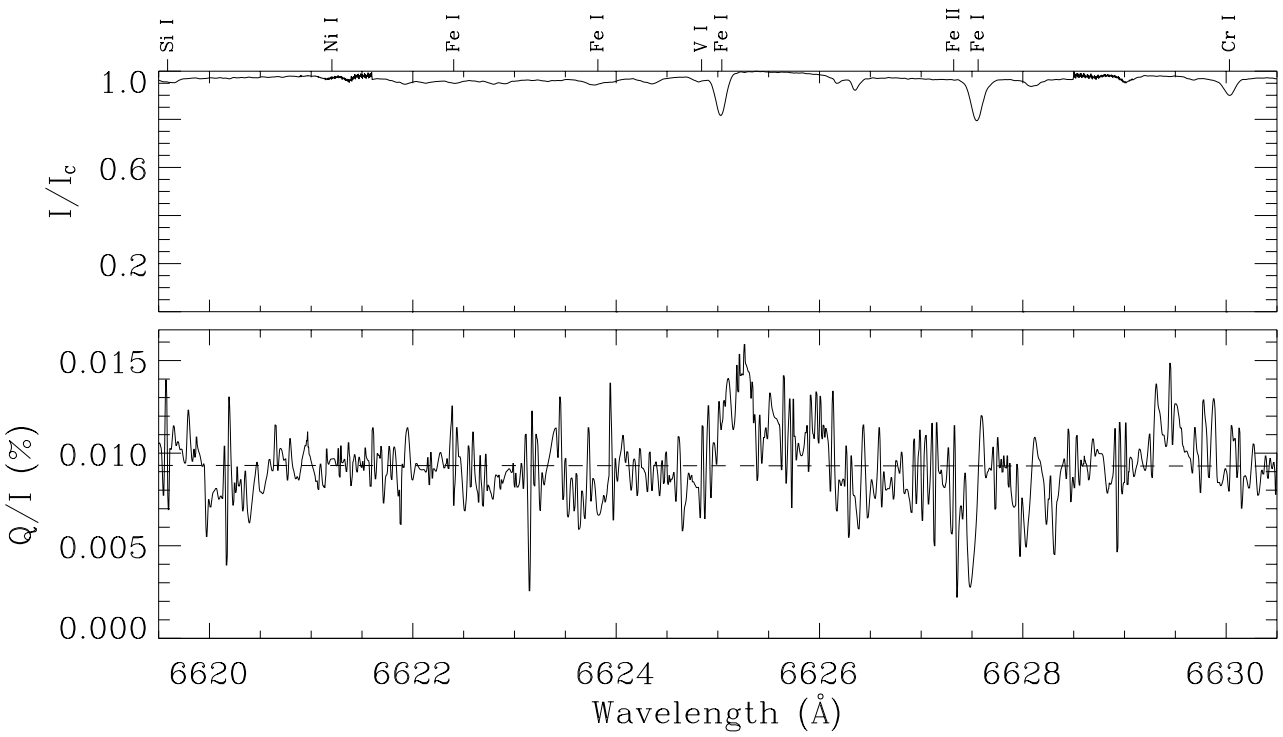

Fe I
Ca I
Fe I
Fe I
Ti I
Ni I
V I
Ni I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
Q/I (%)
6570
6572
6574
6576
6578
6580
Wavelength (Å)

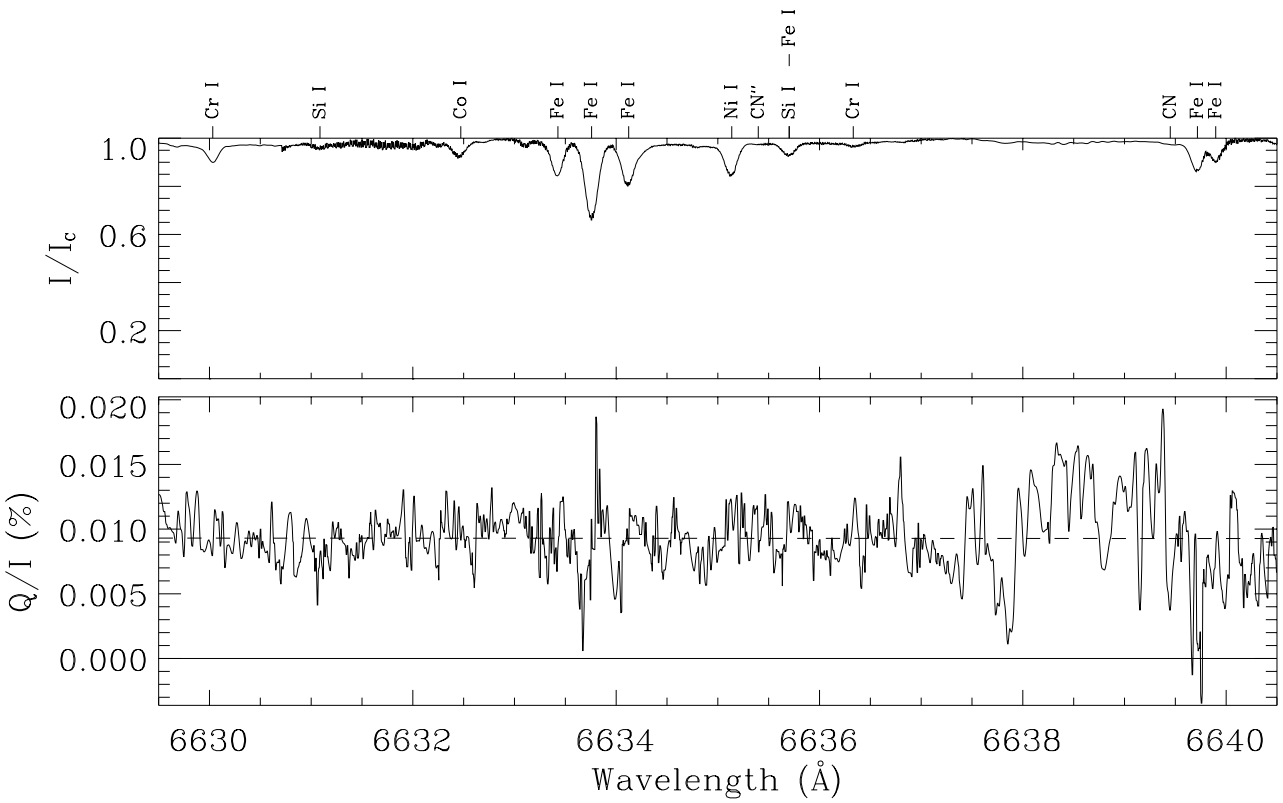

Ni I
Cr I
Fe I
Si I
Ni I
C I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
Q/I (%)
6580
6582
6584
6586
6588
6590
Wavelength (Å)

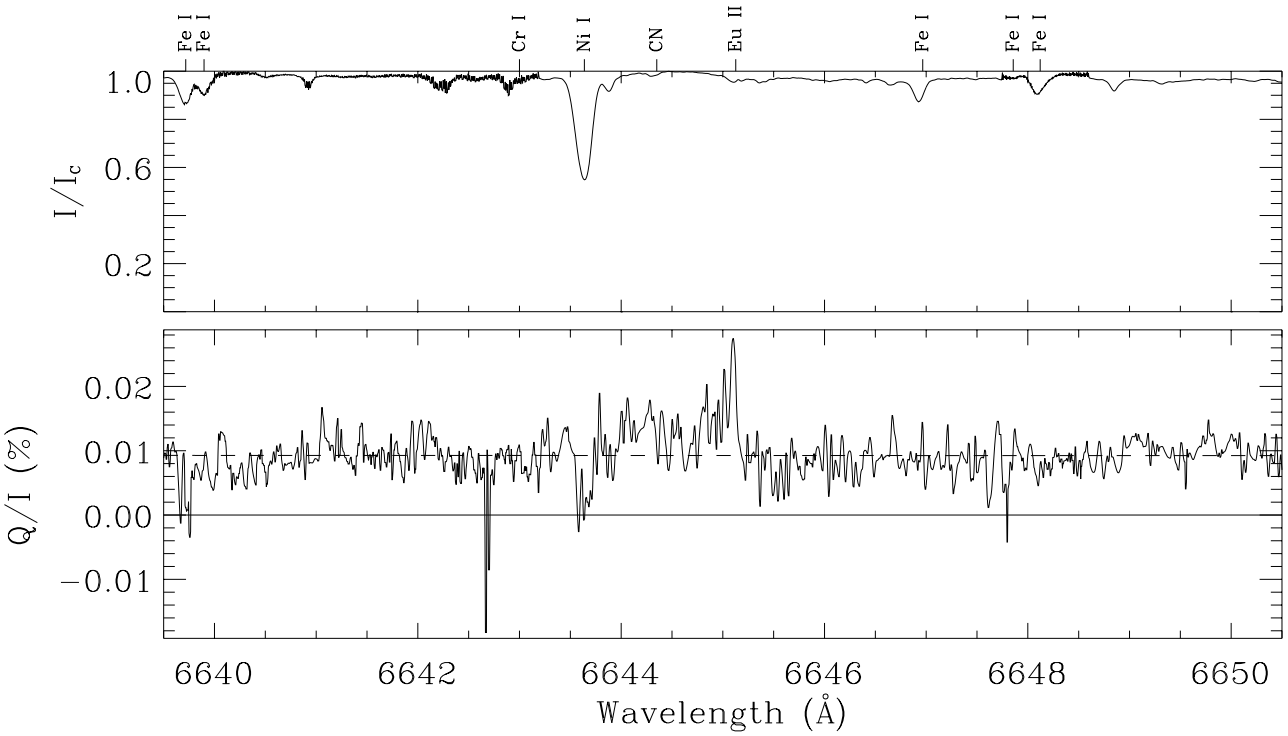

Fe I
Ni I
Fe I – (Ti 1P
Fe I
Ti I
Co I
Fe I – (Cr I)
Ni I
Ti I
1.0
0.6
0.2
I/I_c
0.02
0.01
0.00
−0.01
Q/I (%)
6590
6592
6594
6596
6598
6600
Wavelength (Å)

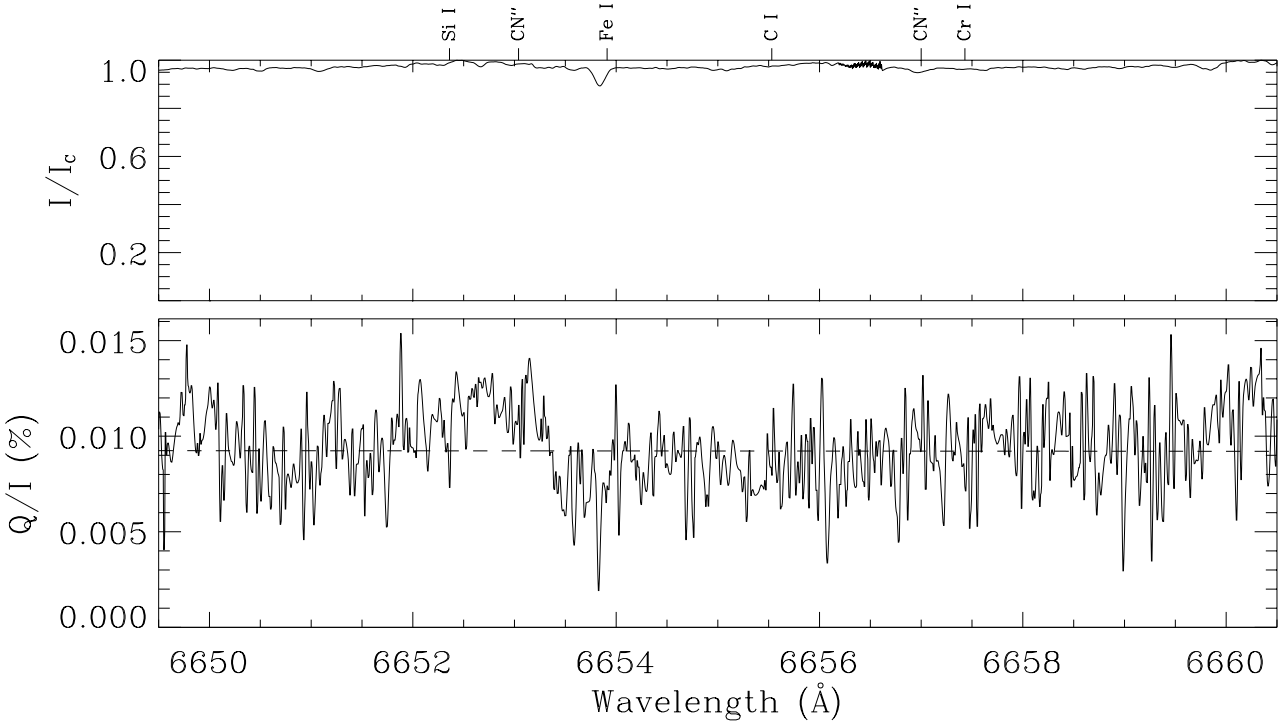

Fe I
Fe I
Sc II
Cr I
V I
Ti II
V I
Fe I
Fe I
Fe I
Fe I
1.0
0.6
0.2
I/I$_c$
0.015
0.010
0.005
0.000
Q/I (%)
6600
6602
6604
6606
6608
6610
Wavelength (Å)

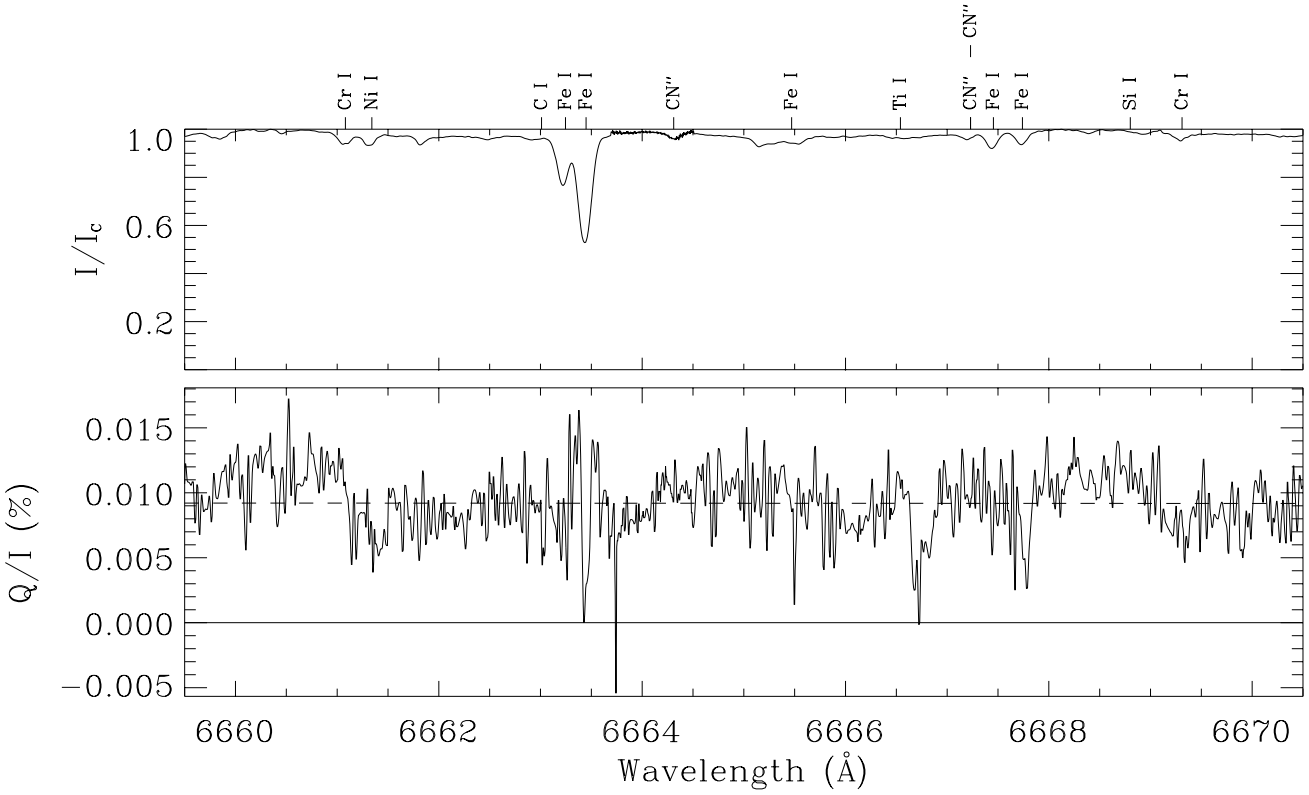

Fe I
Fe I
Ni I
Cr I
Y II
Fe I
Fe I
Si I
Ni I
Sr I
Co I
Si I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
Q/I (%)
6610
6612
6614
6616
6618
6620
Wavelength (Å)

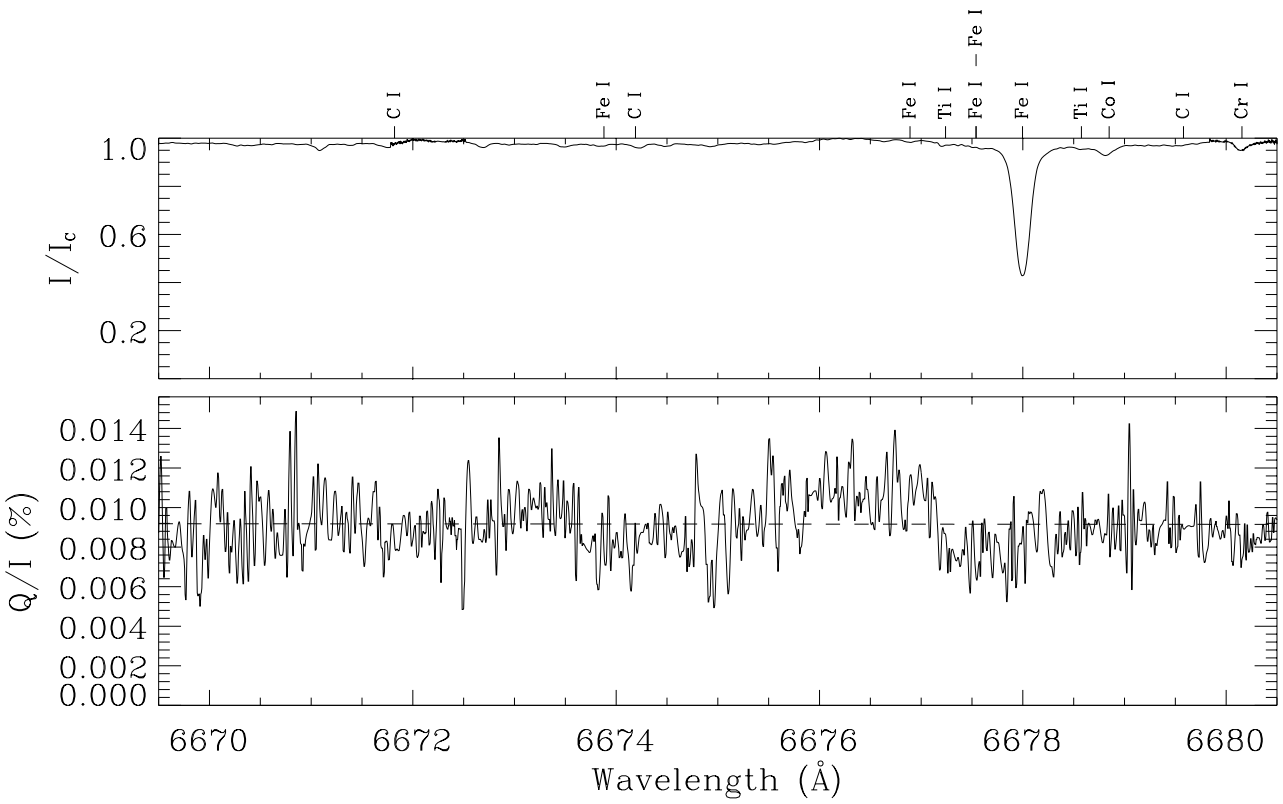

Si I
Ni I
Fe I
Fe I
V I
Fe I
Fe II
Fe I
Cr I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
Q/I (%)
6620
6622
6624
6626
6628
6630
Wavelength (Å)

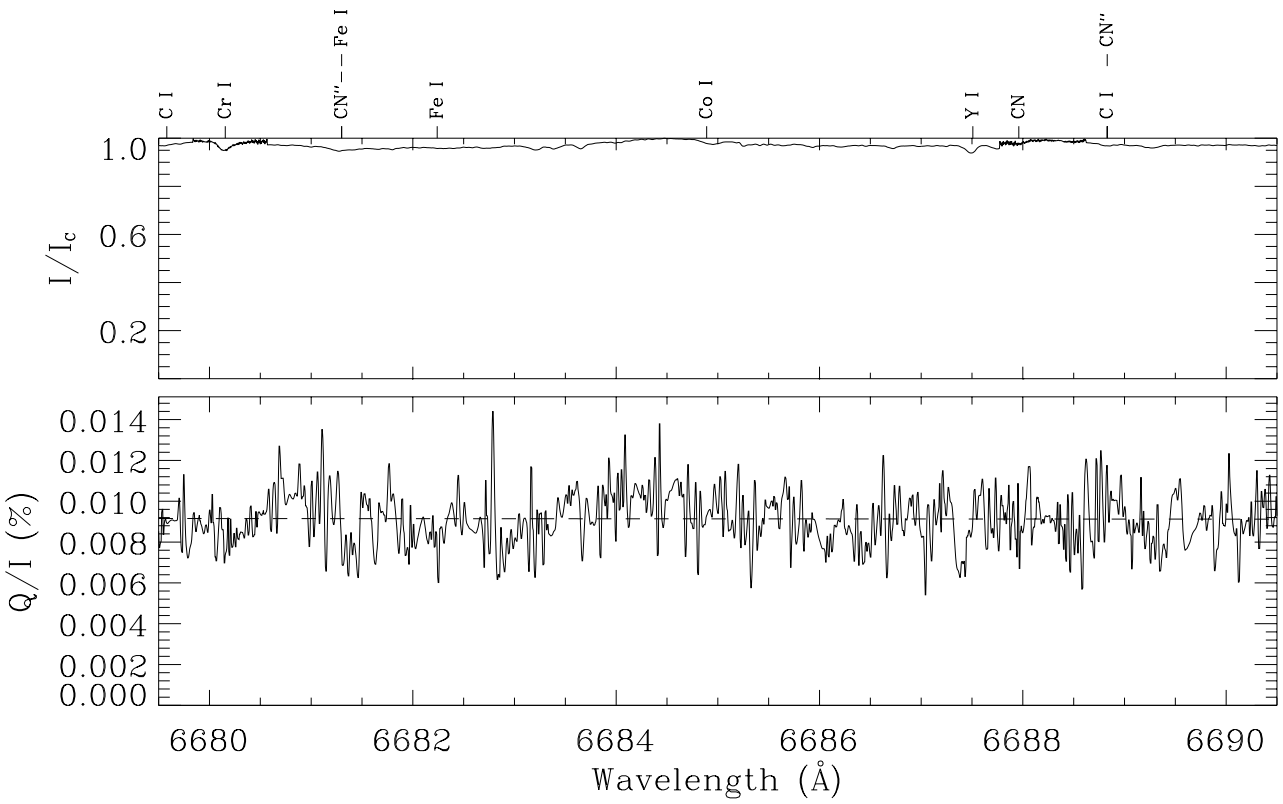

Cr I
Si I
Co I
Fe I
Fe I
Fe I
Ni I
CN''
Si I
– Fe I
Cr I
CN
Fe I
Fe I
1.0
0.6
0.2
I/I$_c$
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6630
6632
6634
6636
6638
6640
Wavelength (Å)

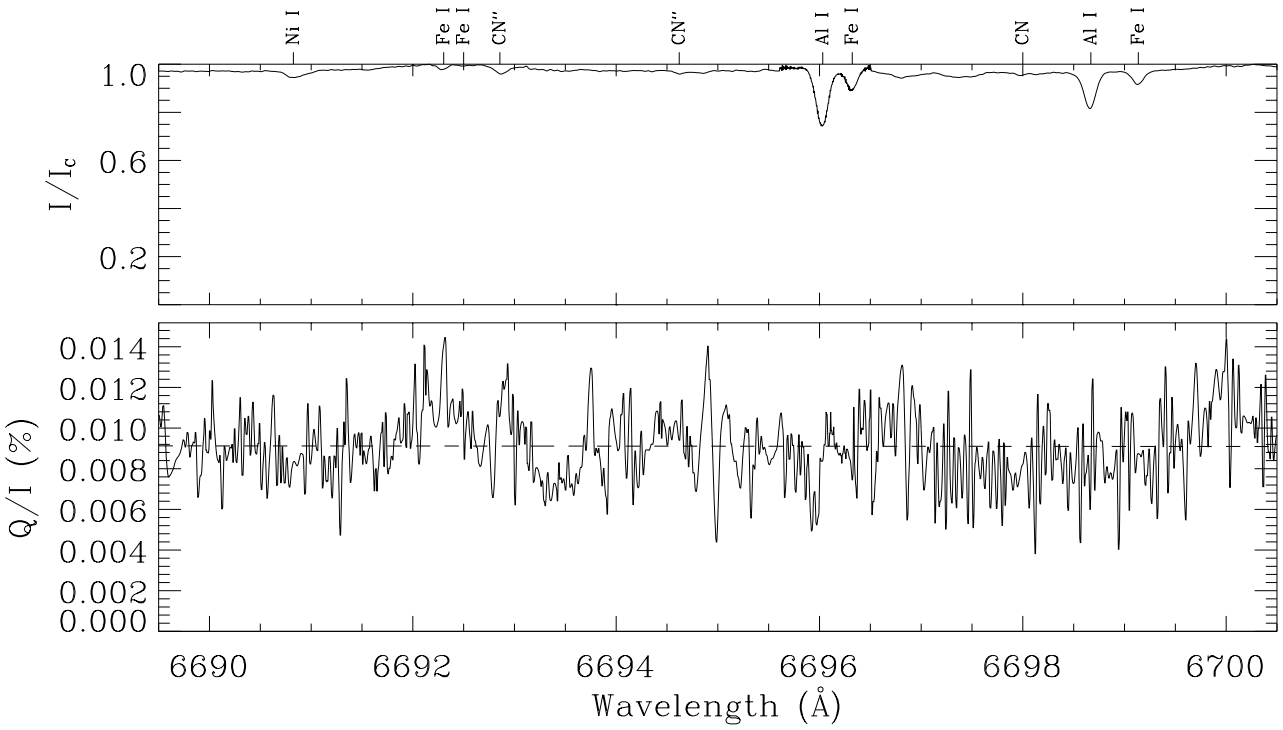

Fe I
Fe I
Cr I
Ni I
CN
Eu II
Fe I
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.02
0.01
0.00
−0.01
Q/I (%)
6640
6642
6644
6646
6648
6650
Wavelength (Å)

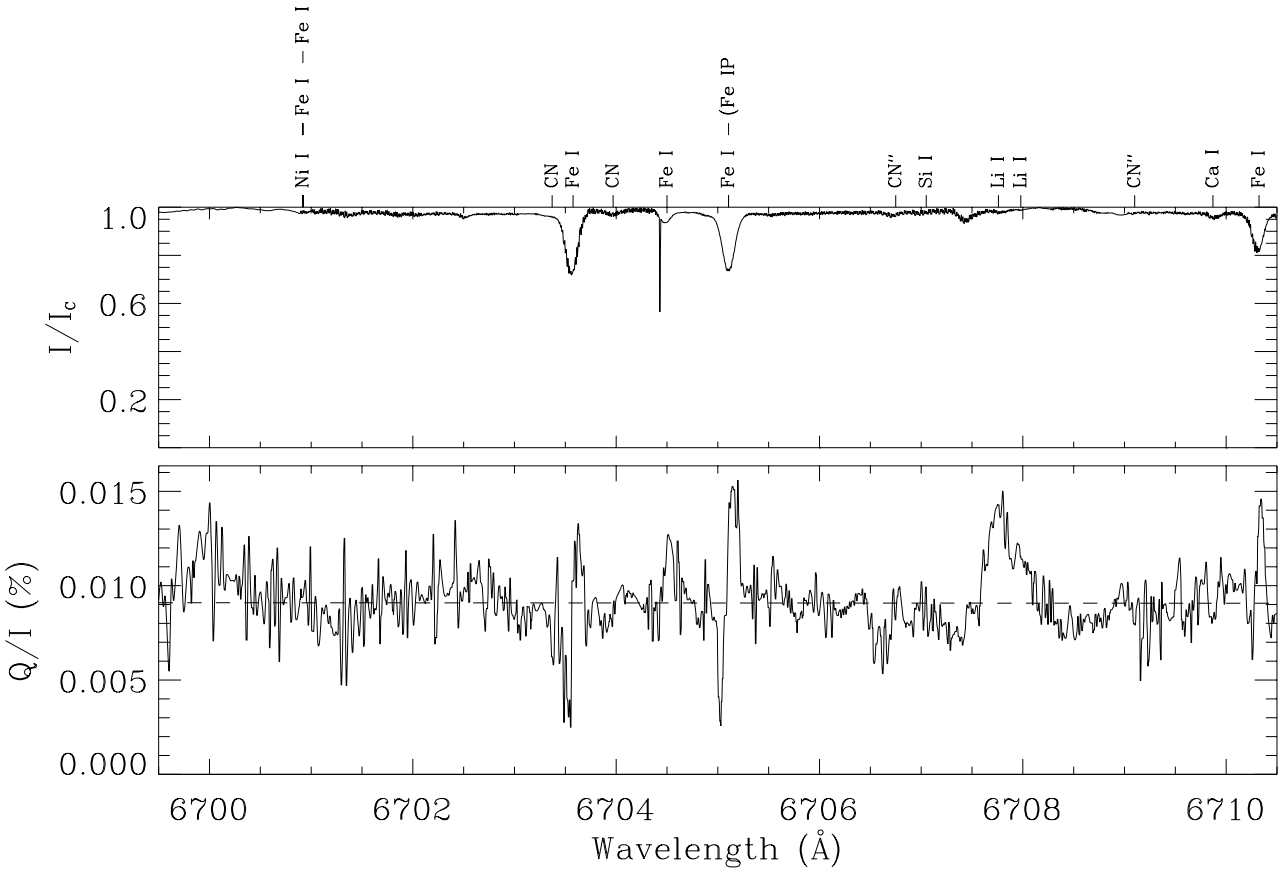

Si I
CN''
Fe I
C I
CN''
Cr I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
Q/I (%)
6650
6652
6654
6656
6658
6660
Wavelength (Å)

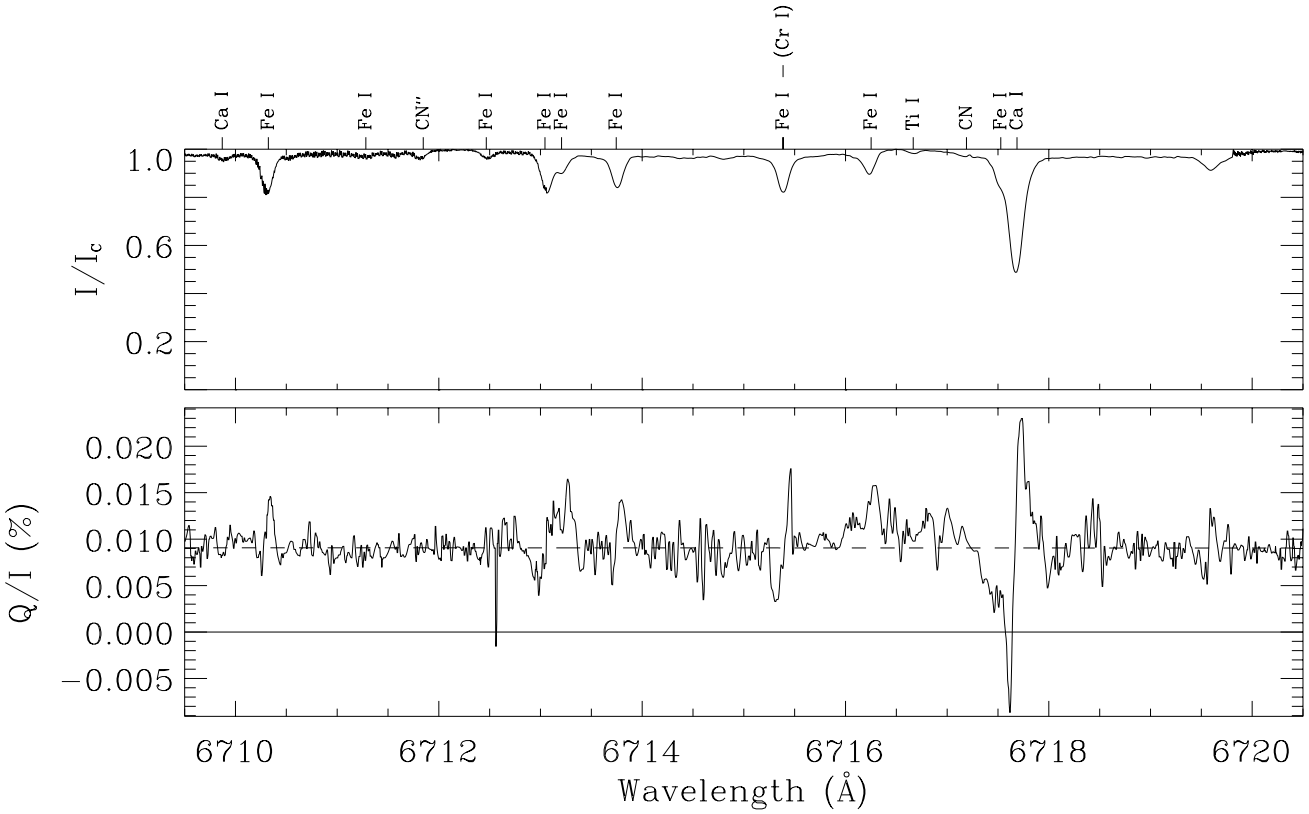

Cr I
Ni I
C I
Fe I
Fe I
CN''
Fe I
Ti I
CN''
CN''
Fe I
Fe I
Si I
Cr I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
−0.005
Q/I (%)
6660
6662
6664
6666
6668
6670
Wavelength (Å)

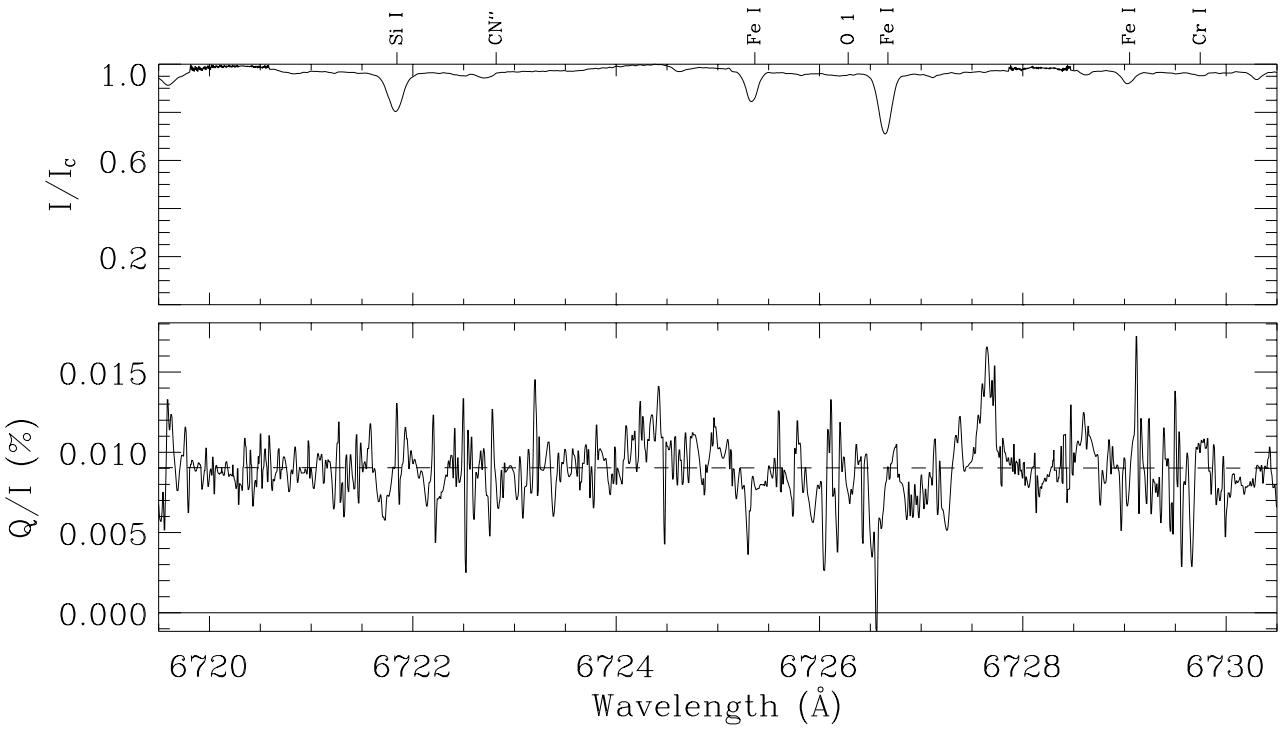

C I
Fe I
C I
Fe I
Ti I
Fe I
Fe I
Fe I
Ti I
Co I
C I
Cr I
1.0
0.6
0.2
I/I_c
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
Q/I (%)
6670
6672
6674
6676
6678
6680
Wavelength (Å)

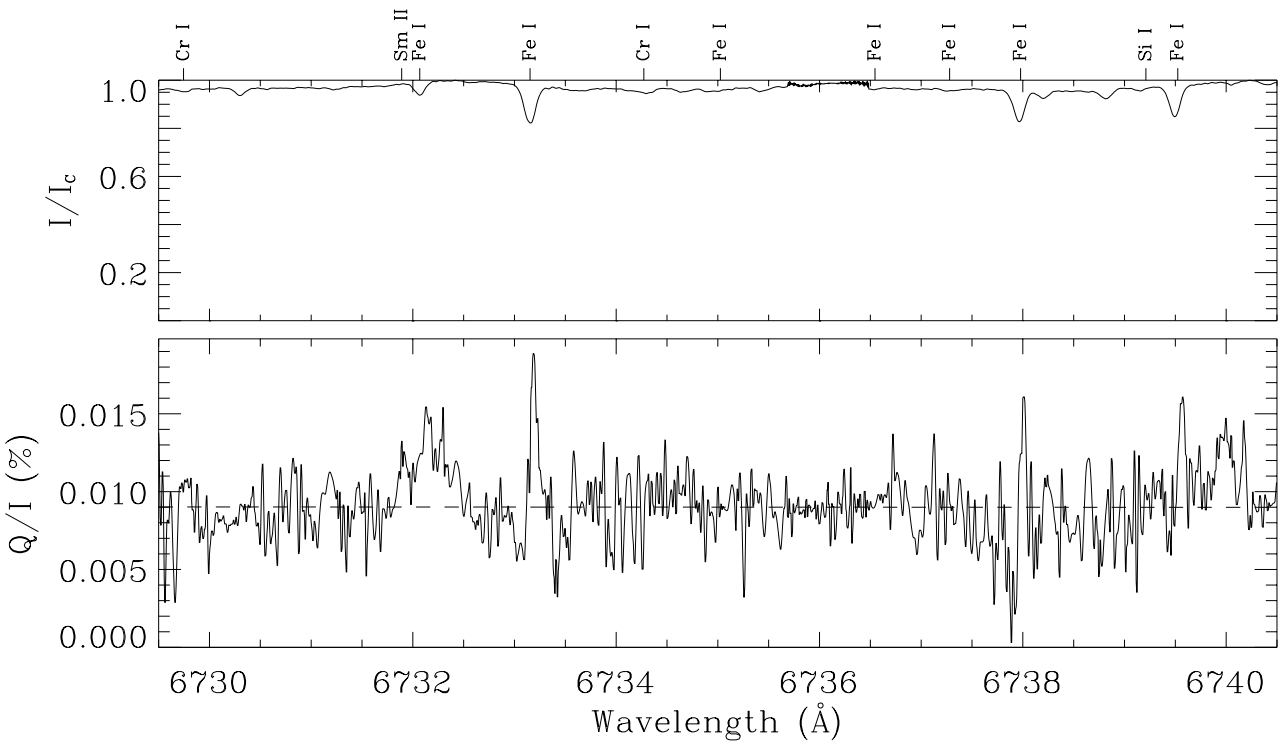

C I
Cr I
CN''
Fe I
Fe I
Co I
Y I
CN
C I
CN''
1.0
0.6
0.2
I/I_c
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
Q/I (%)
6680
6682
6684
6686
6688
6690
Wavelength (Å)

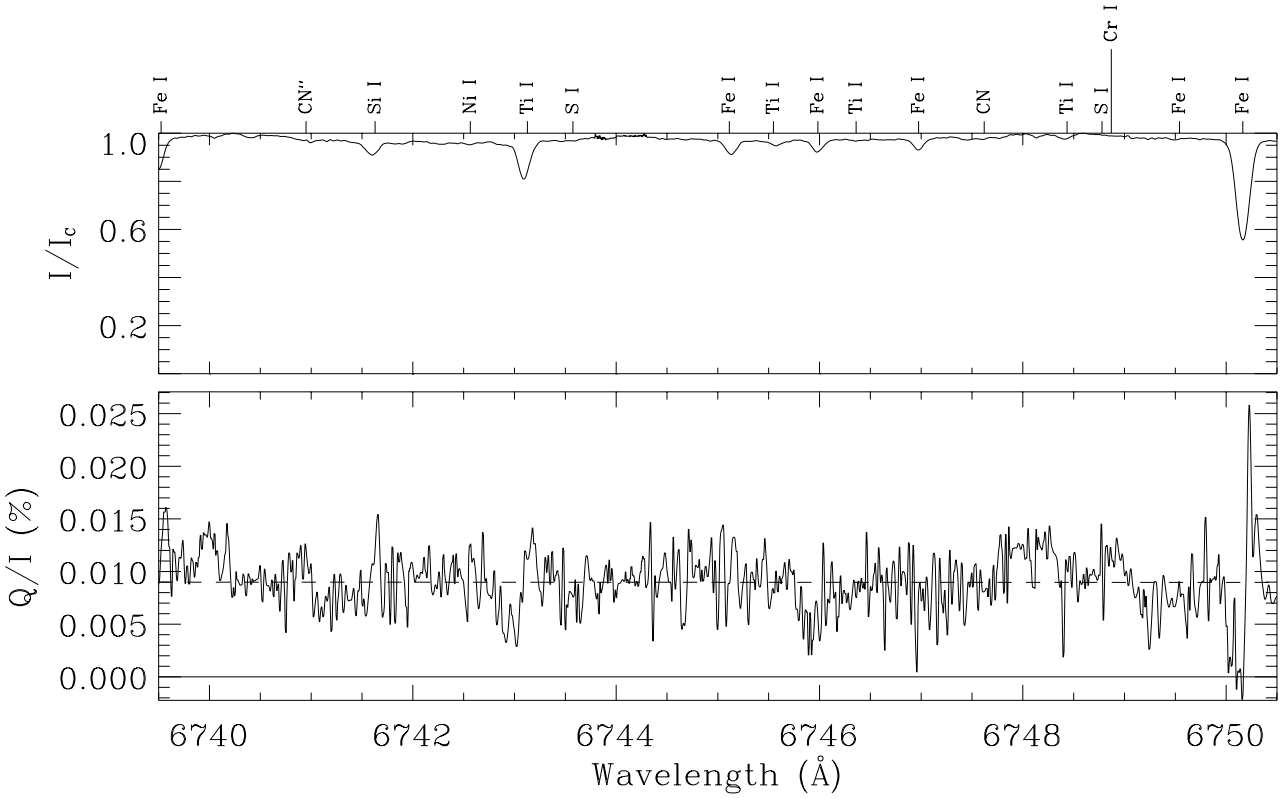

Ni I
Fe I
Fe I
CN''
CN''
Al I
Fe I
CN
Al I
Fe I
1.0
0.6
0.2
I/I_c
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
Q/I (%)
6690
6692
6694
6696
6698
6700
Wavelength (Å)

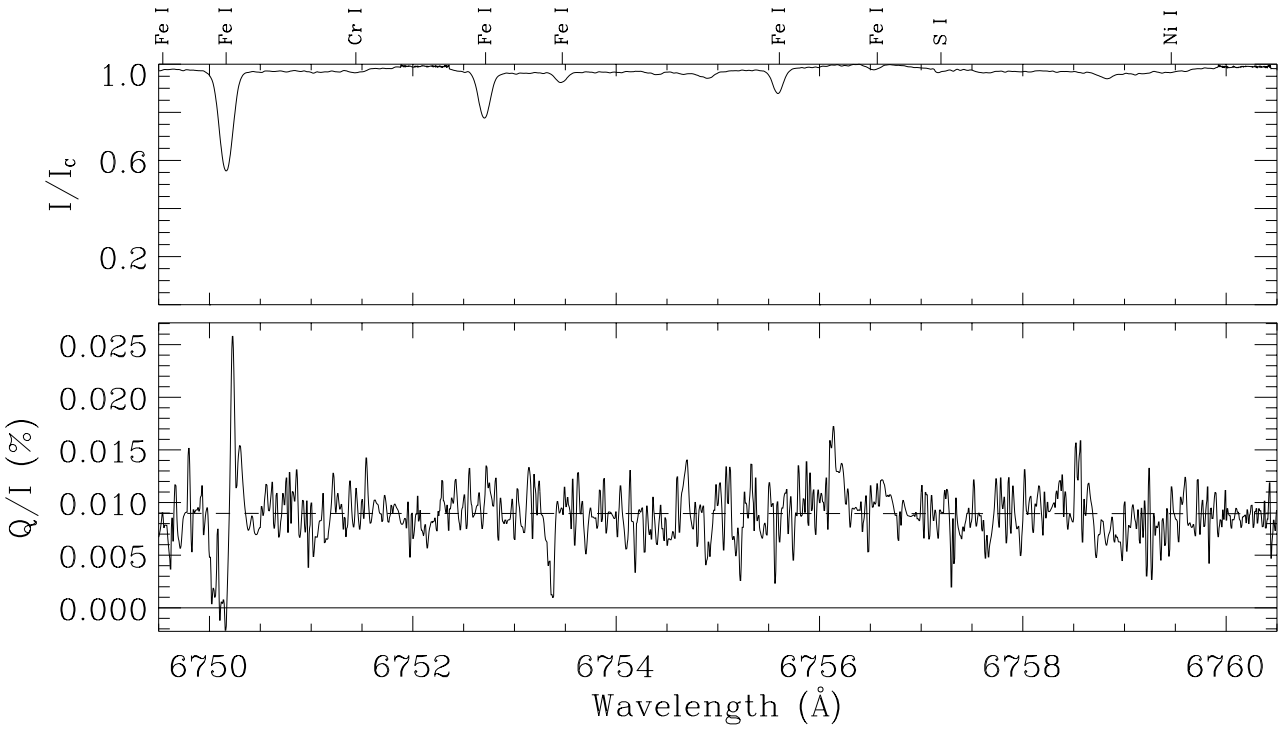

Ni I
Fe I
Fe I
CN
Fe I
CN
Fe I
Fe I
(Fe IP
CN''
Si I
Li I
Li I
CN''
Ca I
Fe I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
Q/I (%)
6700
6702
6704
6706
6708
6710
Wavelength (Å)

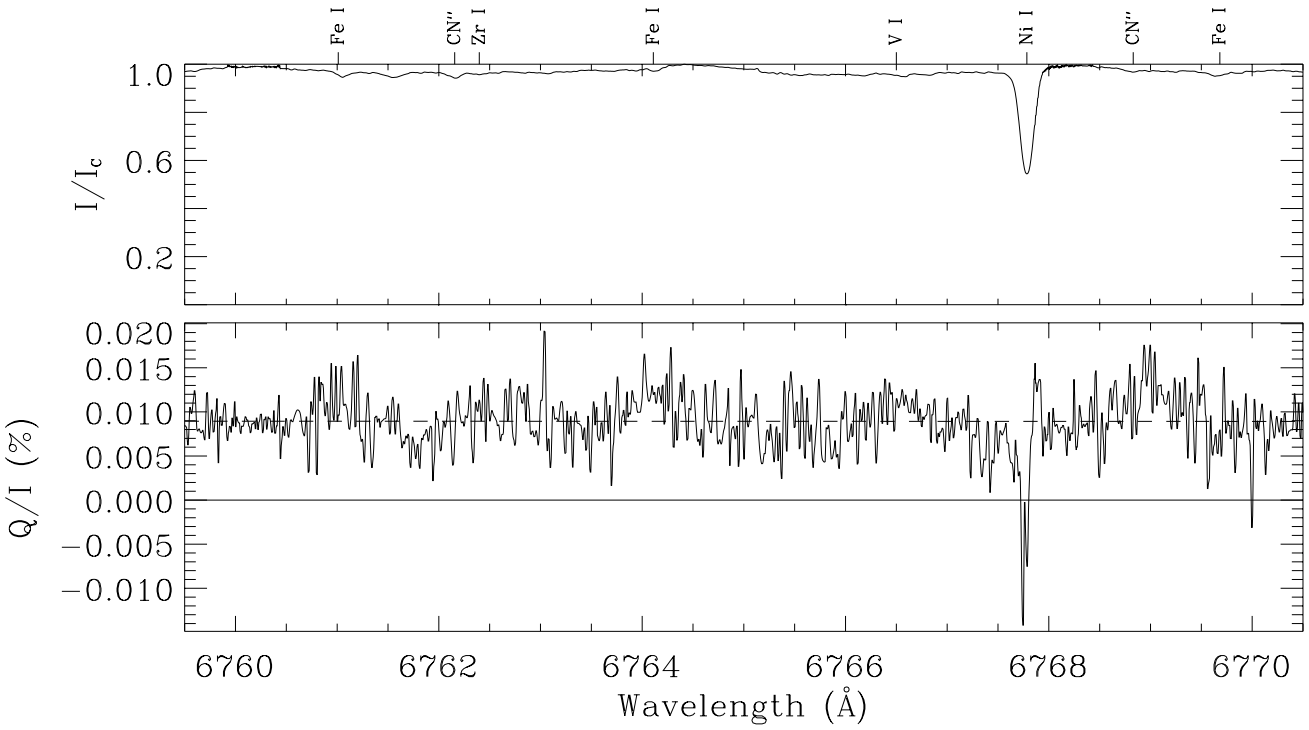

Ca I
Fe I
Fe I
CN''
Fe I
Fe I
Fe I
Fe I
Fe I – (Cr I)
Fe I
Ti I
CN
Fe I
Ca I
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
−0.005
Q/I (%)
6710
6712
6714
6716
6718
6720
Wavelength (Å)

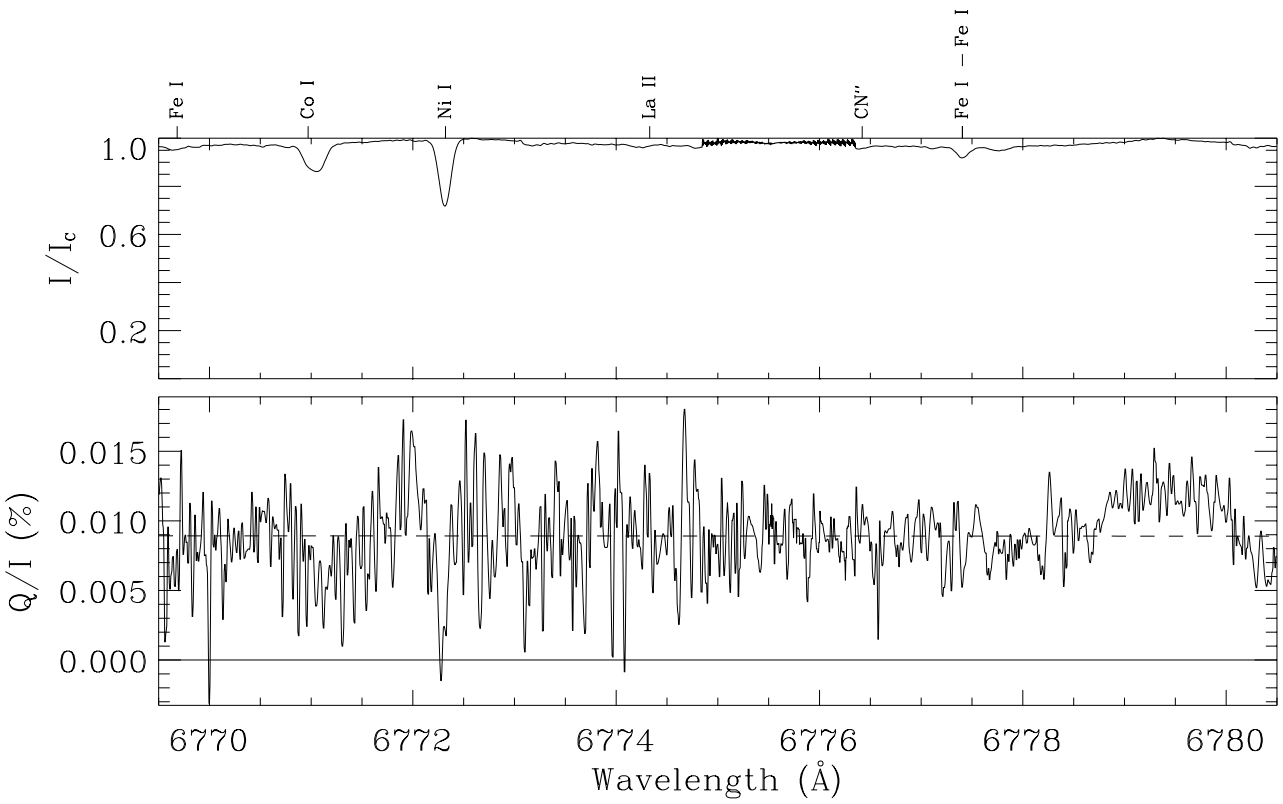

Si I
CN''
Fe I
O 1
Fe I
Fe I
Cr I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
Q/I (%)
6720
6722
6724
6726
6728
6730
Wavelength (Å)

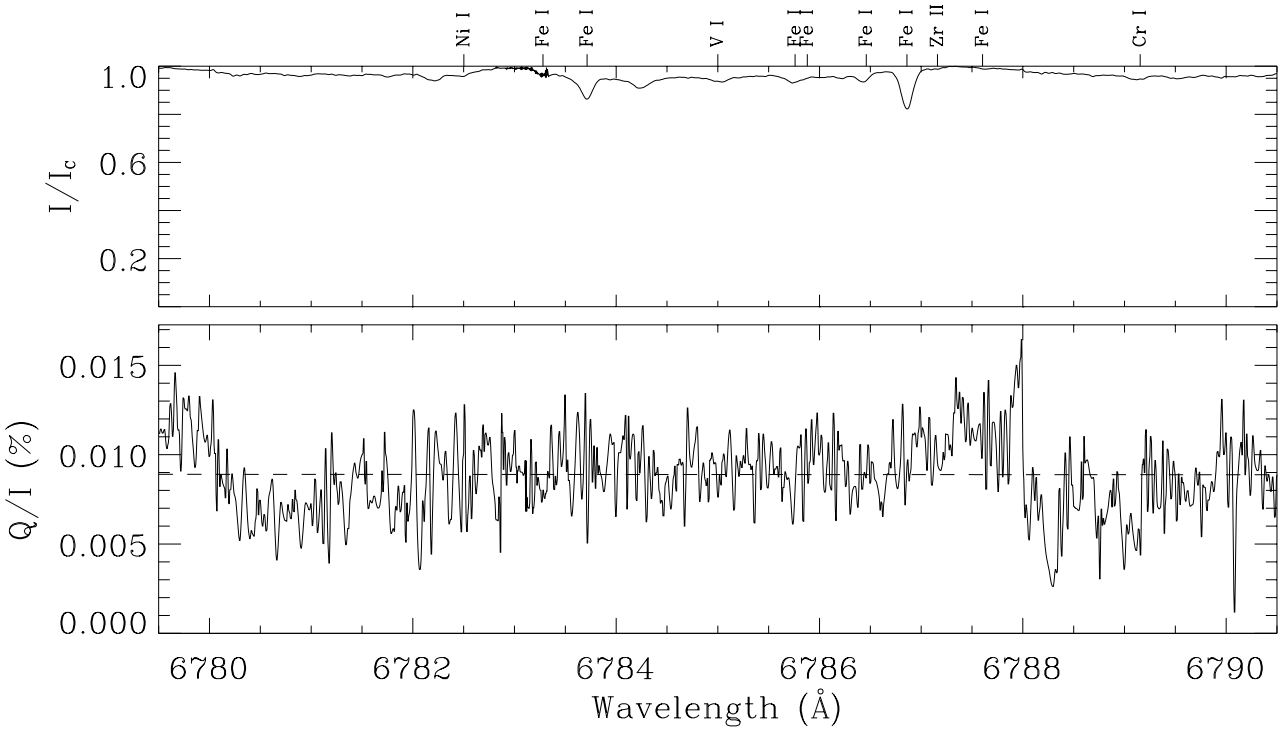

Cr I
Sm II
Fe I
Fe I
Cr I
Fe I
Fe I
Fe I
Fe I
Si I
Fe I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
Q/I (%)
6730
6732
6734
6736
6738
6740
Wavelength (Å)

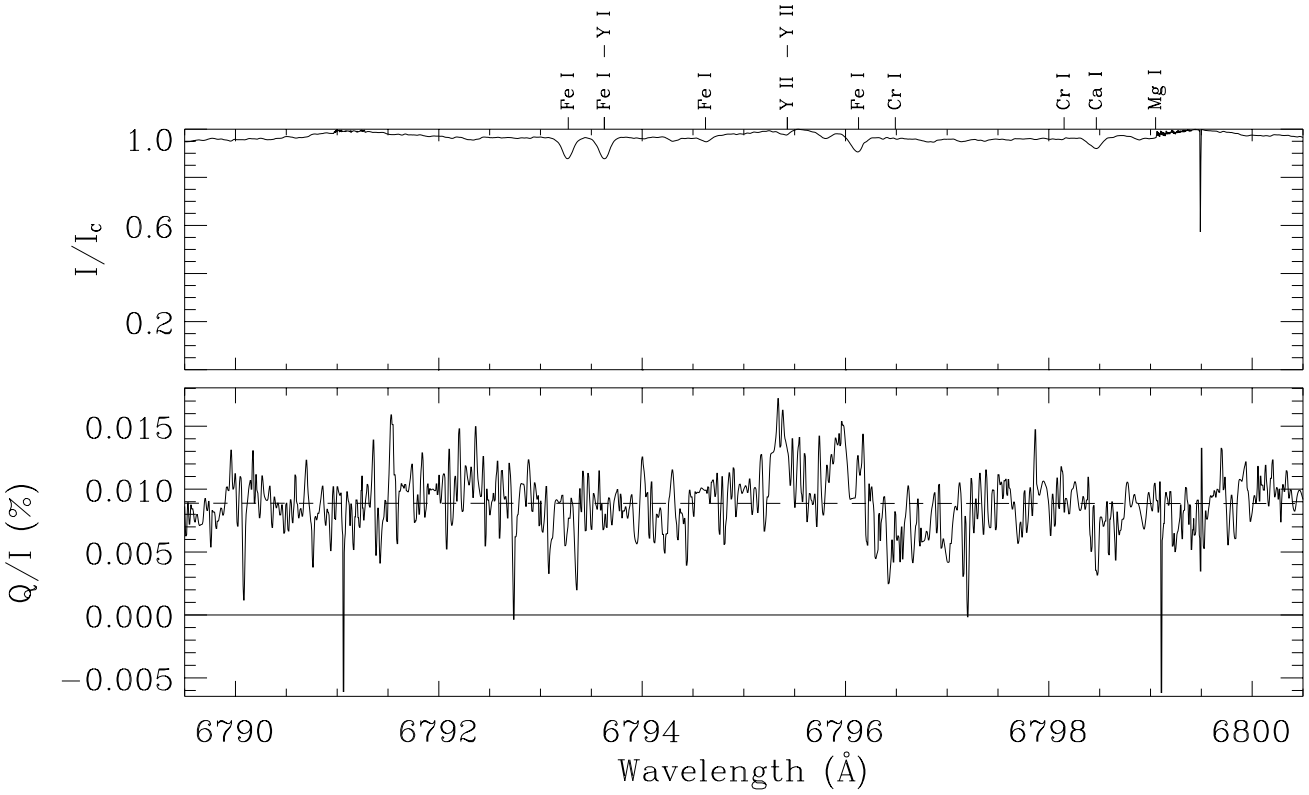

Fe I
CN''
Si I
Ni I
Ti I
S I
Fe I
Ti I
Fe I
Ti I
Fe I
CN
Ti I
S I
Cr I
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.025
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6740
6742
6744
6746
6748
6750
Wavelength (Å)

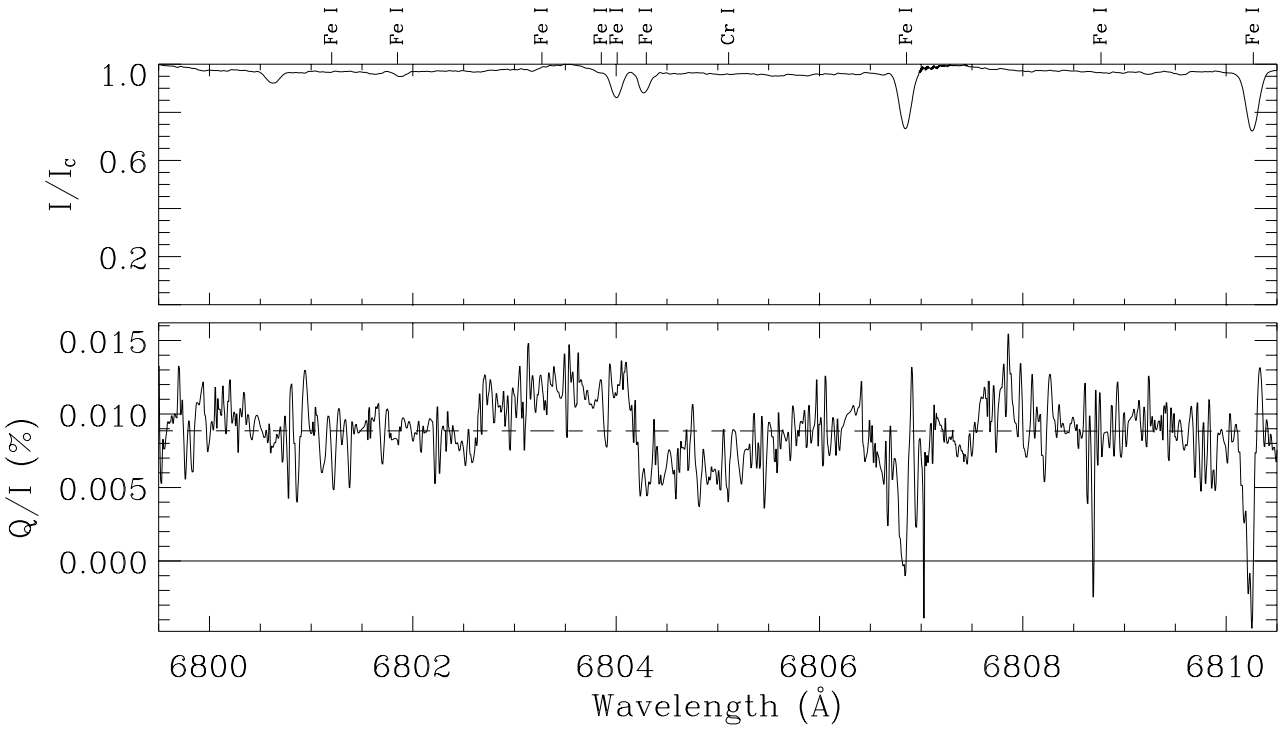

Fe I
Fe I
Cr I
Fe I
Fe I
Fe I
Fe I
S I
Ni I
1.0
0.6
0.2
I/I_c
0.025
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6750
6752
6754
6756
6758
6760
Wavelength (Å)

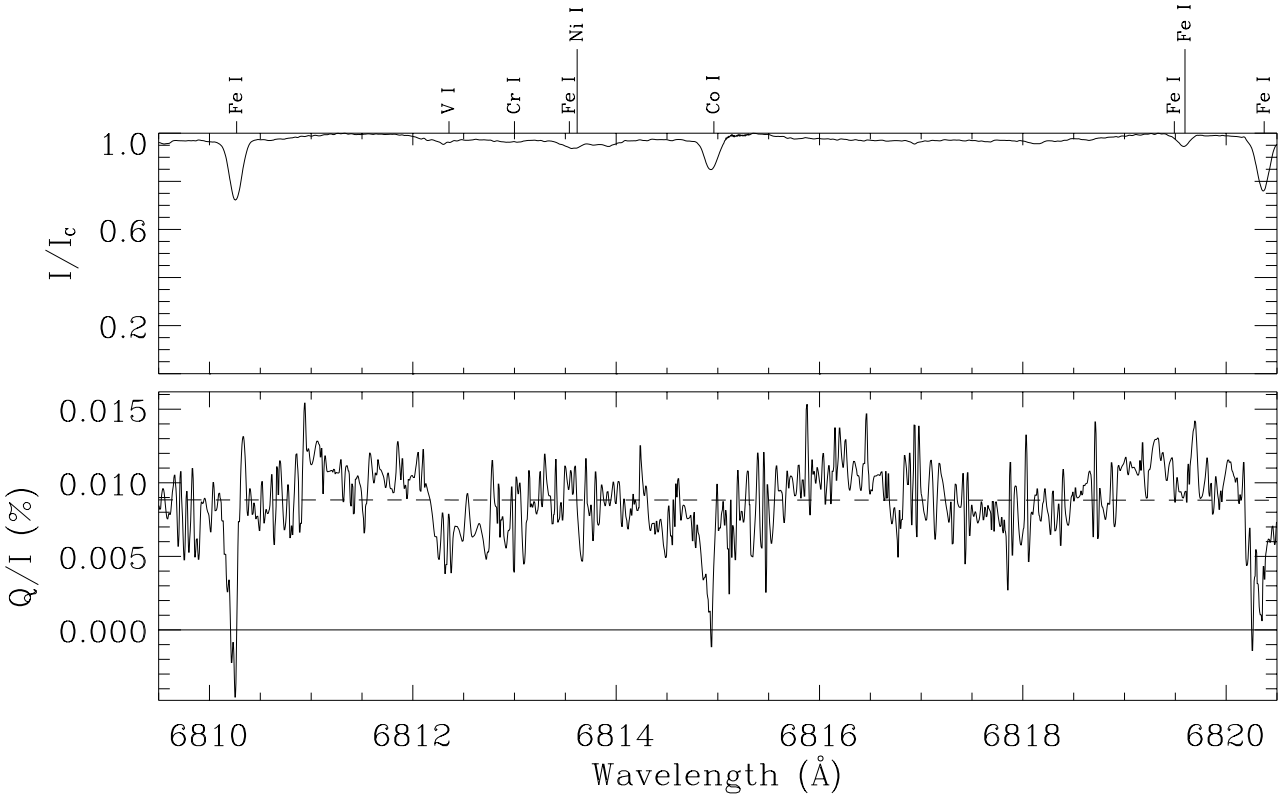

Fe I
CN''
Zr I
Fe I
V I
Ni I
CN''
Fe I
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
−0.005
−0.010
Q/I (%)
6760
6762
6764
6766
6768
6770
Wavelength (Å)

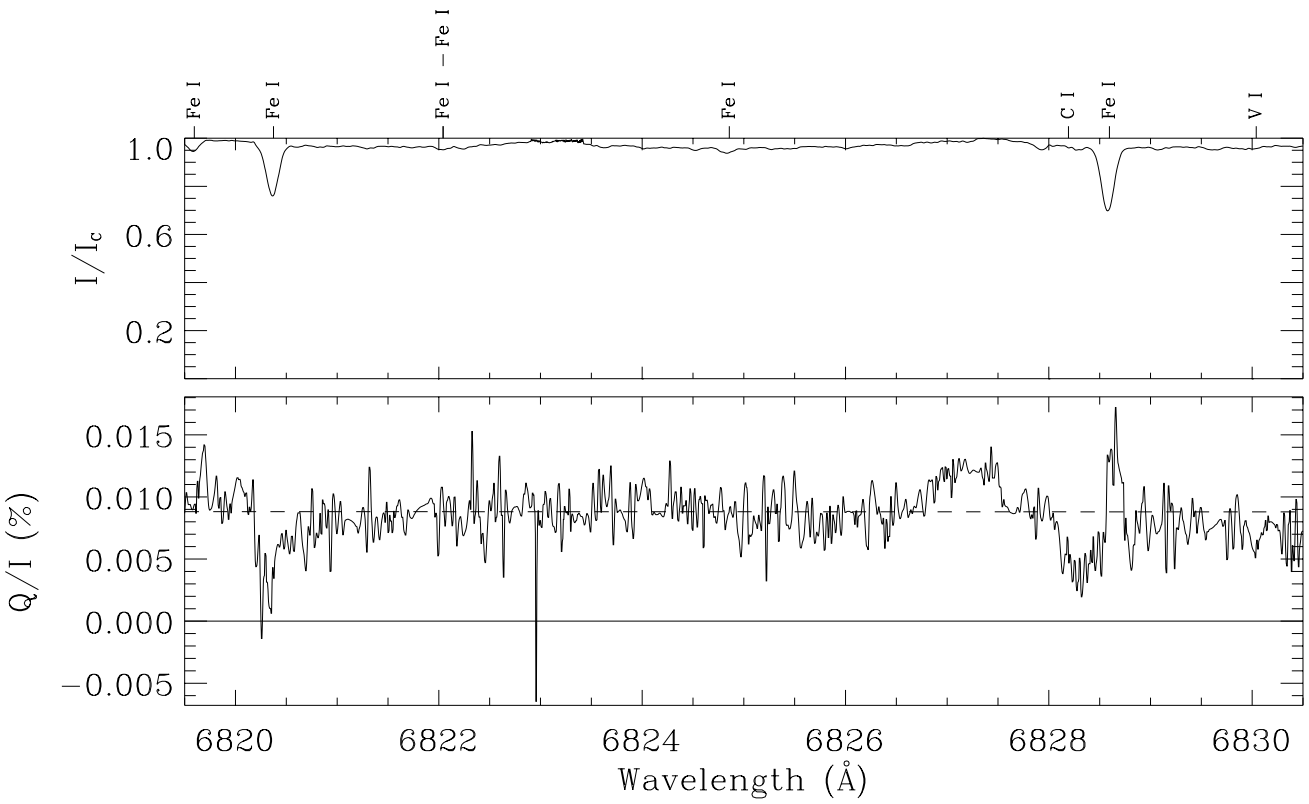

Fe I
Co I
Ni I
La II
CN''
Fe I – Fe I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
Q/I (%)
6770
6772
6774
6776
6778
6780
Wavelength (Å)

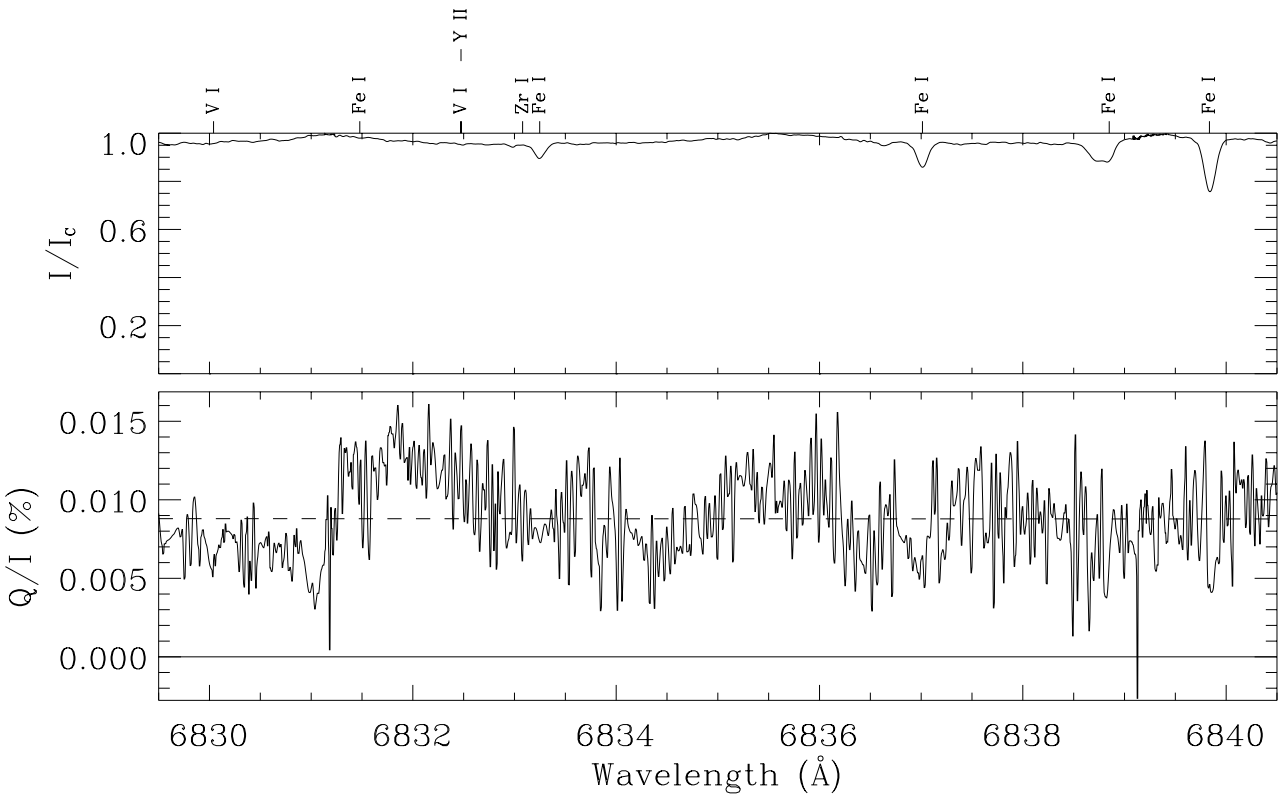

Ni I
Fe I
Fe I
V I
Fe I
Fe I
Fe I
Fe I
Zr II
Fe I
Cr I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
Q/I (%)
6780
6782
6784
6786
6788
6790
Wavelength (Å)

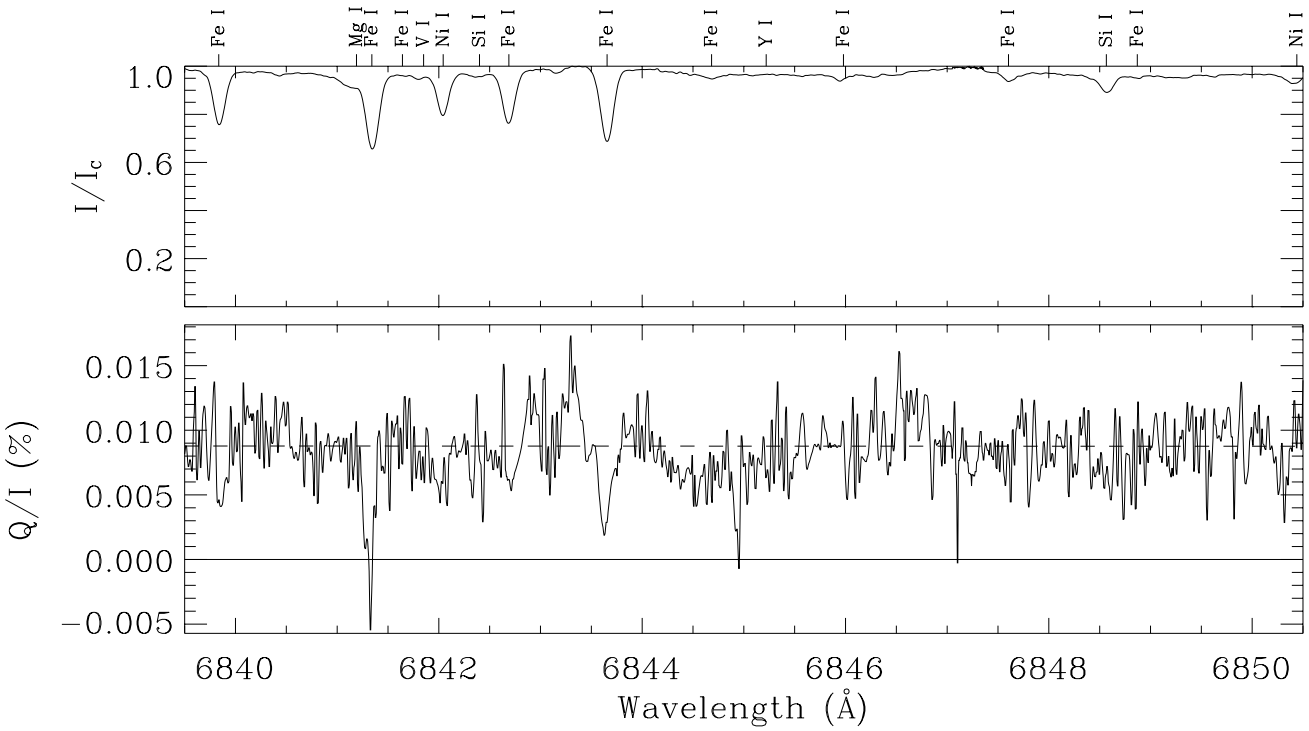

Fe I
Fe I – Y I
Fe I
Y II – Y II
Fe I
Cr I
Cr I
Ca I
Mg I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
−0.005
Q/I (%)
6790
6792
6794
6796
6798
6800
Wavelength (Å)

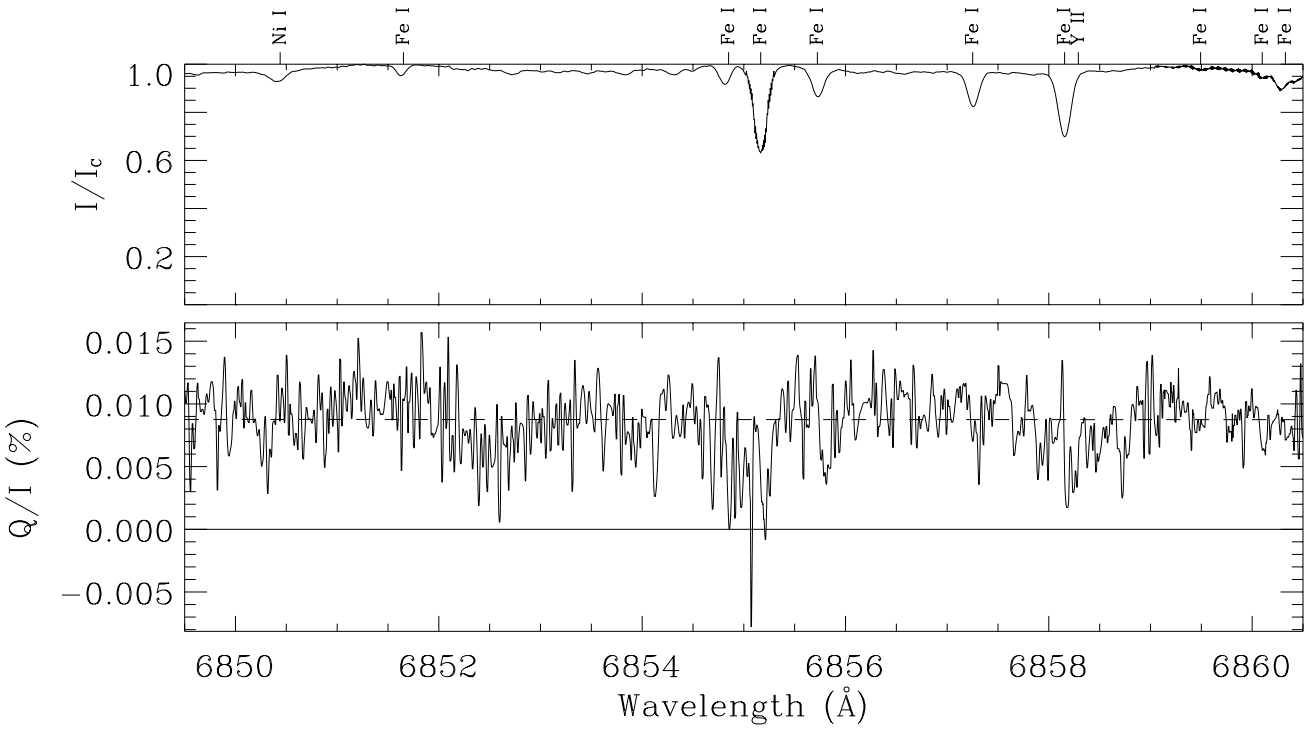

Fe I
Fe I
Fe I
Fe I
Fe I
Fe I
Cr I
Fe I
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
Q/I (%)
6800
6802
6804
6806
6808
6810
Wavelength (Å)

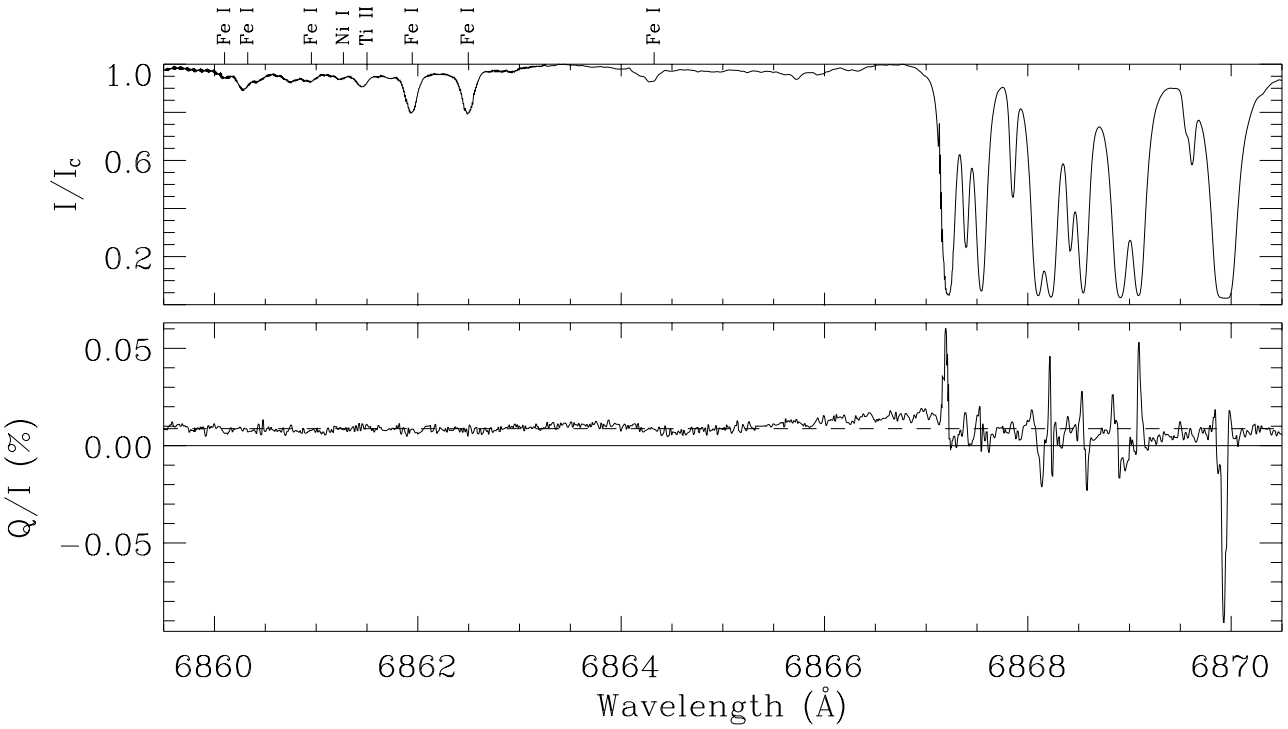

Fe I
V I
Cr I
Fe I
Ni I
Co I
Fe I
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
Q/I (%)
6810
6812
6814
6816
6818
6820
Wavelength (Å)

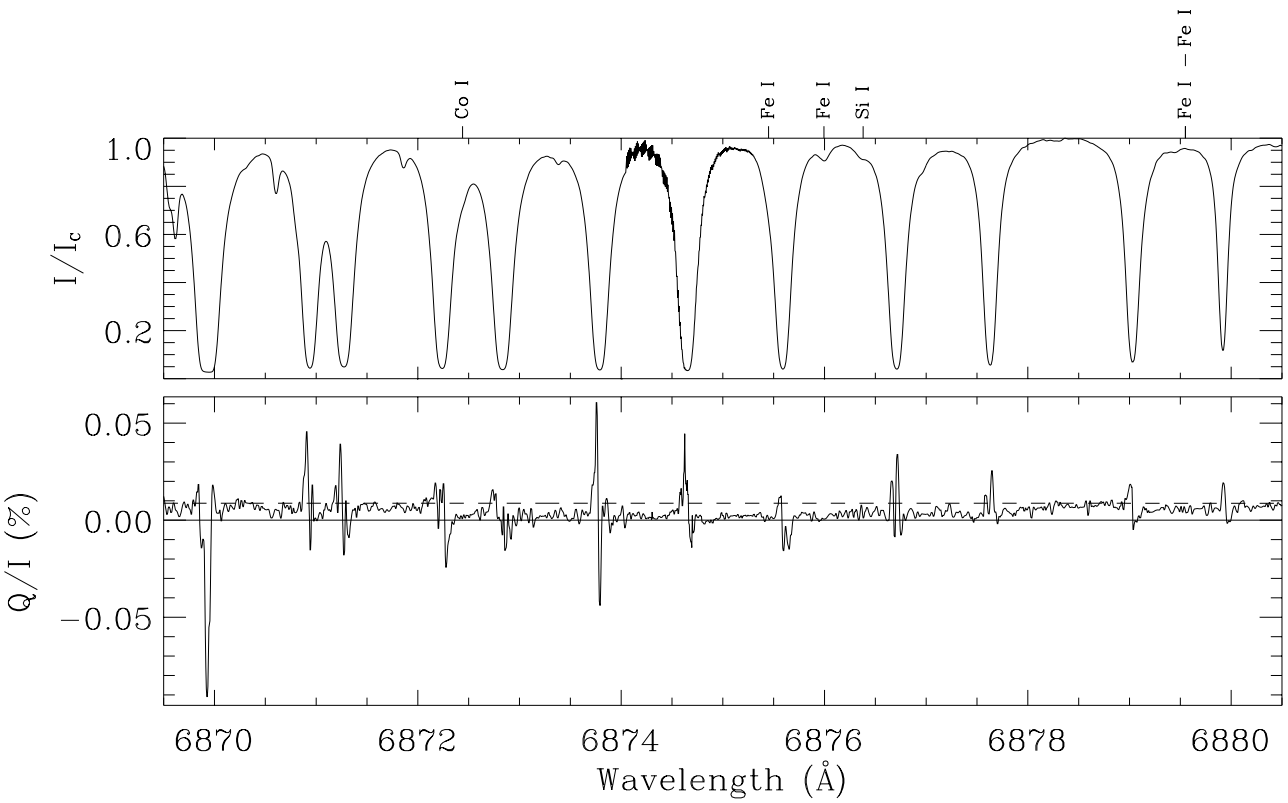

Fe I
Fe I
Fe I – Fe I
Fe I
C I
Fe I
V I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
−0.005
Q/I (%)
6820
6822
6824
6826
6828
6830
Wavelength (Å)

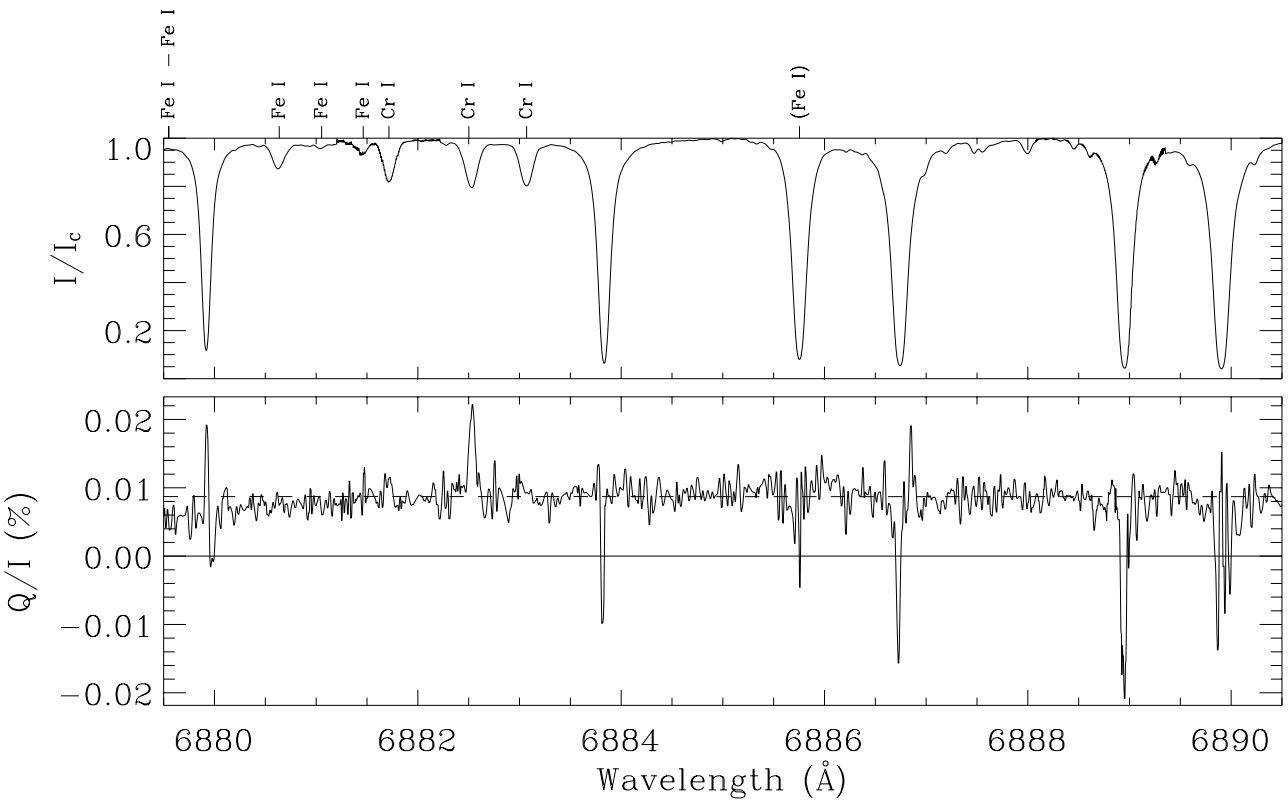

V I
Fe I
V I
Y II
Zr I
Fe I
Fe I
Fe I
Fe I
1.0
0.6
0.2
I/I$_c$
0.015
0.010
0.005
0.000
Q/I (%)
6830
6832
6834
6836
6838
6840
Wavelength (Å)

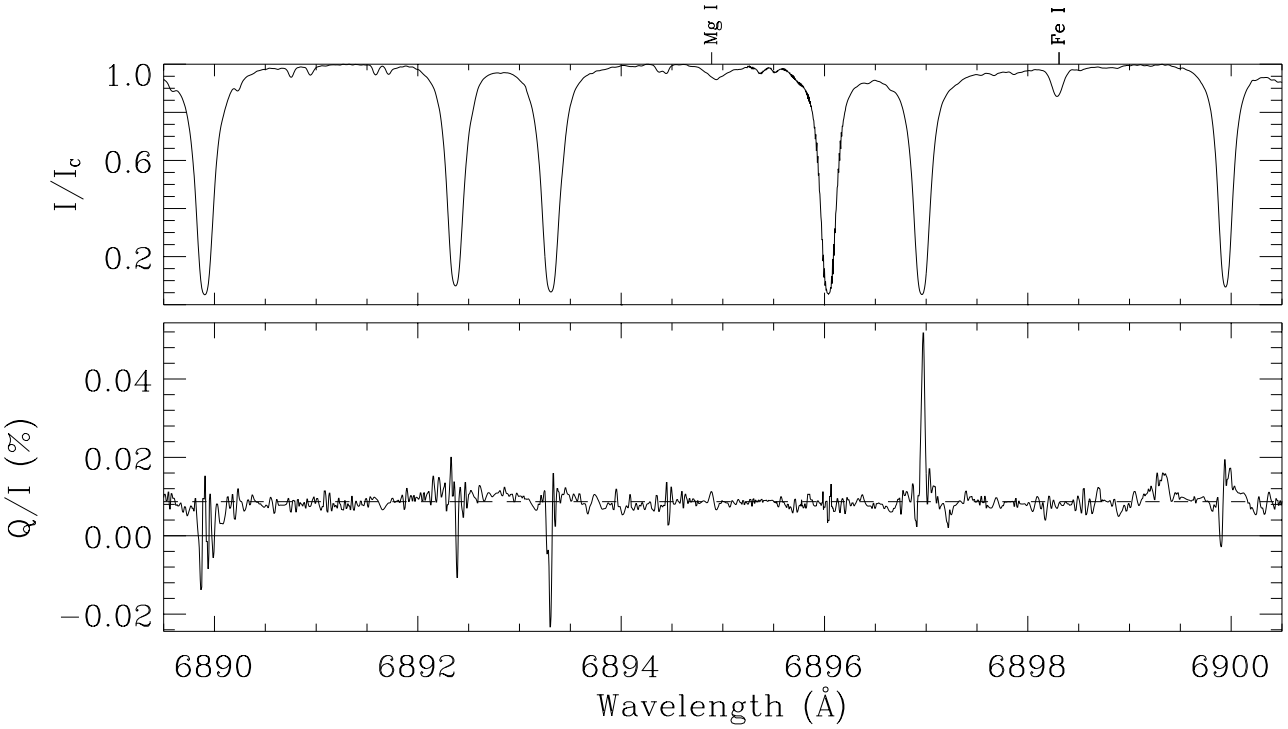

Fe I
Mg I
Fe I
Fe I
V I
Ni I
Si I
Fe I
Fe I
Fe I
Y I
Fe I
Fe I
Si I
Fe I
Ni I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
−0.005
Q/I (%)
6840
6842
6844
6846
6848
6850
Wavelength (Å)

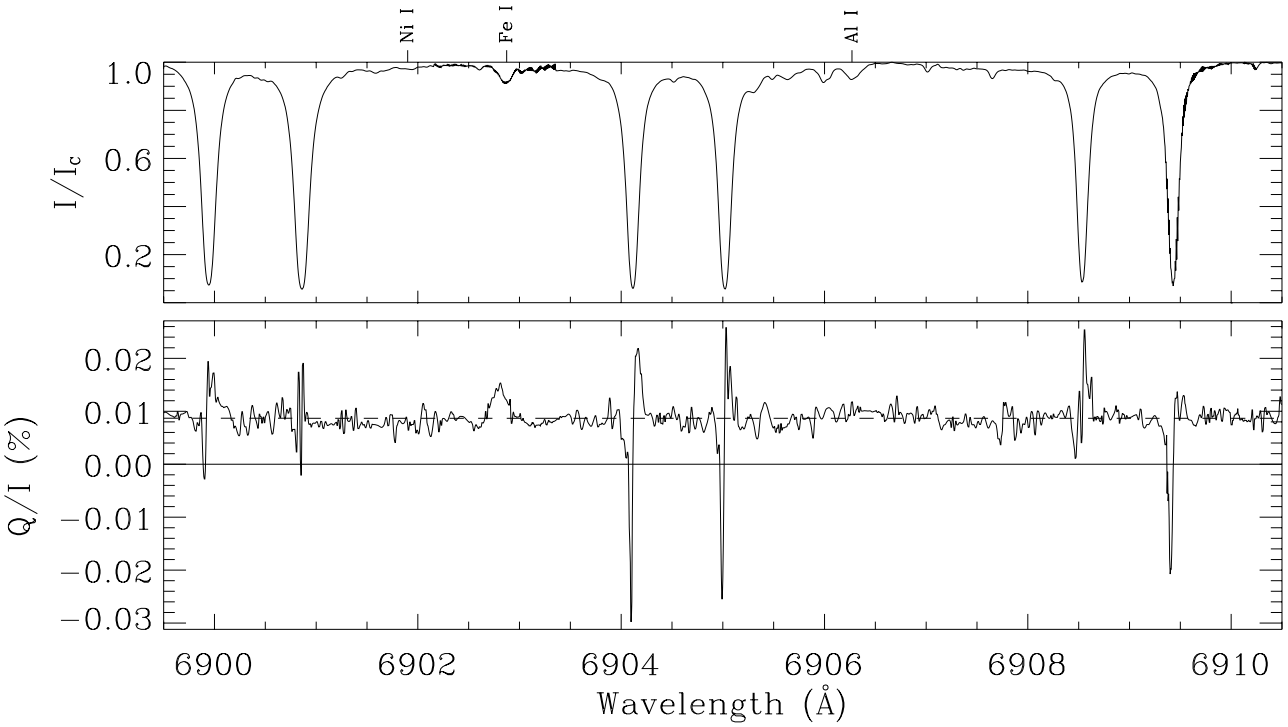

Ni I
Fe I
Fe I
Fe I
Fe I
Fe I
Fe I
Y II
Fe I
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
−0.005
Q/I (%)
6850
6852
6854
6856
6858
6860
Wavelength (Å)

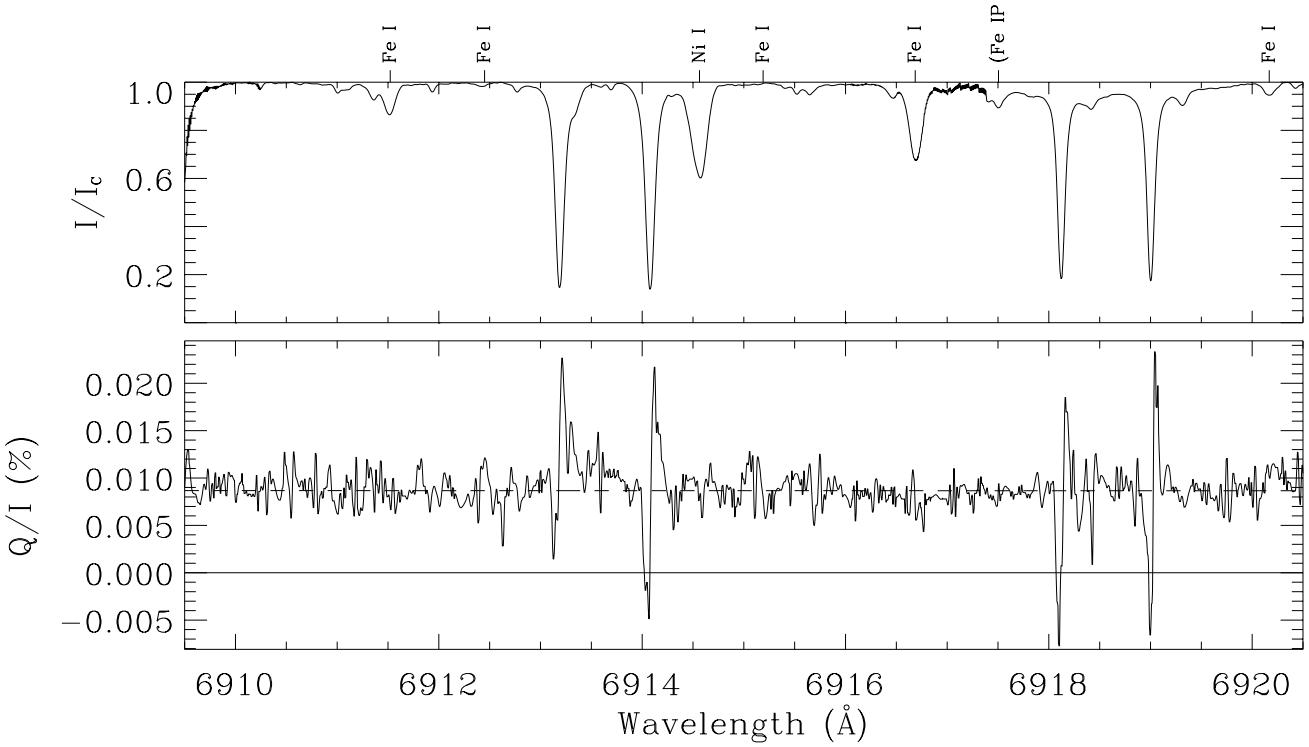

Fe I
Fe I
Fe I
Ni I
Ti II
Fe I
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.05
0.00
−0.05
Q/I (%)
6860
6862
6864
6866
6868
6870
Wavelength (Å)

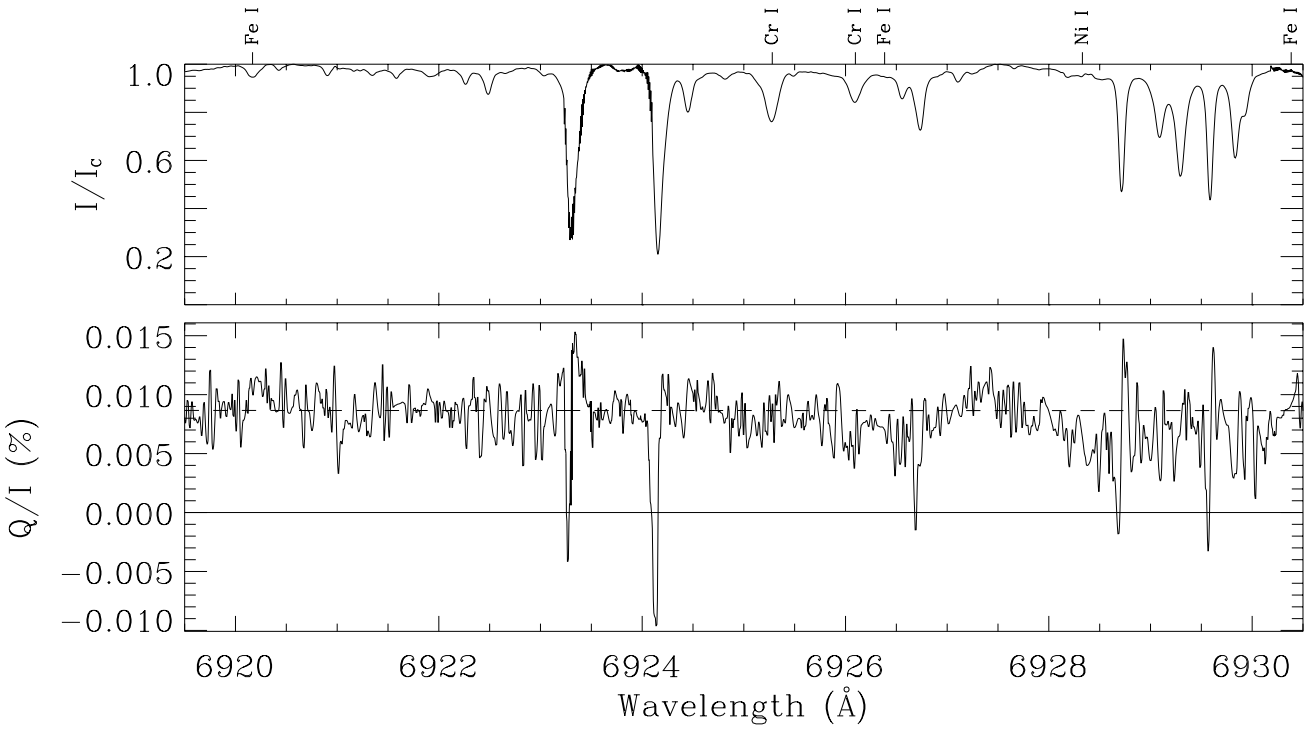

Co I
Fe I
Fe I
Si I
Fe I – Fe I
1.0
0.6
0.2
I/I_c
0.05
0.00
−0.05
Q/I (%)
6870
6872
6874
6876
6878
6880
Wavelength (Å)

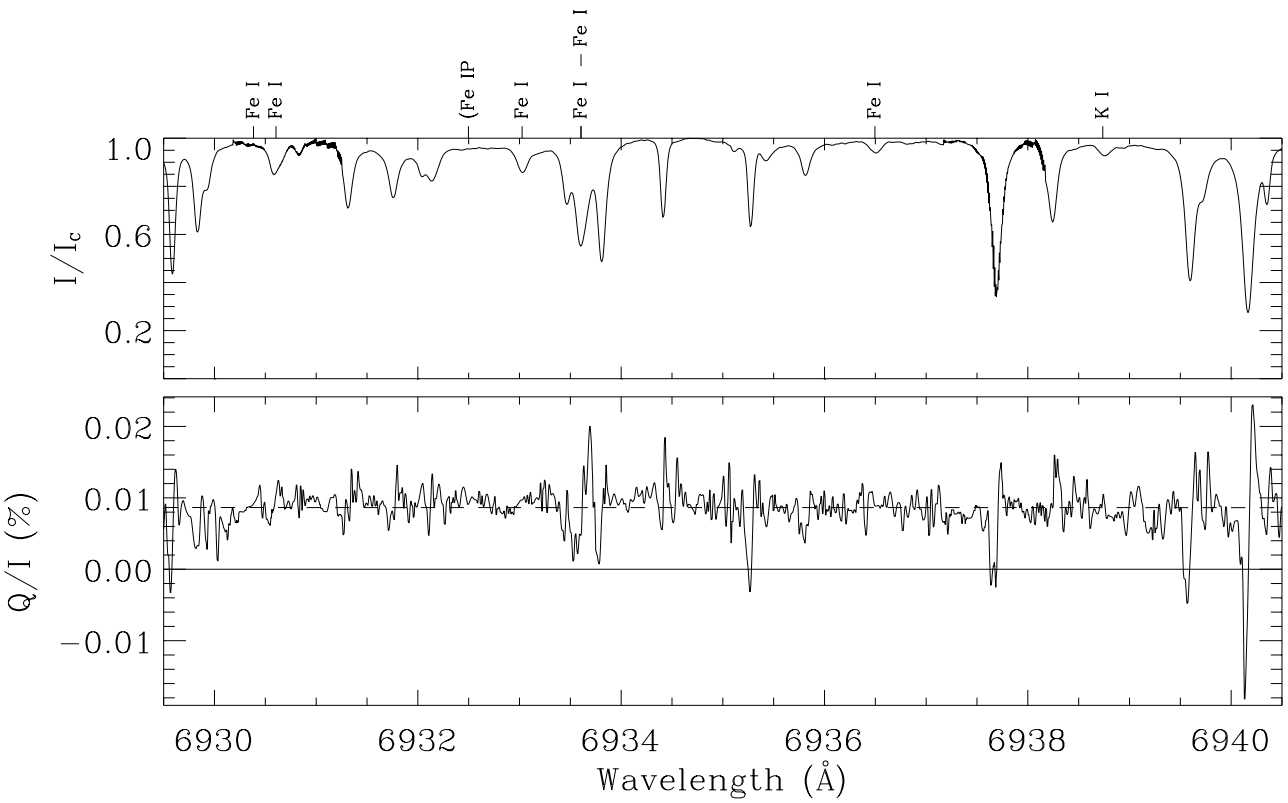

Fe I – Fe I
Fe I
Fe I
Fe I
Cr I
Cr I
Cr I
(Fe I)
1.0
0.6
0.2
I/I_c
0.02
0.01
0.00
−0.01
−0.02
Q/I (%)
6880
6882
6884
6886
6888
6890
Wavelength (Å)

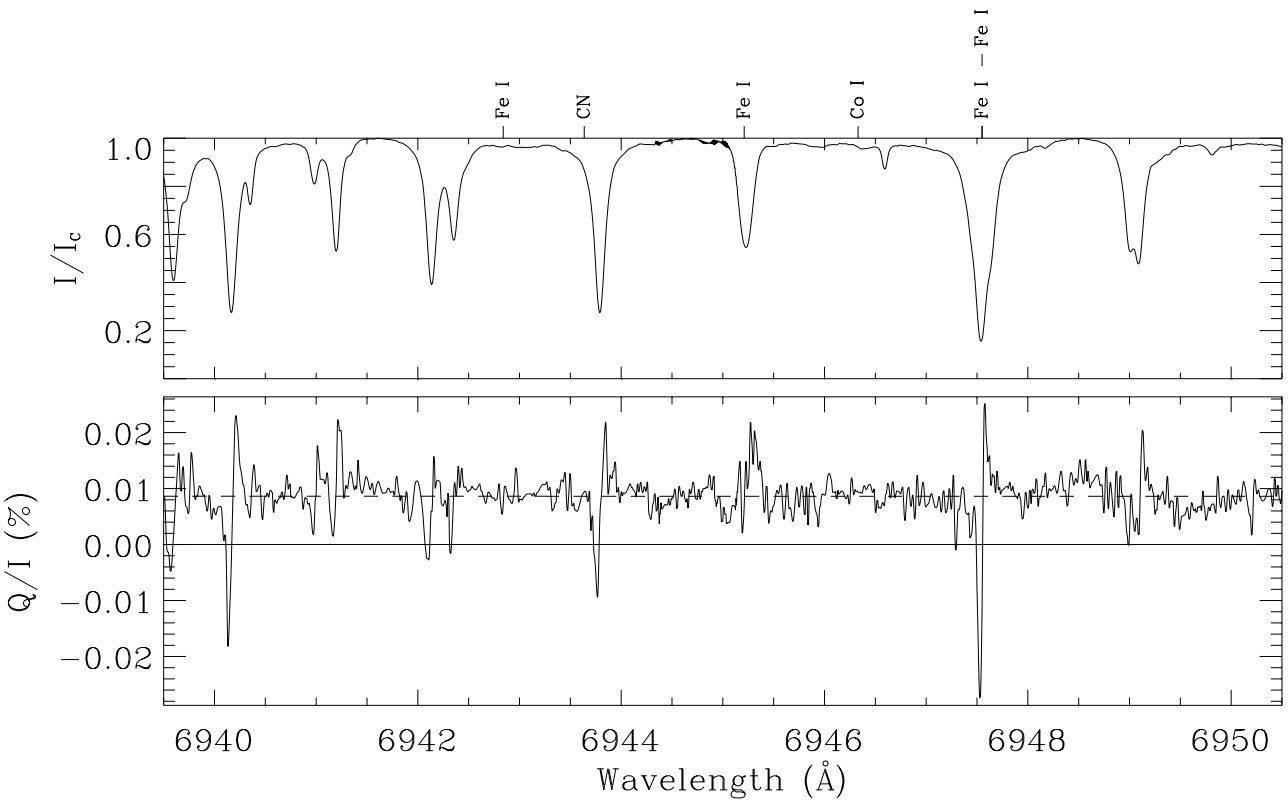

Mg I
Fe I
1.0
0.6
0.2
I/I_c
0.04
0.02
0.00
−0.02
Q/I (%)
6890
6892
6894
6896
6898
6900
Wavelength (Å)

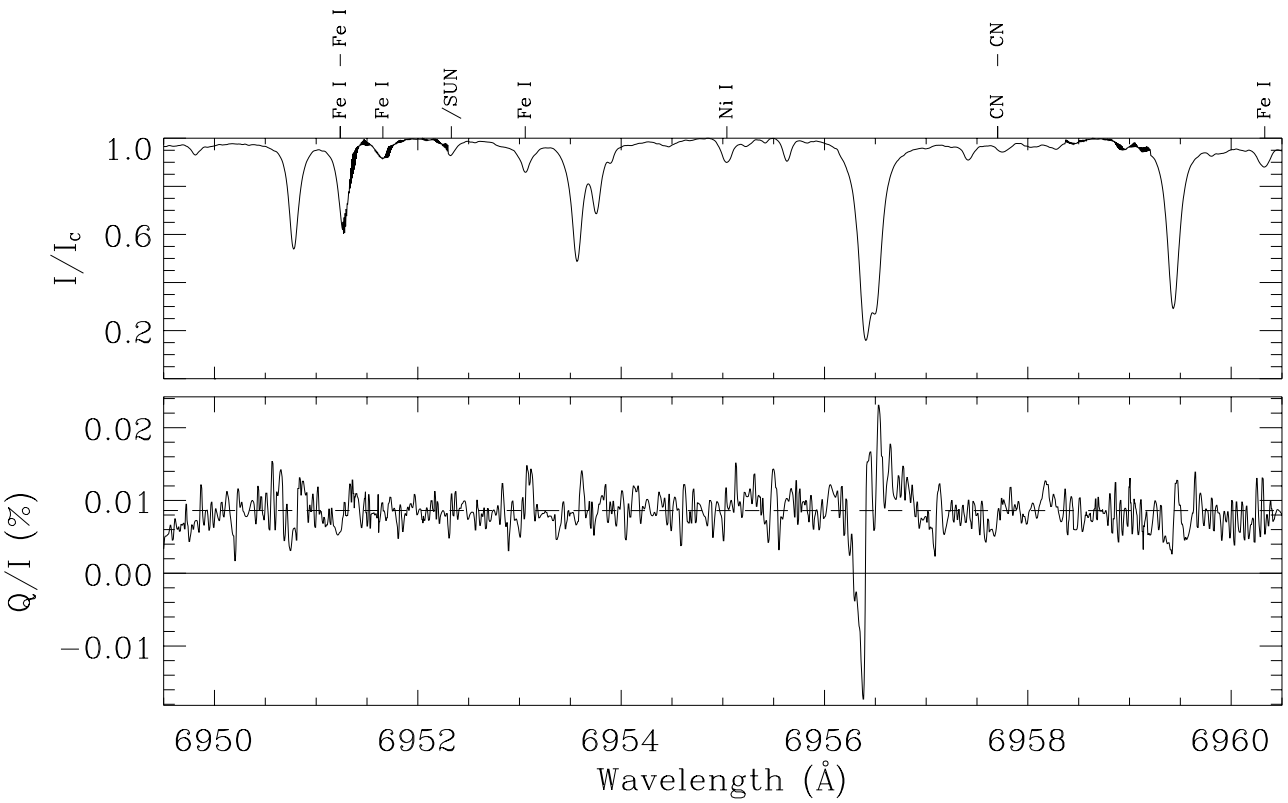

Ni I
Fe I
Al I
1.0
0.6
0.2
I/I_c
0.02
0.01
0.00
−0.01
−0.02
−0.03
Q/I (%)
6900
6902
6904
6906
6908
6910
Wavelength (Å)

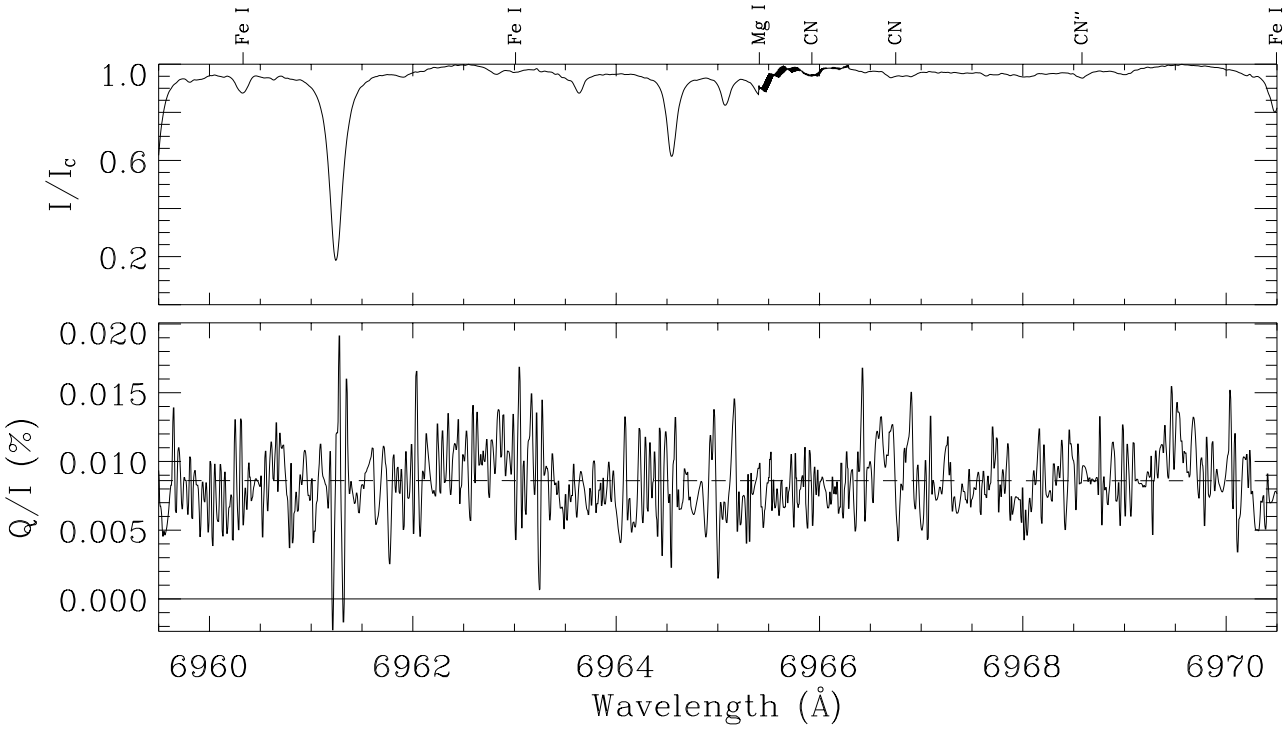

Fe I
Fe I
Ni I
Fe I
Fe I
(Fe IP
Fe I
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
−0.005
Q/I (%)
6910
6912
6914
6916
6918
6920
Wavelength (Å)

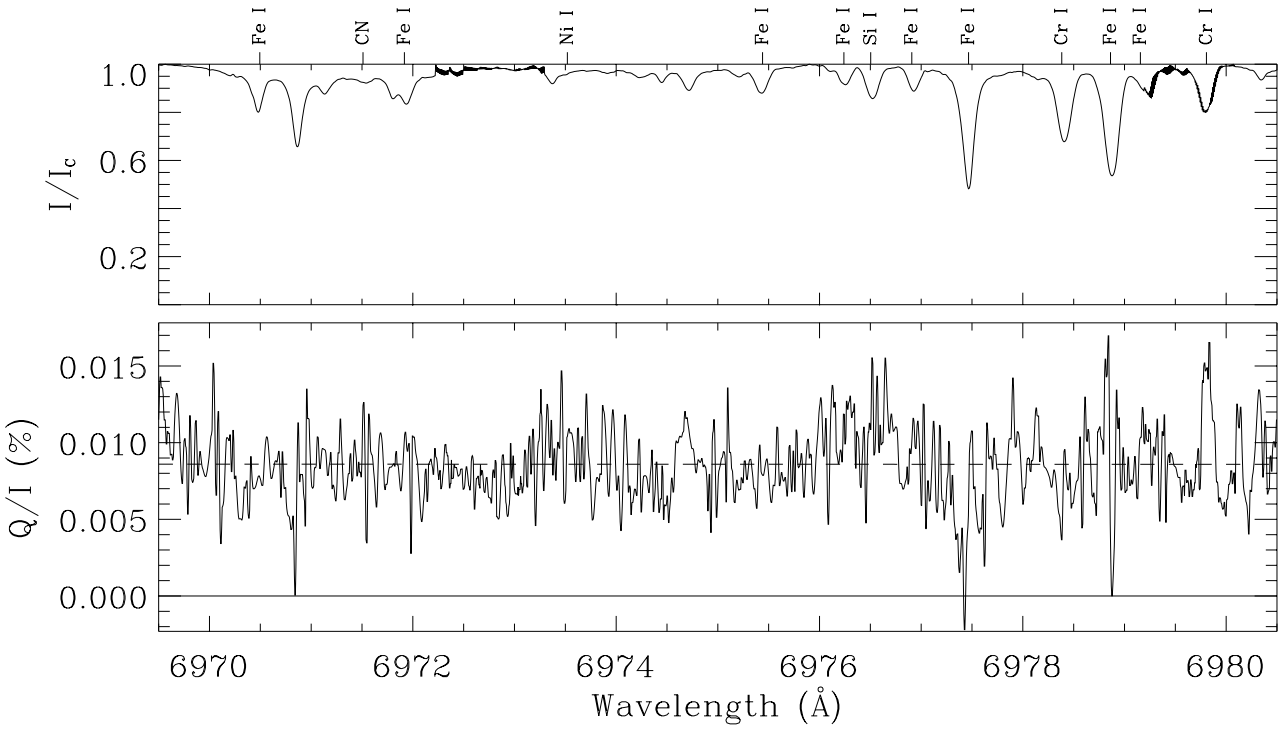

Fe I
Cr I
Cr I
Fe I
Ni I
Fe I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
−0.005
−0.010
Q/I (%)
6920
6922
6924
6926
6928
6930
Wavelength (Å)

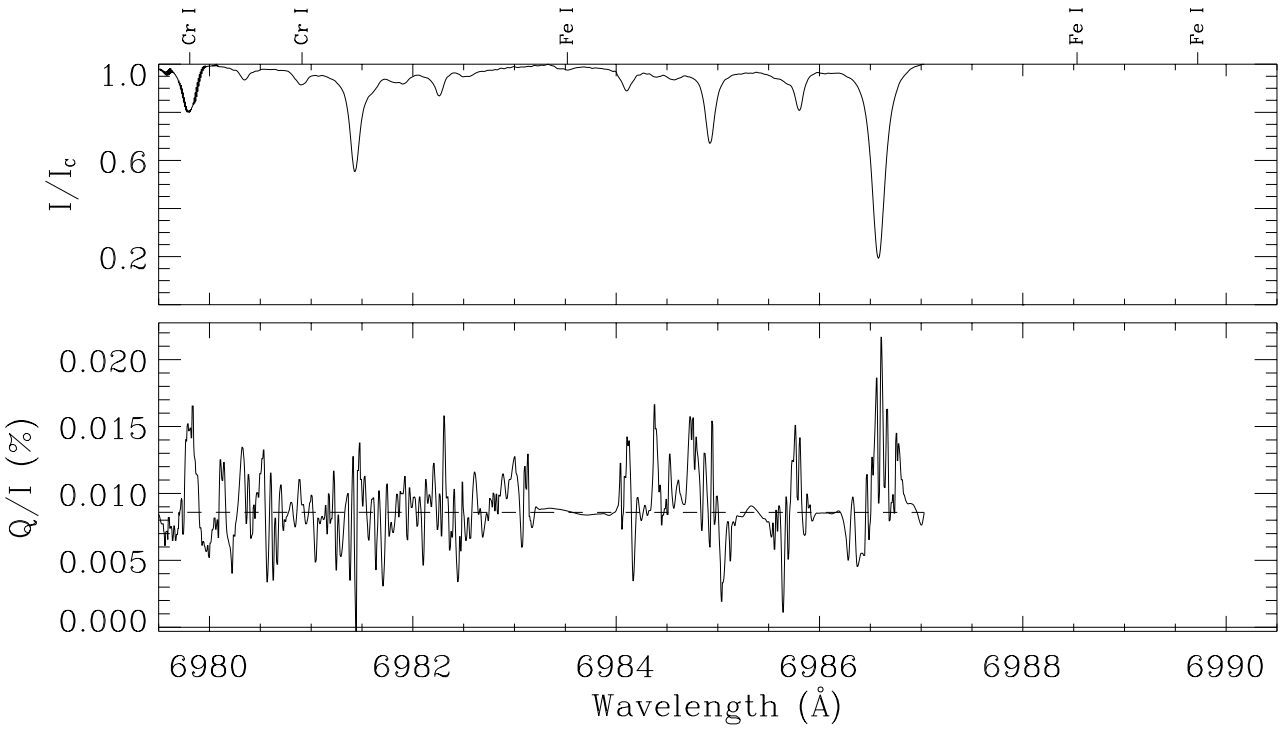

Fe I
Fe I
(Fe IP
Fe I
Fe I – Fe I
Fe I
K I
1.0
0.6
0.2
I/I_c
0.02
0.01
0.00
−0.01
Q/I (%)
6930
6932
6934
6936
6938
6940
Wavelength (Å)


Fe I
CN
Fe I
Co I
Fe I – Fe I
1.0
0.6
0.2
I/I_c
0.02
0.01
0.00
−0.01
−0.02
Q/I (%)
6940
6942
6944
6946
6948
6950
Wavelength (Å)


Fe I
Fe I
Fe I
/SUN
Fe I
Ni I
CN
CN
Fe I
1.0
0.6
0.2
I/I_c
0.02
0.01
0.00
−0.01
Q/I (%)
6950
6952
6954
6956
6958
6960
Wavelength (Å)


Fe I
Fe I
Mg I
CN
CN
CN''
Fe I
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6960
6962
6964
6966
6968
6970
Wavelength (Å)


Fe I
CN
Fe I
Ni I
Fe I
Fe I
Si I
Fe I
Fe I
Cr I
Fe I
Fe I
Cr I
1.0
0.6
0.2
I/I_c
0.015
0.010
0.005
0.000
Q/I (%)
6970
6972
6974
6976
6978
6980
Wavelength (Å)


Cr I
Cr I
Fe I
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.020
0.015
0.010
0.005
0.000
Q/I (%)
6980
6982
6984
6986
6988
6990
Wavelength (Å)