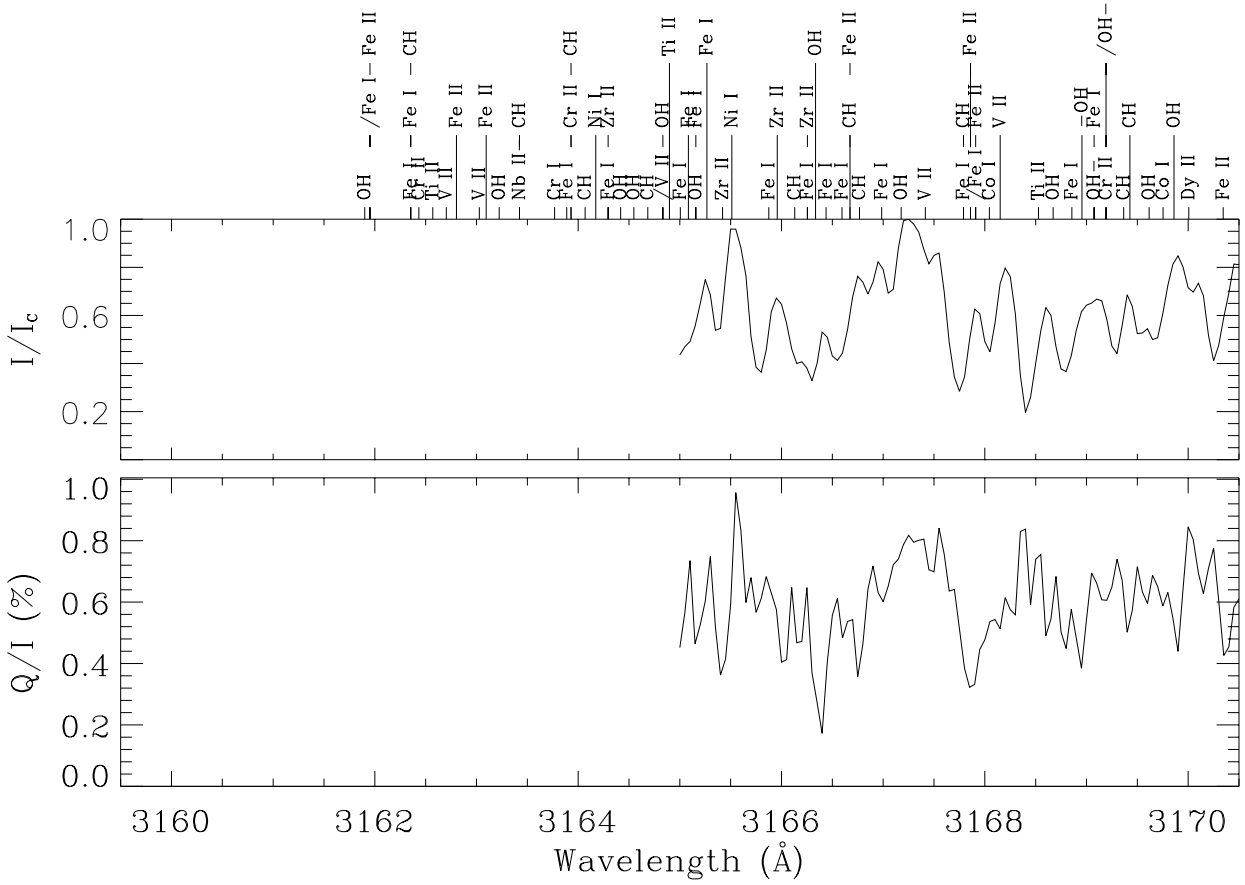
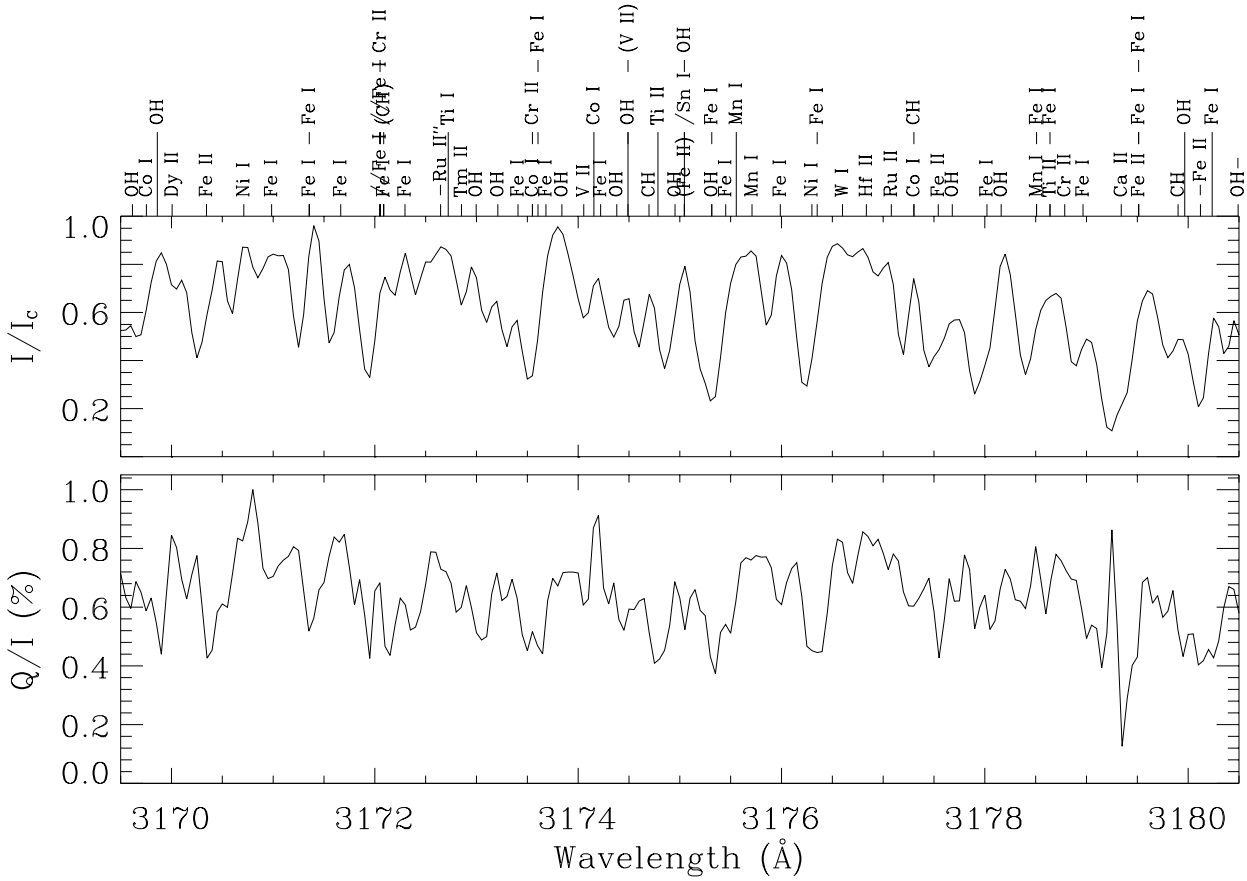
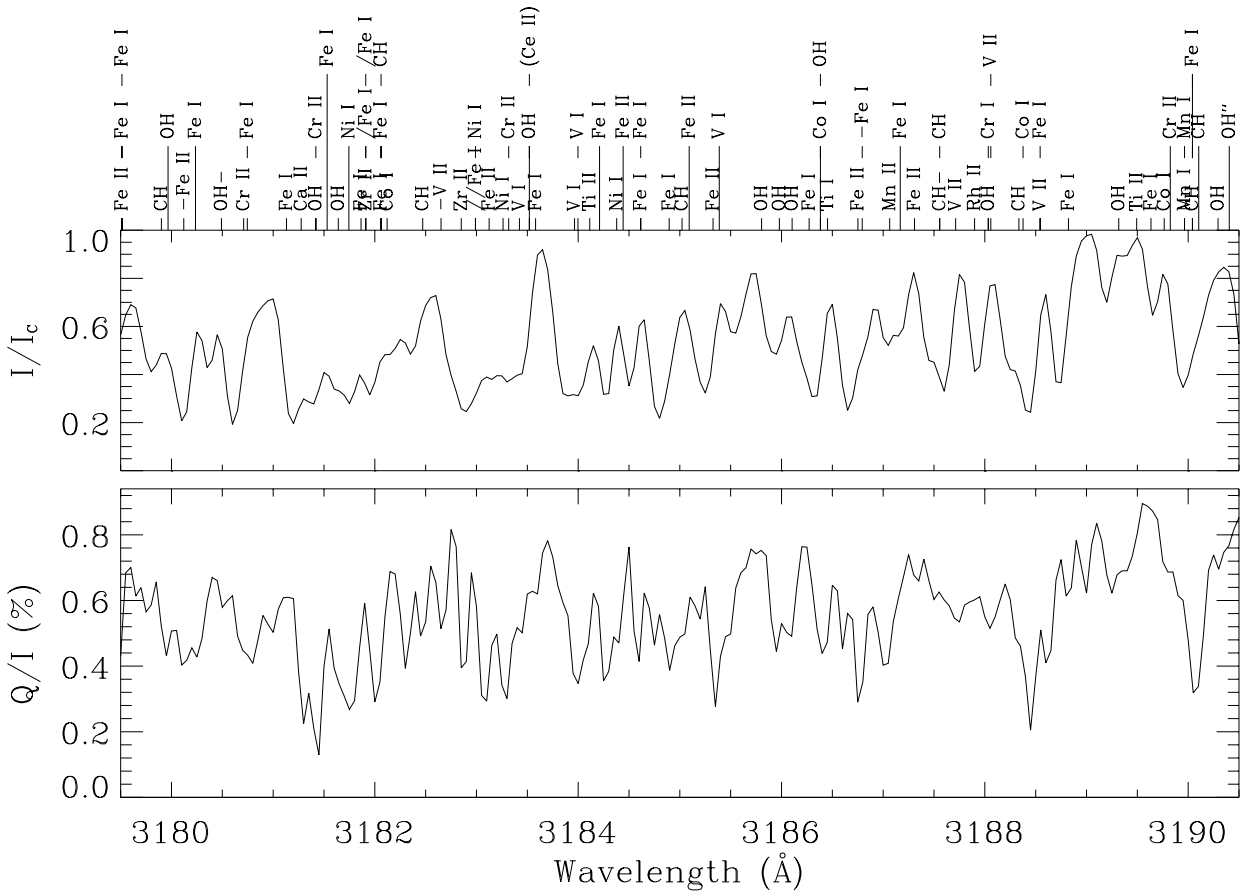
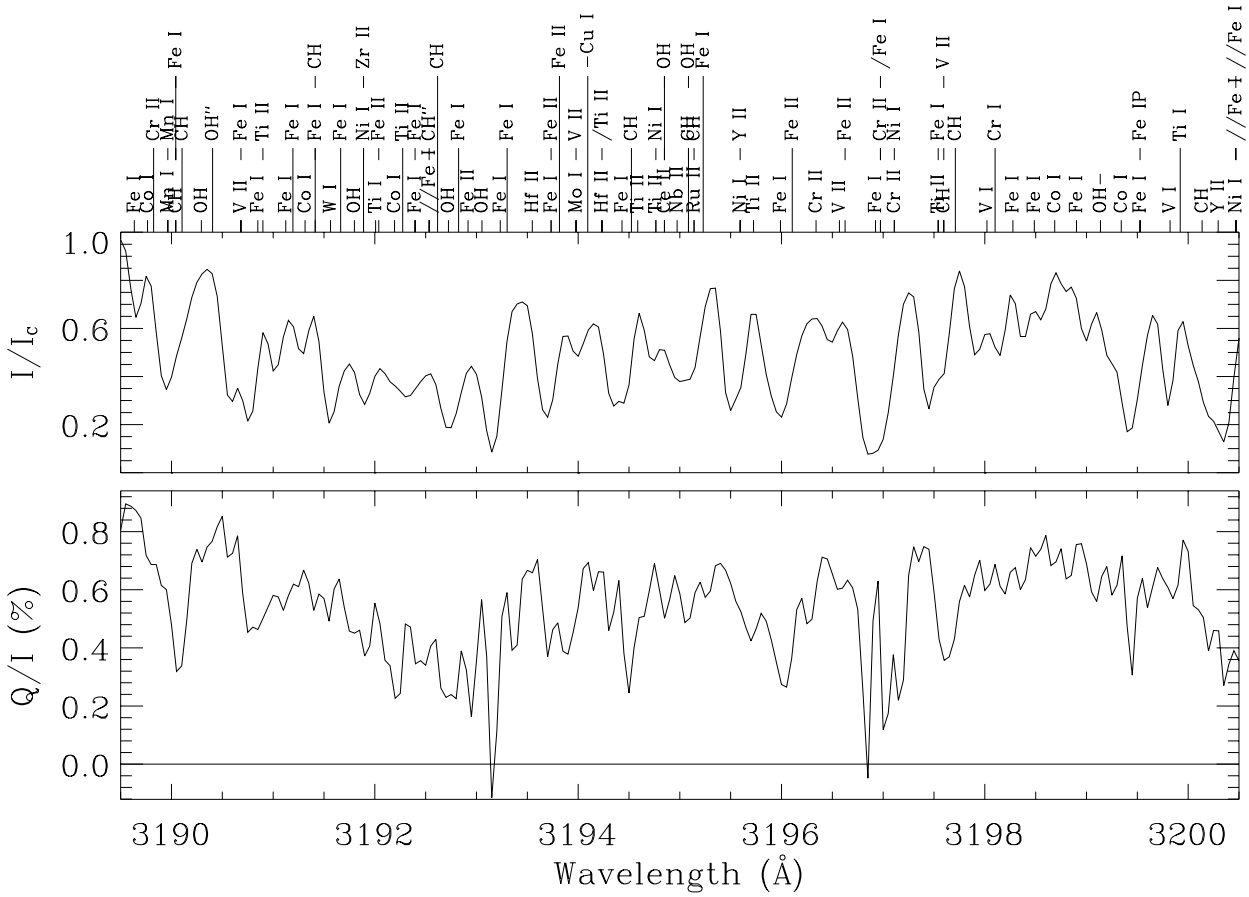
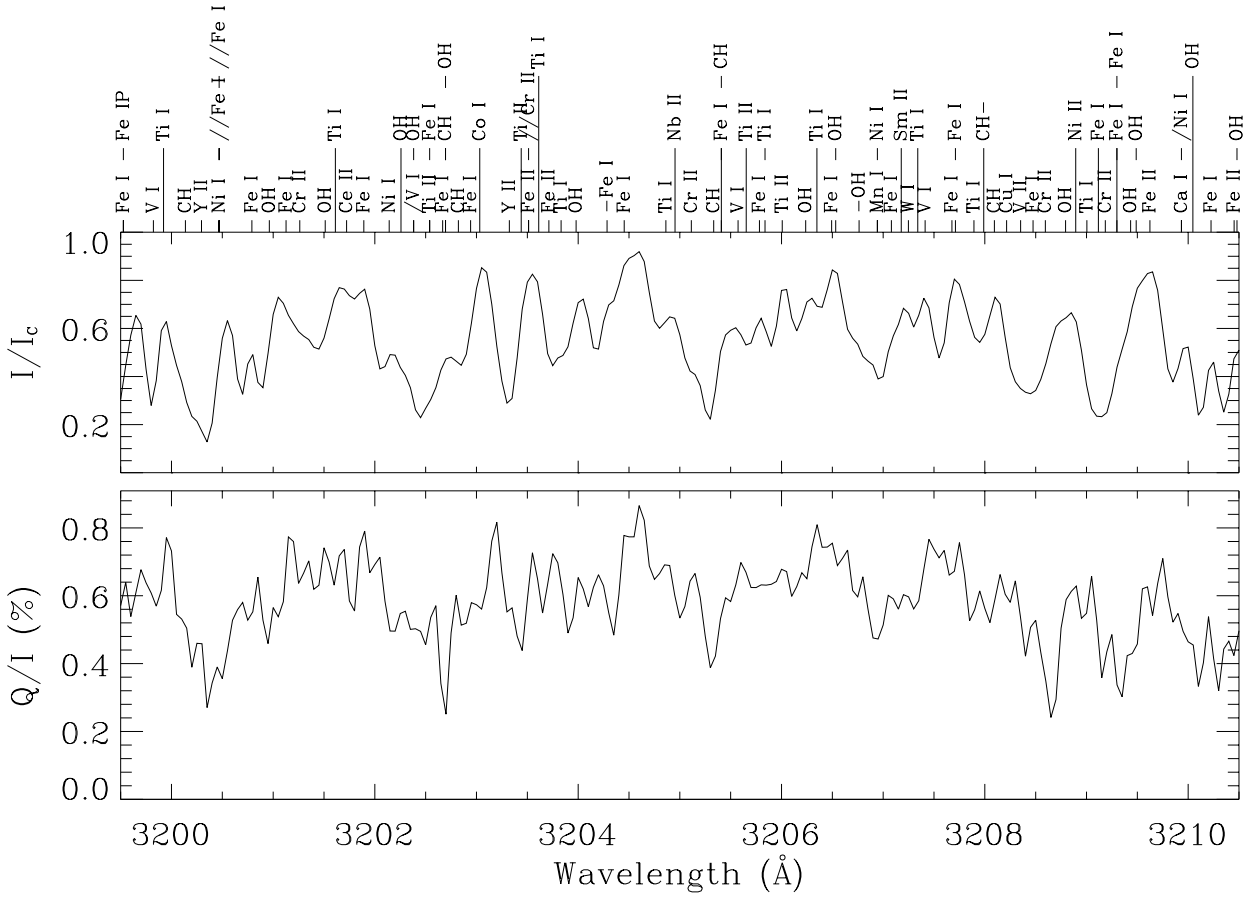
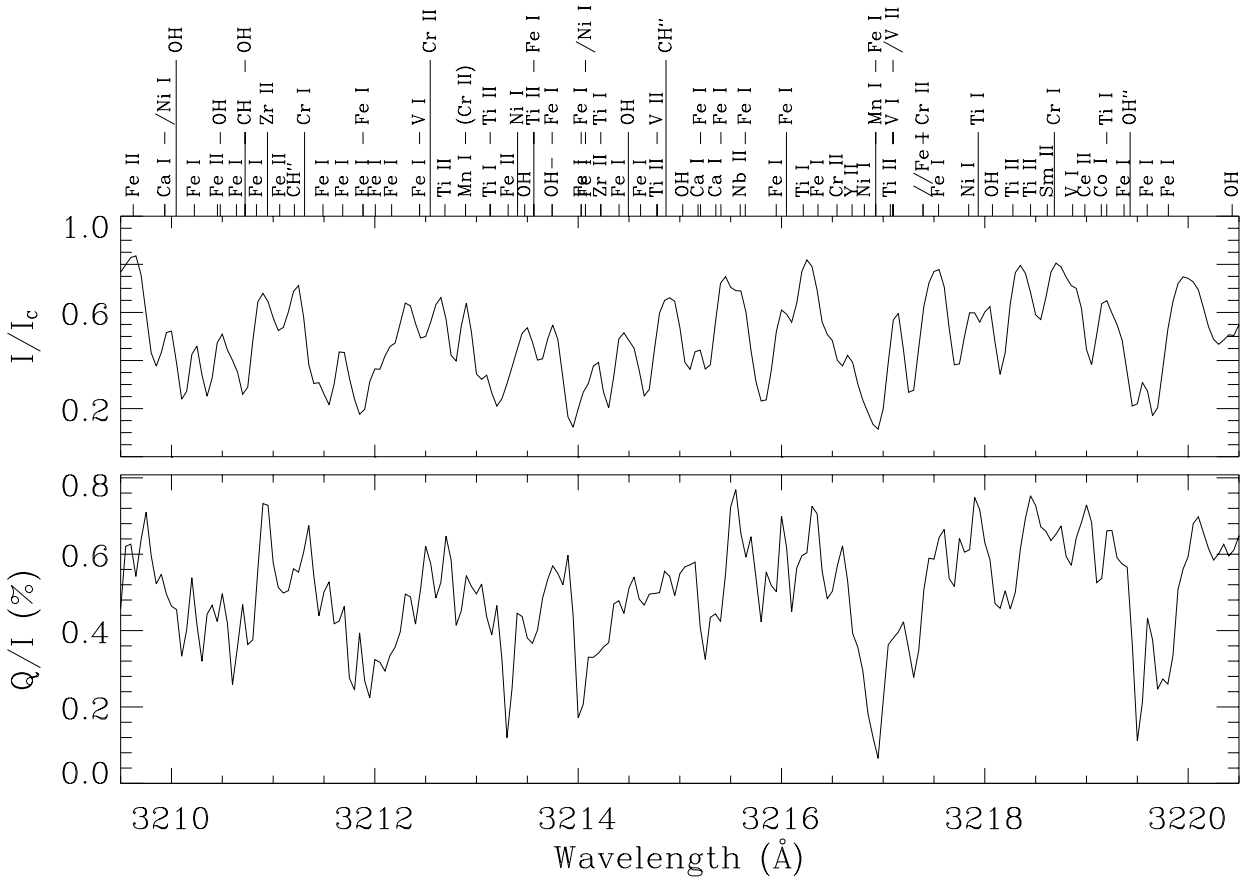

OH
/Fe I
Fe II
Fe I
CH
Fe II
V II
Fe II
OH
Nb II
CH
Cr I
Fe I
Cr II
CH
CH
Fe I
Ni I
Zr II
OH
OH
OH
V II
OH
Ti II
Fe I
OH
Fe I
Fe I
Zr II
Ni I
Fe I
Zr II
CH
Fe I
Zr II
OH
Fe I
Fe I
CH
Fe II
Fe I
OH
V II
Fe I
CH
Fe II
Co I
V II
Fe II
Ti II
OH
Fe I
OH
Fe I
/OH
Cr II
CH
CH
OH
Co I
OH
Dy II
Fe II
I/I_c
1.0
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)

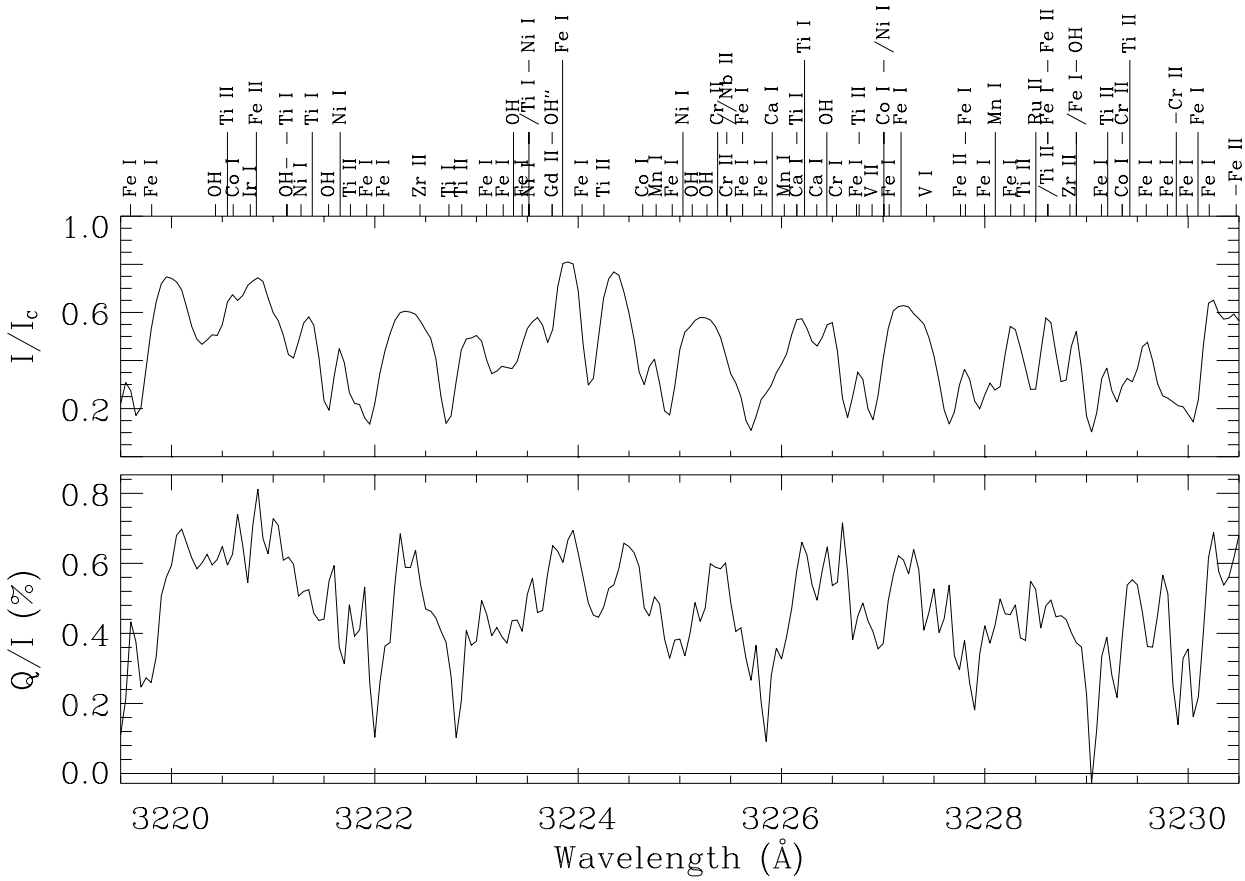

OH
Co I
OH
Dy II
Fe II
Ni I
Fe I
Fe I – Fe I
Fe I
Fe I + Cr II
Fe I
Ru II
Ti I
Tm II
OH
OH
Fe I
Co I
Fe I
Cr II – Fe I
OH
V II
Co I
Fe I
OH
(V II)
CH
Ti II
OH
(Fe II)
/Sn I – OH
OH
Fe I
Mn I
Mn I
Fe I
Ni I – Fe I
W I
Hf II
Ru II
Co I – CH
Fe II
OH
Fe I
OH
Mn I – Fe I
Ti II
Cr II
Fe I
Ca II
Fe II – Fe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

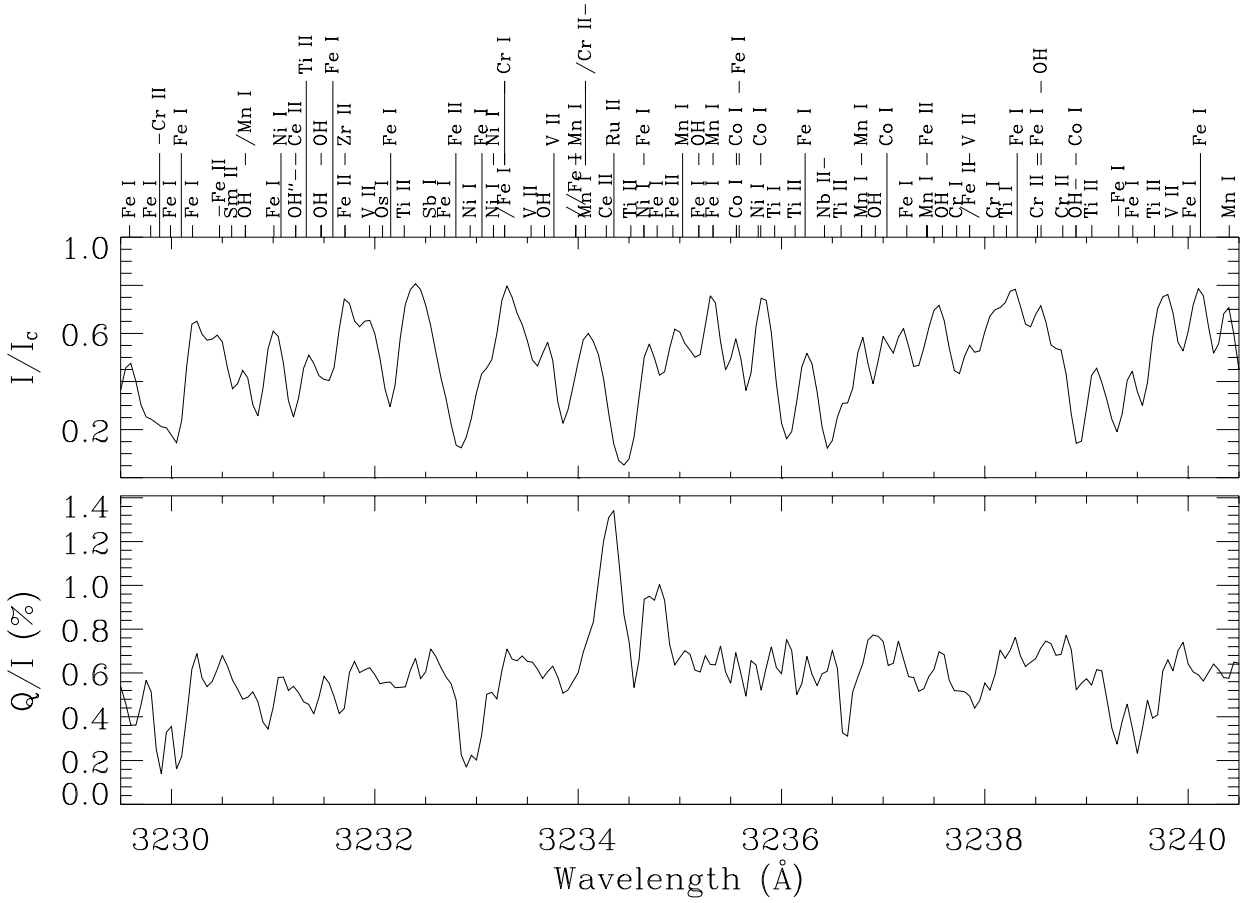

I/I_c
Q/I (%)
Wavelength (Å)
3180
3182
3184
3186
3188
3190

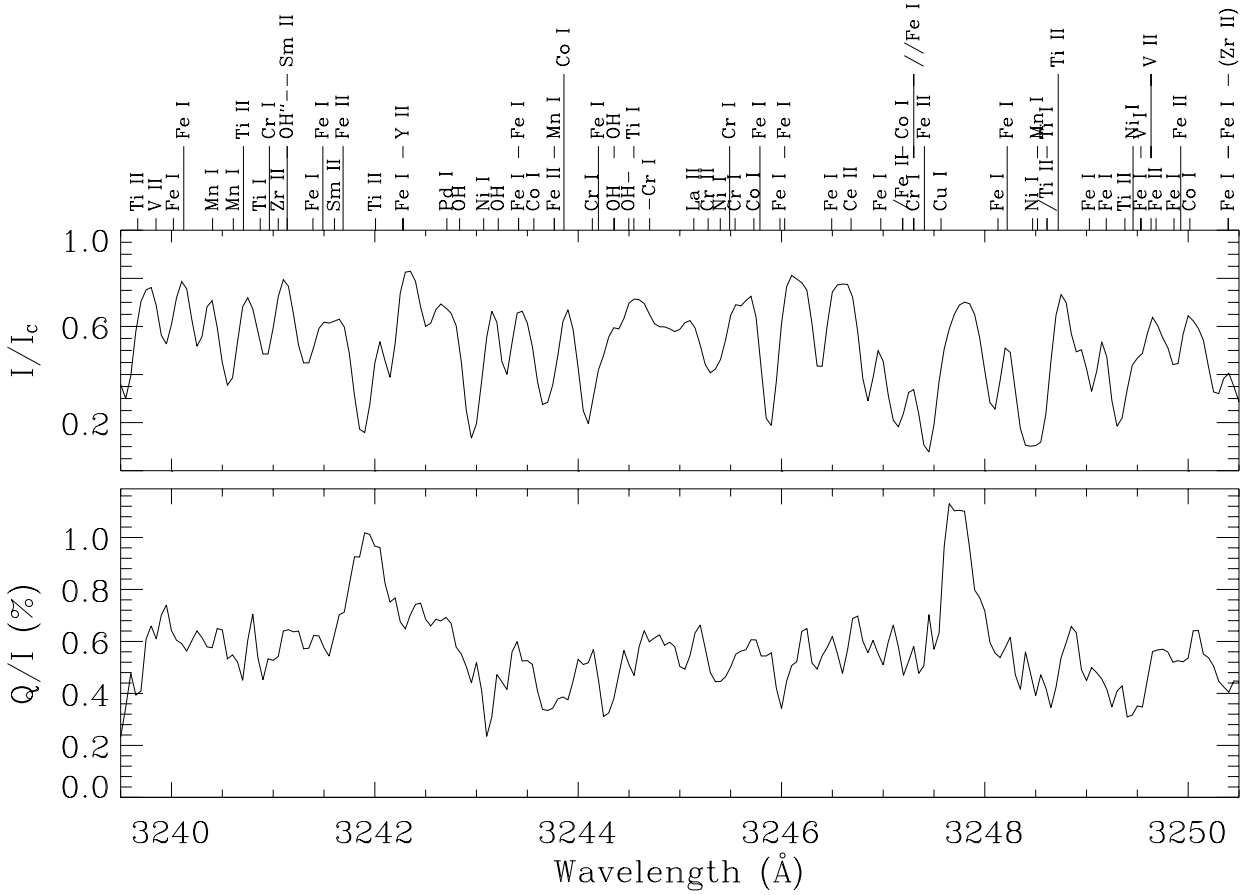

I/I_c
Q/I (%)
Wavelength (Å)
3190
3192
3194
3196
3198
3200

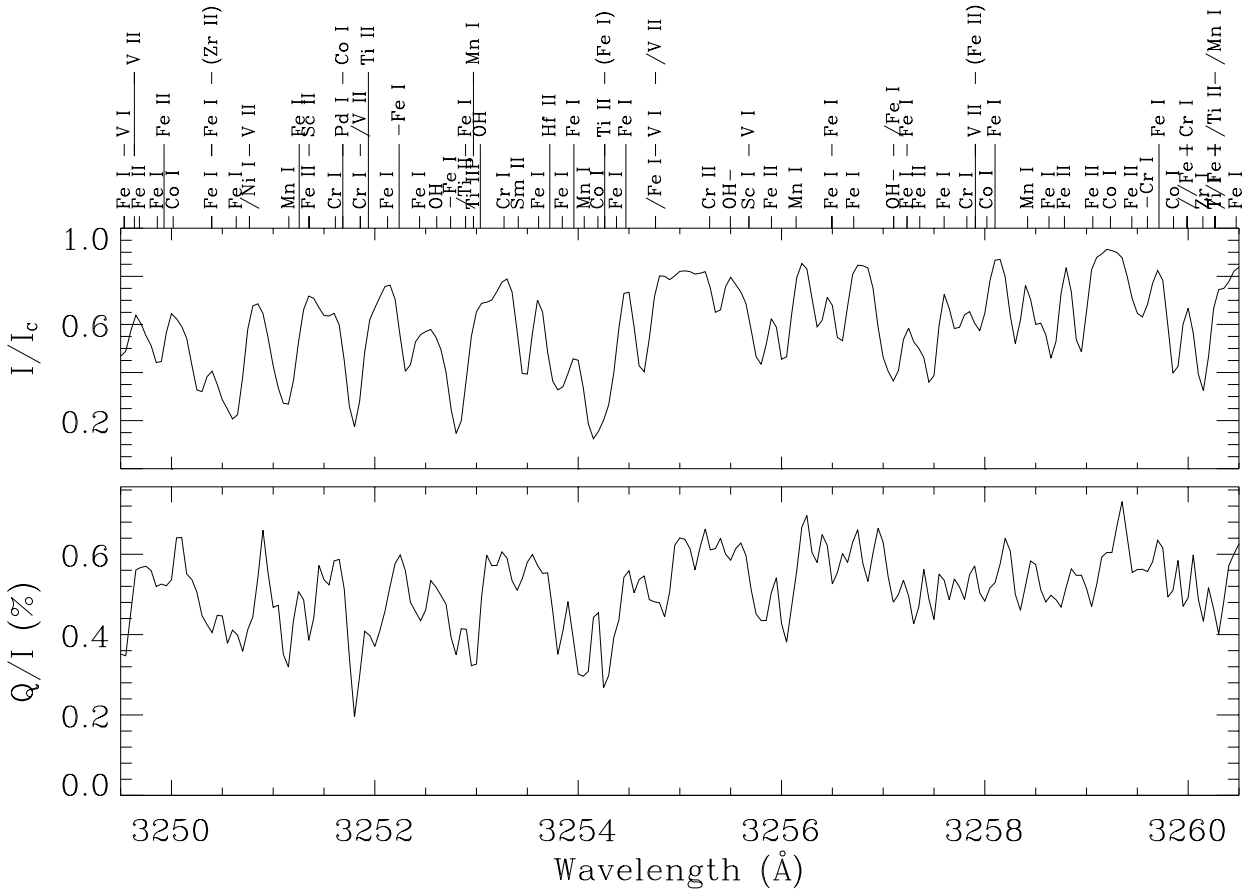

Fe I – Fe IP
V I
Ti I
CH
Y II
Ni I – //Fe I – //Fe I
Fe I
OH
Fe I
Cr II
OH
Ti I
Ce II
Fe I
Ni I
OH
OH
/V I – Fe I
Ti II – CH – OH
Fe I
CH
Fe I
Co I
Y II
Fe II – Ti/Cr II
Ti I
Fe II
Ti I
OH
–Fe I
Fe I
Ti I
Nb II
Cr II
CH
Fe I – CH
V I
Ti II
Fe I – Ti I
Ti II
OH
Ti I
Fe I – OH
–OH
Mn I – Ni I
Fe I
Sm II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

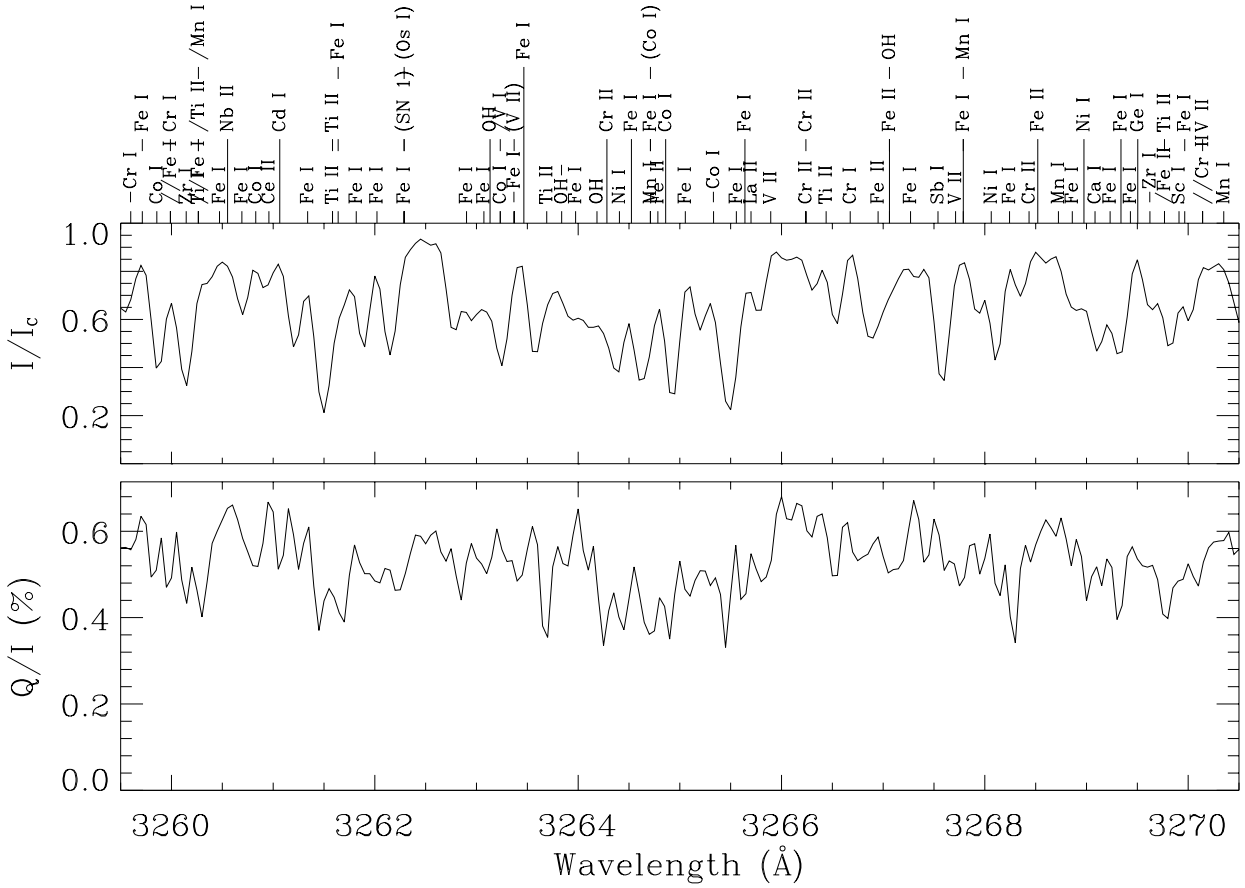

Fe II
Ca I – /Ni I
OH
Fe I
Fe II – OH
Fe I
CH – OH
Fe I
Zr II
Fe II
CH''
Cr I
Fe I
Fe I
Fe I – Fe I
Fe I
Fe I – V I
Cr II
Ti II
Mn I – (Cr II)
Ti I – Ti II
Fe II
Ni I
OH – Ti II – Fe I
OH – Fe I
Fe I – /Ni I
Zr II – Ti I
Fe I
OH
Fe I
Ti II – V II
CH''
OH
Ca I – Fe I
Ca I – Fe I
Nb II – Fe I
Fe I
Fe I
Ti I
Fe I
Cr II
Y II
Ni I
Ti II – Mn I – Fe I
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)

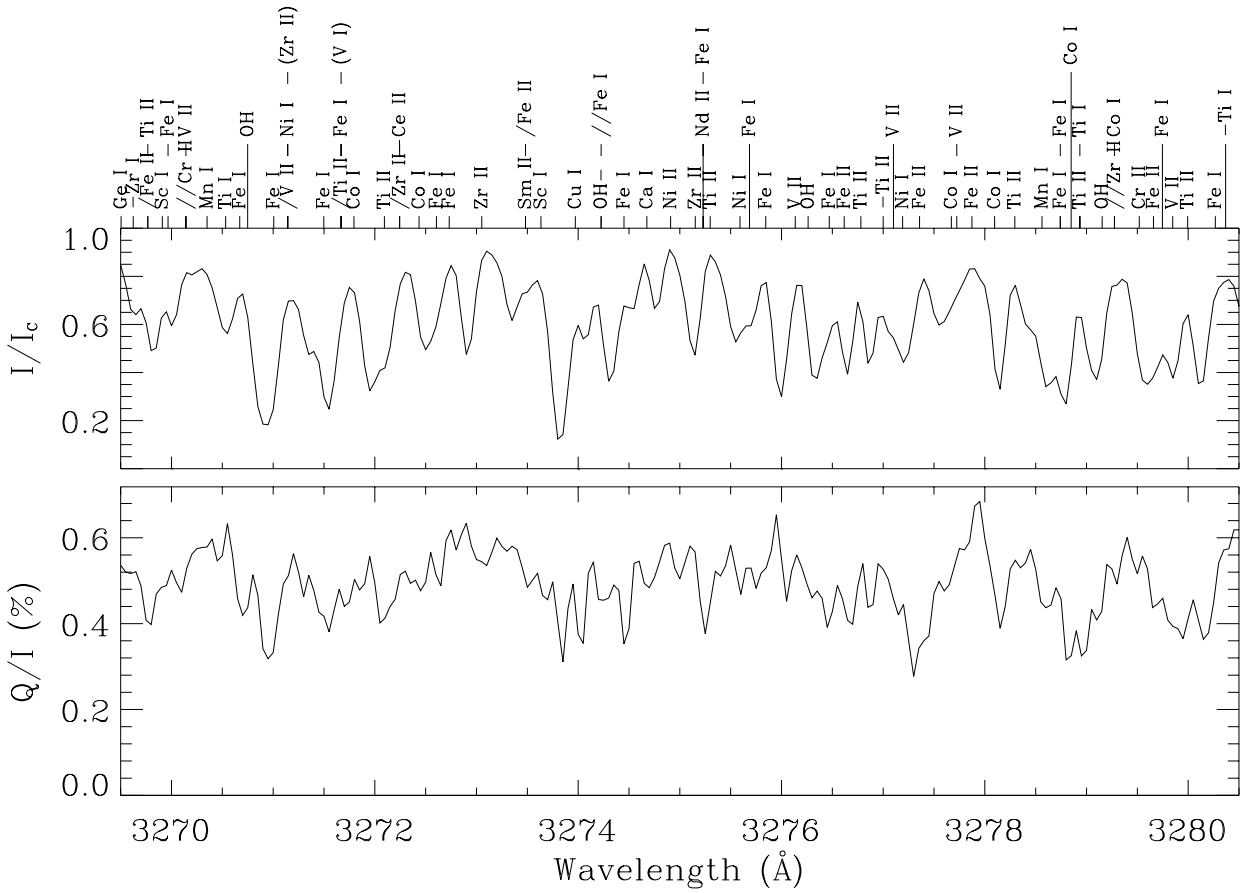

Fe I
Fe I
OH
Co I
Ir I
Ti II
Fe II
OH
Ni I
Ti I
Ti I
OH
Ni I
Ti II
Fe I
Fe I
Zr II
Ti I
Ti II
Fe I
Fe I
Fe I
OH
Ti I
Ni I
Gd II
OH''
Fe I
Fe I
Ti II
Co I
Mn I
Fe I
Ni I
OH
OH
Cr II
Nb II
Fe I
Fe I
Ca I
Mn I
Ca I
Ti I
Ti I
Ca I
OH
Cr I
Fe I
Ti II
V II
Co I
Ni I
Fe I
V I
Fe II
Fe I
Fe I
Mn I
Fe I
Ti II
Ru I
Fe II
Ti II
Fe I
OH
Zr II
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)

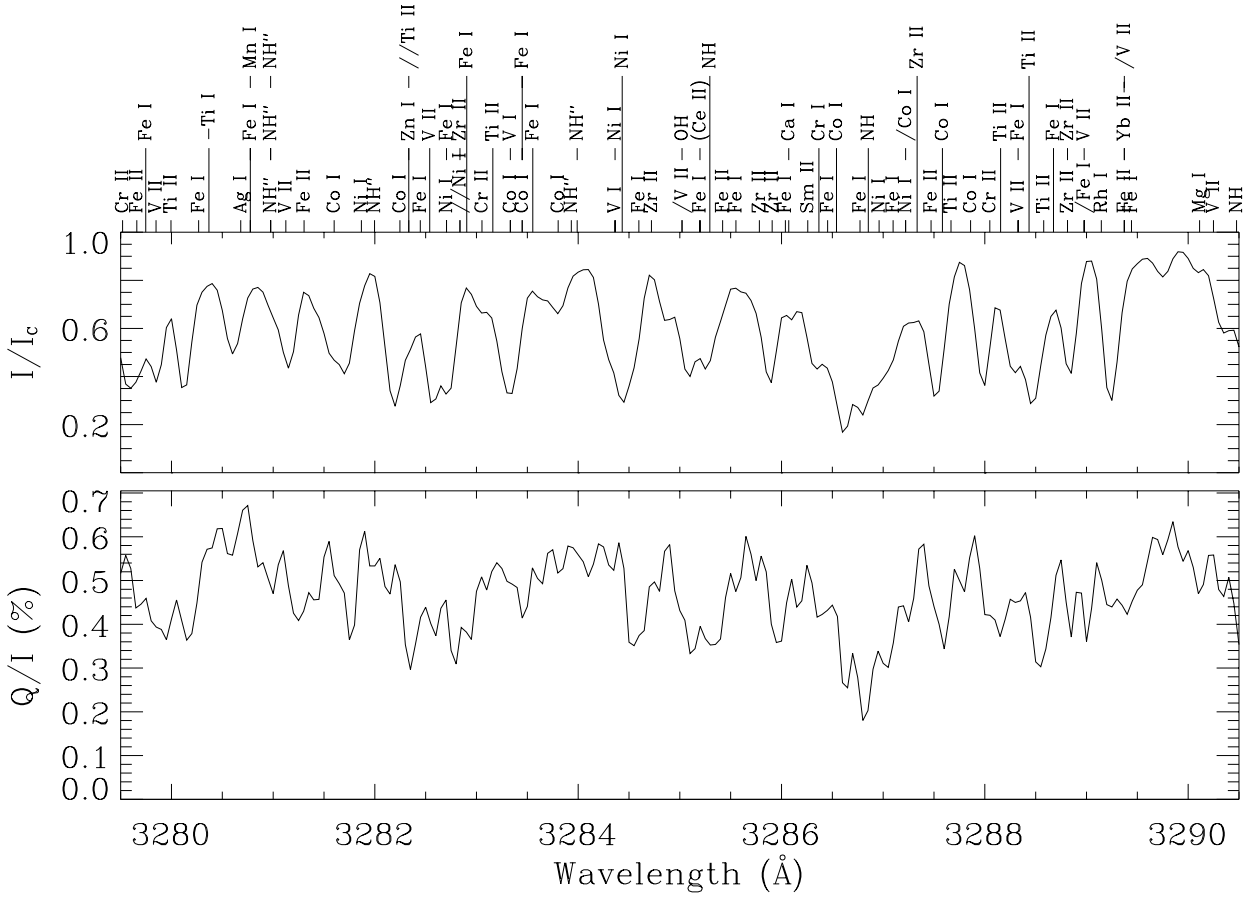

Fe I
Fe I
Cr II
Fe I
Fe I
Fe II
Sm II
OH
Mn I
Fe I
Ni I
OH
Ce II
Ti II
OH
OH
Fe II
Zr II
Fe I
V II
Os I
Fe I
Ti II
Sb I
Fe I
Fe II
Ni I
Fe I
Ni I
Fe I
Cr I
V II
OH
Fe I
Mn I
Cr II
Ce II
Ru II
Ti II
Ni I
Fe I
Fe II
Fe I
Mn I
OH
Fe I
Mn I
Co I
Fe I
Ni I
Co I
Ti I
Ti II
Fe I
Nb II
Ti II
Mn I
OH
Mn I
Co 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
Fe I
Mn I
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 (%)
3230
3232
3234
3236
3238
3240
Wavelength (Å)

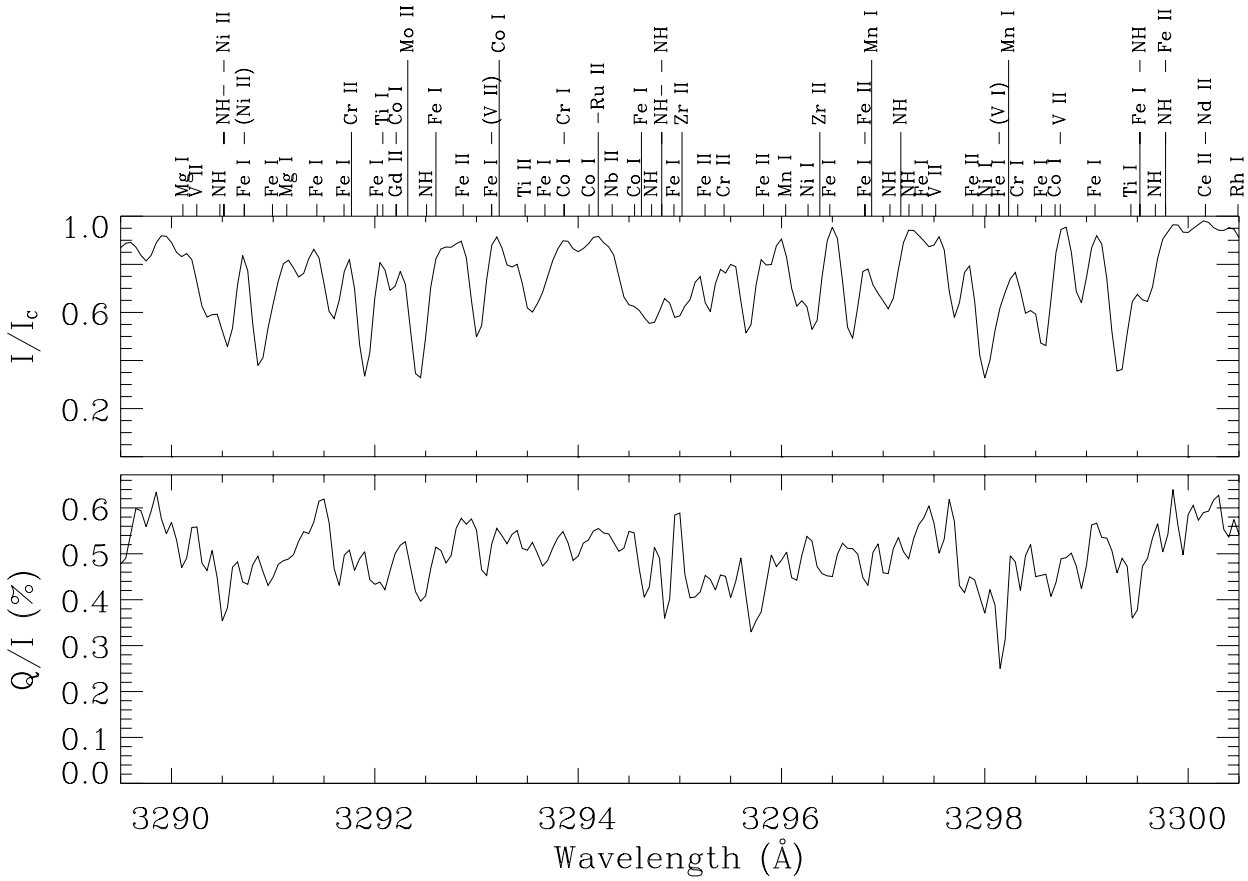

Ti II
V II
Fe I
Fe I
Mn I
Mn I
Ti II
Ti I
Zr II
Cr I
OH
Sm II
Fe I
Sm II
Fe II
Ti II
Fe I
Y II
Pd I
OH
Ni I
OH
Fe I
Co I
Fe II
Mn I
Co I
Cr I
Fe I
OH
OH
Ti I
Cr I
La II
Cr II
Ni I
Cr I
Co I
Fe I
Fe I
Fe I
Ce II
Fe I
Fe II
Co I
Fe II
Cr I
Cu I
Fe I
Fe I
Ni I
Mn I
Ti II
Ti II
Fe I
Fe I
Ti II
Ni I
V I
Fe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

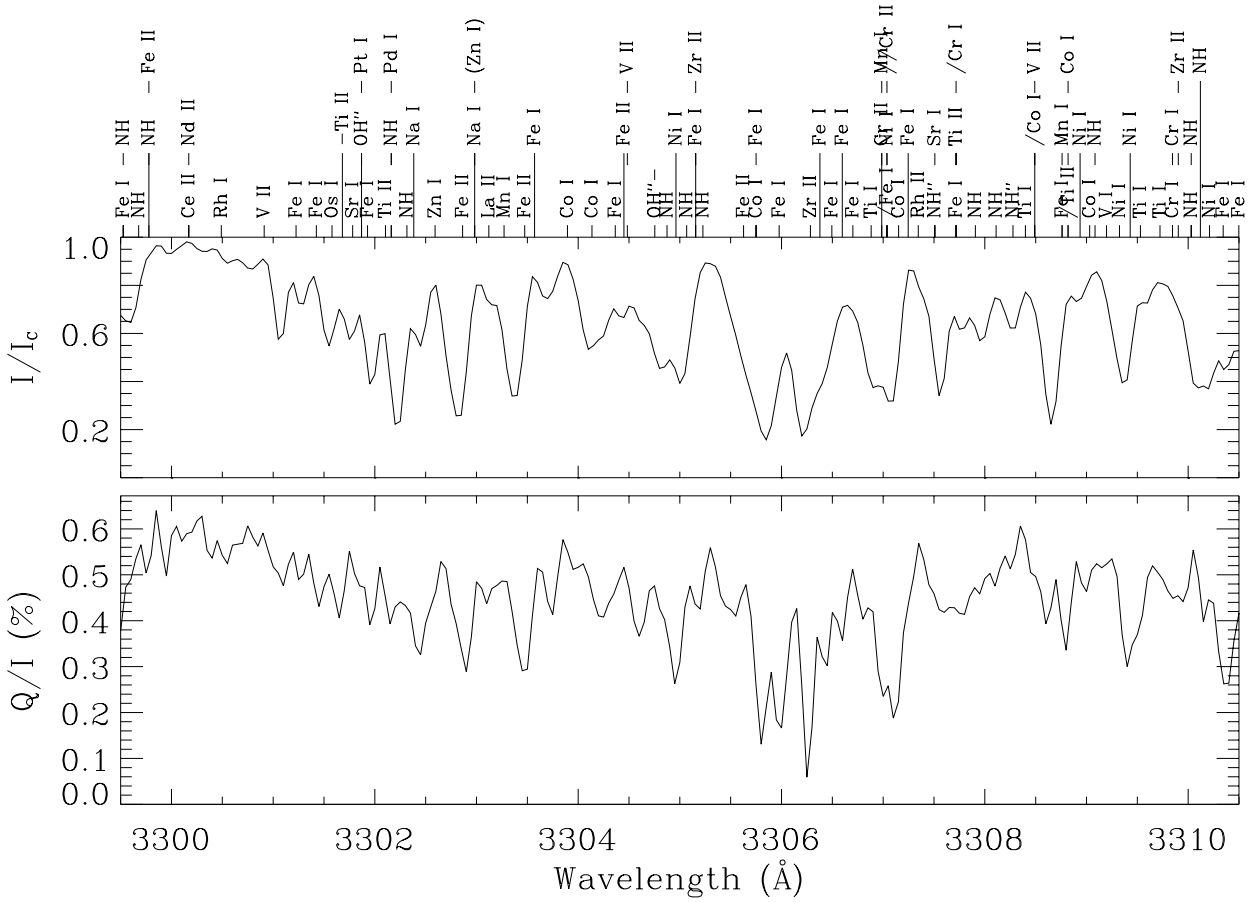

Fe I
V I
V II
Fe II
Fe I
Co I
Fe II
Fe I
(Zr II)
Fe I
Ni I
V II
Mn I
Fe II
Sc II
Cr I
Pd I
Co I
Cr I
V II
Ti II
Fe I
Fe I
OH
Fe I
Ti II
OH
Mn I
Cr I
Sm II
Fe I
Hf II
Fe I
Mn I
Co I
Ti II
(Fe I)
Fe I
Fe I
V I
V II
Cr II
OH
Sc I
V I
Fe II
Mn I
Fe I
Fe I
Fe I
OH
Fe I
Fe II
Fe I
Cr I
V II
(Fe II)
Co I
Fe I
Mn I
Fe I
Fe II
Fe II
Co I
Fe II
Cr I
Fe I
Co I
Fe I
Cr I
Ti II
Mn I
Fe I
1.0
0.6
0.2
I/I_c
0.6
0.4
0.2
0.0
Q/I (%)
3250
3252
3254
3256
3258
3260
Wavelength (Å)

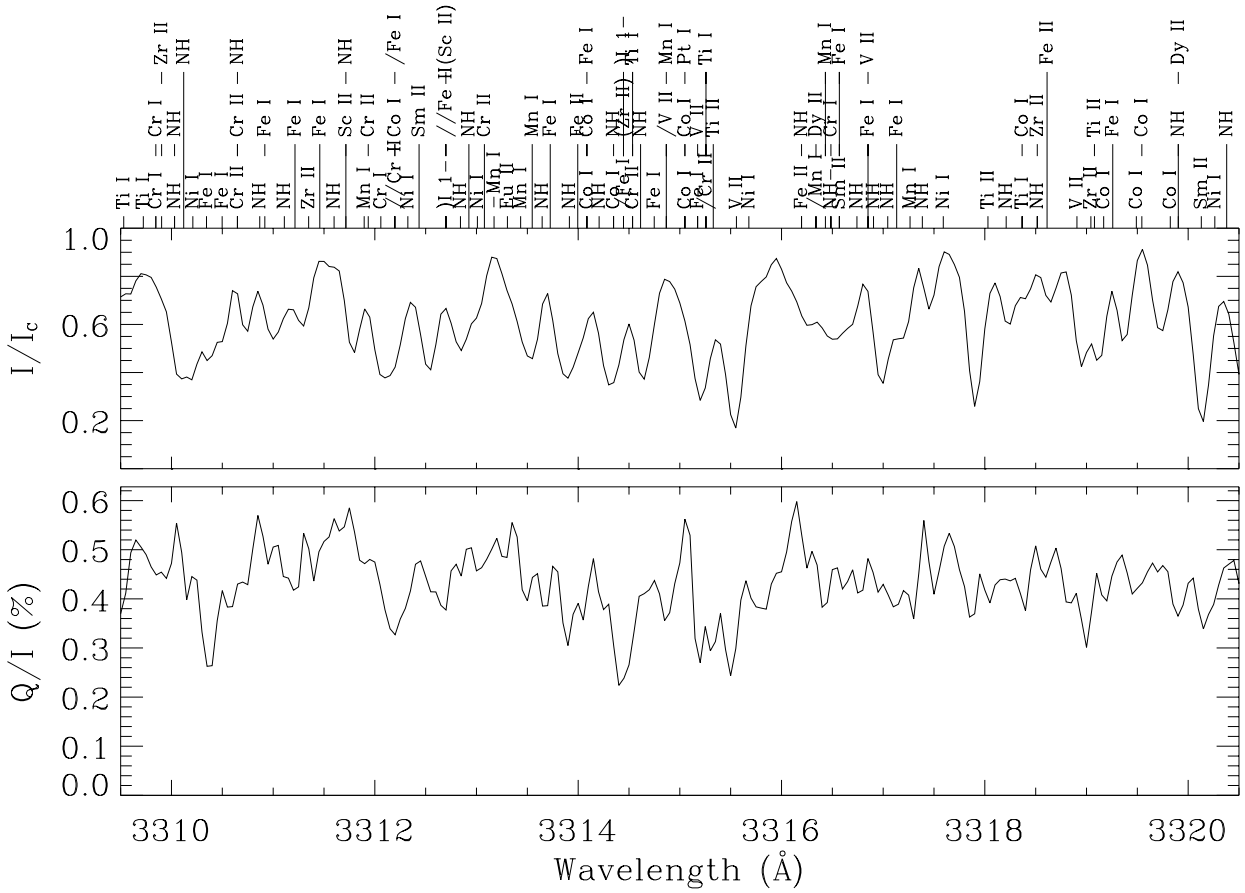

Cr I
Fe I
Co I
Fe I
Cr I
Fe I
Ti II
Mn I
Fe I
Nb II
Fe I
Co I
Ce II
Cd I
Fe I
Ti II
Fe I
Fe I
Fe I
Fe I
(SN 1)
(Os I)
Fe I
Fe I
OH I
Co I
Fe I
(V II)
Fe I
Ti II
OH I
Fe I
OH
Cr II
Ni I
Fe I
Mn I
Fe I
(Co I)
Co I
Fe I
Co I
Fe I
Fe I
La II
V II
Cr II
Cr II
Ti II
Cr I
Fe II
Fe II
OH
Fe I
Sb I
V II
Fe I
Mn I
Ni I
Fe I
Cr II
Fe II
Mn I
Fe I
Ni 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 (%)
0.6
0.4
0.2
0.0
3260
3262
3264
3266
3268
3270
Wavelength (Å)

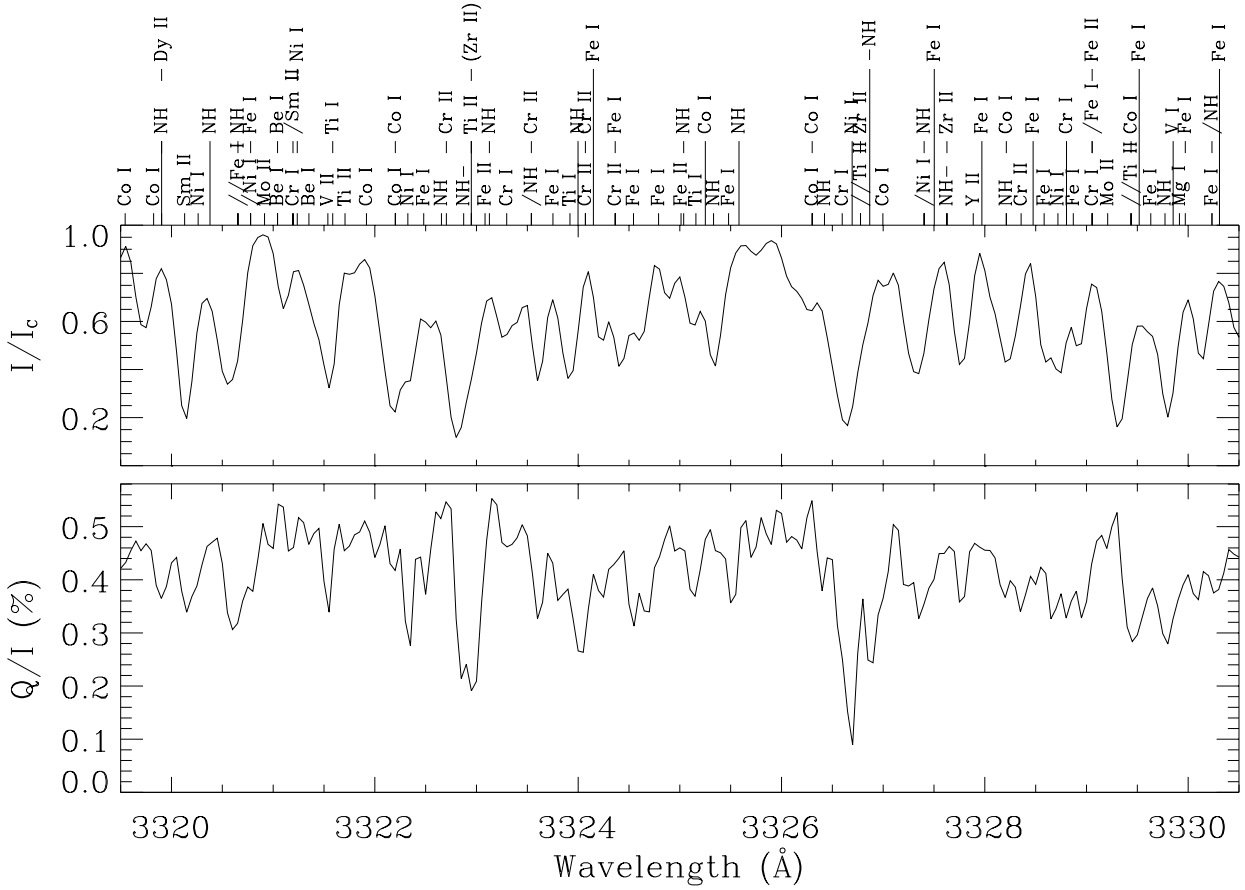

Ge I
Zr I
Fe II
Ti II
Sc I
Fe I
Cr I
V II
Mn I
Ti I
Fe I
OH
Fe I
V II
Ni I
(Zr II)
Fe I
Ti II
Fe I
Co I
(V I)
Ti II
Zr II
Ce II
Co I
Fe I
Fe I
Zr II
Sm II
Fe II
Sc I
Cu I
OH
Fe I
Fe I
Ca I
Ni II
Zr II
Ti II
Nd II
Fe I
Ni I
Fe I
V II
OH
Fe I
Fe II
Ti II
Ti II
V II
Ni I
Fe II
Co I
V II
Fe II
Co I
Ti II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

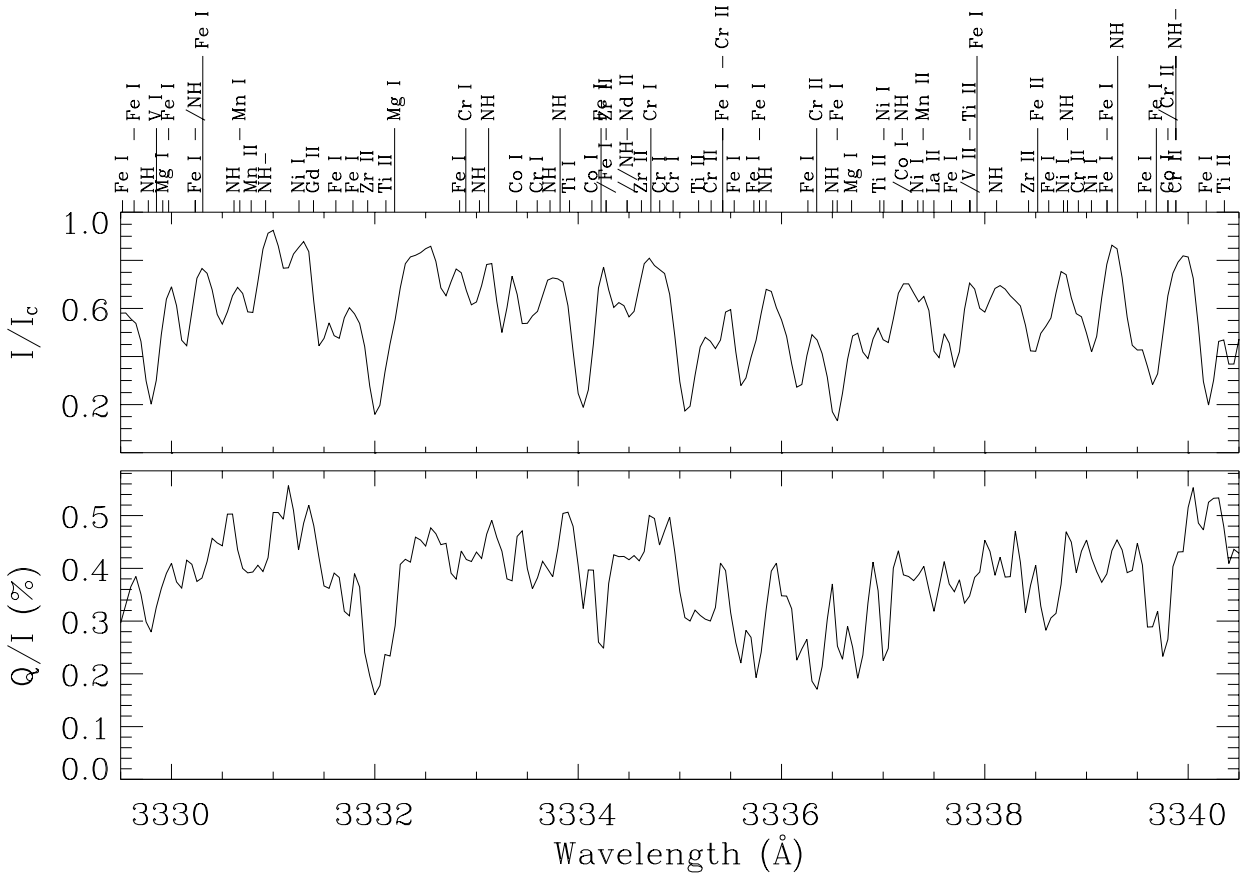

I/I_c
Q/I (%)
Wavelength (Å)
3280
3282
3284
3286
3288
3290

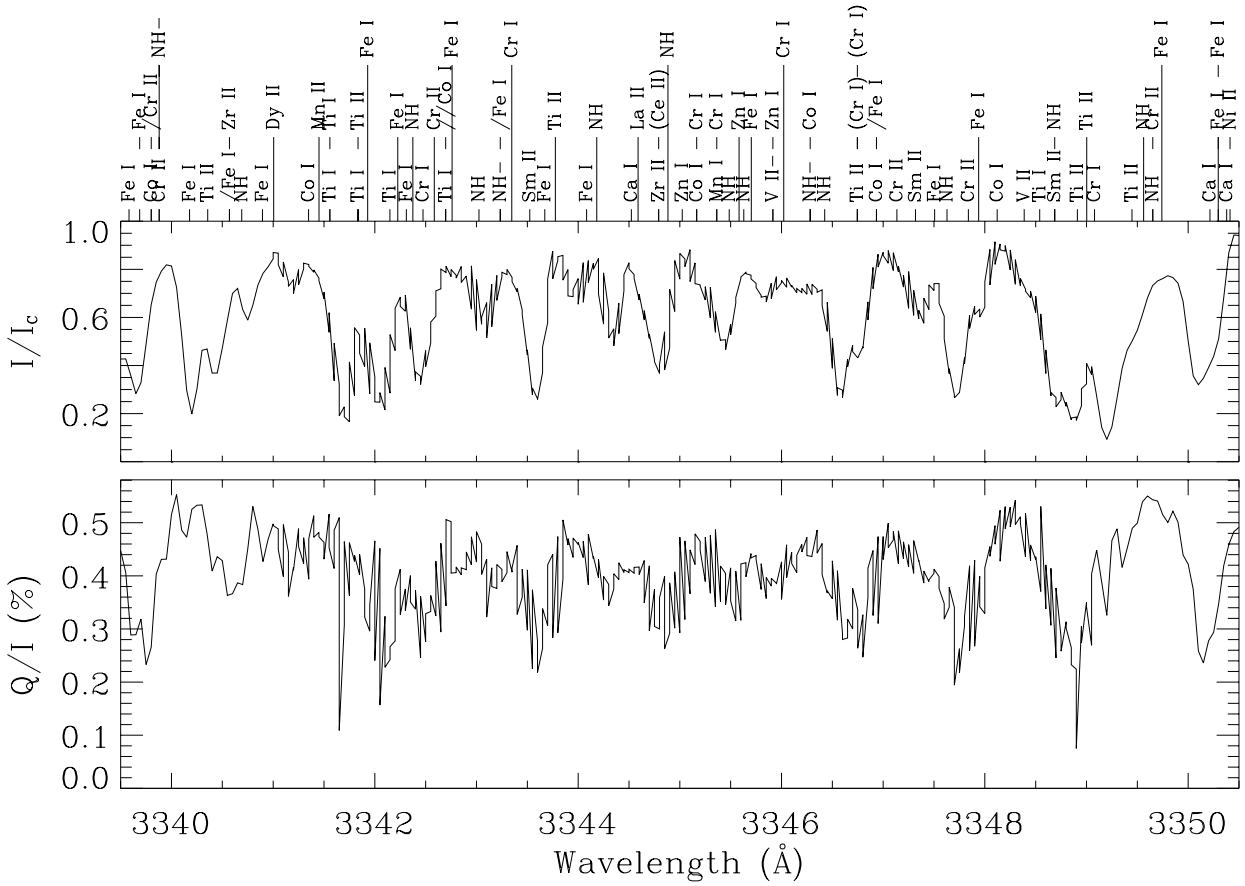

Mg I
V II
NH
Fe I
(Ni II)
Ni II
Fe I
Mg I
Fe I
Fe I
Cr II
Fe I
Ti I
Gd II
Co I
Mo II
NH
Fe I
Fe II
Fe I
(V II)
Co I
Ti II
Fe I
Co I
Cr I
Co I
Ru II
Nb II
Co I
Fe I
NH
NH
Fe I
Zr II
Fe II
Cr II
Fe II
Mn I
Ni I
Zr II
Fe I
Fe I
Fe II
Mn I
NH
NH
NH
Fe I
V II
Fe II
Ni I
Fe I
(V I)
Mn I
Cr I
Fe I
Co I
V II
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
0.5
0.4
0.3
0.2
0.1
0.0
Q/I (%)
3290
3292
3294
3296
3298
3300
Wavelength (Å)

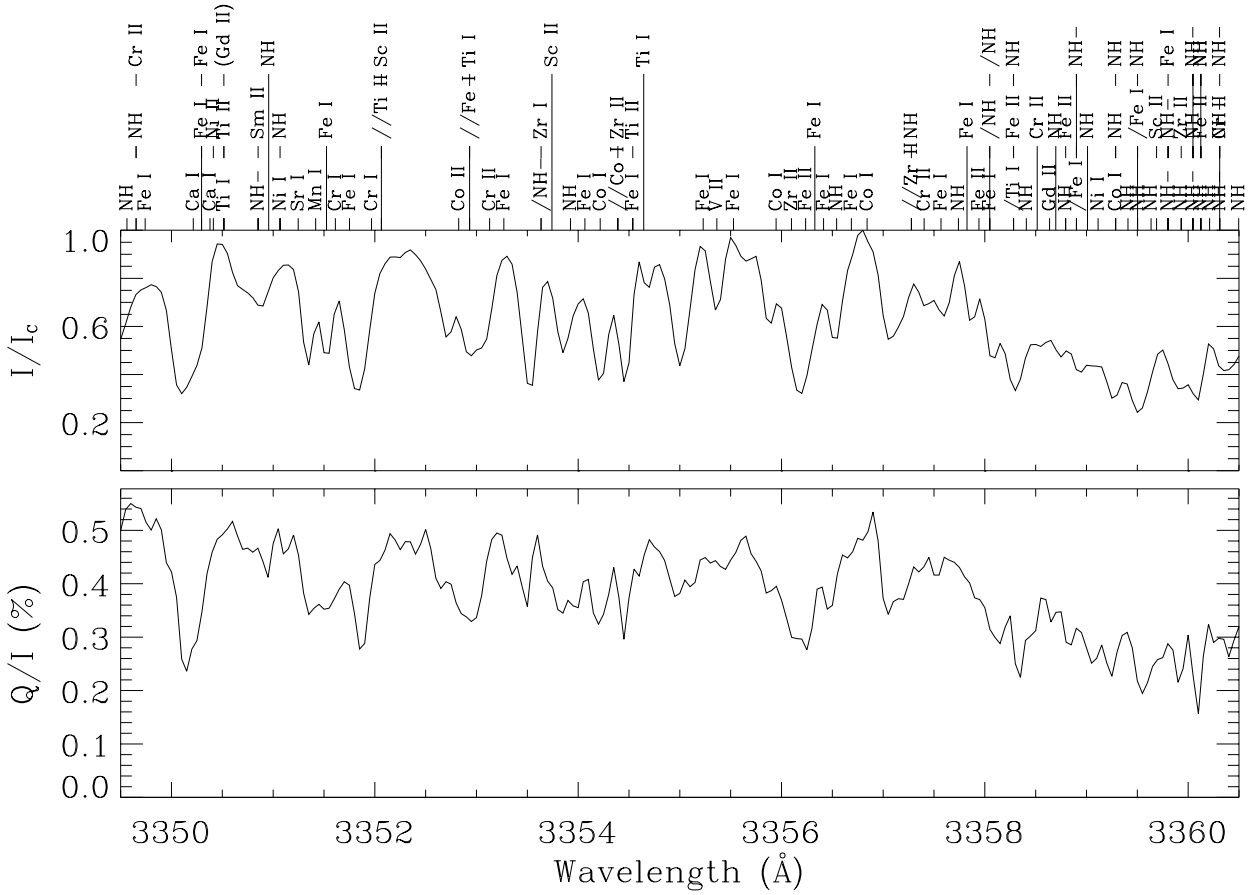

Fe I – NH
NH
NH – Fe II
Ce II – Nd II
Rh I
V II
Fe I
Fe I
Os I
–Ti II
Sr I
OH'' – Pt I
Fe I
Ti II – NH – Pd I
NH
Na I
Zn I
Fe II
Na I – (Zn I)
La II
Mn I
Fe II
Fe I
Co I
Co I
Fe I – Fe II – V II
OH''–
NH
Ni I
NH
Fe I – Zr II
NH
Fe II
Co I – Fe I
Fe I
Zr II
Fe I
Fe I
Fe I
Ti I
Fe I – Sr II = Mn I – Ti II
Co I
Fe I
Rh II
NH'' – Sr I
Fe I – Ti II – /Cr I
NH
NH
NH''
Ti I
/Co I – V II
Fe I
Ti II
Mn I – Co I
Co I – Ni I
NH
V I
Ni I
Ni I
Ti I
Ti I
Cr I
Cr I – Zr II
NH
NH
Ni I
Fe I
Fe 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 (%)
3300
3302
3304
3306
3308
3310
Wavelength (Å)

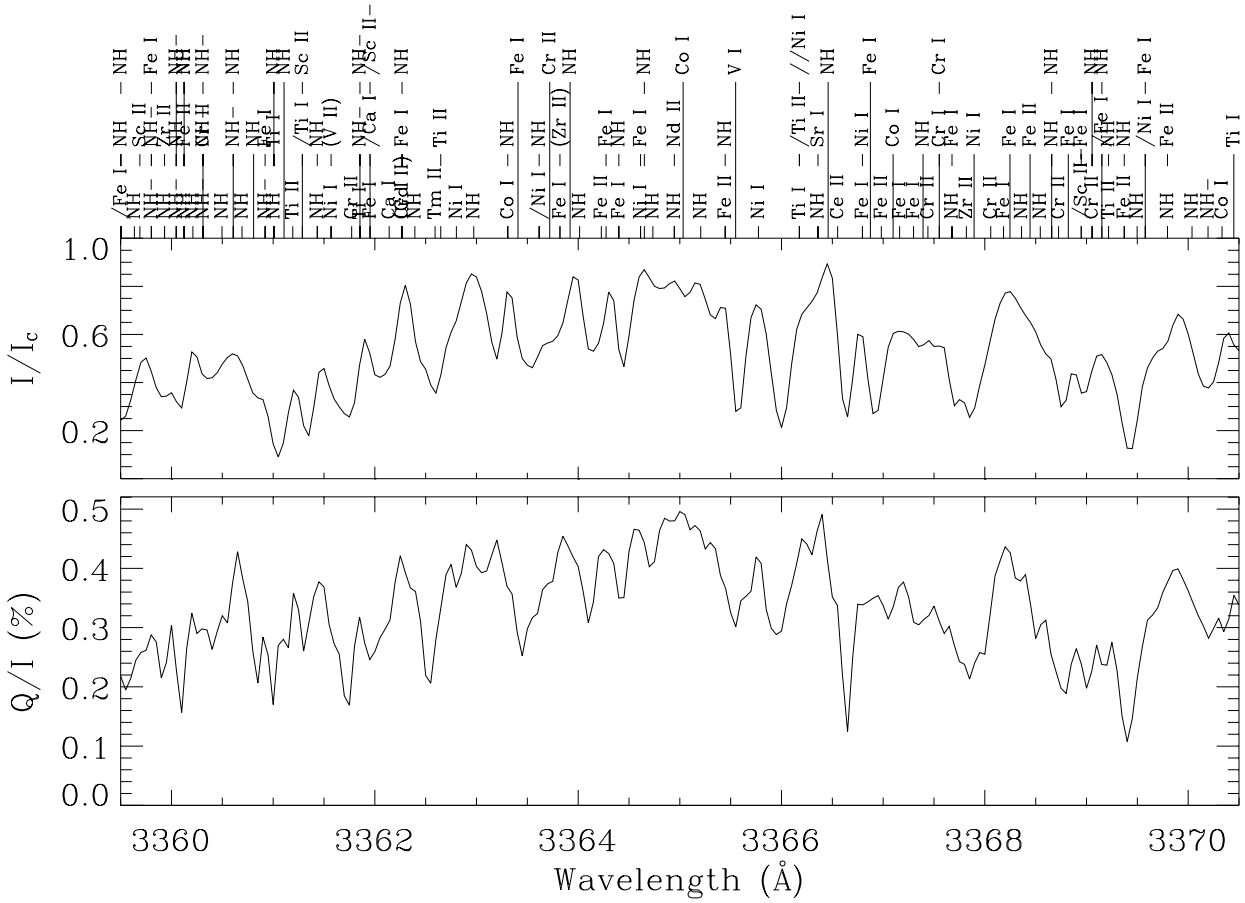

I/I_c
Q/I (%)
Wavelength (Å)
3310
3312
3314
3316
3318
3320

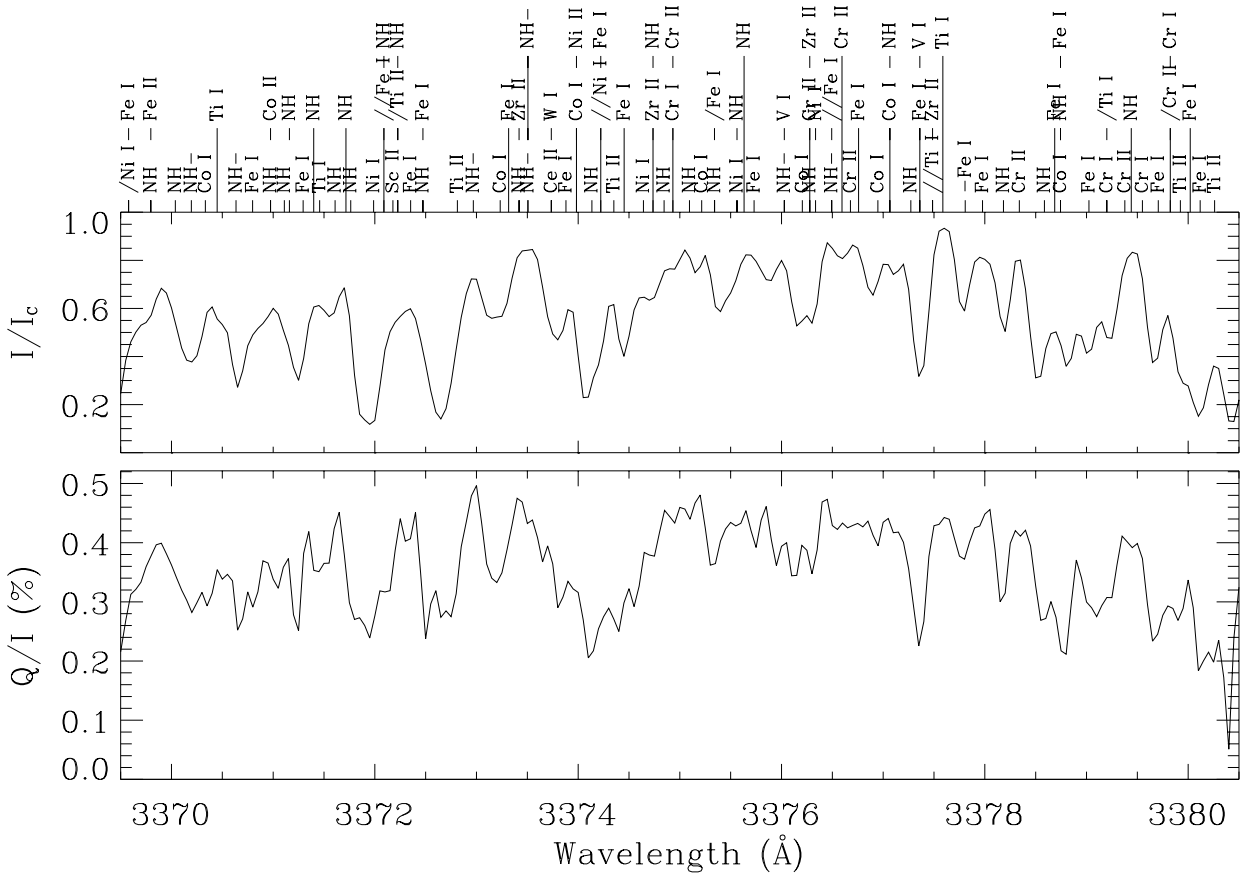

I/I_c
Q/I (%)
Wavelength (Å)
3320
3322
3324
3326
3328
3330

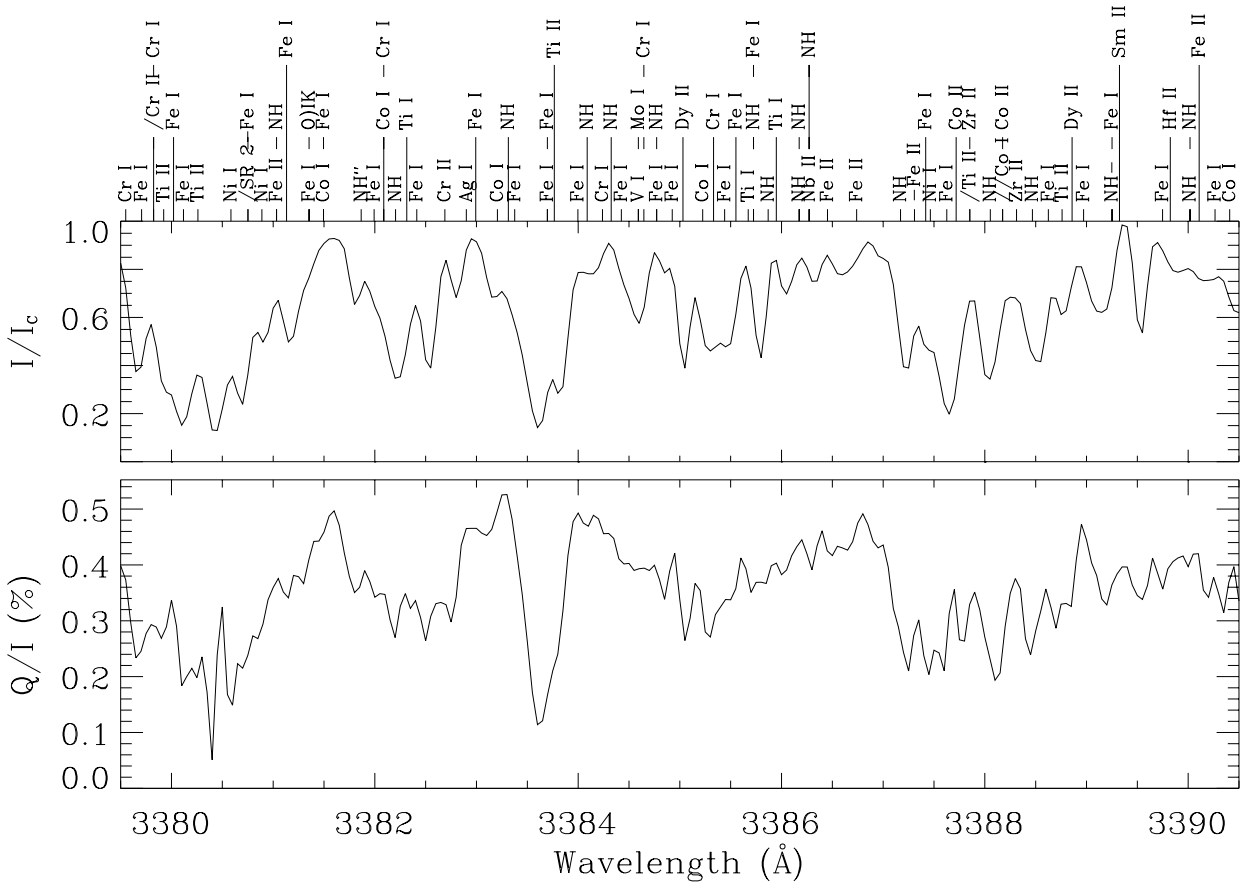

I/I_c
Q/I (%)
Wavelength (Å)
3330
3332
3334
3336
3338
3340

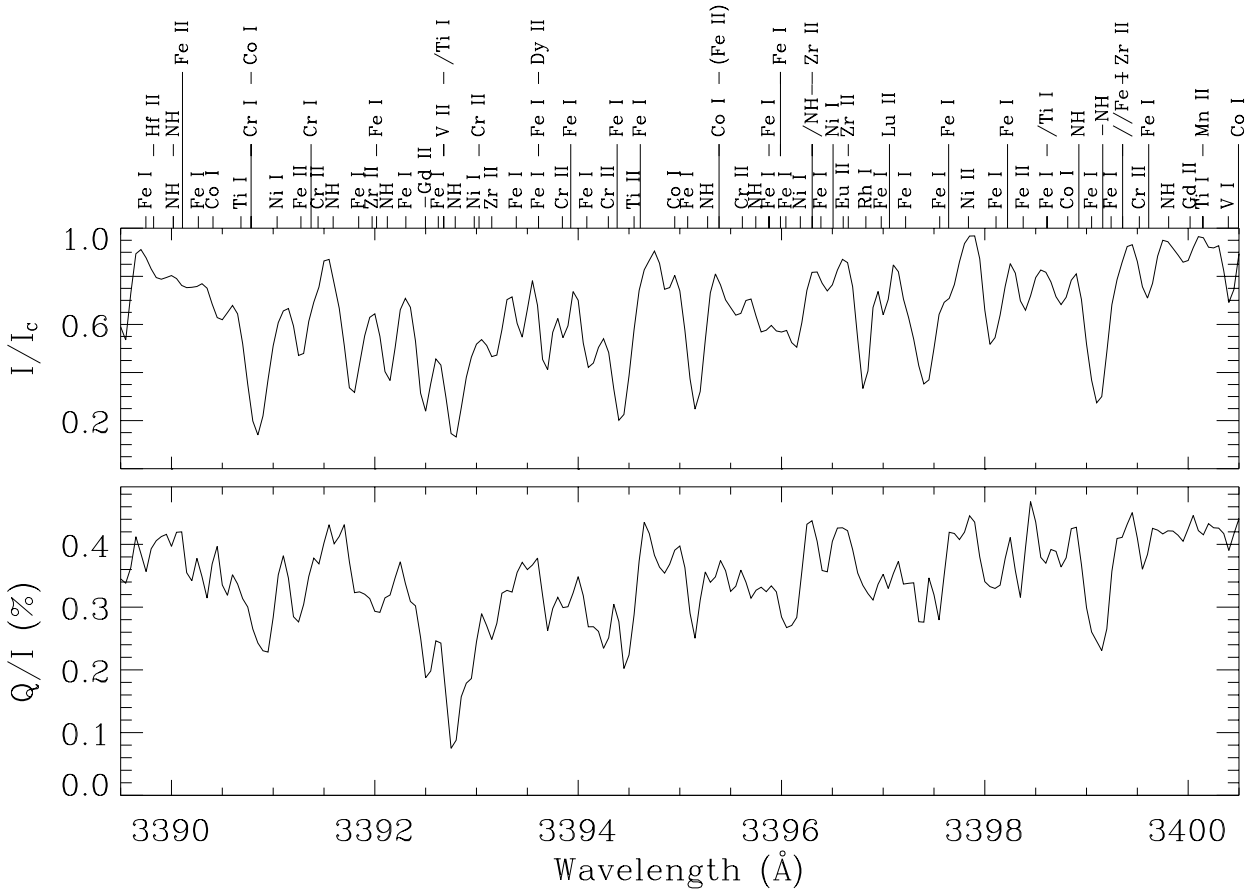

I/I_c
Q/I (%)
Wavelength (Å)
3340
3342
3344
3346
3348
3350

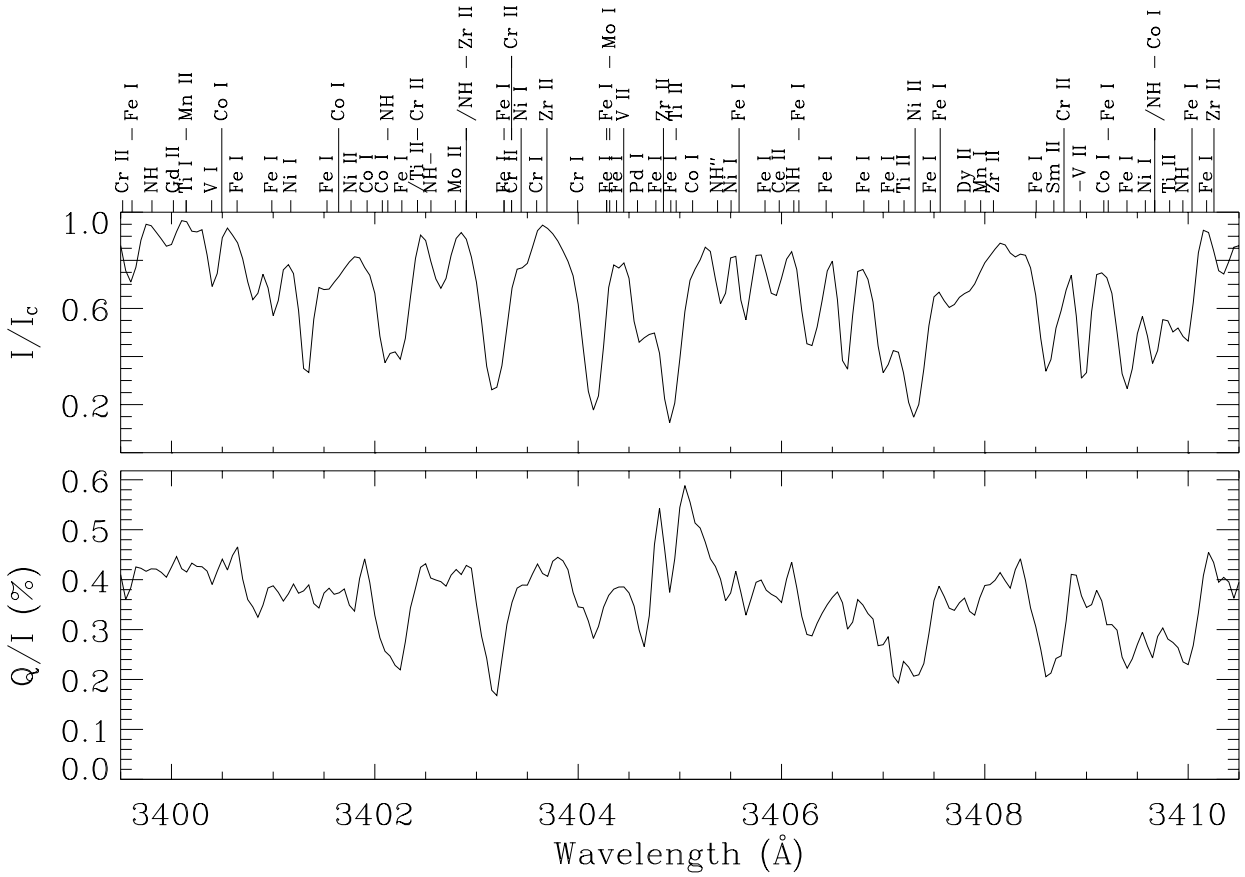

I/I_c
Q/I (%)
Wavelength (Å)
3350
3352
3354
3356
3358
3360

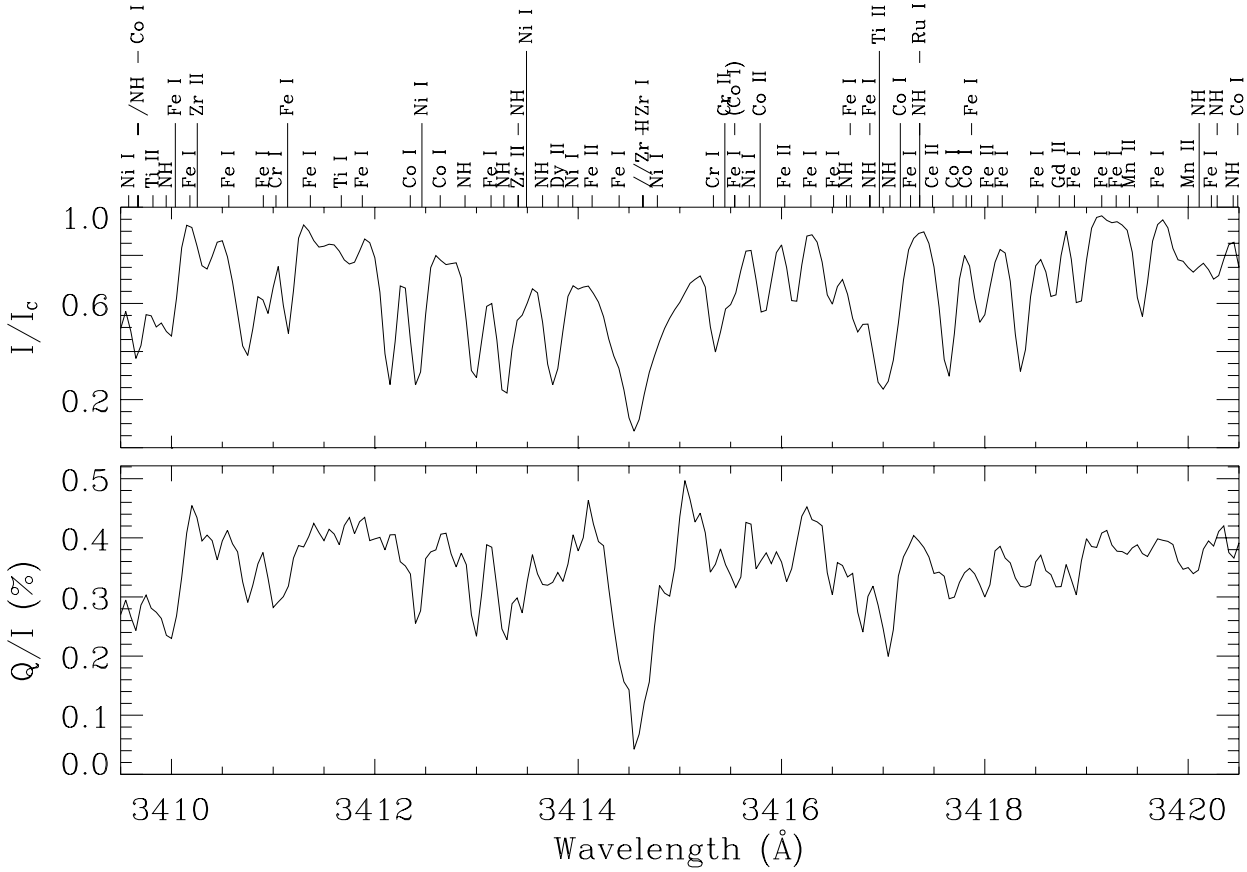

I/I_c
Q/I (%)
Wavelength (Å)
3360
3362
3364
3366
3368
3370

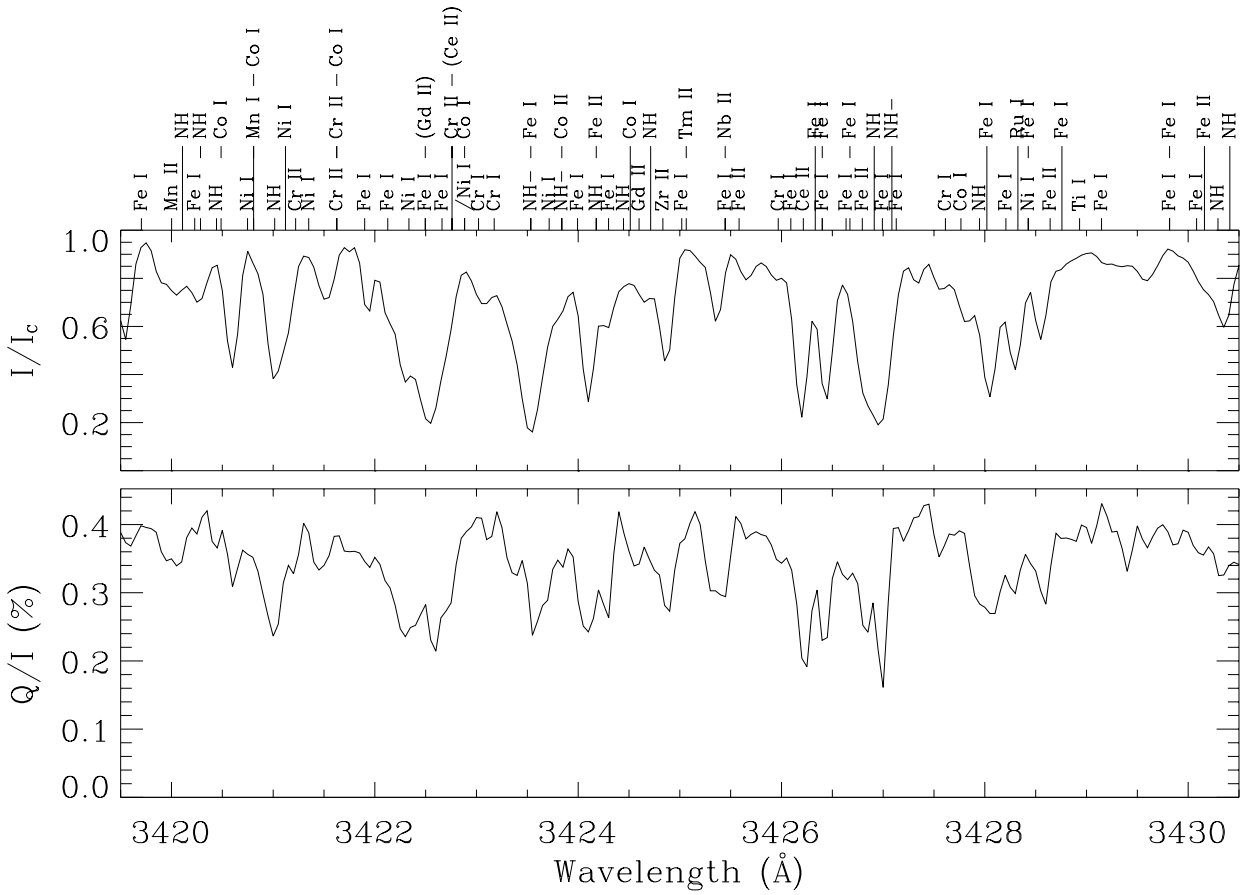

I/I_c
Q/I (%)
Wavelength (Å)
3370
3372
3374
3376
3378
3380

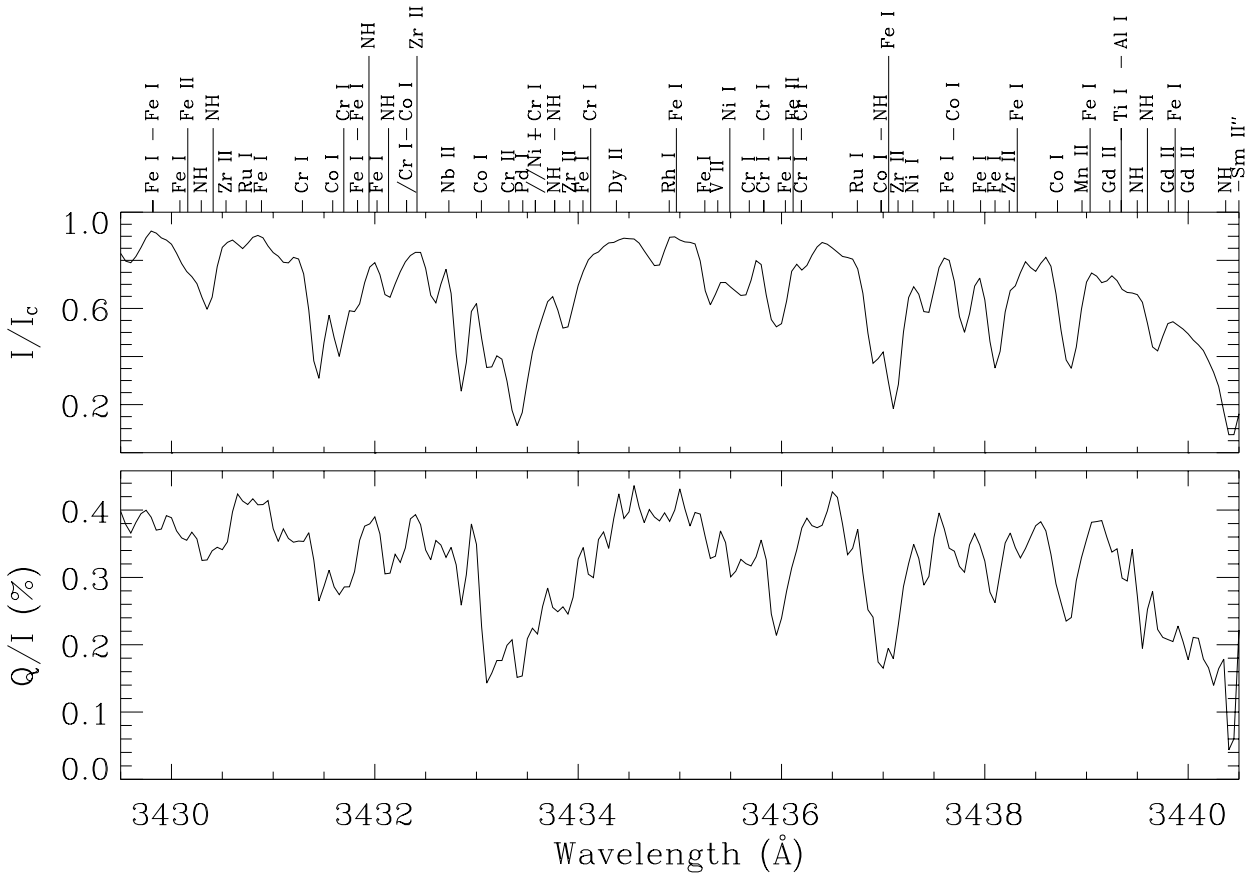

I/I_c
Q/I (%)
Wavelength (Å)
3380
3382
3384
3386
3388
3390

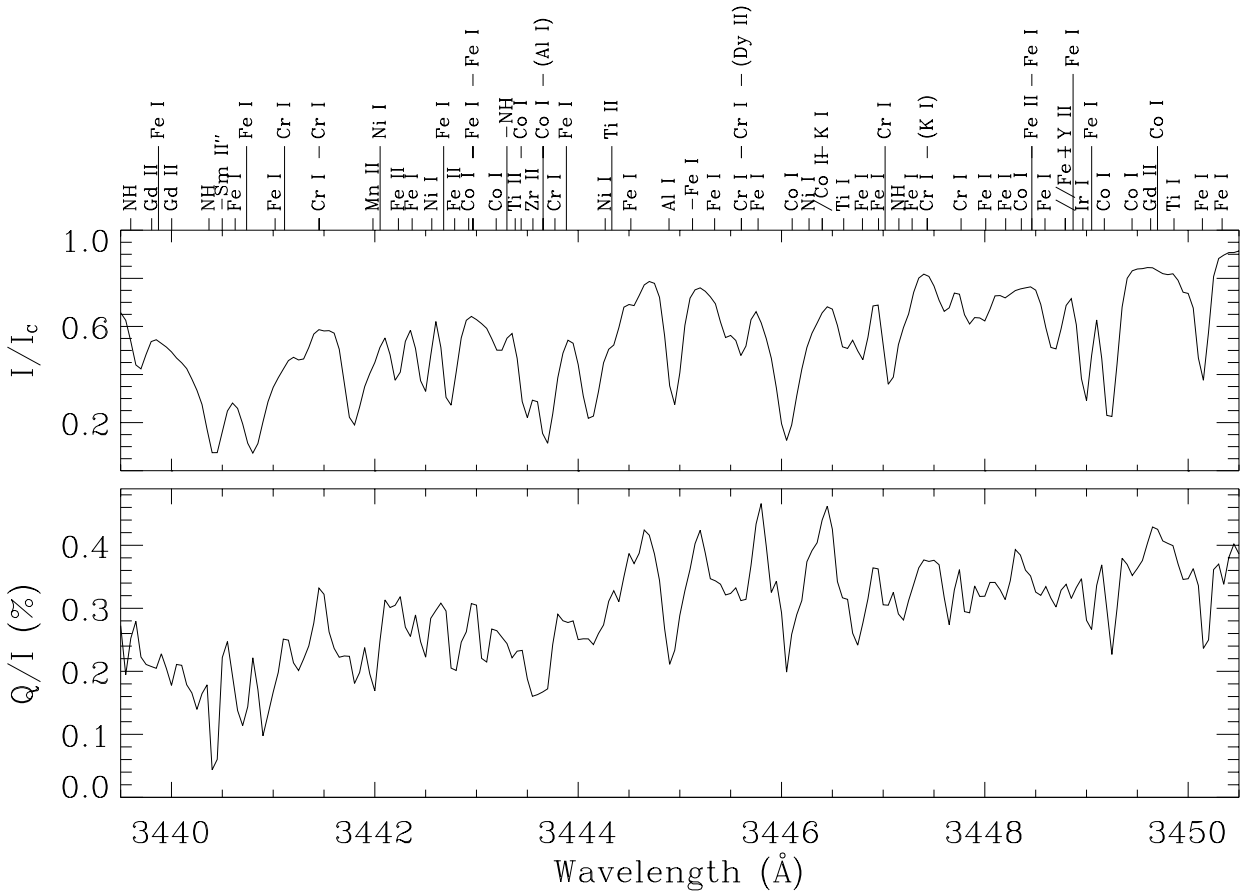

Fe I
Hf II
NH
Fe II
Fe I
Co I
Ti I
Cr I
Co I
Ni I
Fe II
Cr II
NH
Cr I
Fe I
Zr II
NH
Fe I
Gd II
Fe I
V II
/Ti I
NH
Ni I
Zr II
Cr II
Fe I
Fe I
Dy II
Cr II
Fe I
Fe I
Cr II
Ti II
Fe I
Co I
Fe I
NH
Co I
(Fe II)
Cr II
NH
Fe I
Fe I
Ni I
Fe I
Fe I
/NH
Zr II
Ni I
Eu II
Zr II
Rh I
Fe I
Lu II
Fe I
Fe I
Ni II
Fe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

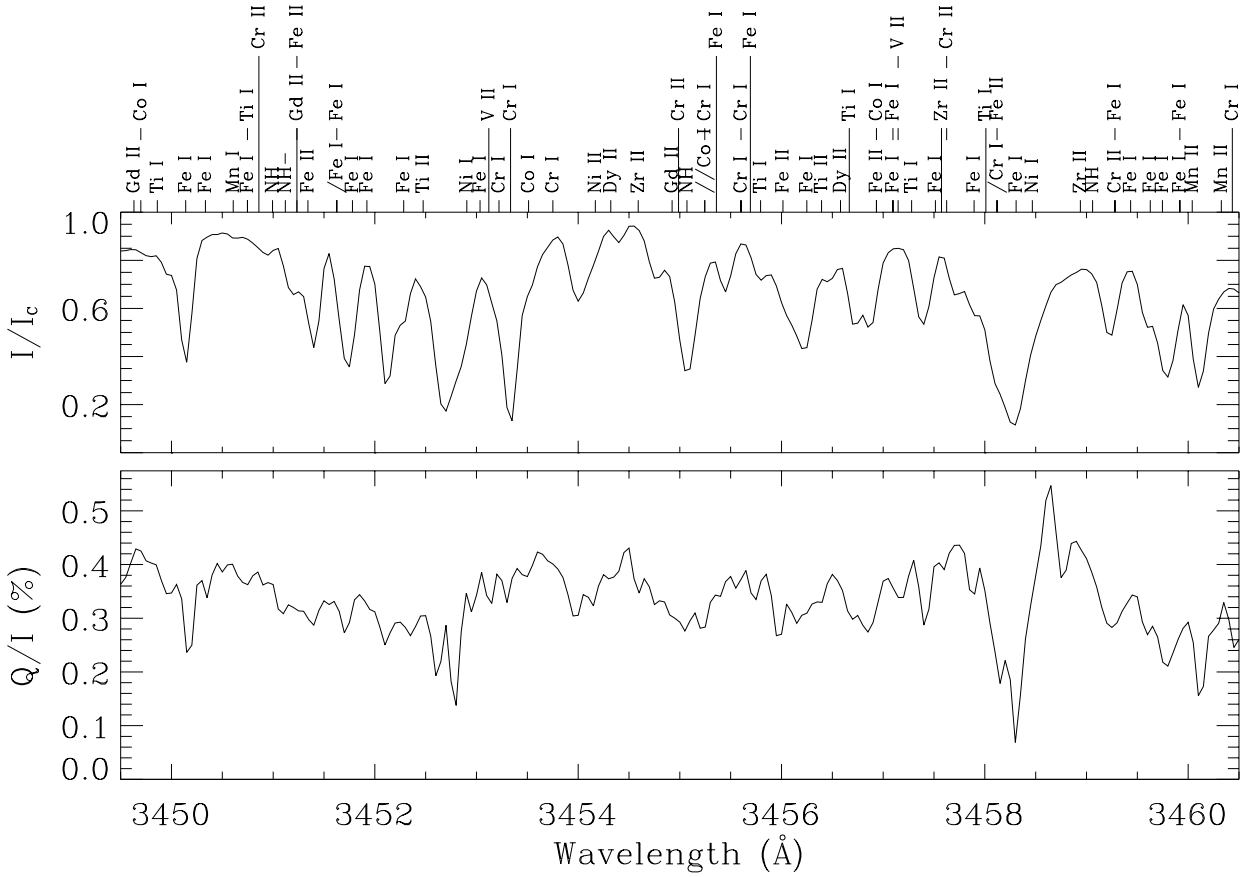

Cr II
Fe I
NH
Gd II
Ti I
Mn II
V I
Co I
Fe I
Fe I
Ni I
Fe I
Co I
Ni II
Co I
NH
Fe I
Ti II
Cr II
NH
Mo II
NH
Zr II
Fe I
Cr II
Ni I
Cr I
Zr II
Cr I
Fe I
Fe I
V II
Mo I
Pd I
Fe I
Fe I
Zr II
Ti II
Co I
NH
Ni I
Fe I
Fe I
Ce II
NH
Fe I
Fe I
Fe I
Ti II
Ni II
Fe I
Dy II
Mn I
Zr II
Fe I
Sm II
Cr II
V II
Co I
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)

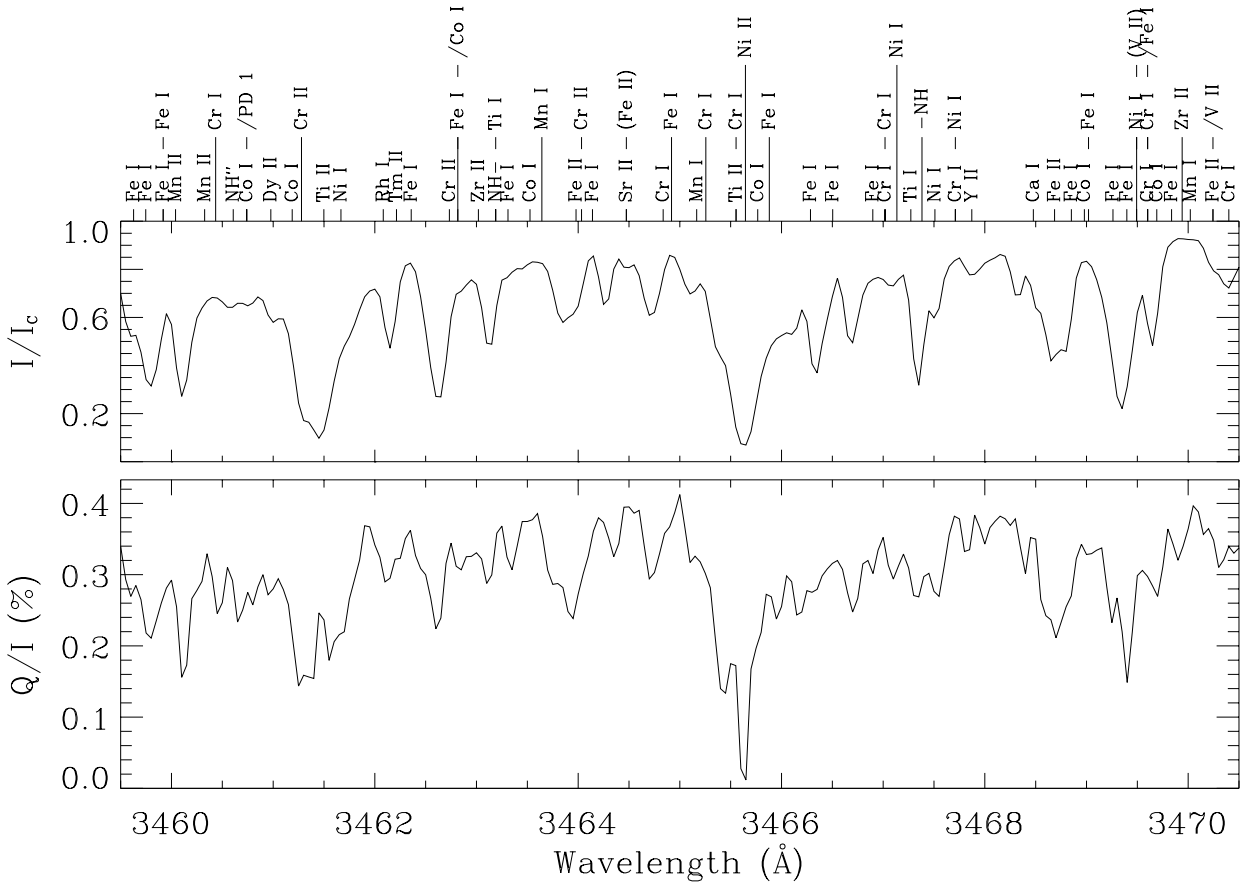

Ni I
Ti II
NH
Fe I
Zr II
Fe I
Fe I
Cr I
Fe I
Ti I
Fe I
Co I
Ni I
Co I
NH
Fe I
NH
Zr II
NH
Ni I
NH
Dy II
Ny I
Fe II
Fe I
Zr
Zr I
Ni I
Cr I
Cr II
Fe I
(Co I)
Ni I
Co II
Fe II
Fe I
Fe
NH
Fe I
Fe I
NH
Ti II
Co I
Fe I
NH
Ce II
Co I
Co I
Fe II
Fe I
Fe I
Gd II
Fe I
Fe I
Fe I
Mn II
Fe I
Mn II
NH
Fe I
NH
NH
Co 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)

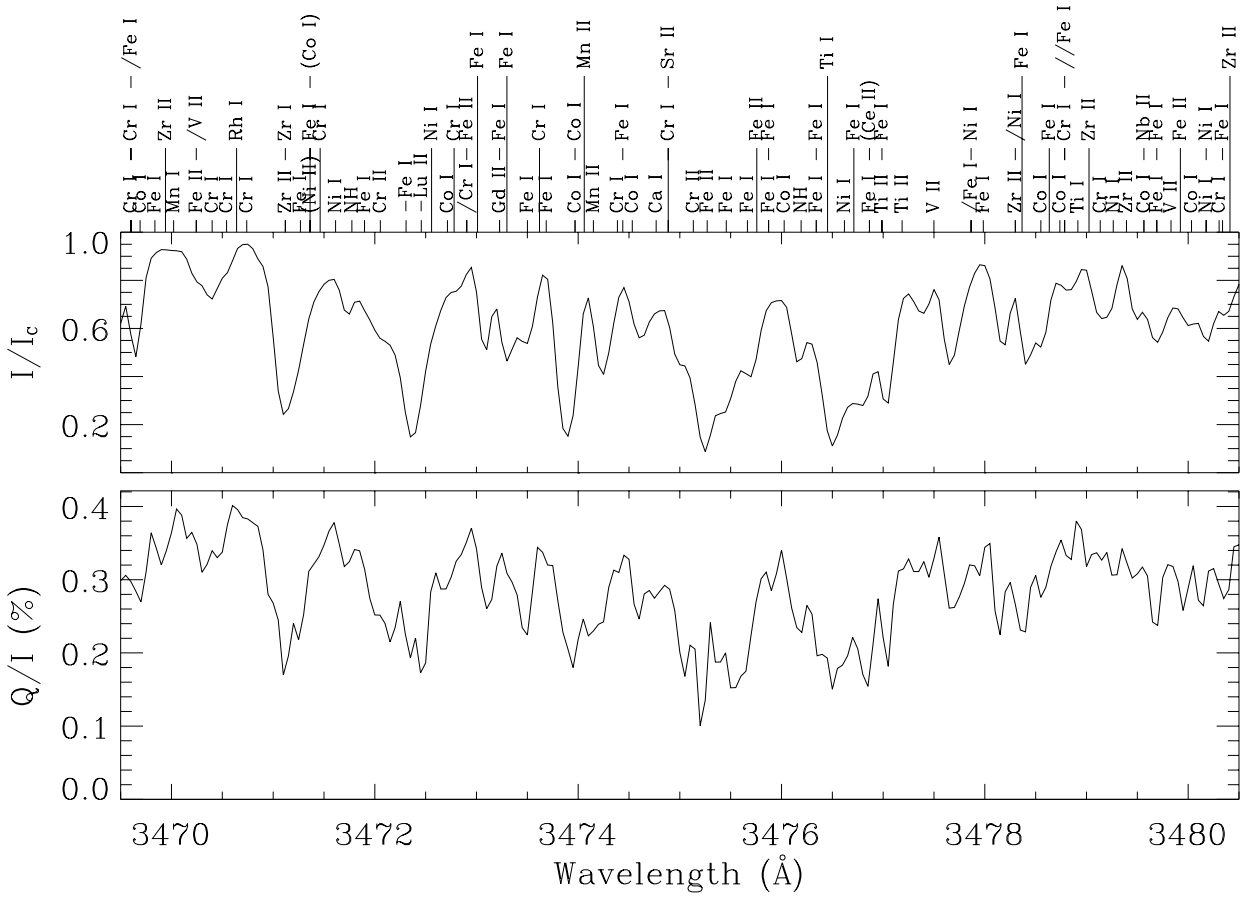

I/I_c
Q/I (%)
Wavelength (Å)
3420
3422
3424
3426
3428
3430

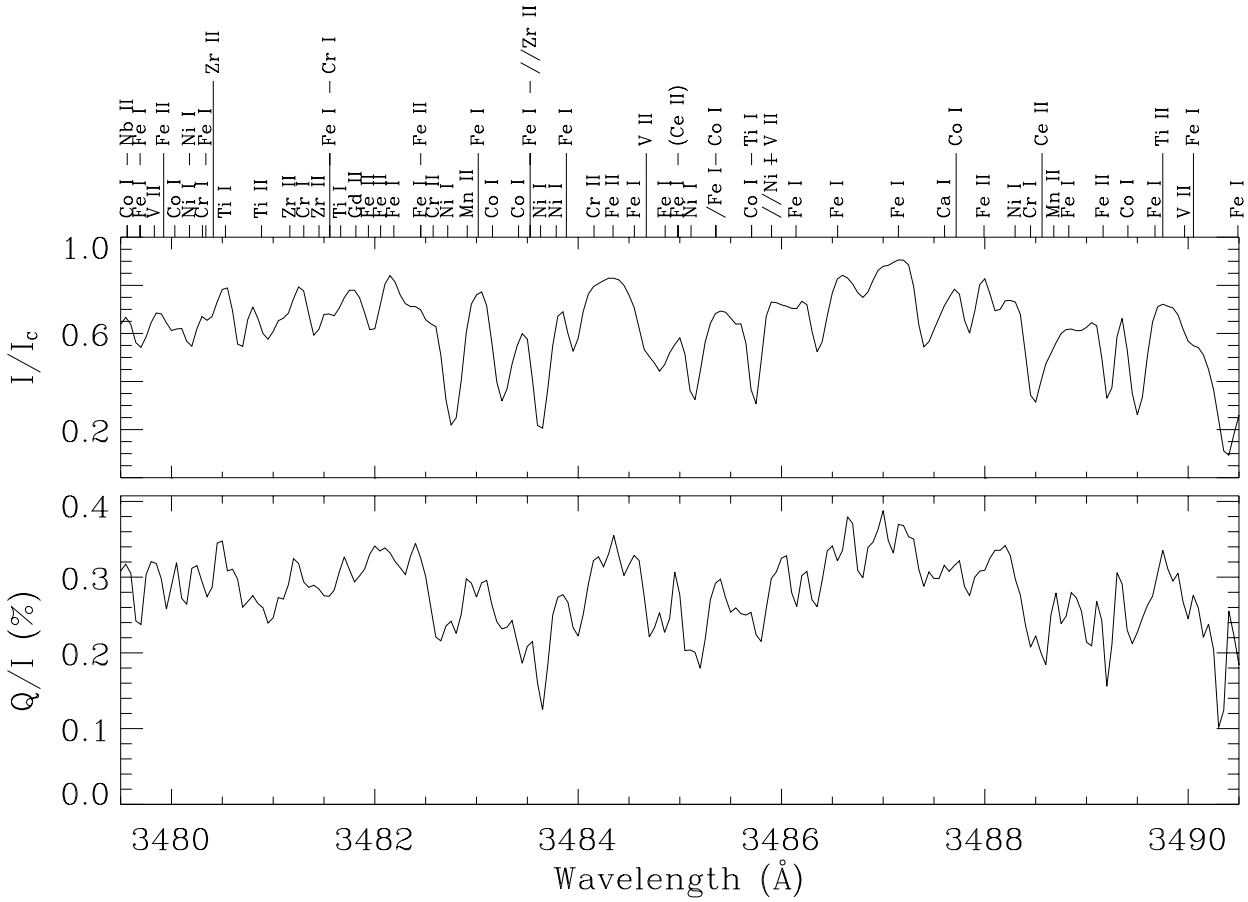

Fe I
Fe I
Fe II
NH
Zr II
Ru I
Fe I
Cr I
Co I
Cr I
Fe I
Fe I
NH
Fe I
NH
Co I
Zr II
Nb II
Co I
Cr II
Pd I
Ni + Cr I
NH
Zr II
Fe I
Cr I
Dy II
Rh I
Fe I
Fe I
Ni I
Cr I
Cr I
Fe I
Fe I
Cr I
Ru I
Co I
NH
Fe I
Zr II
Ni I
Fe I
Co I
Fe I
Fe I
Zr II
Fe I
Co I
Mn II
Fe I
Gd II
Ti I
Al I
NH
NH
Gd II
Fe I
Gd II
NH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

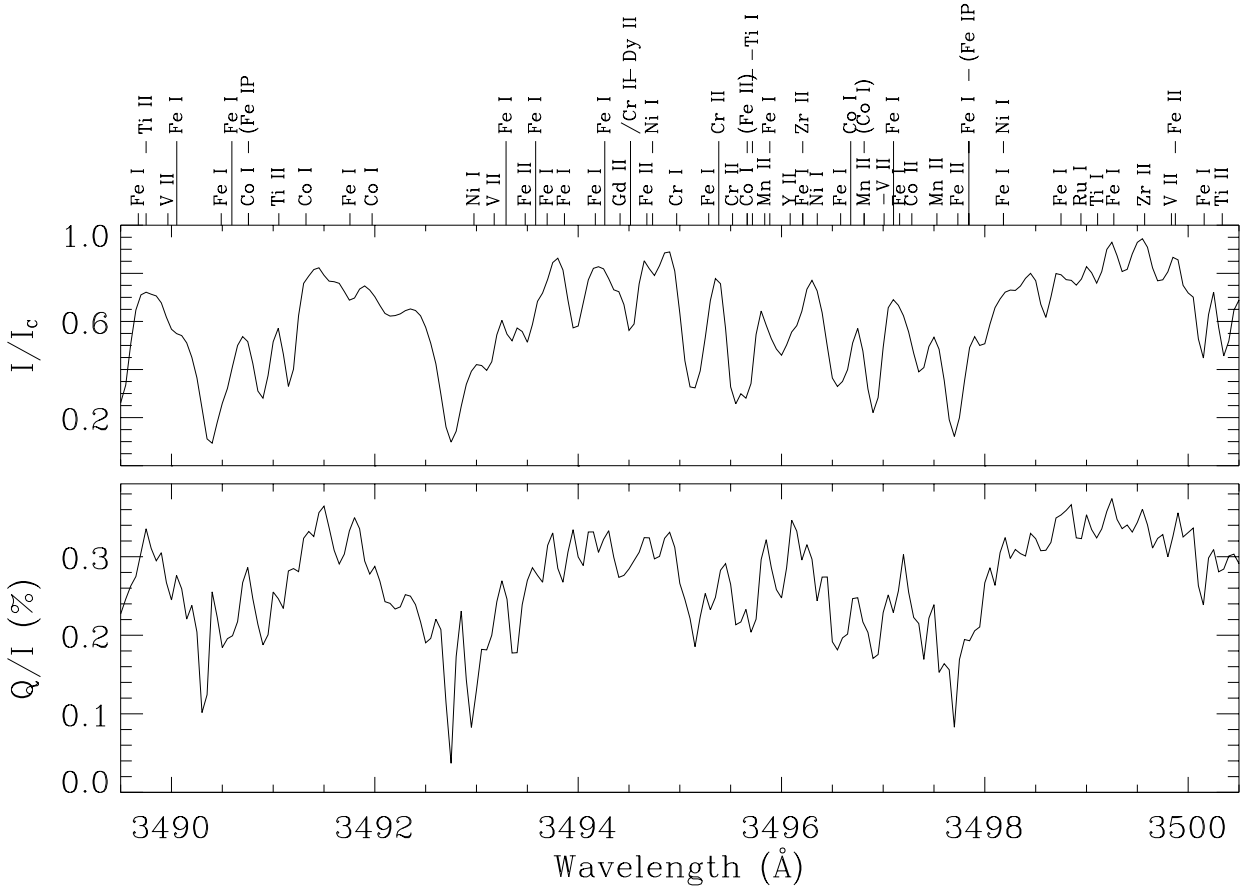

NH
Gd II
Gd II
Fe I
NH
Sm II"
Fe I
Fe I
Cr I
Cr I
Cr I
Mn II
Ni I
Fe I
Fe II
Fe I
Ni I
Fe I
Fe II
Co I
Fe I
Co I
NH
Ti II
Co I
Zr II
Co I
(Al I)
Cr I
Fe I
Ni I
Ti II
Fe I
Al I
Fe I
Fe I
Cr I
Cr I
(Dy II)
Fe I
Co I
Ni I
Co II
K I
Ti I
Fe I
Fe I
Cr I
NH
Fe I
Cr I
(K I)
Cr I
Fe I
Fe I
Co I
Fe II
Fe I
Fe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

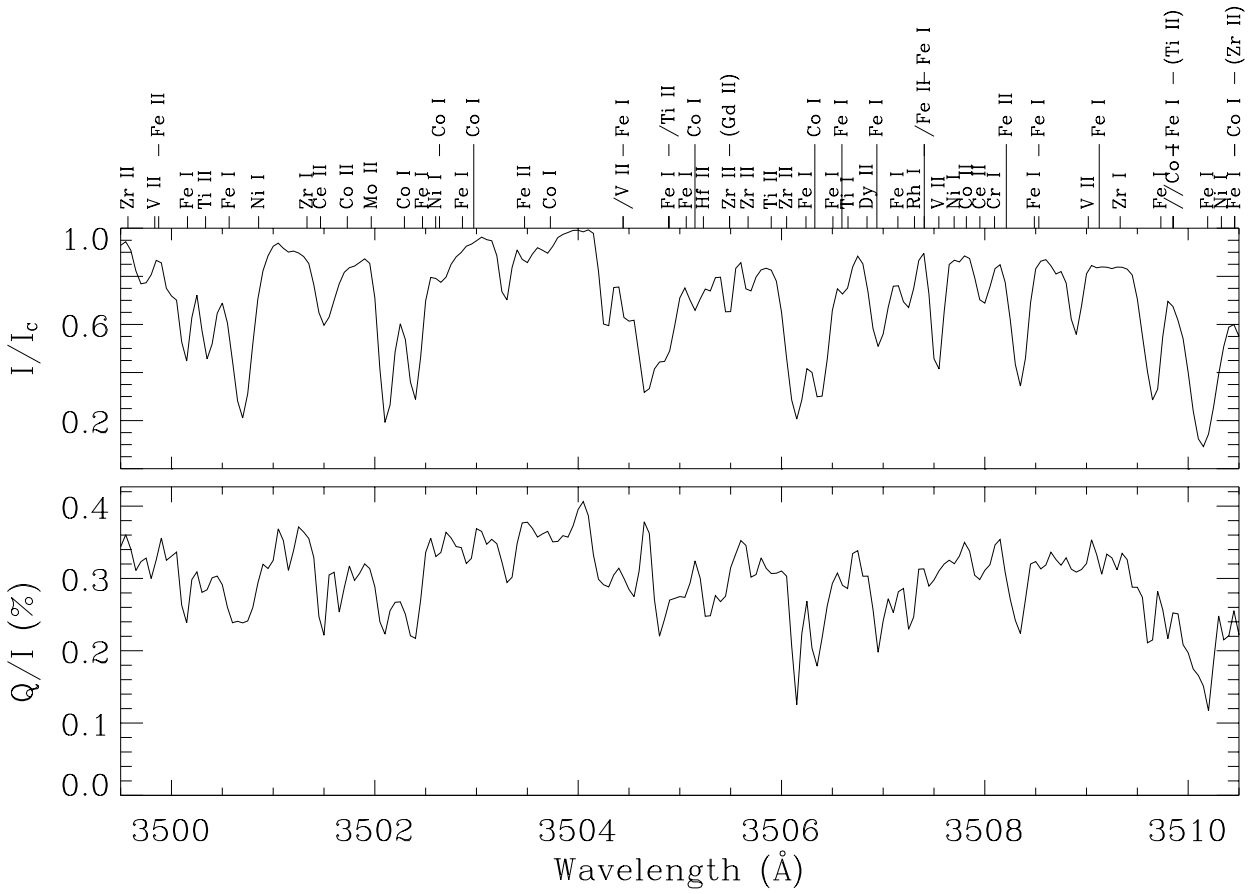

Gd II
Co I
Ti I
Fe I
Fe I
Mn I
Fe I
Ti I
Cr II
NH
NH
Gd II
Fe II
Fe I
Fe I
Fe I
Fe I
Fe I
Ti II
Ni I
Fe I
V II
Cr I
Cr I
Co I
Cr I
Ni II
Dy II
Zr II
Gd II
Cr II
NH
NH
Co I
Cr I
Fe I
Cr I
Cr I
Fe I
Ti I
Fe II
Fe I
Ti II
Dy II
Ti I
Fe II
Co I
Fe I
V II
Ti I
Fe I
Zr II
Cr II
Fe I
Cr I
Ti I
Fe II
Fe I
Ni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

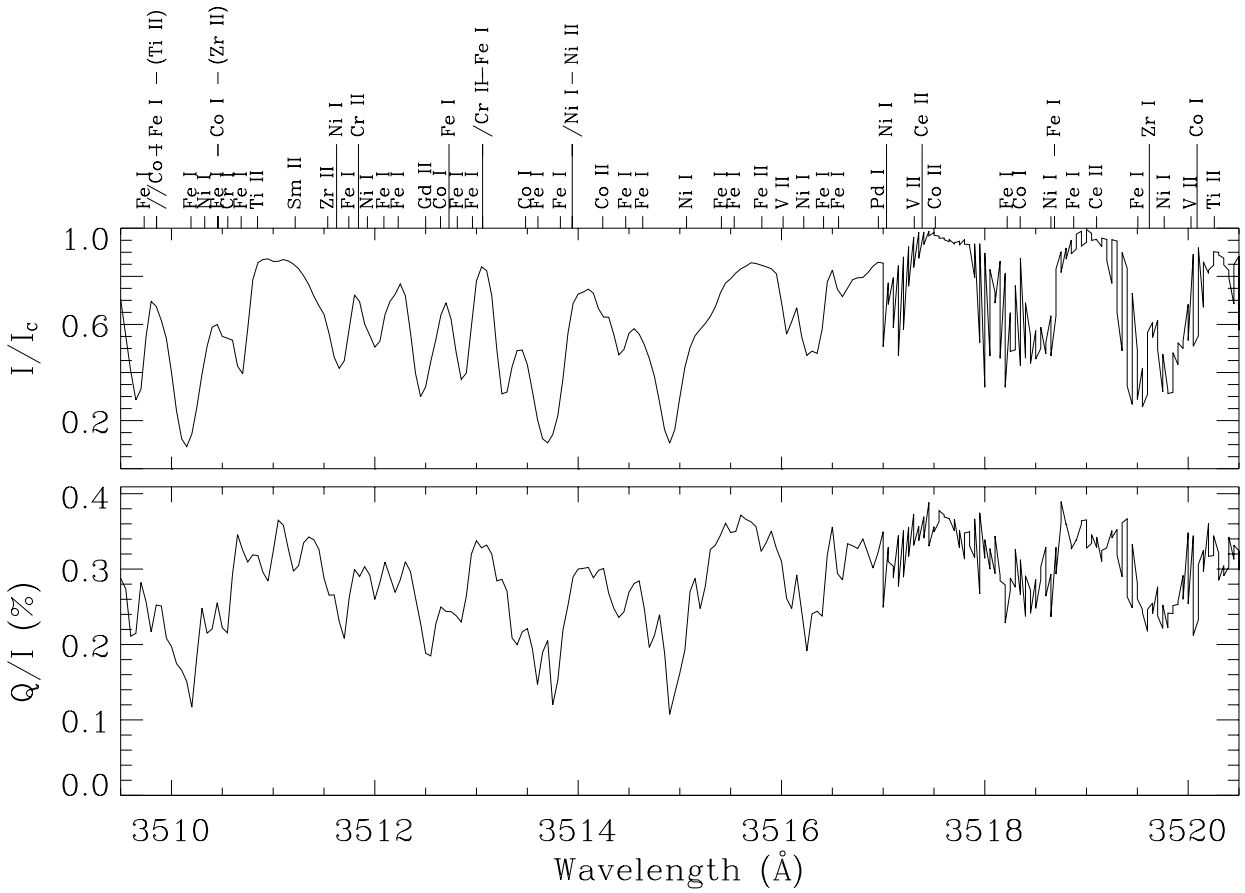

Fe I
Fe I
Mn II
Fe I
Mn II
Cr I
NH''
Co I
/PD 1
Dy II
Co I
Cr II
Ti II
Ni I
Rh I
Tm II
Fe I
Cr II
Fe I
/Co I
Zr II
NH
Fe I
Ti I
Co I
Mn I
Fe II
Fe I
Cr II
Sr II
(Fe II)
Cr I
Fe I
Mn I
Cr I
Ti II
Cr I
Ni II
Co I
Fe I
Fe I
Fe I
Fe I
Cr I
Cr I
Ni I
Ti I
NH
Ni I
Cr I
Y II
Ca I
Fe II
Fe I
Co I
Fe I
Fe I
Ni I
(Y II)
Cr I
Co I
Fe I
Fe I
Zr II
Mn I
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)

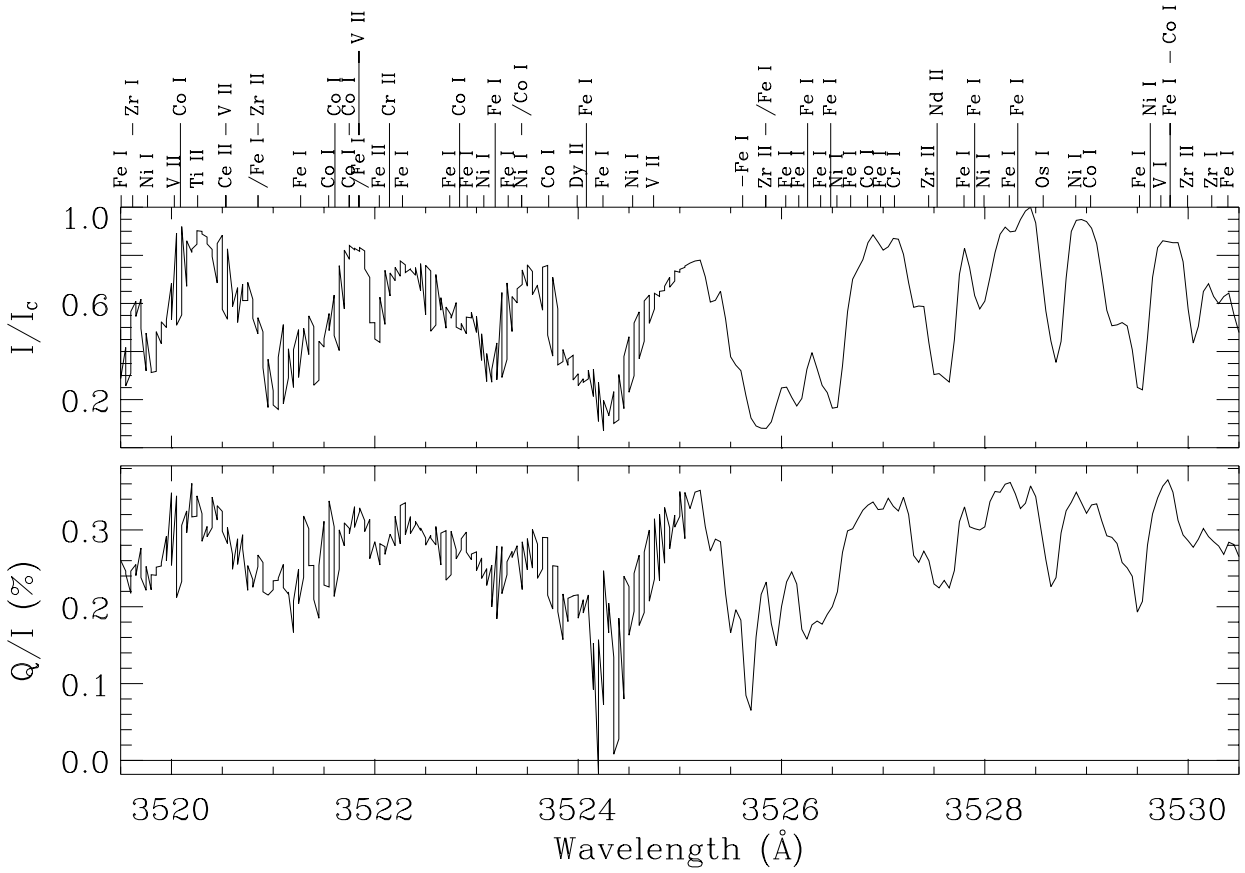

I/I_c
Q/I (%)
Wavelength (Å)
3470
3472
3474
3476
3478
3480

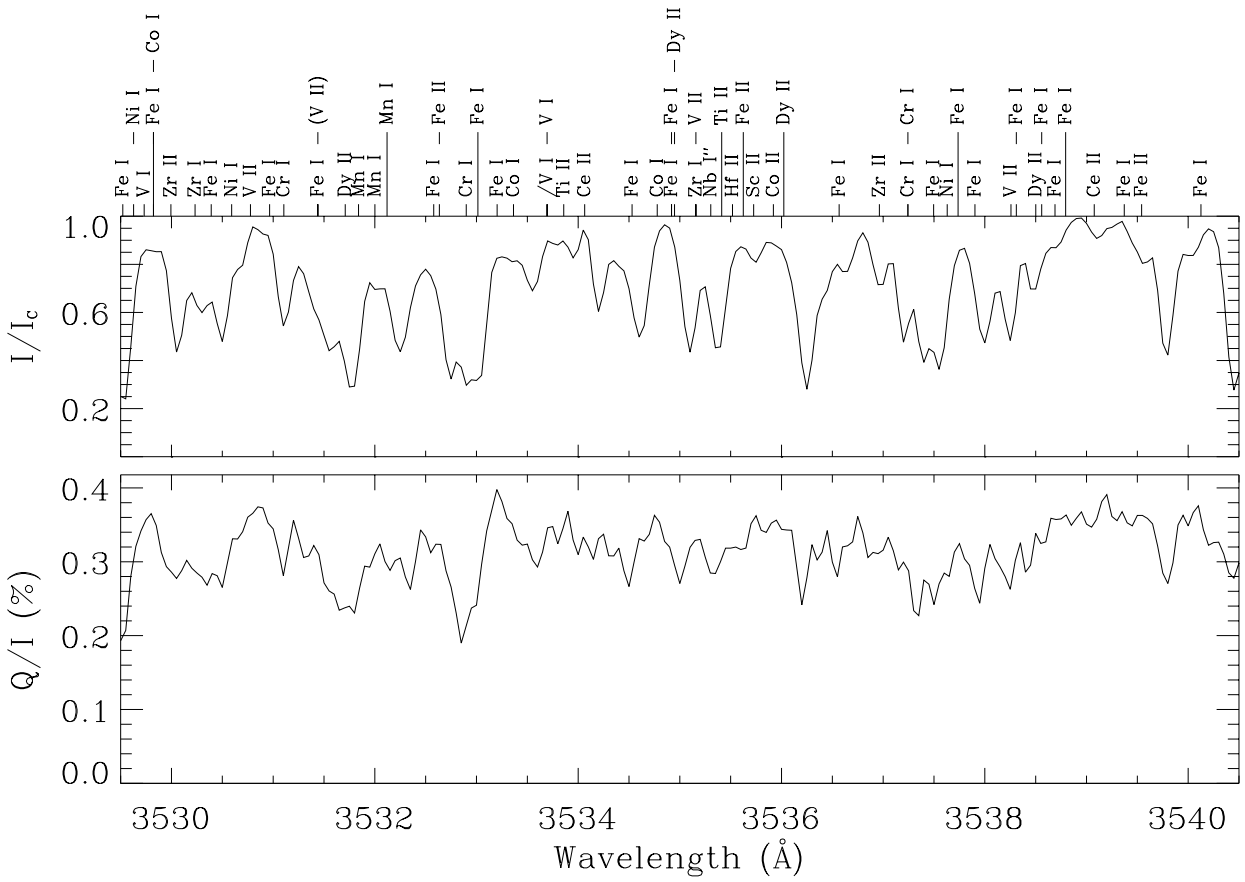

Co I – Nb II
Fe I – Fe I
V II
Fe II
Co I
Ni I – Ni I
Cr I – Fe I
Zr II
Ti I
Ti II
Zr II
Cr I
Zr II
Fe I – Cr I
Ti I
Gd II
Fe II
Fe I
Fe I – Fe II
Cr I
Ni I
Mn II
Fe I
Co I
Co I – //Zr II
Ni I
Ni I
Fe I
Cr II
Fe II
Fe I
V II
Fe I – (Ce II)
Fe I
Ni I
/Fe I – Co I
Co I – Ti I
//Ni + V II
Fe I
Fe I
Fe I
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)

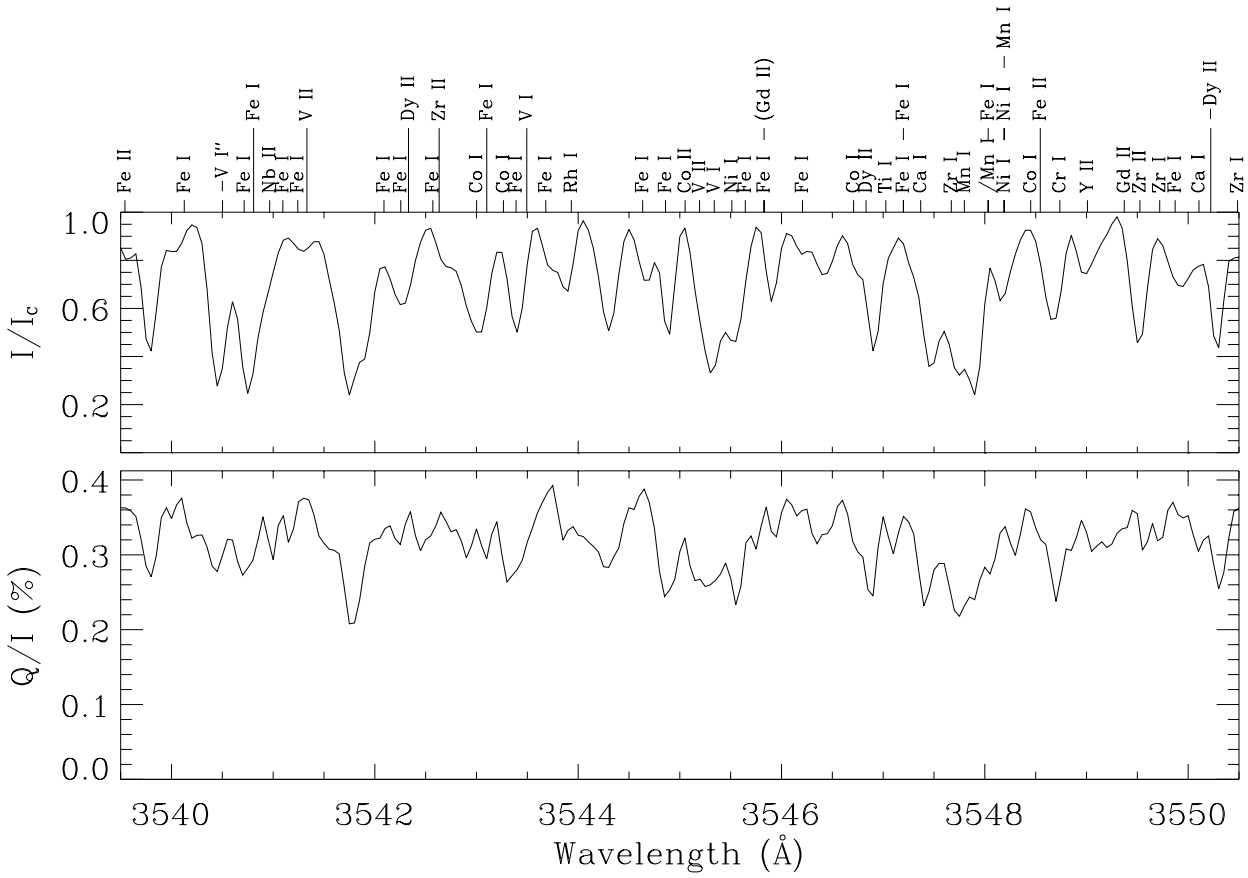

Fe I
Ti II
V II
Fe I
Fe I
Co I
(Fe IP
Ti II
Co I
Fe I
Co I
Ni I
V II
Fe I
Fe II
Fe I
Fe I
Fe I
Gd II
/Cr II
Dy II
Fe II
Ni I
Cr I
Fe I
Cr II
Cr II
Co I
(Fe II)
Ti I
Mn II
Fe I
Y II
Zr II
Fe I
Ni I
Fe I
Co I
Mn II
(Co I)
V II
Fe I
Fe I
Co II
Mn II
Fe II
Fe I
(Fe IP
Fe I
Ni I
Fe I
Ru I
Ti I
Fe I
Zr II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

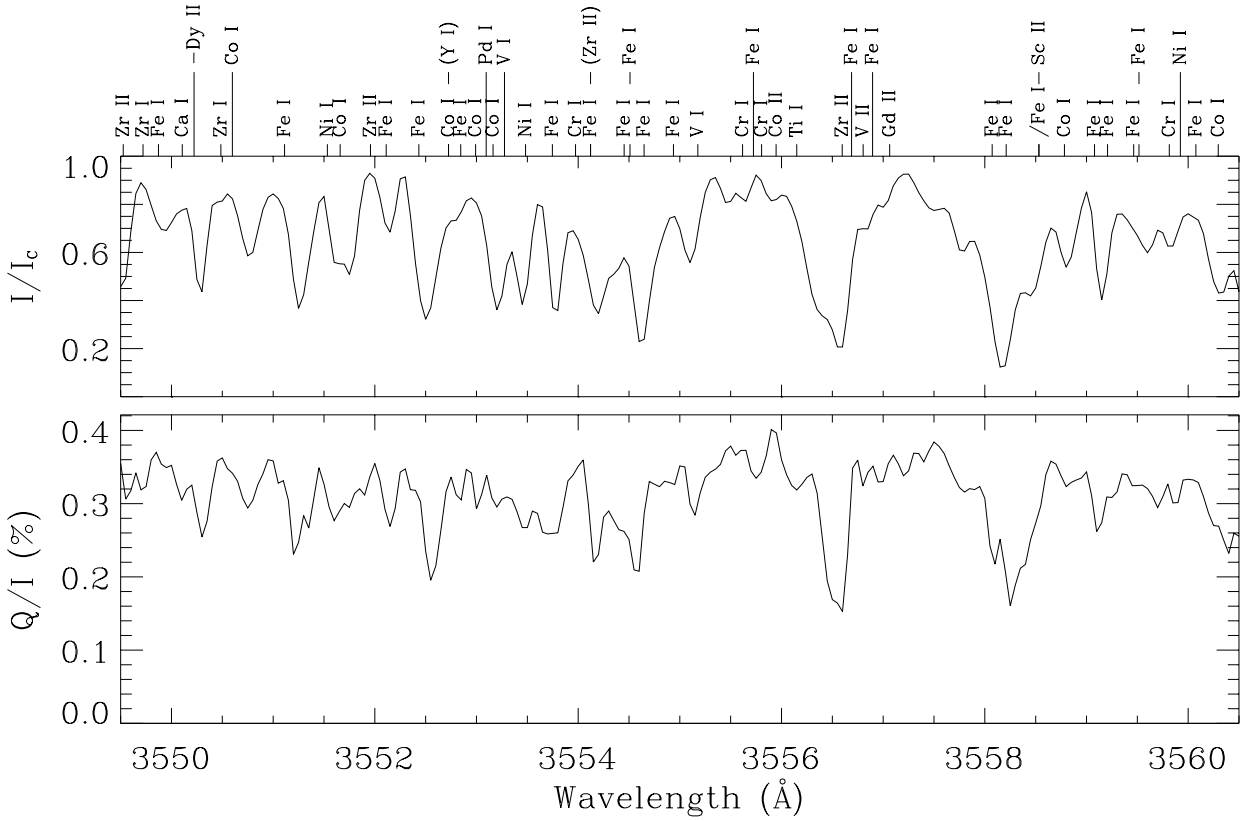

Zr II
V II – Fe II
Fe I
Ti II
Fe I
Ni I
Zr I
Ce II
Co II
Mo II
Co I
Fe I
Ni I – Co I
Fe I
Co I
Fe II
Co I
/V II – Fe I
Fe I – /Ti II
Fe I
Hf II
Co I
Zr II – (Gd II)
Zr II
Ti II
Zr II
Fe I
Co I
Fe I
Ti I
Dy II
Fe I
Fe I
Rh I
/Fe II – Fe I
V II
Ni I
Ce II
Cr I
Fe II
Fe I – Fe I
V II
Fe I
Zr I
Fe I
/Co 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)

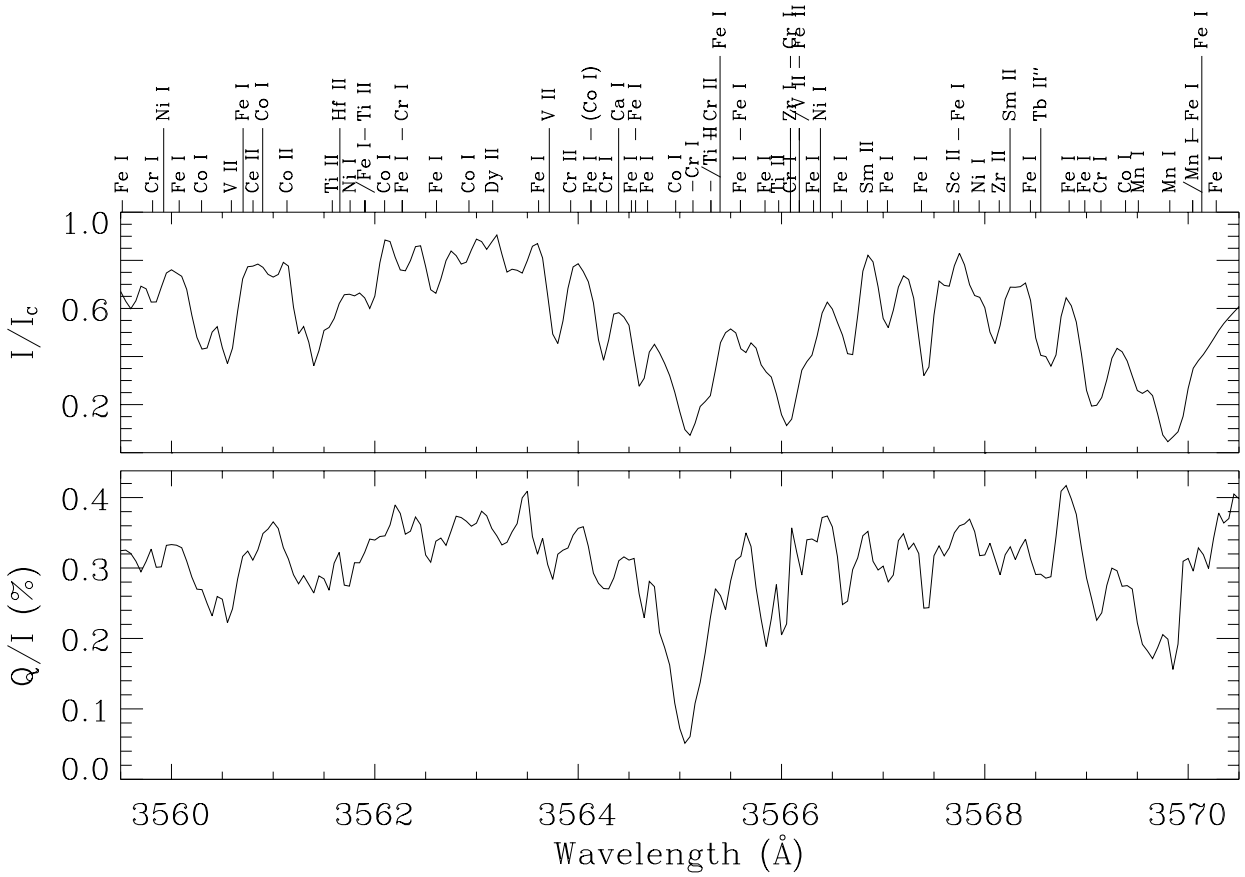

Fe I
Co I
Fe I – (Ti II)
Fe I
Ni I
Fe I
Cr I
Fe I – Co I – (Zr II)
Ti II
Sm II
Zr II
Fe I
Ni I
Ni I
Cr II
Fe I
Fe I
Gd II
Co I
Fe I
Fe I
Fe I
/Cr II–Fe I
Co I
Fe I
Fe I
/Ni I – Ni II
Co II
Fe I
Fe I
Ni I
Fe I
Fe I
Fe II
V II
Ni I
Fe I
Fe I
Pd I
Ni I
V II
Ce II
Co II
Fe I
Co I
Ni I – Fe I
Fe I
Ce II
Fe 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)

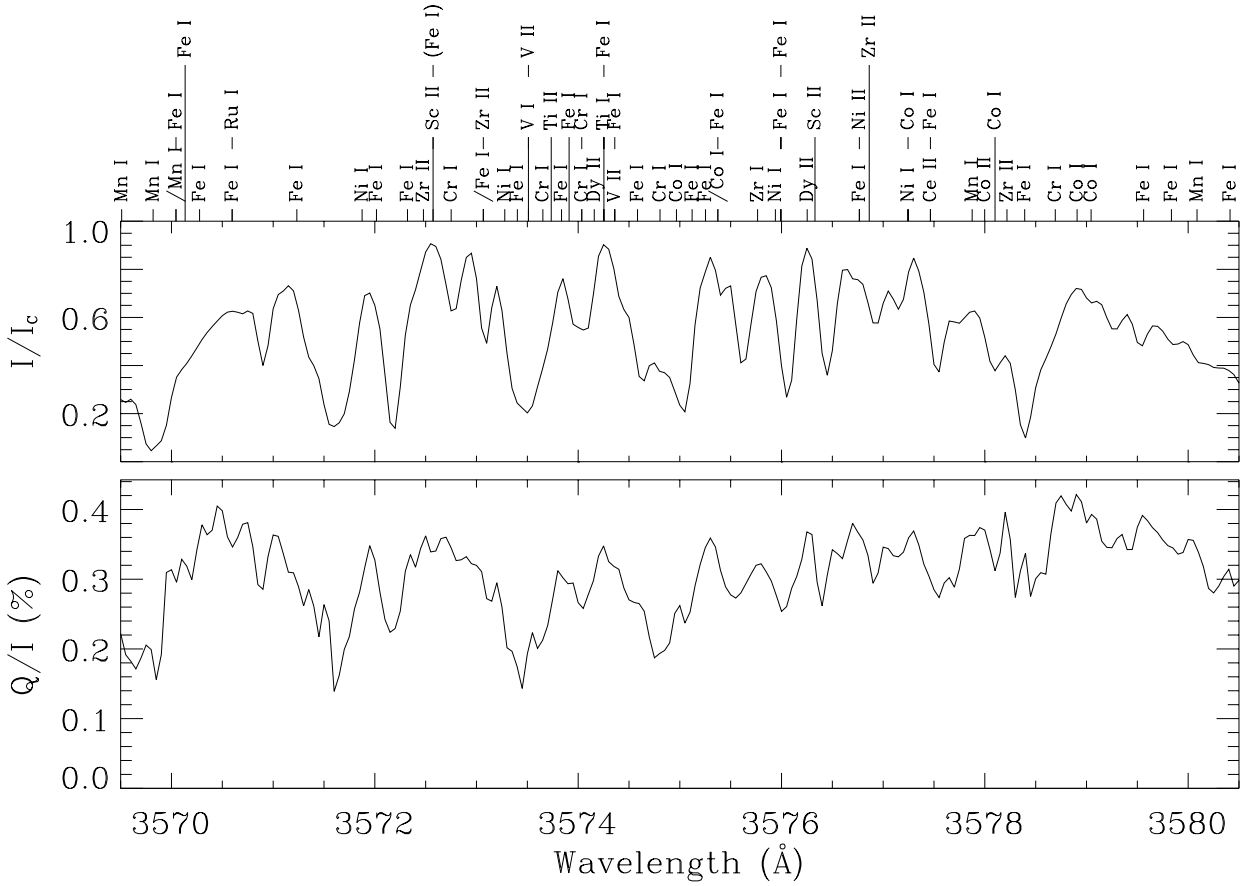

Fe I
Zr I
Ni I
V II
Co I
Ti II
Ce II
V II
/Fe I
Zr II
Fe I
Co I
Co I
Co I
V II
Fe I
Fe II
Cr II
Fe I
Co I
Fe I
Fe I
Ni I
Fe I
Fe I
/Co I
Co I
Dy II
Fe I
Ni I
V II
Fe I
Zr II
/Fe I
Fe I
Fe I
Fe I
Fe I
Ni I
Fe I
Co I
Fe I
Cr I
Zr II
Nd II
Fe I
Fe I
Ni I
Fe I
Fe I
Os I
Ni I
Co I
Fe I
Ni I
V I
Fe I
Co I
Zr II
Zr I
Fe I
1.0
0.6
0.2
I/I_c
0.3
0.2
0.1
0.0
Q/I (%)
3520
3522
3524
3526
3528
3530
Wavelength (Å)

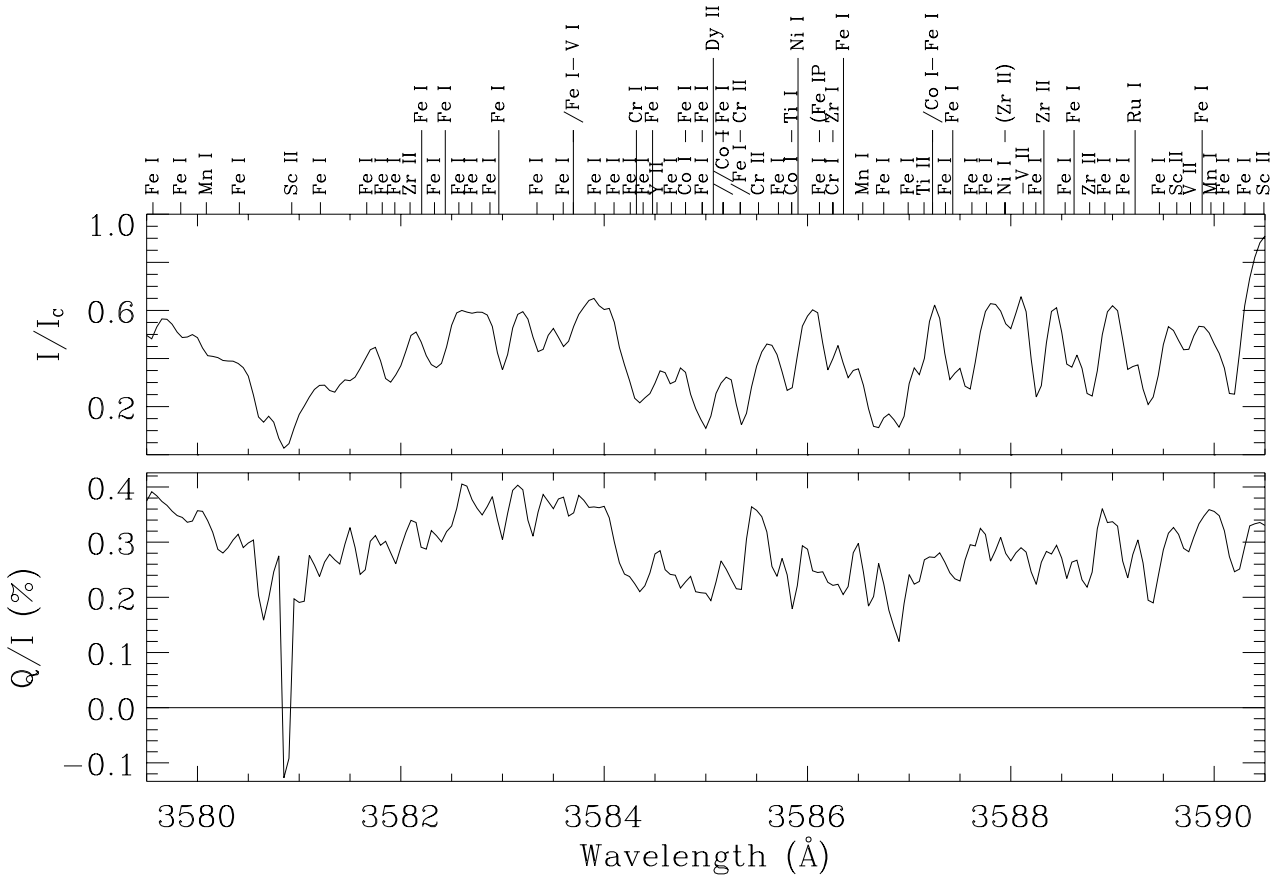

Fe I – Ni I
V I
Fe I – Co I
Zr II
Zr I
Fe I
Ni I
V II
Fe I
Cr I
Fe I – (V II)
Dy II
Mn I
Mn I
Mn I
Fe I – Fe II
Cr I
Fe I
Co I
/V I – V I
Ti II
Ce II
Fe I
Co I
Fe I = Fe I – Dy II
Zr I – V II
Nb I''
Ti II
Hf II
Fe II
Sc II
Co II
Dy II
Fe I
Zr II
Cr I – Cr I
Fe I
Ni I
Fe I
V II – Fe I
Dy II – Fe I
Fe 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)

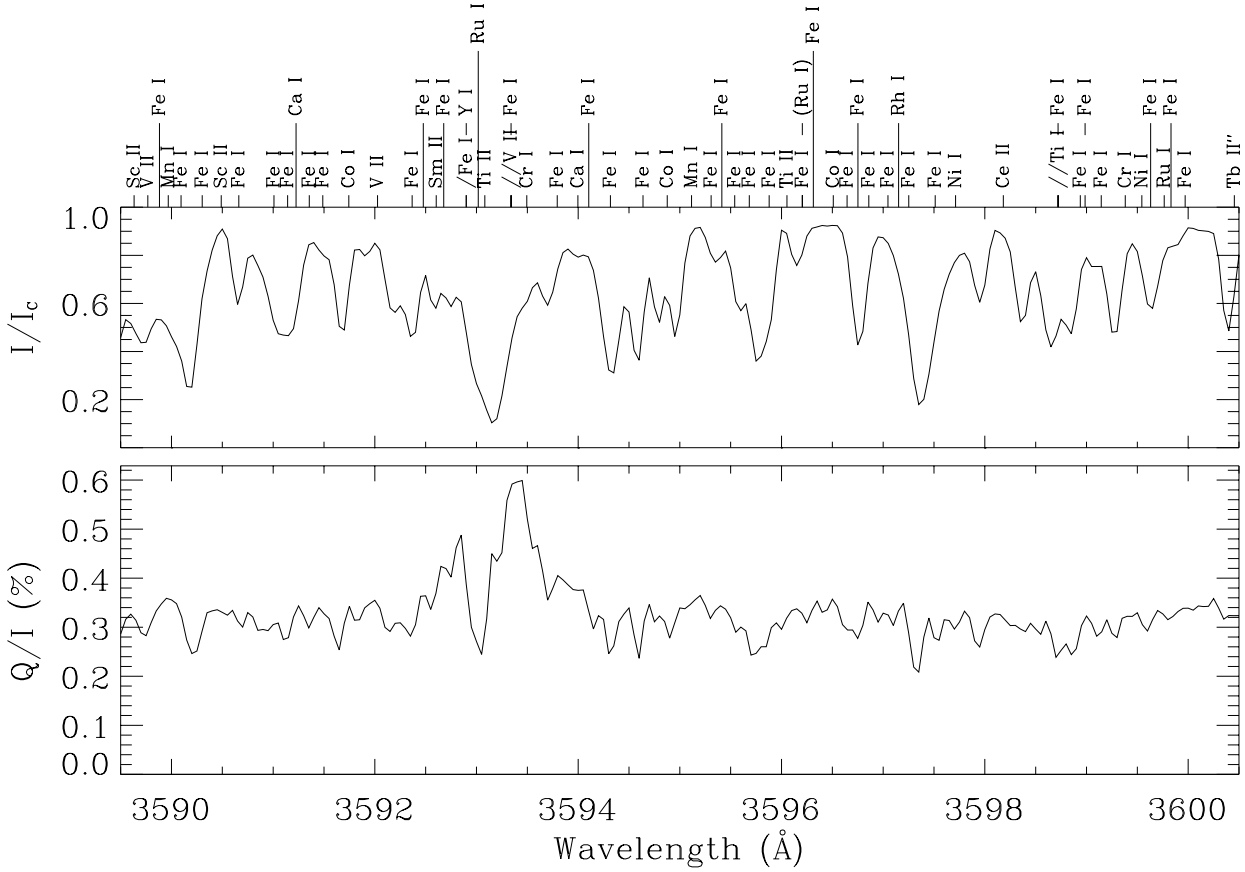

Fe II
Fe I
V I"
Fe I
Nb II
Fe I
Fe I
V II
Fe I
Fe I
Dy II
Fe I
Zr II
Co I
Fe I
Co I
Fe I
V I
Fe I
Rh I
Fe I
Fe I
Co II
V II
V I
Ni I
Fe I
Fe I
(Gd II)
Fe I
Co I
Dy II
Ti I
Fe I
Fe I
Ca I
Zr I
Mn I
Mn I
Fe I
Ni I
Ni I
Mn I
Co I
Fe II
Cr I
Y II
Gd II
Zr II
Zr I
Fe I
Ca I
Dy II
Zr I
I/I$_c$
1.0
0.6
0.2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

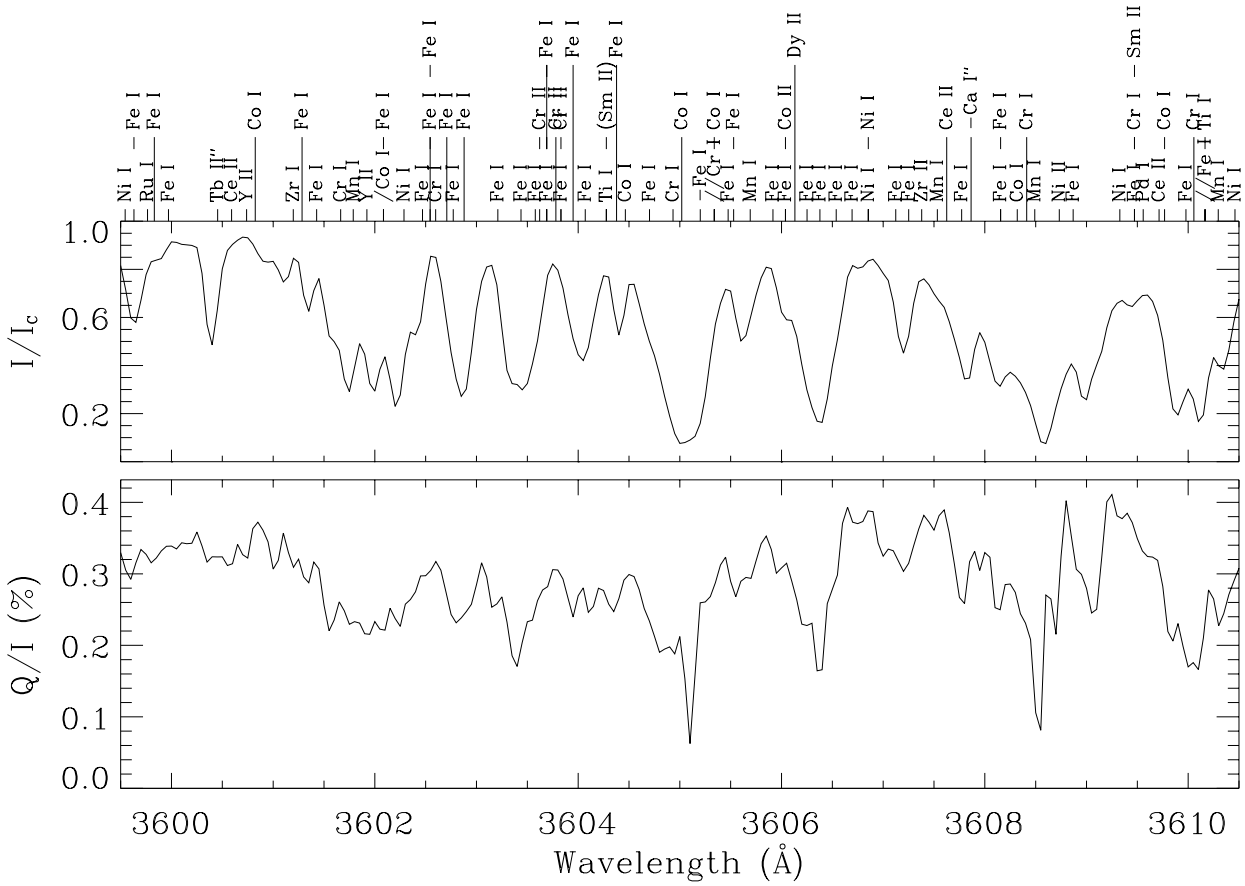

Zr II
Zr I
Fe I
Ca I
Dy II
Zr I
Co I
Fe I
Ni I
Co I
Zr II
Fe I
Fe I
Co I
Fe I
Co I
Co I
(Y I)
Pd I
V I
Ni I
Fe I
Cr I
Fe I
(Zr II)
Fe I
Fe I
Fe I
Fe I
V I
Cr I
Cr I
Co II
Ti I
Fe I
Zr II
V II
Fe I
Gd II
Fe I
Fe I
/Fe I
Sc II
Co I
Fe I
Fe I
Fe I
Fe I
Cr I
Ni I
Fe I
Co I
1.0
0.6
0.2
I/I$_c$
0.4
0.3
0.2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

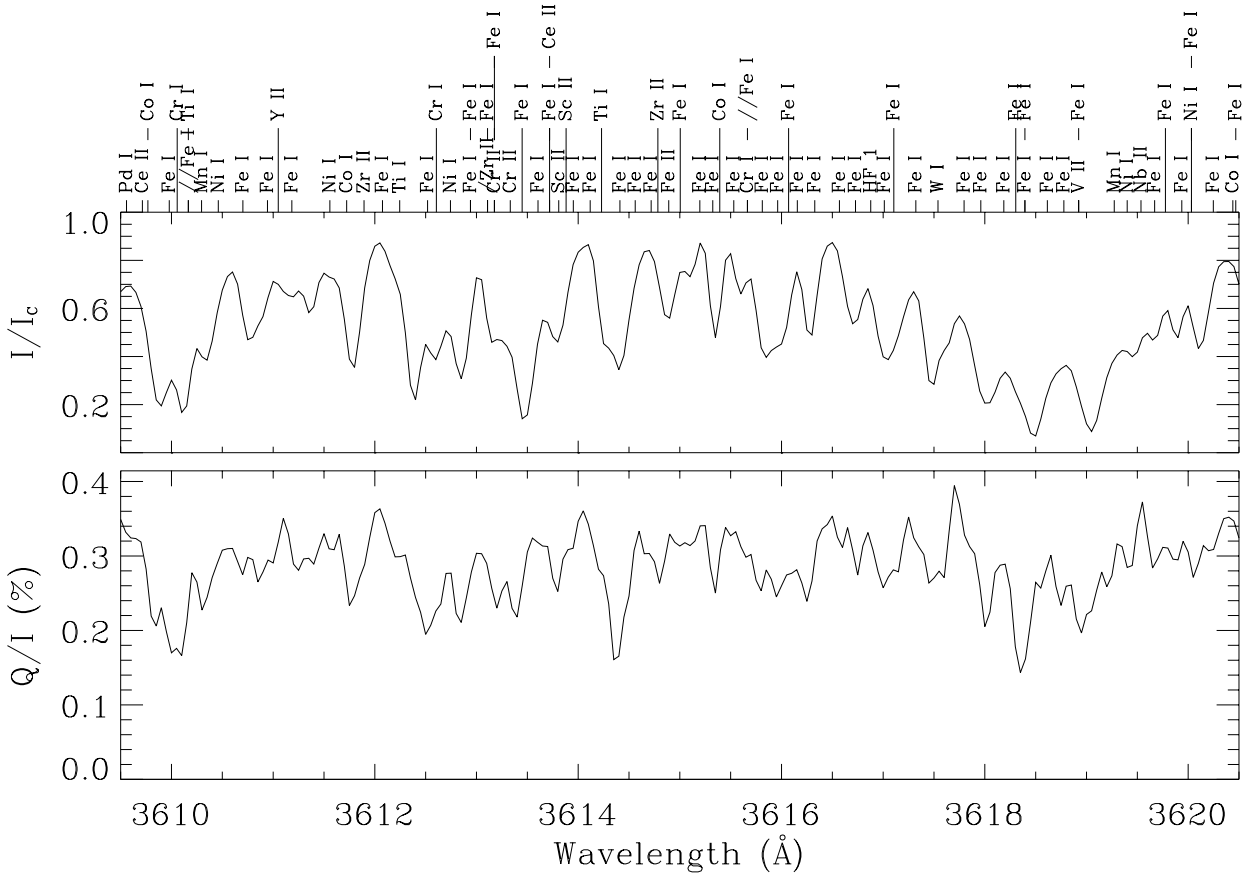

Fe I
Cr I
Ni I
Fe I
Co I
V II
Fe I
Ce II
Co I
Co II
Ti II
Hf II
Ni I
Fe I
Ti II
Co I
Fe I
Cr I
Fe I
Co I
Dy II
Fe I
V II
Cr II
Fe I
(Co I)
Cr I
Ca I
Fe I
Fe I
Co I
Cr I
H
Cr II
Fe I
Fe I
Fe I
Fe I
Ti II
Cr I
Fe I
Ni I
Fe I
Sm II
Fe I
Fe I
Sc II
Fe I
Ni I
Zr II
Sm II
Fe I
Tb II
Fe I
Fe I
Cr I
Co I
Mn I
Mn I
Mn I
Fe I
Fe I
I/I$_c$
1.0
0.6
0.2
Q/I (%)
0.4
0.3
0.2
0.1
0.0
3560
3562
3564
3566
3568
3570
Wavelength (Å)

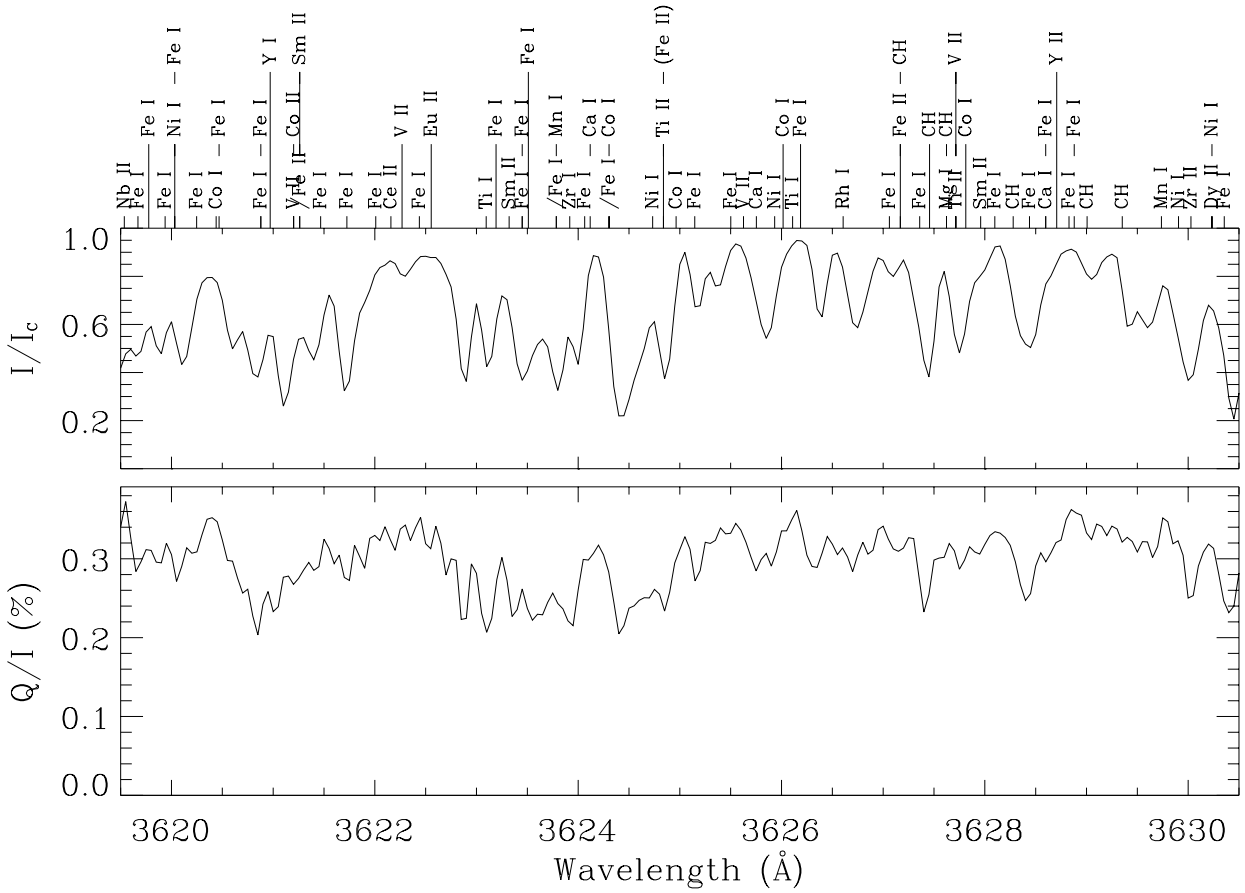

Mn I
Mn I
/Mn I
Fe I
Fe I
Fe I
Ru I
Fe I
Ni I
Fe I
Fe I
Zr II
Sc II
(Fe I)
Cr I
/Fe I
Zr II
Ni I
Fe I
V I
V II
Cr I
Ti II
Fe I
Fe I
Cr I
Cr I
Dy II
Ti I
Fe I
V II
Fe I
Fe I
Cr I
Co I
Fe I
Fe I
/Co I
Fe I
Zr I
Ni I
Fe I
Dy II
Sc II
Fe I
Ni II
Zr II
Ni I
Co I
Ce II
Fe I
Mn I
Co II
Co I
Zr II
Fe I
Cr I
Co I
Co I
Fe I
Fe I
Mn I
Fe I
1.0
0.6
0.2
I/I_c
0.4
0.3
0.2
0.1
0.0
Q/I (%)
3570
3572
3574
3576
3578
3580
Wavelength (Å)

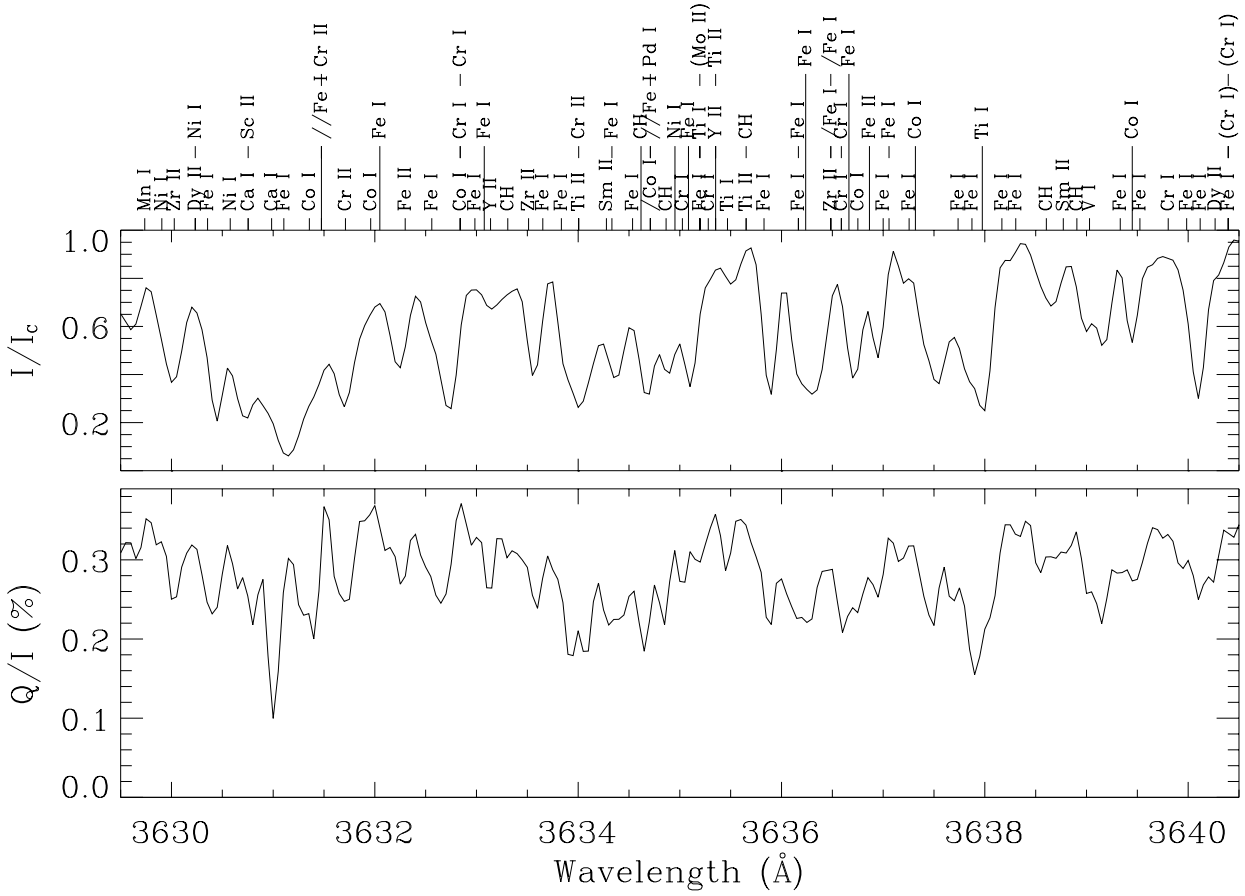

Fe I
Fe I
Mn I
Fe I
Sc II
Fe I
Fe I
Fe I
Fe I
Zr II
Fe I
Fe I
Fe I
Fe I
Fe I
Fe I
/Fe I – V I
Fe I
Fe I
Fe I
Cr I
Fe I
Fe I
Fe I
Fe I
Co I – Fe I
Fe I – Dy II
/Co I – Fe I
Fe I – Cr II
Cr II
Fe I
Co I – Ti I
Ni I
Fe I – (Fe IP
Cr I – Zr I
Fe I
Mn I
Fe I
Fe I
Ti II
/Co I – Fe I
Fe I
Fe I
Fe I
Ni I – (Zr 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
−0.1
Q/I (%)
3580
3582
3584
3586
3588
3590
Wavelength (Å)

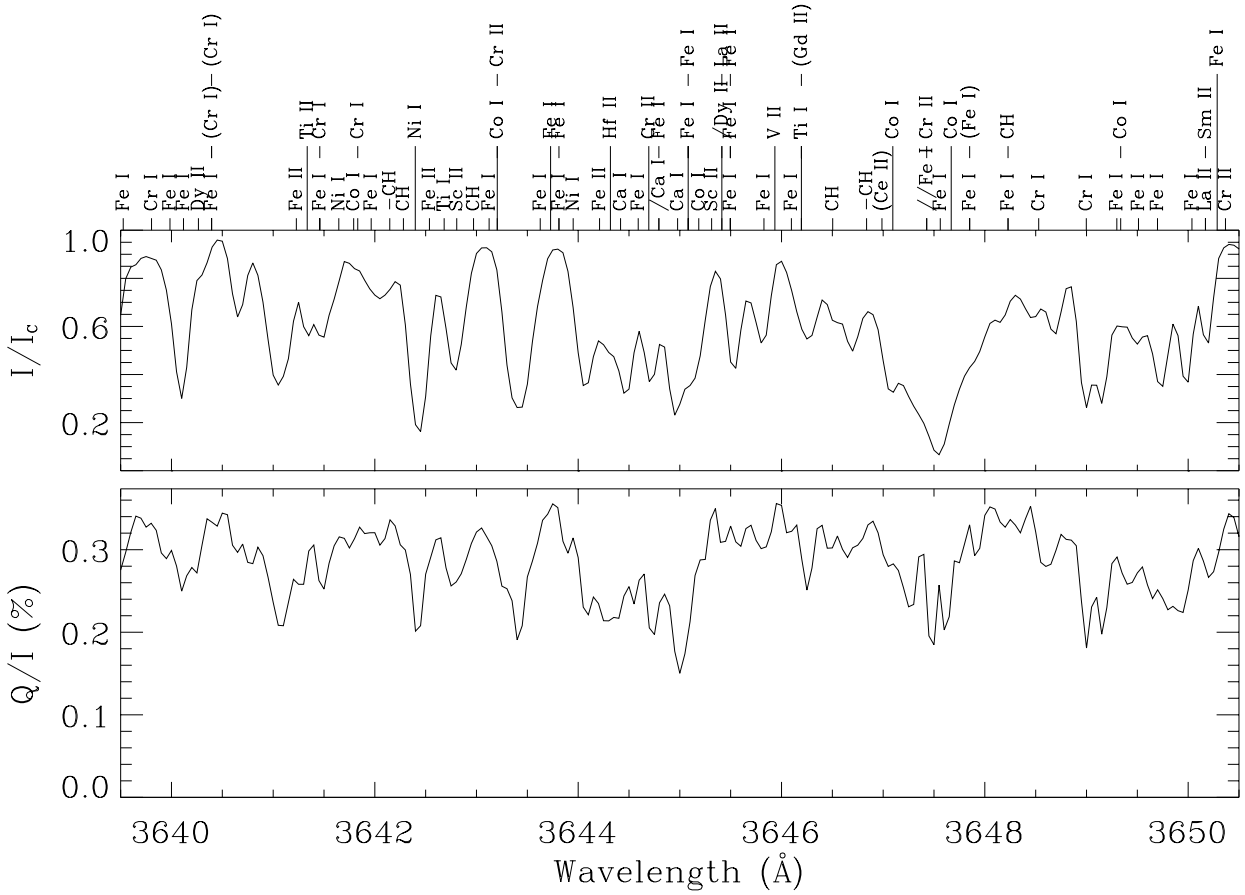

Sc II
V II
Mn I
Fe I
Fe I
Sc II
Fe I
Fe I
Fe I
Ca I
Fe I
Fe I
Co I
V II
Fe I
Fe I
Sm II
Fe I
Fe I
Y I
Ru I
Ti II
V II
Fe I
Cr I
Fe I
Ca I
Fe I
Fe I
Fe I
Co I
Mn I
Fe I
Fe I
Fe I
Fe I
Ti II
Fe I
(Ru I)
Fe I
Co I
Fe I
Fe I
Fe I
Rh I
Fe I
Fe I
Ni I
Ce II
Ti II
Fe I
Fe I
Fe I
Cr I
Ni I
Fe I
Ru I
Fe I
Tb 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 (%)
3590
3592
3594
3596
3598
3600
Wavelength (Å)

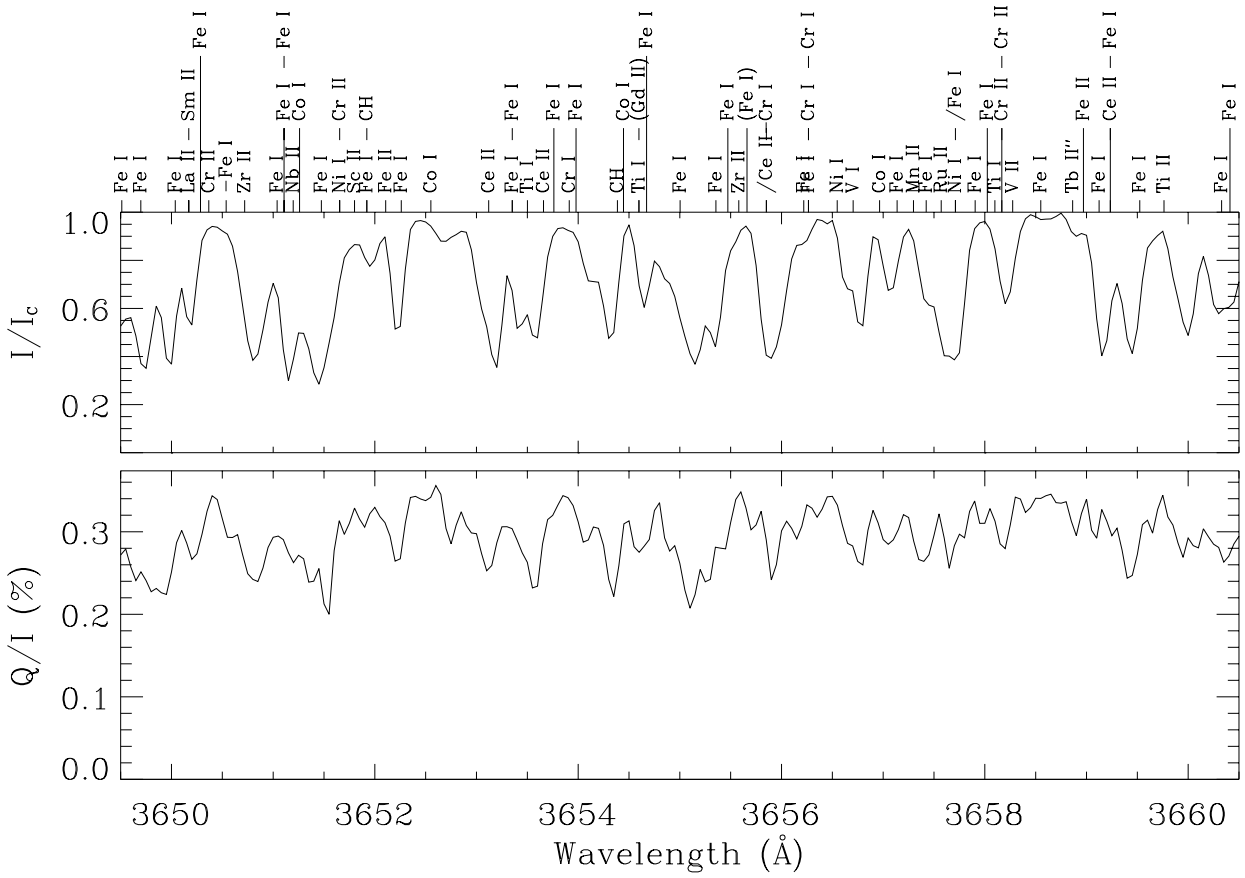

Ni I
Fe I
Ru I
Fe I
Tb II''
Ce II
Y II
Co I
Zr I
Fe I
Cr I
Mn I
Y II
Co I
Fe I
Ni I
Fe I
Cr I
Fe I
Fe I
Fe I
Fe I
Cr II
Fe I
Cr II
Fe I
Fe I
Ti I
(Sm II)
Fe I
Co I
Fe I
Cr I
Co I
Fe I
Cr I
Fe I
Mn I
Fe I
Co II
Dy II
Fe I
Fe I
Fe I
Fe I
Ni I
Ni I
Fe I
Fe I
Zr II
Mn I
Ce II
Ca I''
Fe I
Fe I
Co I
Cr I
Mn I
Ni II
Fe I
Ni I
Fe I
Cr I
Sm II
Ce II
Co I
Fe I
Cr I
Ti I
Mn I
Ni I
1.0
0.6
0.2
I/I_c
0.4
0.3
0.2
0.1
0.0
Q/I (%)
3600
3602
3604
3606
3608
3610
Wavelength (Å)

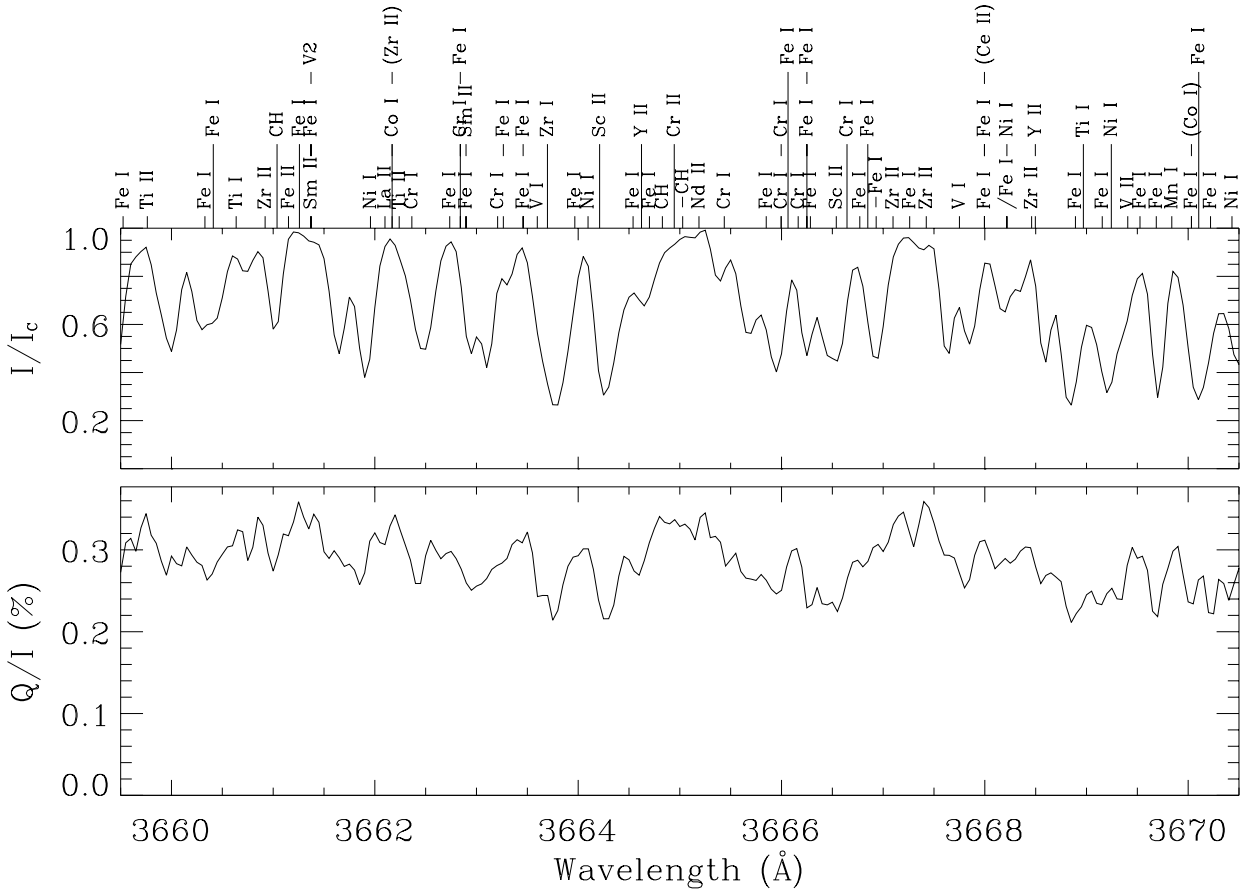

Pd I
Ce II – Co I
Fe I
Cr I
Ti I
/Fe I
Mn I
Ni I
Fe I
Fe I
Y II
Fe I
Ni I
Co I
Zr II
Fe I
Ti I
Fe I
Cr I
Ni I
Fe I – Fe I
Zr II
Cr II
Fe I
Fe I – Ce II
Sc II
Fe I
Ti I
Fe I
Fe I
Fe I
Zr II
Fe II
Fe I
Fe I
Co I
Fe I – //Fe I
Cr I
Fe I
Fe I
Fe I
Fe I
Fe I
Fe I
Fe I
Fe I
W I
Fe I
Fe I
Fe I
Fe I
Fe I
Fe I
V II – Fe I
Mn I
Ni I
Nb II
Fe I
Fe I
Ni I – Fe I
Fe I
Co I – Fe I
1.0
0.6
0.2
I/I_c
0.4
0.3
0.2
0.1
0.0
Q/I (%)
3610
3612
3614
3616
3618
3620
Wavelength (Å)

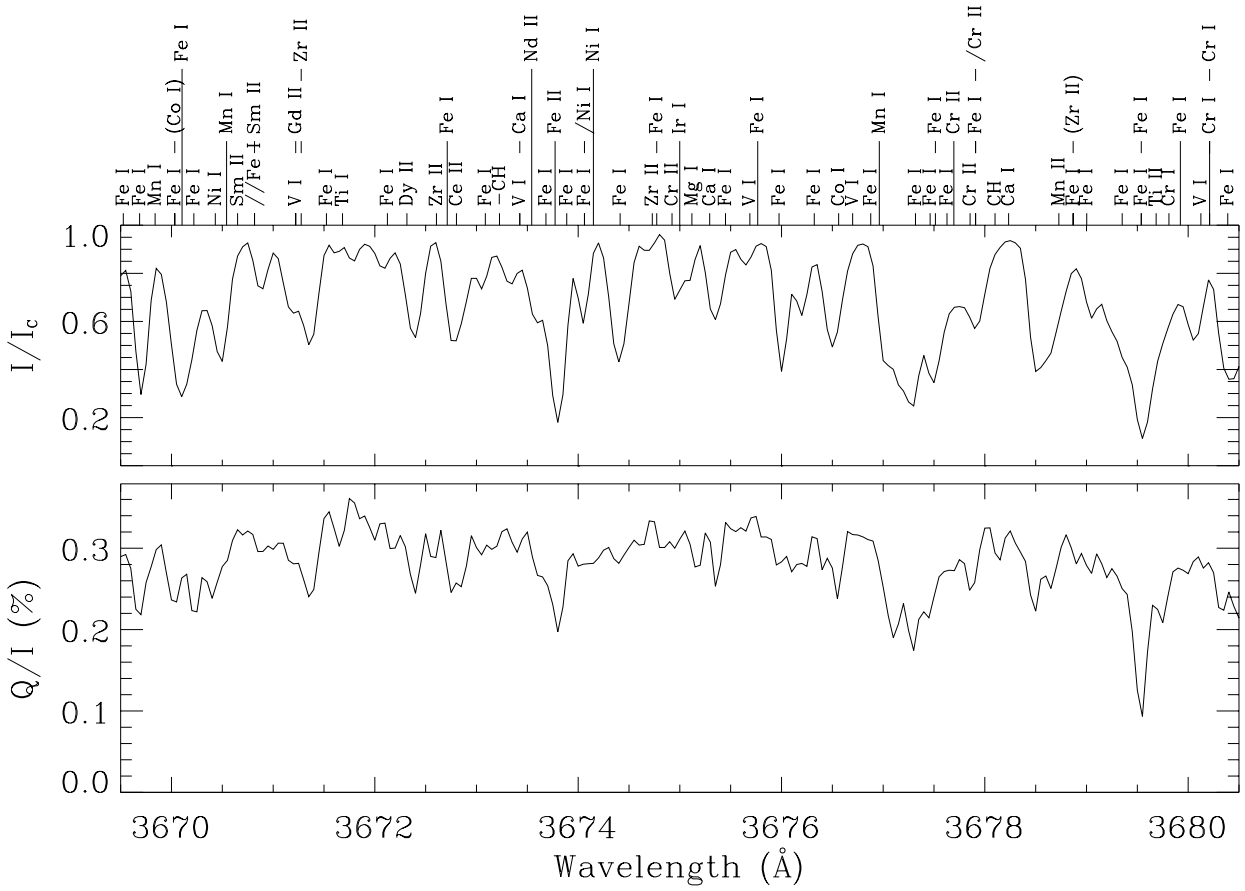

Nb II
Fe I
Fe I
Fe I
Ni I
Fe I
Fe I
Co I
Fe I
Fe I
Fe I
Y I
Y II
Co II
Sm II
Fe I
Fe I
Fe I
Fe I
Ce II
V II
Fe I
Eu II
Ti I
Fe I
Sm II
Fe I
Fe I
Fe I
Mn I
Zr I
Fe I
Ca I
Fe I
Co I
Ni I
Ti II
(Fe II)
Co I
Fe I
Fe I
Ca I
Ni I
Co I
Ti I
Fe I
Rh I
Fe I
Fe II
CH
Fe I
CH
Mg I
CH
Ti II
V II
Co I
Sm II
Fe I
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
0.3
0.2
0.1
0.0
Q/I (%)
3620
3622
3624
3626
3628
3630
Wavelength (Å)

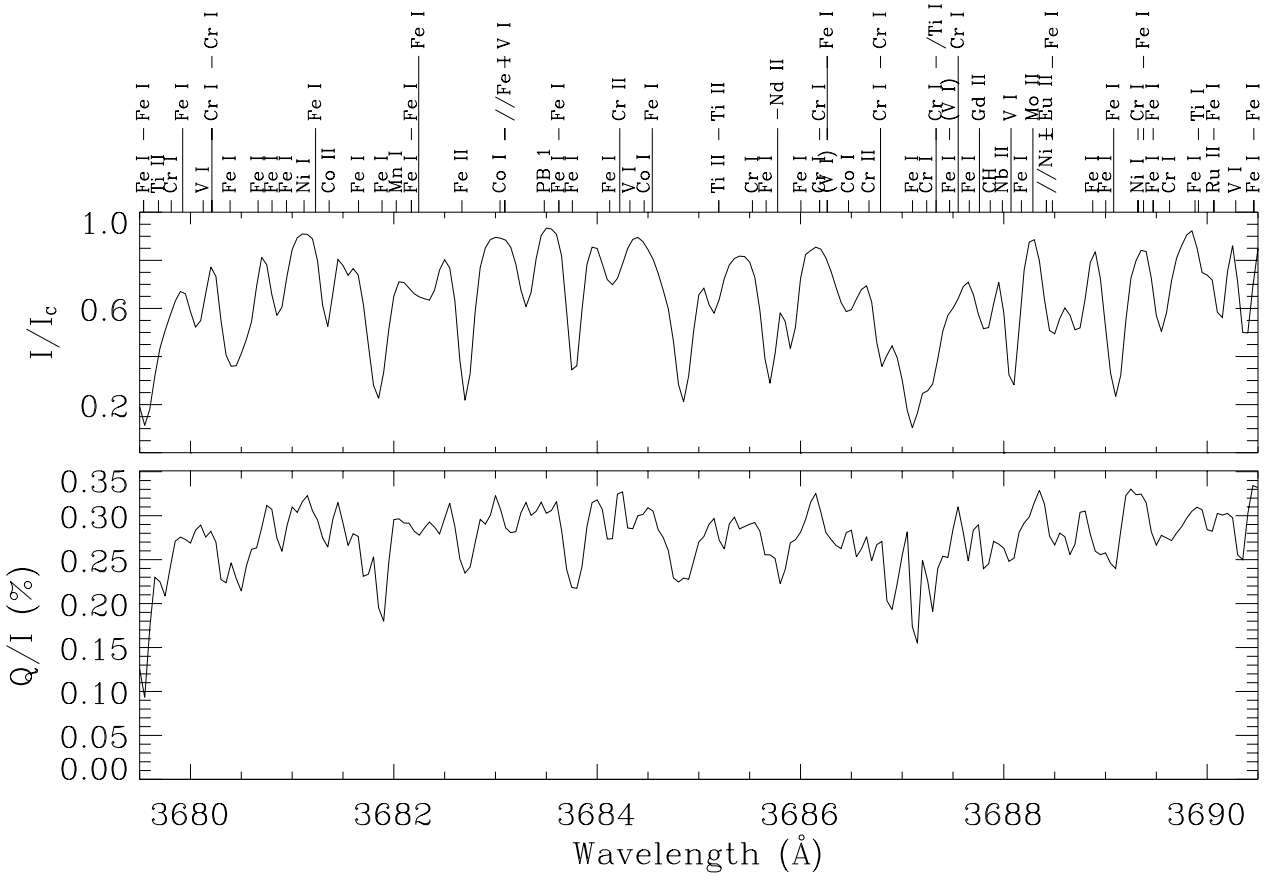

Mn I
Ni I
Zr II
Dy II – Ni I
Fe I
Ni I
Ca I – Sc II
Ca I
Fe I
Co I
//Fe I + Cr II
Cr II
Co I
Fe I
Fe II
Fe I
Co I – Cr I – Cr I
Fe I
Y II
CH
Zr II
Fe I
Fe I
Ti II – Cr II
Sm II
Fe I
Fe I
/Co I
CH
Cr I
Fe I + Pd I
Ni I
Fe I
Cr I
Y II
– (Mo II)
Ti II
Ti I
Ti II – CH
Fe I
Fe I – Fe I
Fe I
Zr II
Cr I
Co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

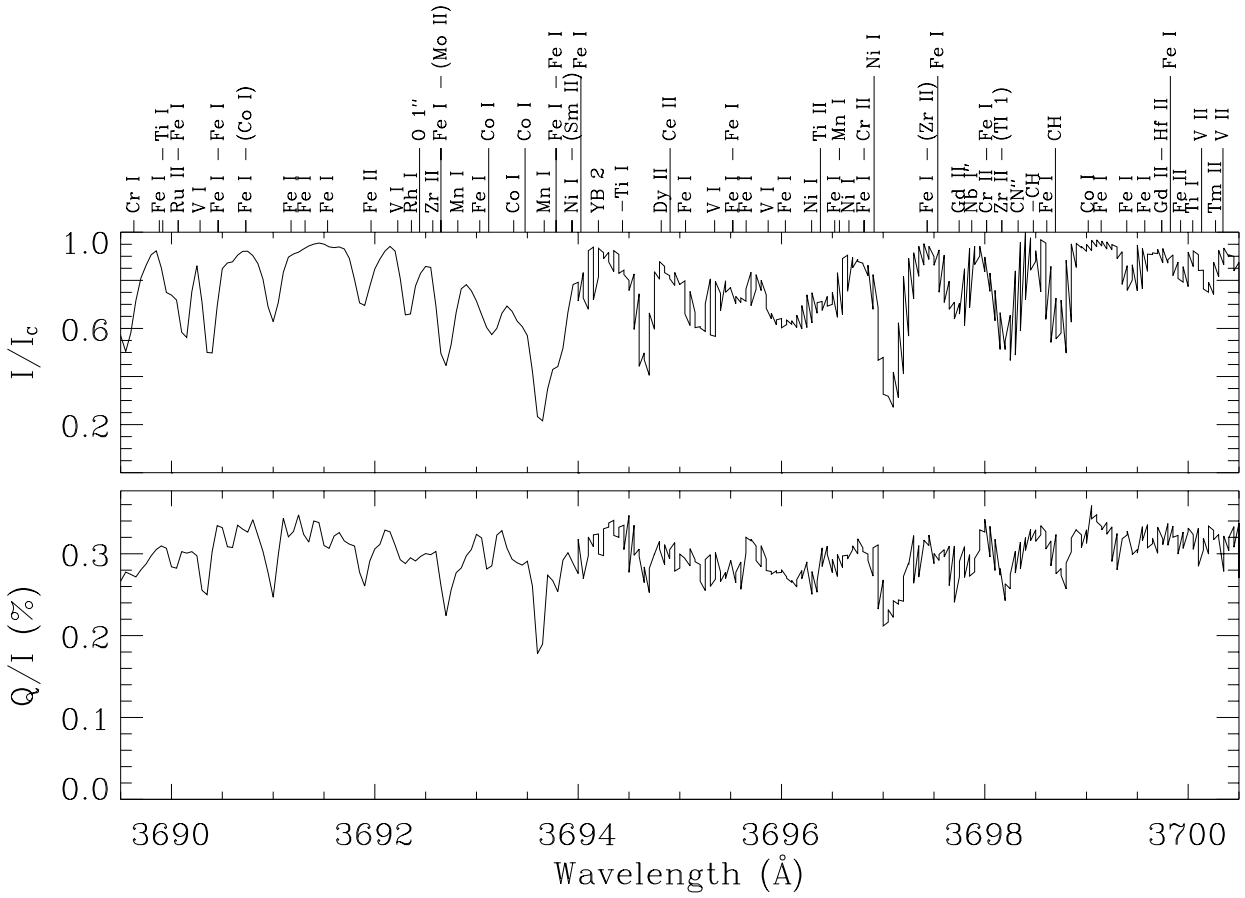

Fe I
Cr I
Fe I
Fe I
Dy II
Fe I
(Cr I)
(Cr I)
Fe II
Ti II
Cr I
Fe I
Ni I
Co I
Cr I
Fe I
CH
CH
Ni I
Fe II
Ti I
Sc II
CH
Fe I
Co I
Cr II
Fe I
Fe I
Fe I
Ni I
Fe II
Hf II
Ca I
Fe I
Cr II
Fe I
Ca I
Fe I
Ca I
Co I
Sc II
Fe I
Dy II
Fe I
Fe I
V II
Fe I
Ti I
(Gd II)
CH
CH
(Ce II)
Co I
Fe I
Cr II
Fe I
Co I
(Fe 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
0.3
0.2
0.1
0.0
Q/I (%)
3640
3642
3644
3646
3648
3650
Wavelength (Å)

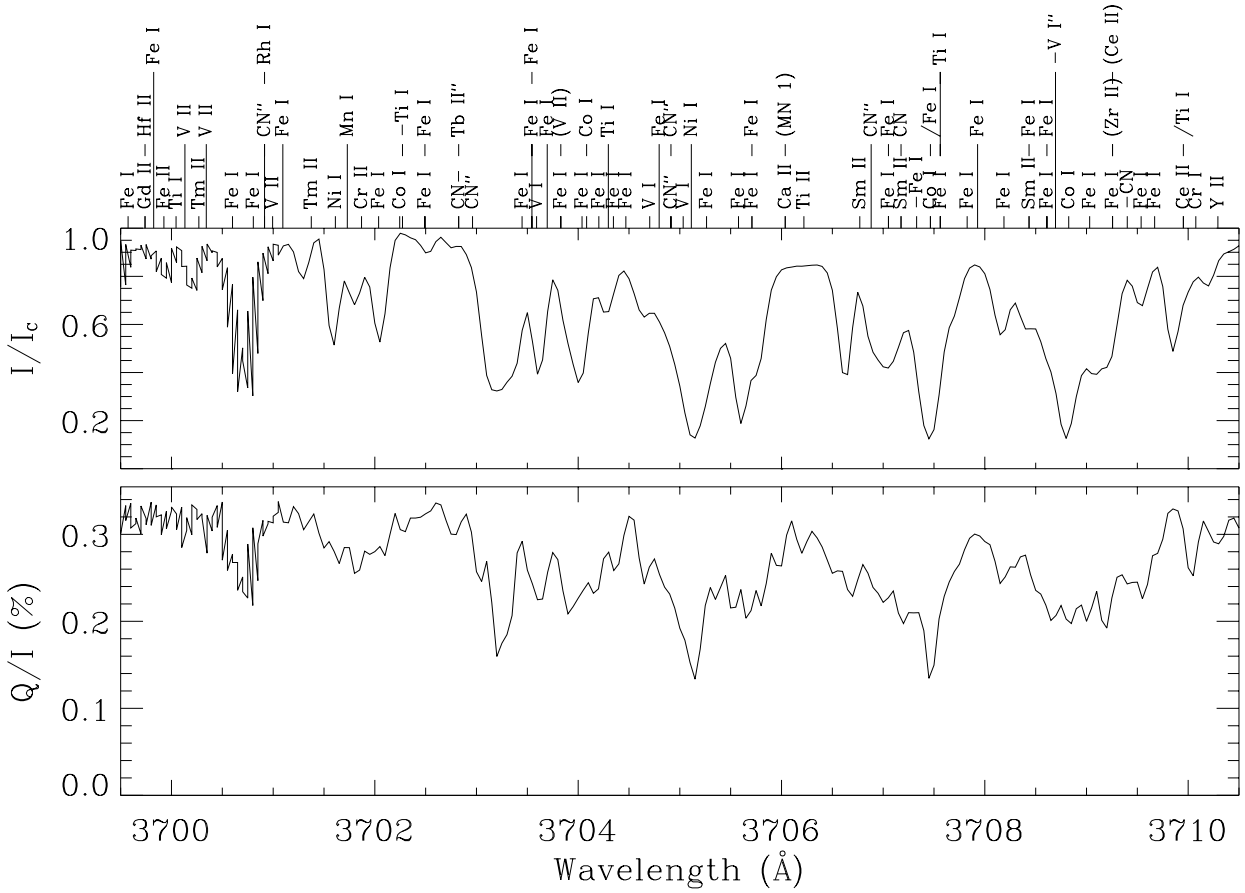

Fe I
Fe I
Fe I
La II – Sm II
Fe I
Cr II
–Fe I
Zr II
Fe I
Fe I – Fe I
Nb II
Co I
Fe I – Cr II
Ni I
Sc II
Fe I – CH
Fe II
Fe I
Co I
Ce II
Fe I – Fe I
Ti I
Ce II
Fe I
Cr I
Fe I
CH
Co I
Ti I – (Gd II)
Fe I
Fe I
Fe I
Zr II
(Fe I)
/Ce II
Cr I
Fe I – Cr I – Cr I
Ni I
V I
Co I
Fe I
Mn II
Fe I
Ru II
Ni I – /Fe 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$_c$
0.3
0.2
0.1
0.0
Q/I (%)
3650
3652
3654
3656
3658
3660
Wavelength (Å)

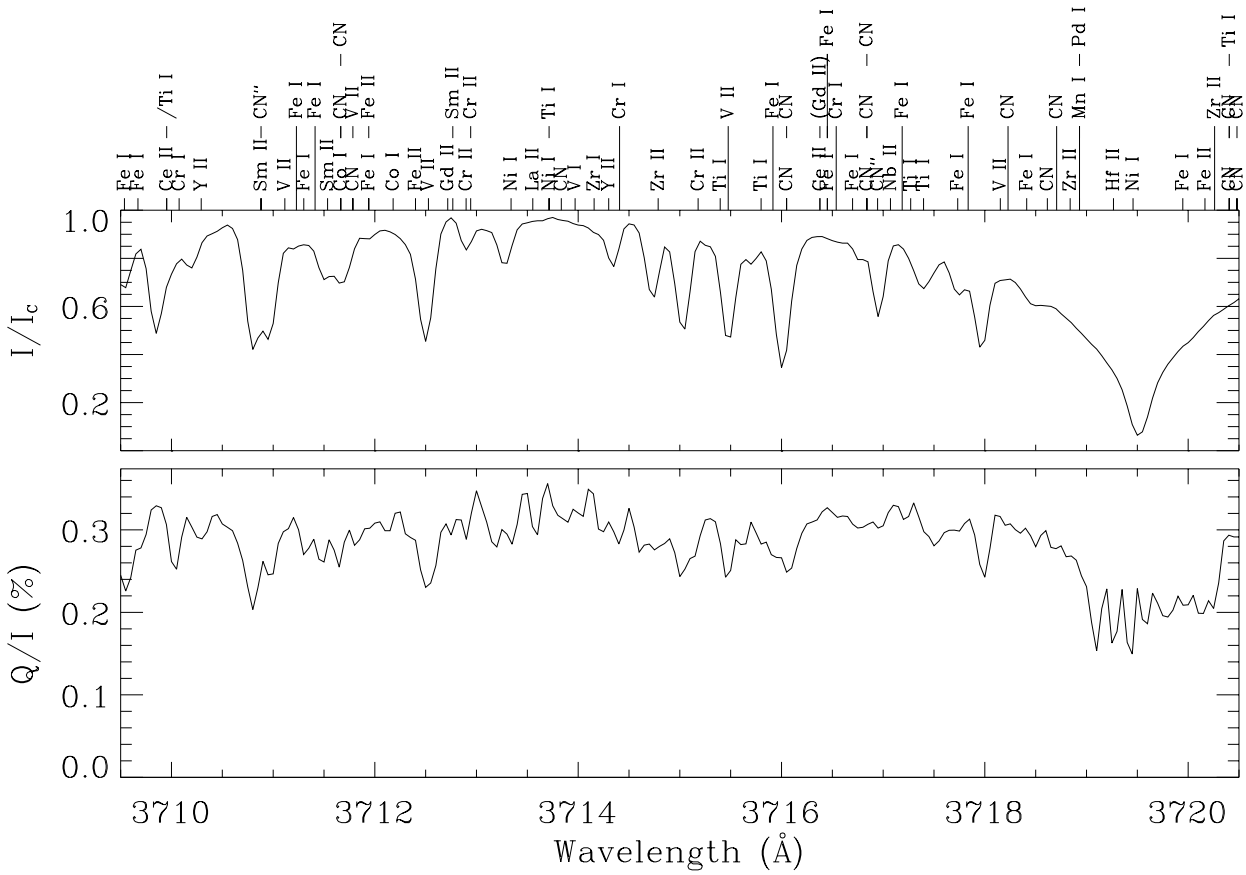

Fe I
Ti II
Fe I
Fe I
Ti I
Zr II
CH
Fe II
Sm II
Fe I
V2
Ni I
Co I
(Zr II)
Fe I
Cr I
Fe I
Fe I
Cr I
Fe I
Fe I
V I
Zr I
Fe I
Ni I
Sc II
Fe I
Y II
Fe I
CH
Cr II
CH
Nd II
Cr I
Fe I
Cr I
Cr I
Fe I
Fe I
Fe I
Sc II
Cr I
Fe I
Fe I
Zr II
Fe I
Zr II
V I
Fe I
Fe I
(Ce II)
Ni I
Zr II
Y II
Fe I
Ti I
Fe I
Ni I
Y II
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
0.3
0.2
0.1
0.0
Q/I (%)
3660
3662
3664
3666
3668
3670
Wavelength (Å)

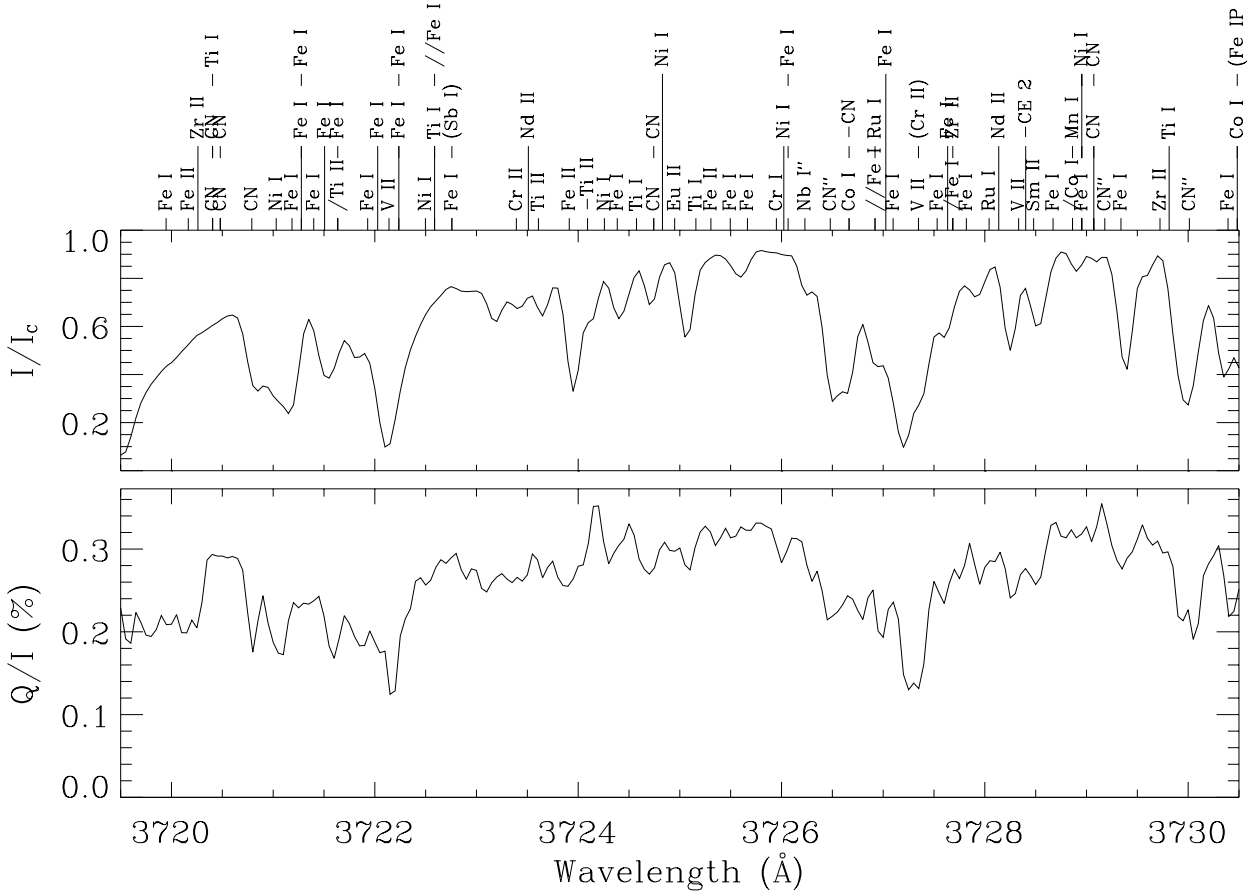

Fe I
Fe I
Mn I
Fe I – (Co I)
Fe I
Fe I
Ni I
Mn I
Sm II
//Fe I Sm II
V I
= Gd II – Zr II
Fe I
Ti I
Fe I
Dy II
Zr II
Ce II
Fe I
Fe I
–CH
V I
– Ca I
Nd II
Fe I
Fe II
Fe I
Fe I
– /Ni I
Ni I
Fe I
Zr II – Fe I
Cr II
Ir I
Mg I
Ca I
Fe I
V I
Fe I
Fe I
Fe I
Co I
V I
Fe I
Mn I
Fe I
Fe I
– Fe I
Fe I
Cr II
Cr II – Fe I – /Cr II
CH
Ca I
Mn II
Fe I
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 (%)
0.3
0.2
0.1
0.0
3670
3672
3674
3676
3678
3680
Wavelength (Å)

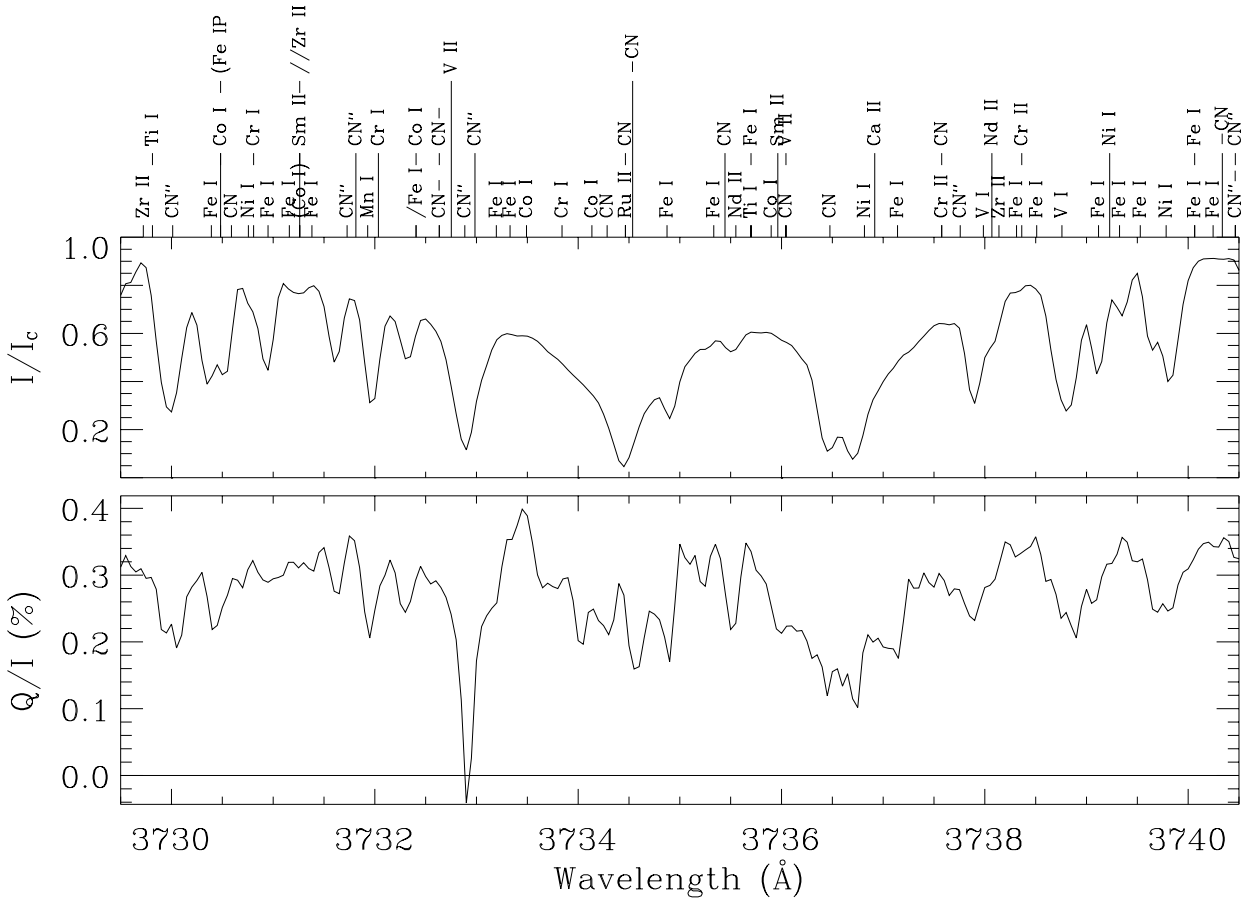

Fe I – Fe I
Ti II
Cr I
Fe I
V I
Cr I – Cr I
Fe I
Fe I
Fe I
Fe I
Ni I
Fe I
Co II
Fe I
Fe I
Mn I
Fe I – Fe I
Fe I
Fe II
Co I – //Fe I + V I
PB 1
Fe I – Fe I
Fe I
Cr II
V I
Co I
Fe I
Ti II – Ti II
Cr I
Fe I
–Nd II
Fe I
(V I)
Co I
Cr II
–Cr I – Fe I
Cr I – Cr I
Fe I
Cr I – /Ti I
(V I) – Cr I
Fe I
Gd II
CH
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 – Fe I
I/I$_c$
1.0
0.6
0.2
Q/I (%)
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
3680
3682
3684
3686
3688
3690
Wavelength (Å)

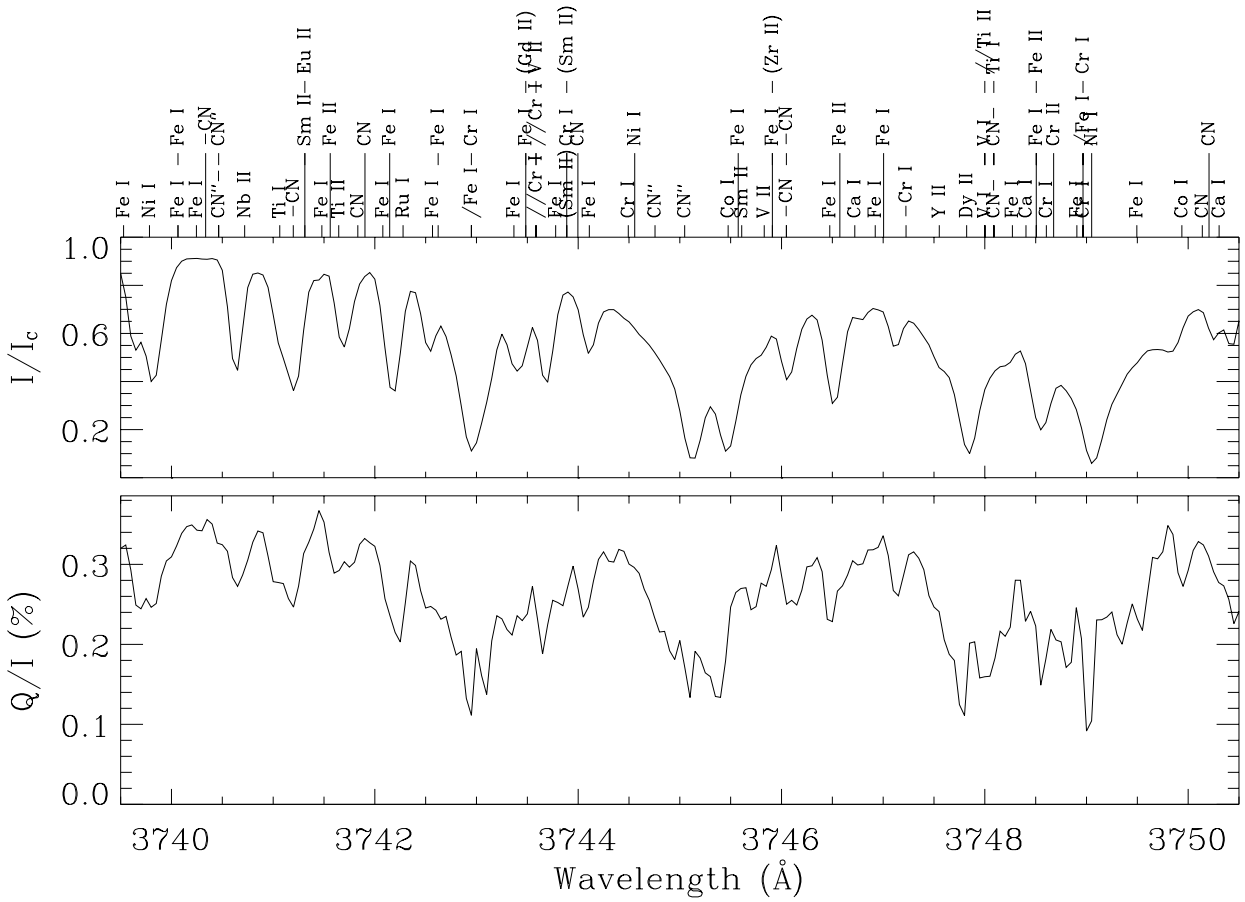

Cr I
Fe I – Ti I
Ru II – Fe I
V I
Fe I – Fe I
Fe I – (Co I)
Fe I
Fe I
Fe I
Fe II
V I
Rh I
O 1''
Zr II – Fe I – (Mo II)
Mn I
Fe I
Co I
Co I
Co I
Mn I
Fe I – Fe I
Ni I – (Sm II)
Fe I
YB 2
Ti I
Dy II
Ce II
Fe I
V I
Fe I – Fe I
Fe I
V I
Fe I
Ni I
Ti II
Fe I – Mn I
Ni I
Fe I – Cr II
Ni I
Fe I – (Zr II)
Fe I
Gd II
Nb I
Cr II – Fe I
Zr II – (Ti 1)
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$_c$
0.3
0.2
0.1
0.0
Q/I (%)
3690
3692
3694
3696
3698
3700
Wavelength (Å)

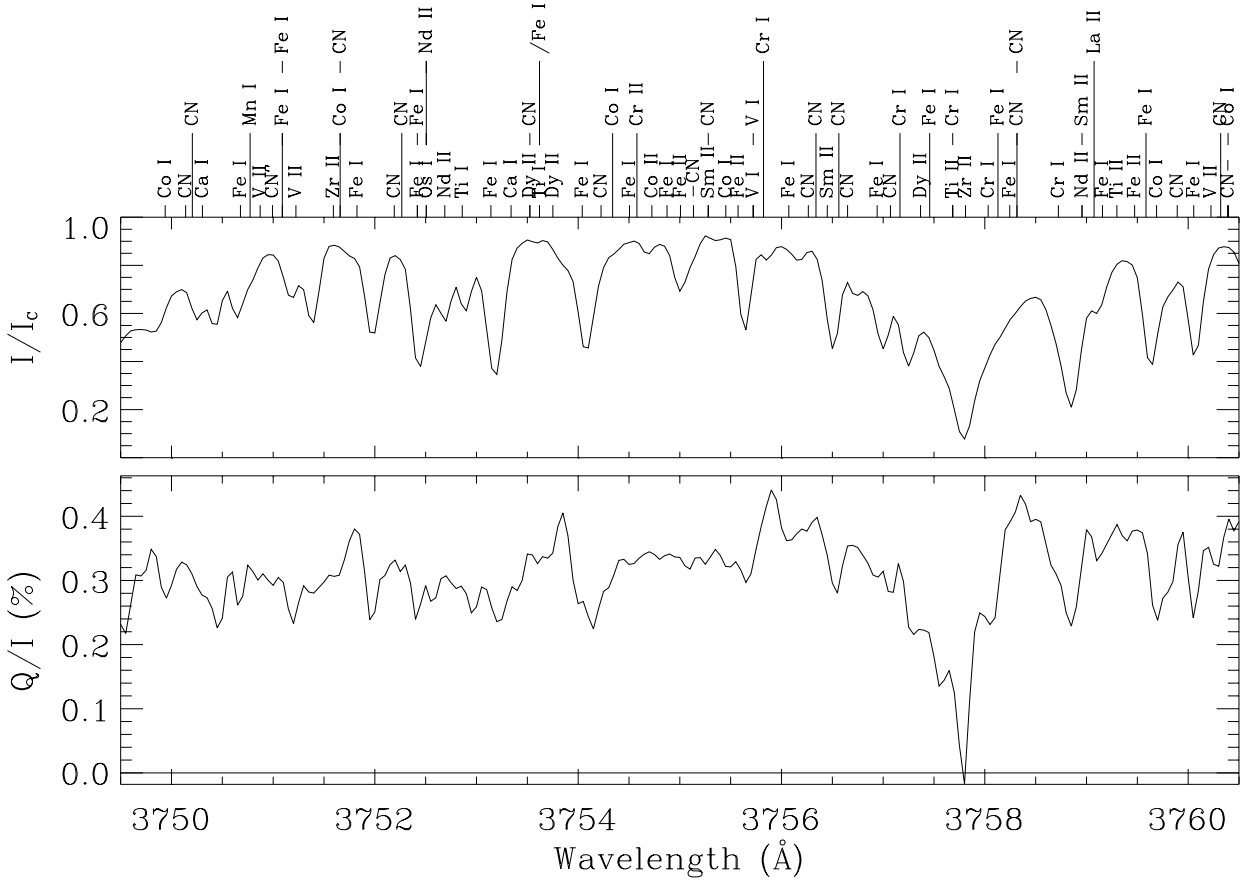

Fe I
Gd II
Hf II
Fe I
Fe II
Ti I
V II
Tm II
V II
Fe I
Fe I
CN''
Rh I
V II
Fe I
Tm II
Ni I
Mn I
Cr II
Fe I
Co I
Ti I
Fe I
Tb II''
CN''
CN''
Fe I
Fe I
V I
Fe I
(V II)
Fe I
Co I
Fe I
Ti I
Fe I
Fe I
V I
Fe I
CN''
V I
Ni I
Fe I
Fe I
Fe I
Ca II
(MN 1)
Ti II
Sm II
CN''
Fe I
Sm II
CN
Fe I
Co I
Fe I
Ti I
Fe I
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)

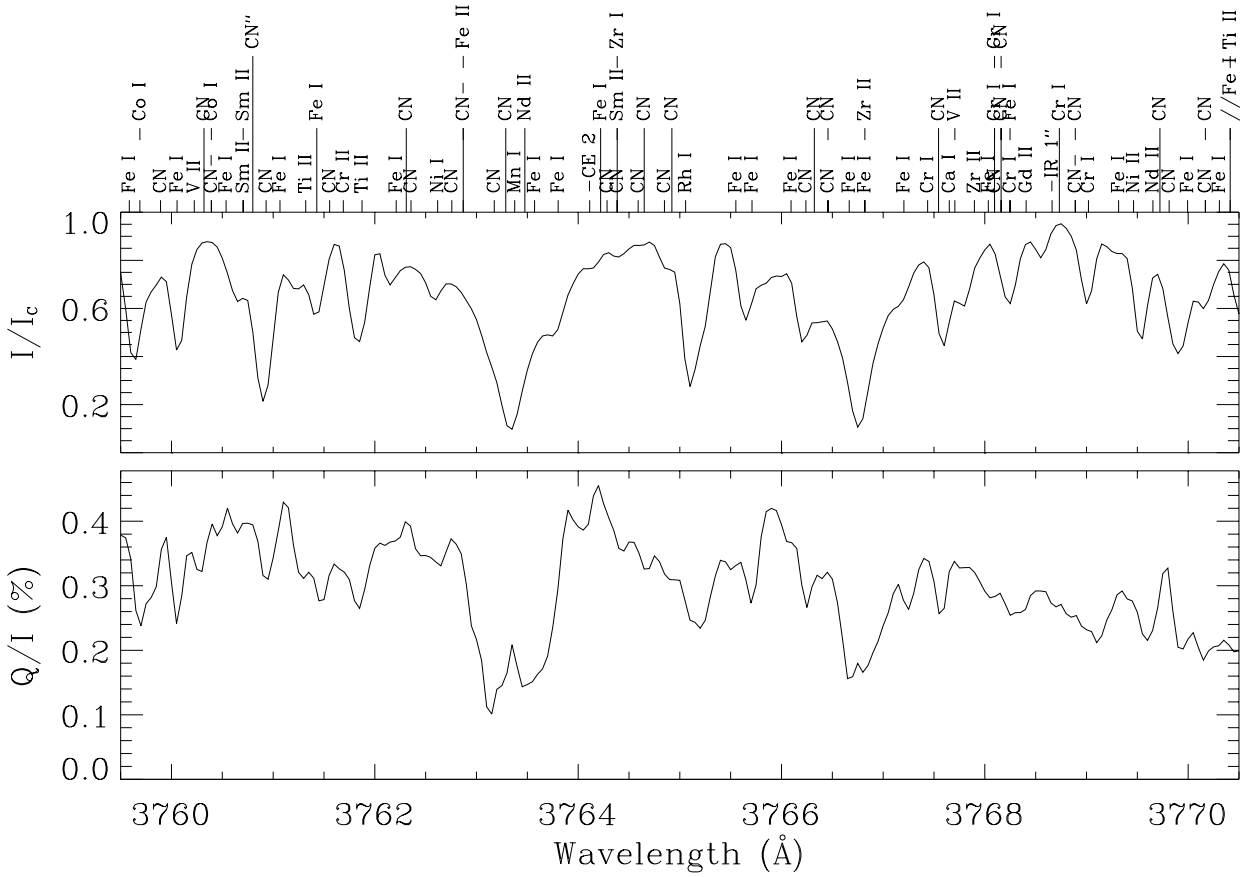

Fe I
Fe I
Ce II – /Ti I
Cr I
Y II
Sm II– CN"
V II
Fe I
Fe I
Sm II
CN – CN
Fe I – Fe II
Co I
Fe II
V II
Gd II – Sm II
Cr II – Cr II
Ni I
La II
Ni I – Ti I
CN I
Zr I
Y II
Cr I
Zr II
Cr II
Ti I
V II
Ti I
Fe I
CN
CN – CN
Fe I
Fe I – (Gd II)
Cr I
Fe I
CN – CN
CN
Nb II
Fe I
Ti I
Ti I
Fe I
Fe I
V II
CN
Fe I
CN
CN
Zr II
Mn I – Pd I
Hf II
Ni I
Fe I
Fe II
Zr II
CN – Ti I
CN
CN
I/I$_c$
1.0
0.6
0.2
Q/I (%)
0.3
0.2
0.1
0.0
3710
3712
3714
3716
3718
3720
Wavelength (Å)

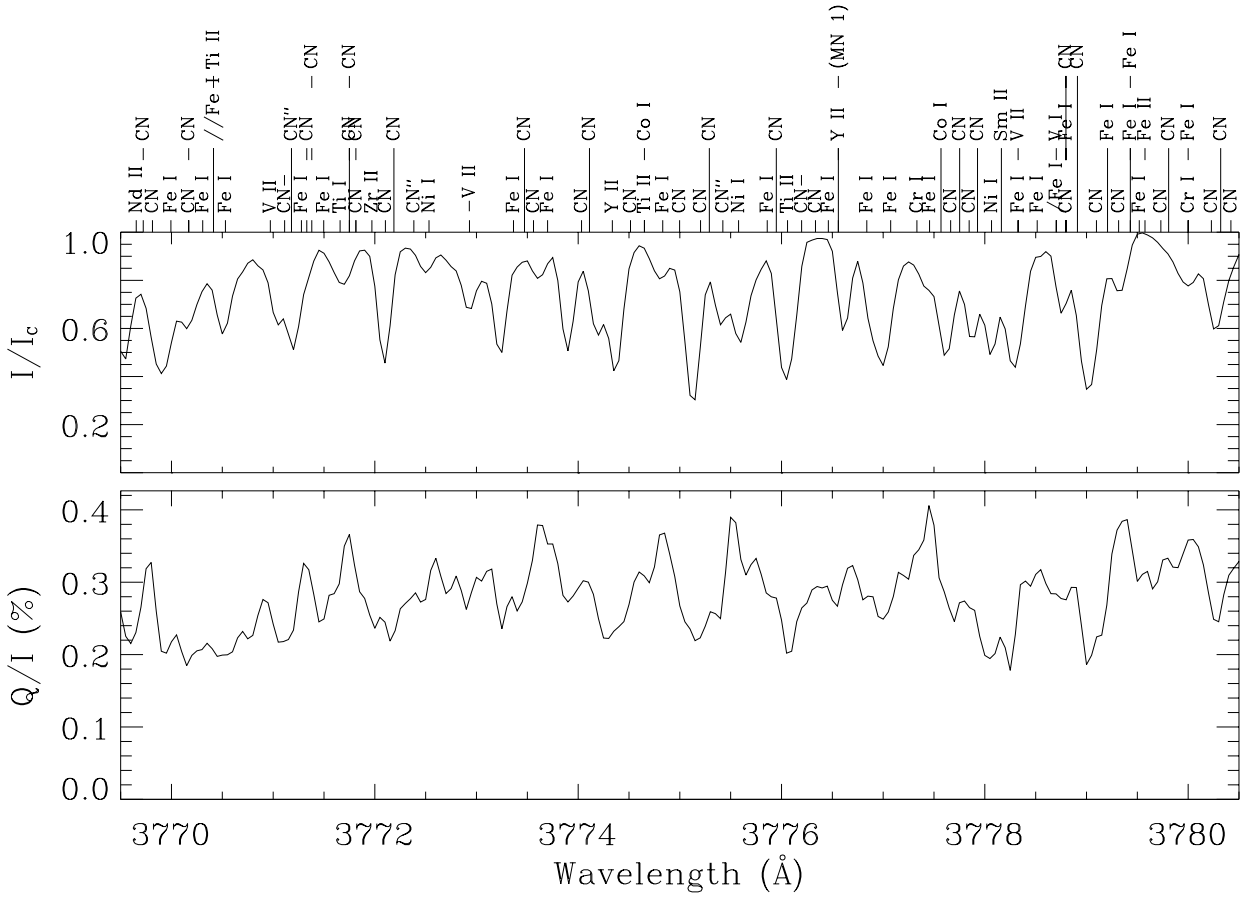

Fe I
Fe II
Zr II
Ti I
CN
CN
CN
Ni I
Fe I
Fe I
Fe I
Fe I
/Ti II
Fe I
Fe I
Fe I
V II
Fe I
Ni I
Ti I
//Fe I
Fe I
(Sb I)
Cr II
Nd II
Ti II
Fe II
Ti II
Ni I
Fe I
Ti I
CN
CN
Ni I
Eu II
Ti I
Fe II
Fe I
Fe I
Cr I
Ni I
Fe I
Nb I''
CN''
Co I
CN
CN
//Fe I
Ru I
Fe I
Fe I
V II
(Cr II)
Fe I
Fe I
Fe I
Ru I
Nd II
V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

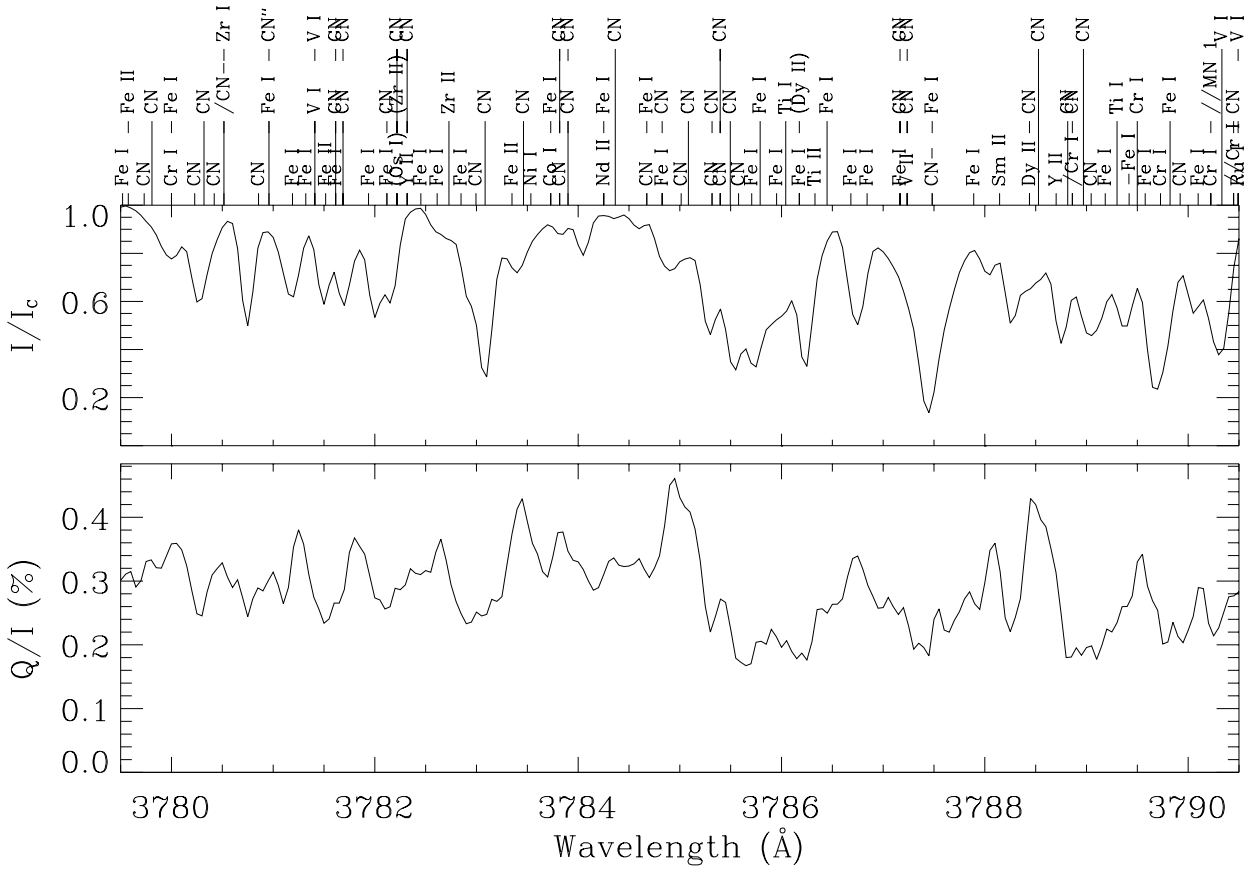

Zr II
Ti I
CN''
Fe I
Co I
(Fe IP
CN
Ni I
Cr I
Fe I
Sm II
//Zr II
Fe I
CN''
Mn I
Cr I
/Fe I
Co I
CN
CN
V II
CN''
Fe I
Co I
Cr I
Co I
CN
Ru II
CN
CN
Fe I
Fe I
CN
Nd II
Ti I
Fe I
Co I
Sm II
CN
V II
CN
Ni I
Ca II
Fe I
Cr II
CN
CN''
V I
Nd II
Zr II
Fe I
Cr II
Fe I
V I
Fe I
Ni I
Fe I
Fe I
Ni I
Fe I
Fe I
CN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

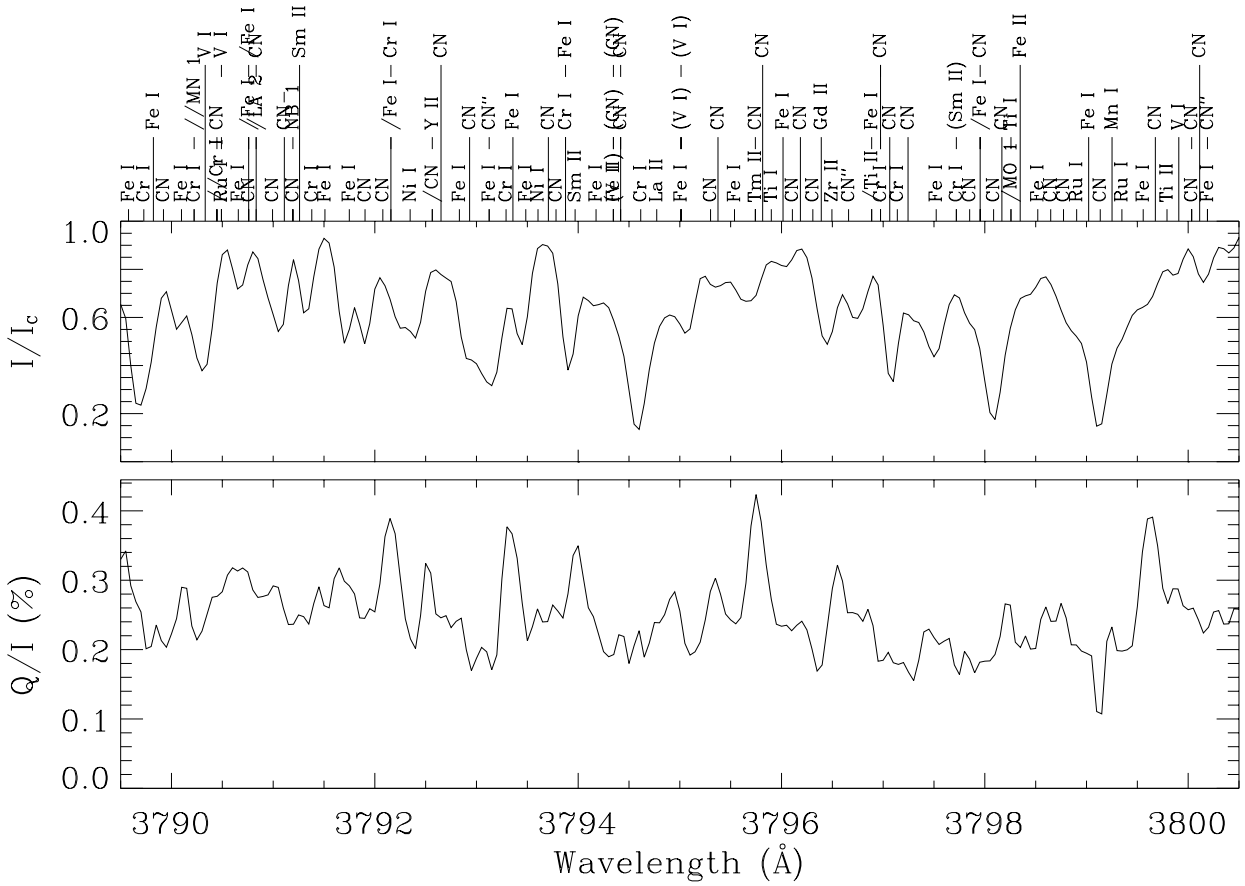

Fe I
Ni I
Fe I
Fe I
CN
CN
Nb II
Ti I
CN
Sm II
Eu II
Fe I
Fe II
Ti II
CN
Fe I
Fe I
Ru I
Fe I
Fe I
Cr I
Fe I
Fe I
Cr I
Gd II
Fe I
Sm II
Sm II
Fe I
CN
Cr I
Ni I
CN
CN
Co I
Fe I
Sm II
V II
Fe I
Zr II
CN
CN
Fe I
Fe II
Ca I
Fe I
Fe I
Cr I
Y II
Dy II
V I
CN
Ti I
Ti II
Fe I
Ca I
Fe I
Fe II
Cr I
Cr II
Fe I
Ni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

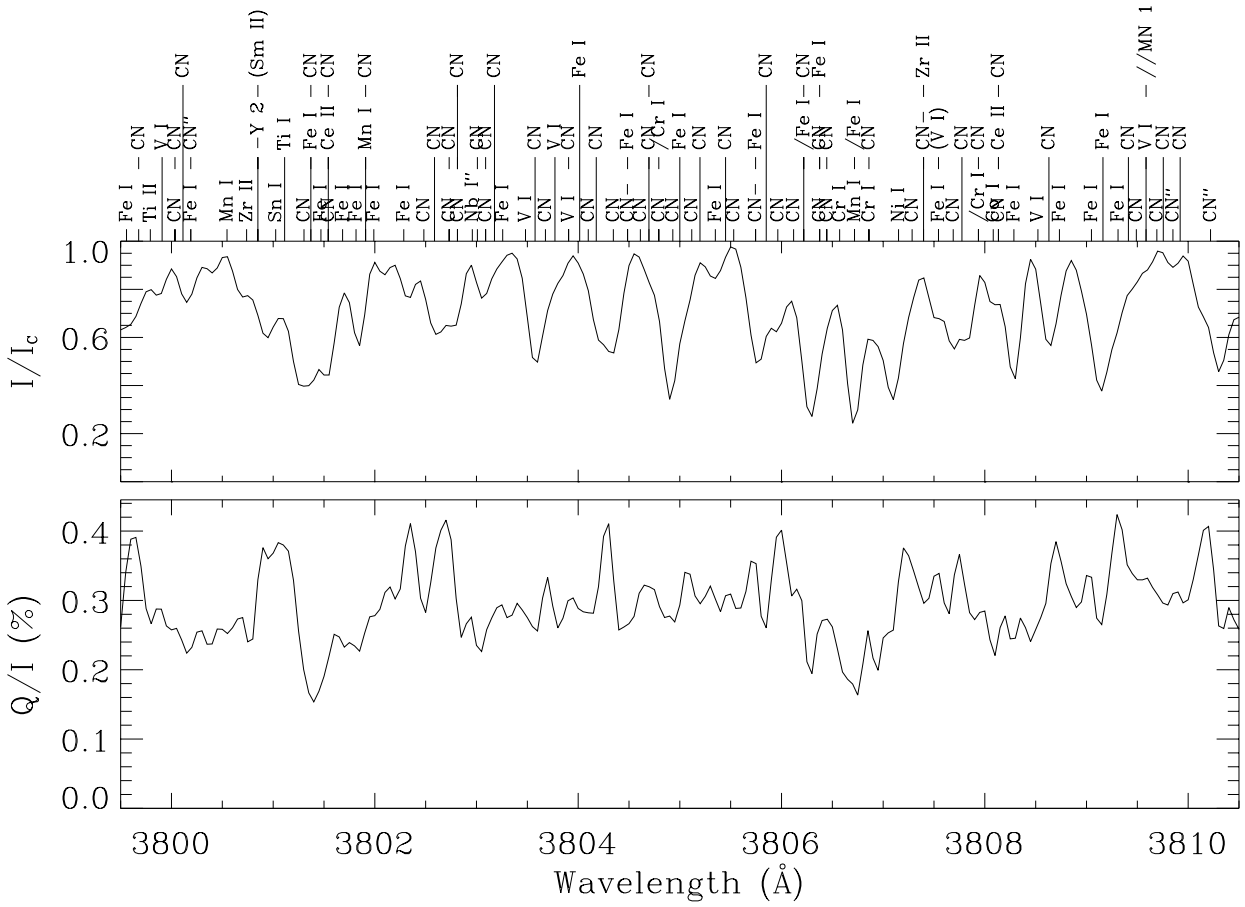

Co I
CN
Ca I
CN
Fe I
Mn I
V II
CN
V II
Fe I
Fe I
Zr II
Co I
CN
Fe I
CN
Fe I
Os I
Nd II
Ti I
Fe I
Ca I
Dy II
CN
Dy II
Fe I
CN
Co I
Fe I
Cr II
Co II
Fe I
Fe I
CN
Sm II
CN
Co I
Fe I
V I
V I
Cr I
Fe I
CN
Sm II
CN
CN
Fe I
CN
Cr I
Dy II
Fe I
Ti II
Cr I
Zr II
Cr I
Fe I
Fe I
CN
Cr I
Nd II
Sm II
La II
Fe I
Ti II
Fe II
Fe I
Co I
CN
Fe I
V II
CN
CN
Co I
1.0
0.6
0.2
I/I_c
0.4
0.3
0.2
0.1
0.0
Q/I (%)
3750
3752
3754
3756
3758
3760
Wavelength (Å)

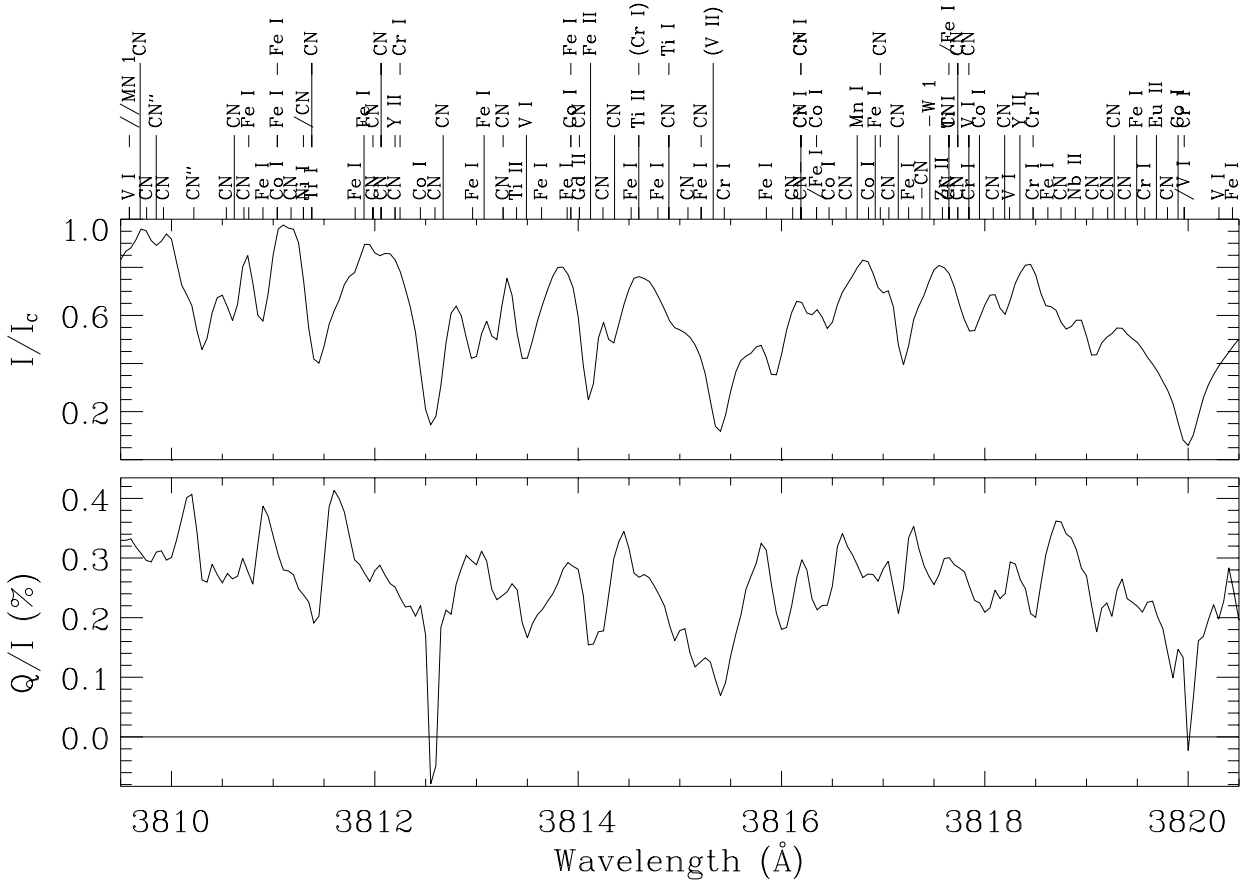

Fe I
Co I
CN
Fe I
V II
CN
Co I
CN
Fe I
Sm II
Sm II
CN''
CN
Fe I
Ti II
Fe I
CN
Cr II
Ti II
Fe I
CN
Ni I
CN
CN
Fe II
CN
CN
Mn I
Nd II
Fe I
Fe I
CE 2
Fe I
CN
Sm II
Zr I
CN
CN
CN
Rh I
Fe I
Fe I
Fe I
CN
CN
CN
Fe I
Zr II
Fe I
Cr I
CN
Ca I
V II
Zr II
Fe I
Cr I
Gd II
IR 1''
Cr I
CN
CN
Cr I
Fe I
Ni II
Nd II
CN
CN
Fe I
CN
Fe I
//Fe + Ti II
1.0
0.6
0.2
I/I_c
0.4
0.3
0.2
0.1
0.0
Q/I (%)
3760
3762
3764
3766
3768
3770
Wavelength (Å)

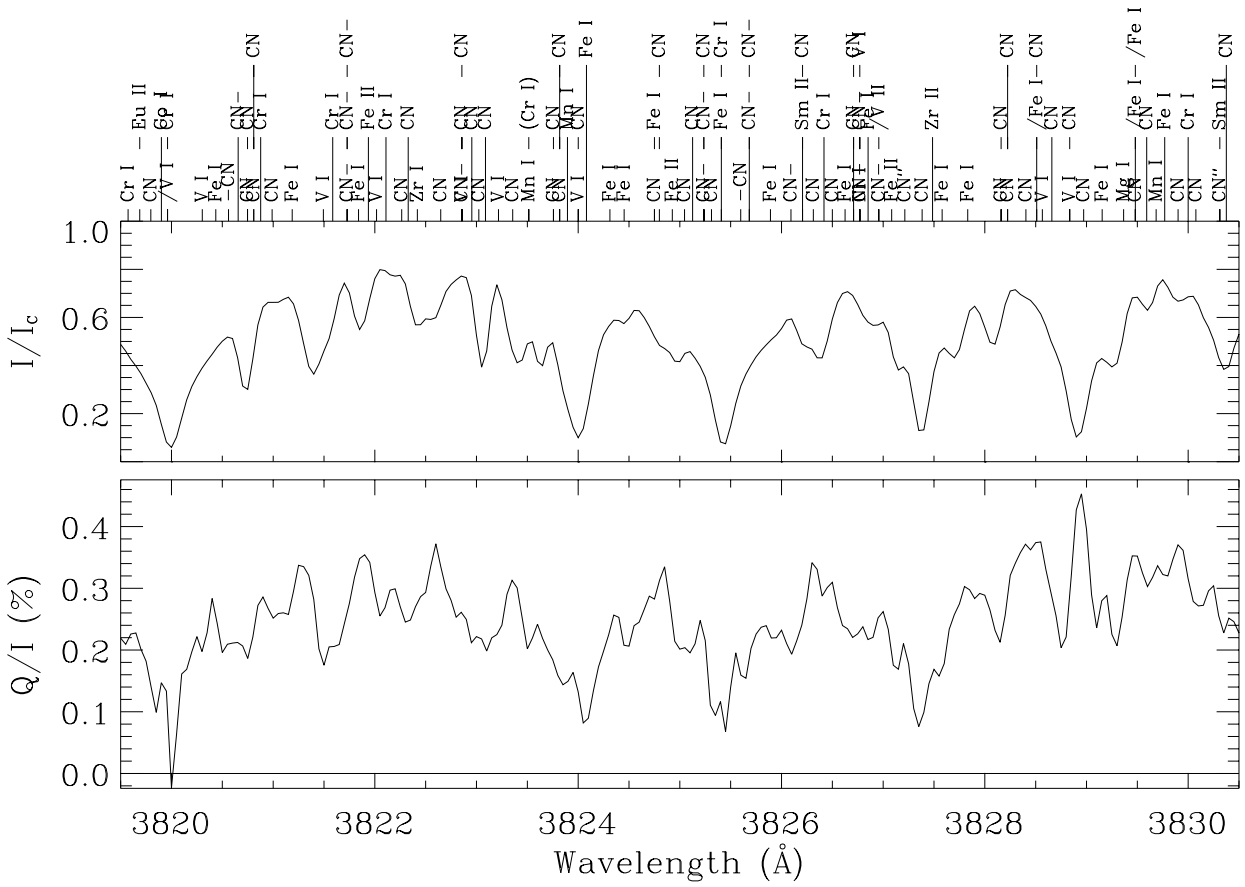

Nd II
CN
Fe I
CN
Fe I
Fe I
Fe I
Ti II
V II
CN
Fe I
Ti I
CN
Zr II
CN
CN
CN
Ni I
V II
Fe I
CN
Fe I
CN
CN
Y II
CN
Ti II
Co I
Fe I
CN
CN
CN
Ni I
Fe I
Ti II
CN
CN
Fe I
Y II
(MN 1)
Fe I
Fe I
Cr I
Fe I
Co I
CN
CN
CN
Sm II
V II
Ni I
Fe I
Fe I
Y I
Fe I
CN
CN
Fe I
CN
CN
Fe I
Fe II
CN
Cr I
Fe I
CN
CN
I/I_c
Q/I (%)
Wavelength (Å)

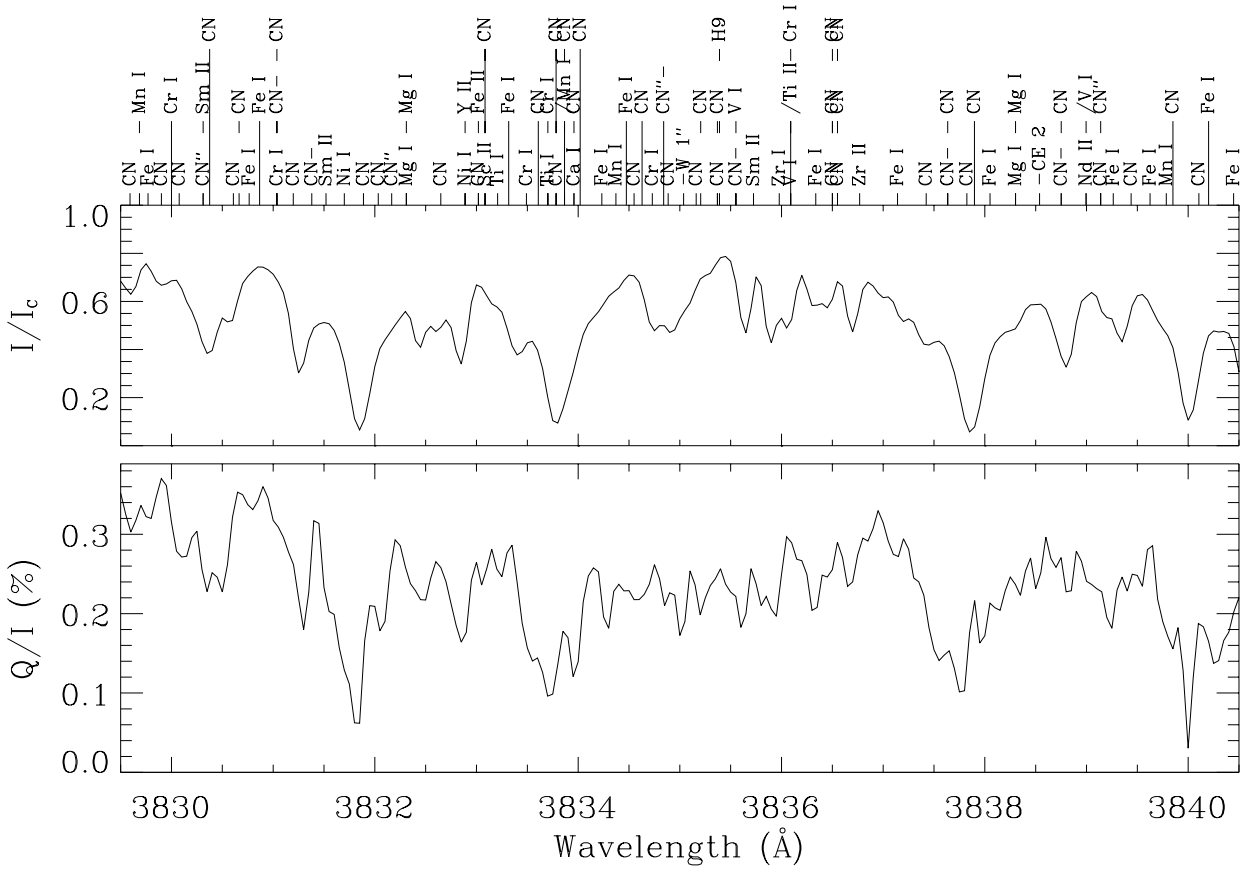

Fe I – Fe II
CN
CN
Cr I – Fe I
CN
CN
/CN– – Zr I
CN
CN
Fe I – CN''
Fe I
V I – V I
Fe I
Fe II
CN
CN
Fe I
Fe I
Fe I
Fe I
Fe I
Zr II
Fe I
CN
CN
Fe II
CN
Ni I
Fe I
CN
CN
Nd II – Fe I
CN
CN
Fe I
Fe I
CN
CN
CN
CN
CN
Fe I
Fe I
Ti I
(Dy II)
Fe I
Fe I
Fe I
Fe I
CN
CN
– Fe I
Fe I
Sm II
Dy II – CN
CN
Y II
/Cr I
CN
CN
Fe I
Ti I
Fe I
Cr I
Fe I
CN
Fe I
Cr I – //MN I
Ru/Cr I
CN
V I
V I
1.0
0.6
0.2
I/I$_c$
0.4
0.3
0.2
0.1
0.0
Q/I (%)
3780
3782
3784
3786
3788
3790
Wavelength (Å)

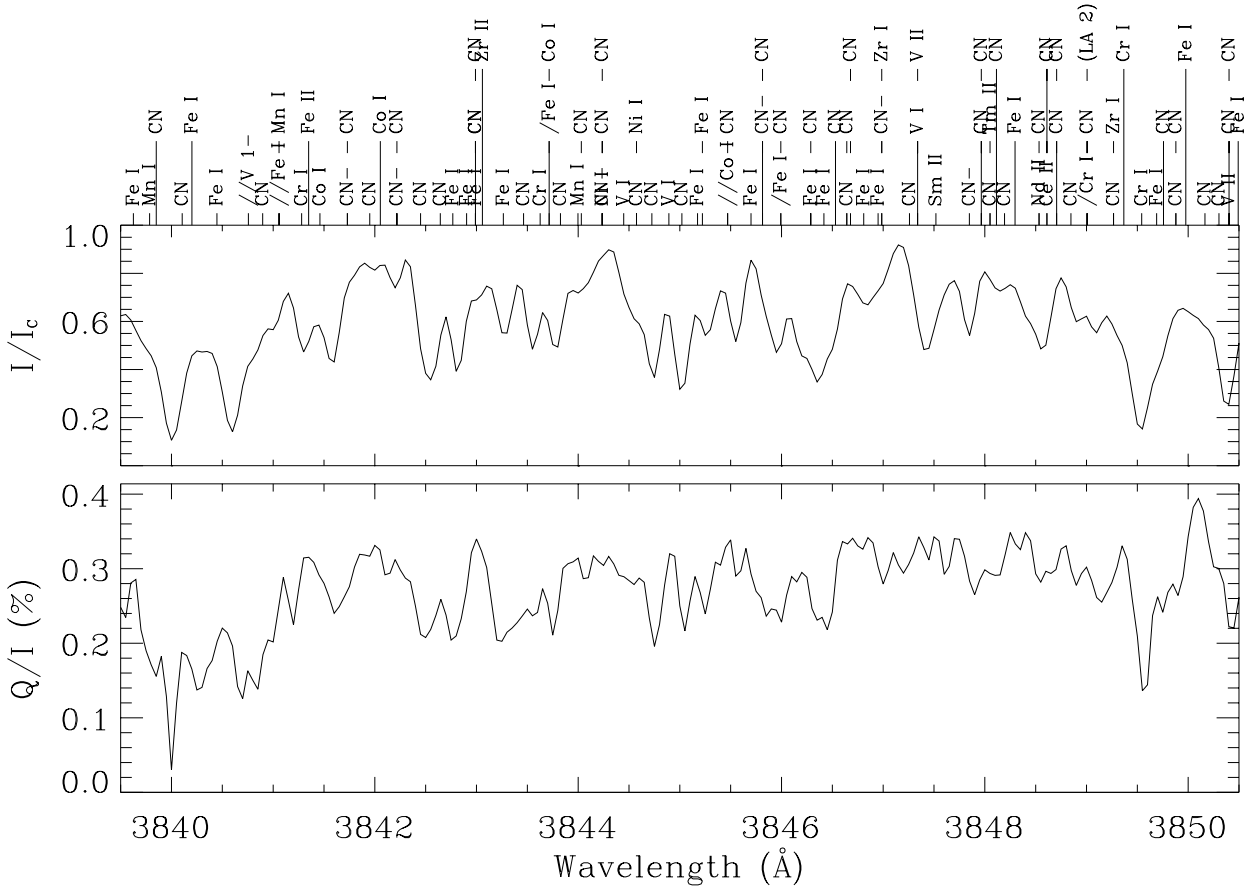

I/I_c
Q/I (%)
Wavelength (Å)
3790
3792
3794
3796
3798
3800

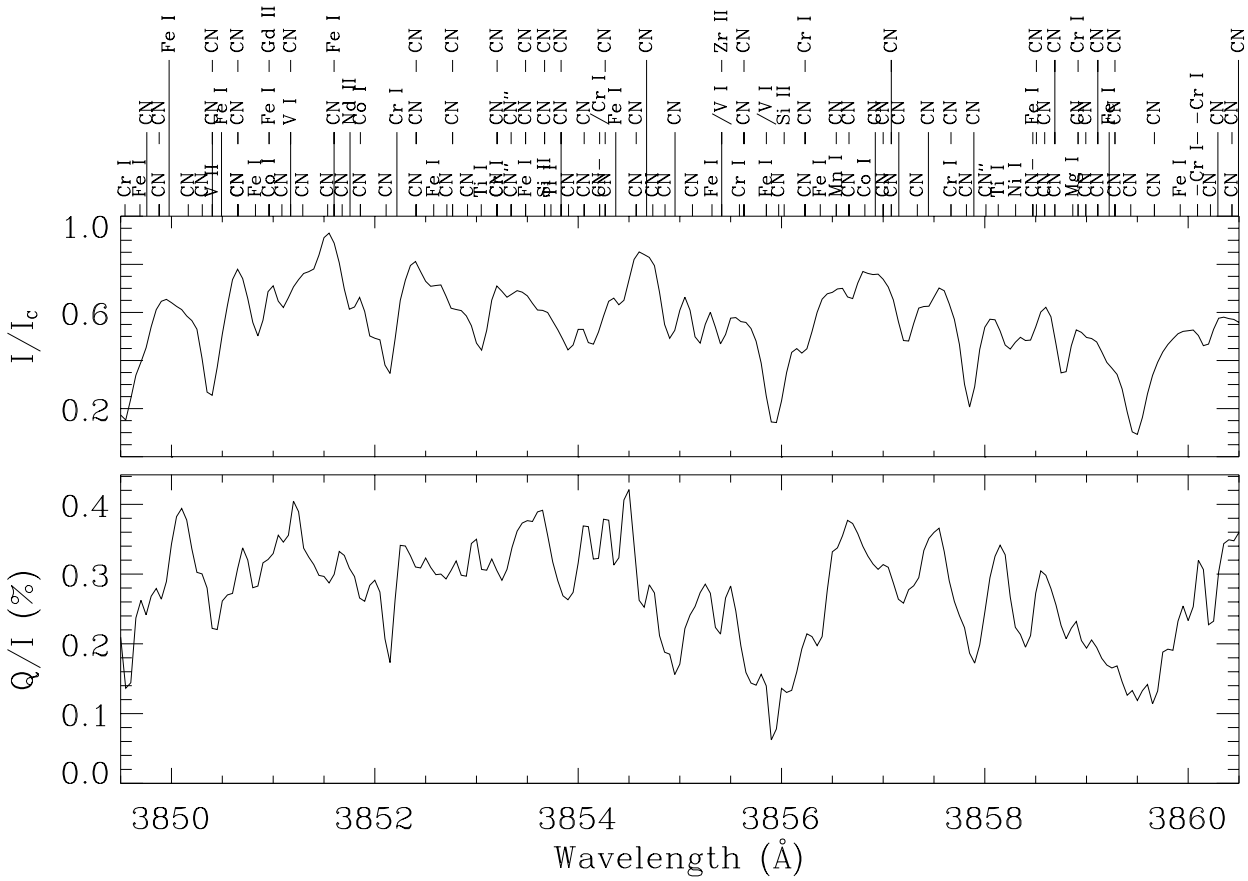

I/I_c
Q/I (%)
Wavelength (Å)
3800
3802
3804
3806
3808
3810

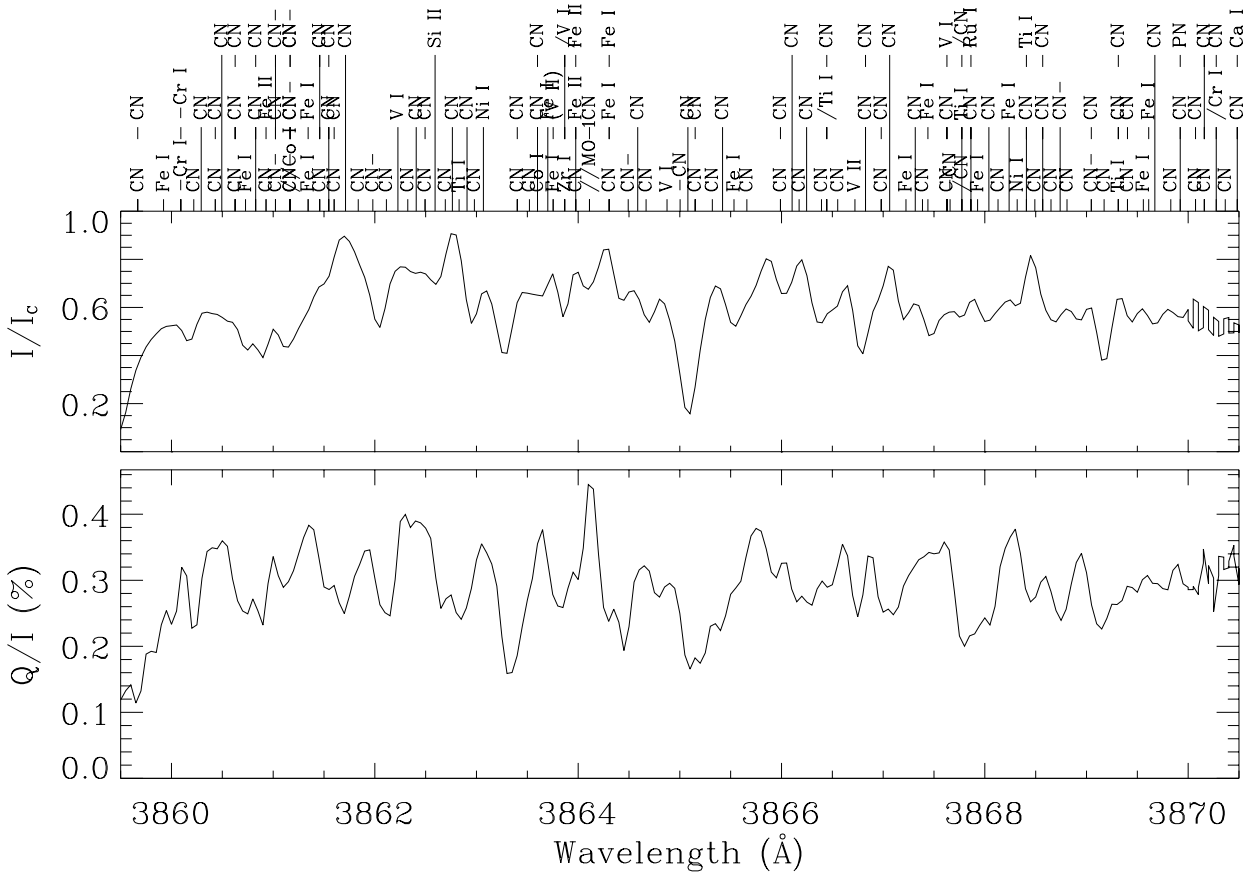

I/I_c
Q/I (%)
Wavelength (Å)
3810
3812
3814
3816
3818
3820

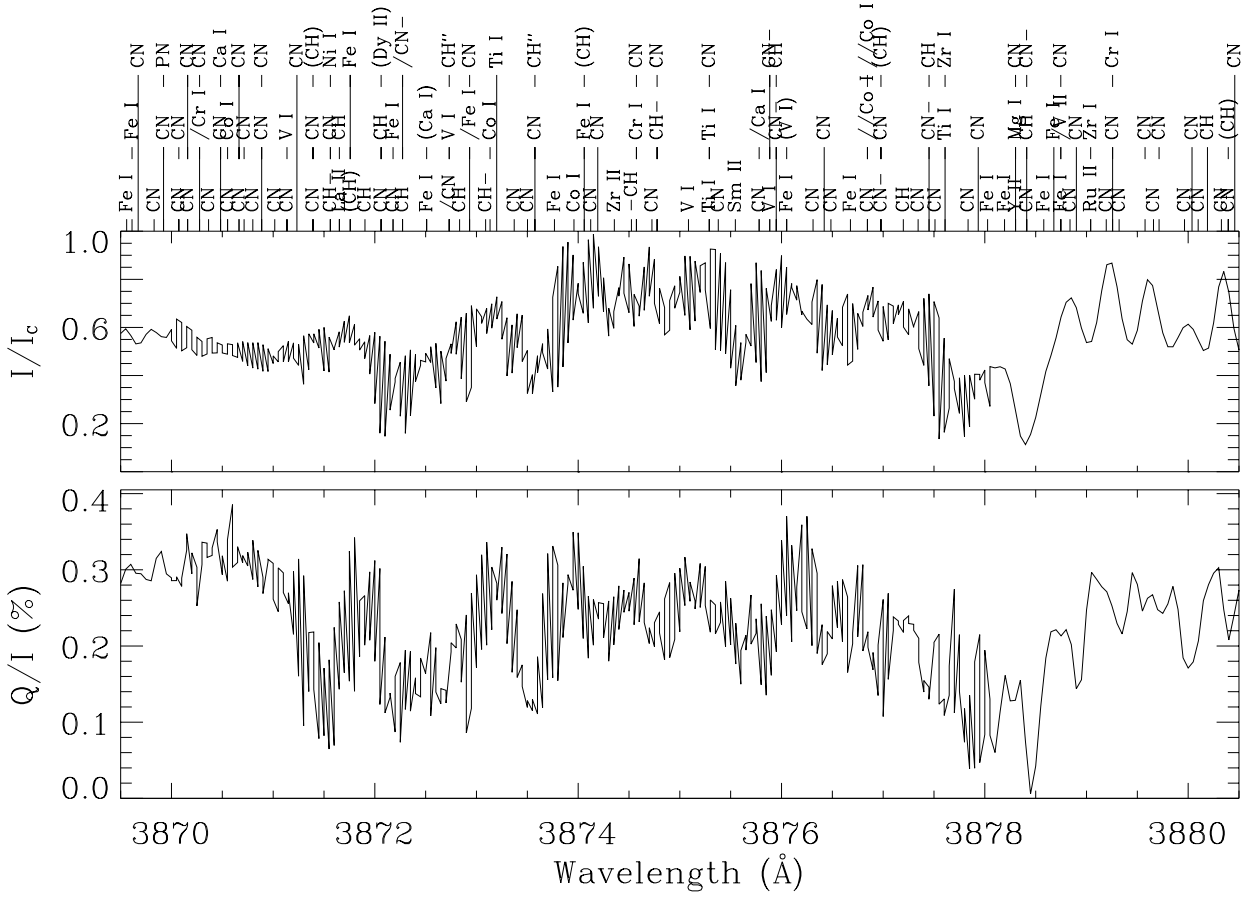

I/I_c
Q/I (%)
Wavelength (Å)
3820
3822
3824
3826
3828
3830

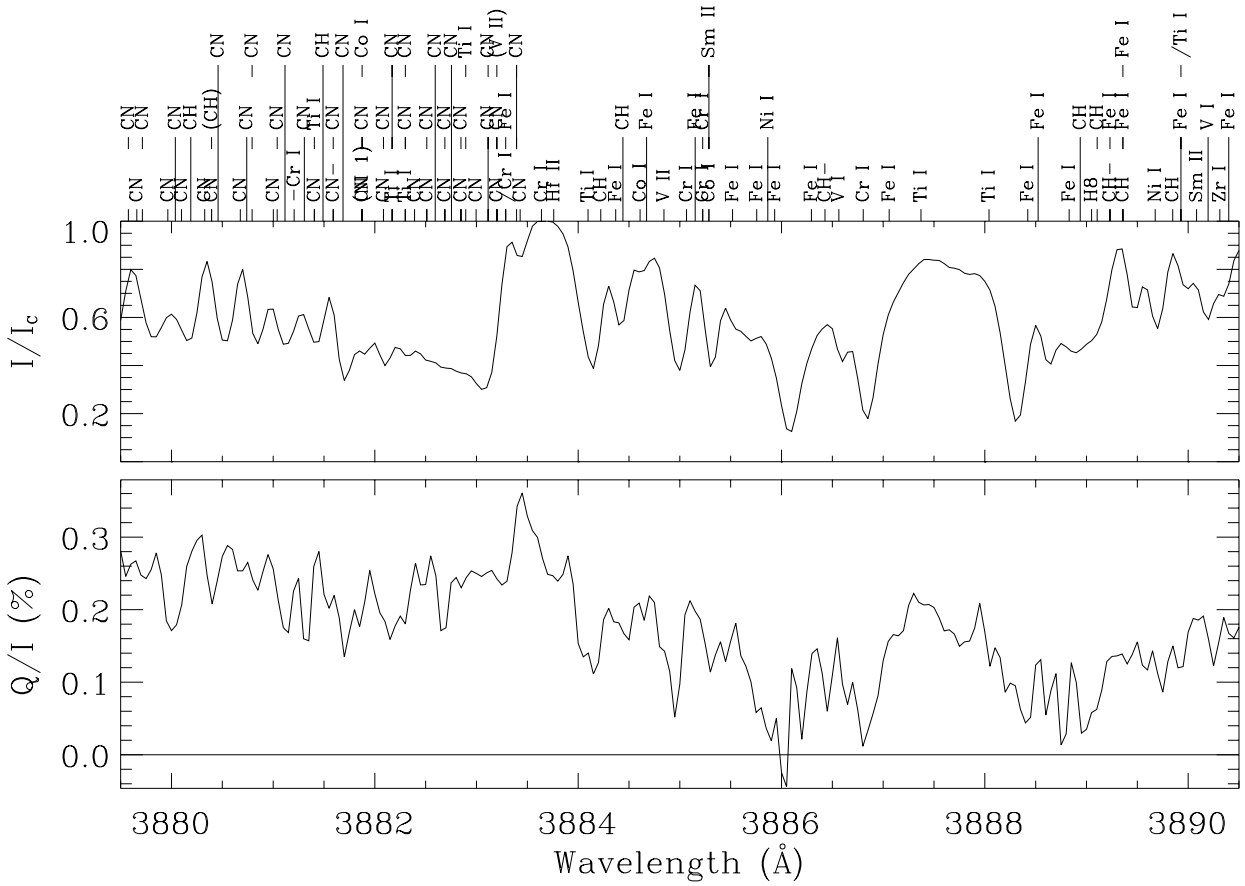

I/I_c
Q/I (%)
Wavelength (Å)
3830
3832
3834
3836
3838
3840
1.0
0.6
0.2
0.3
0.2
0.1
0.0

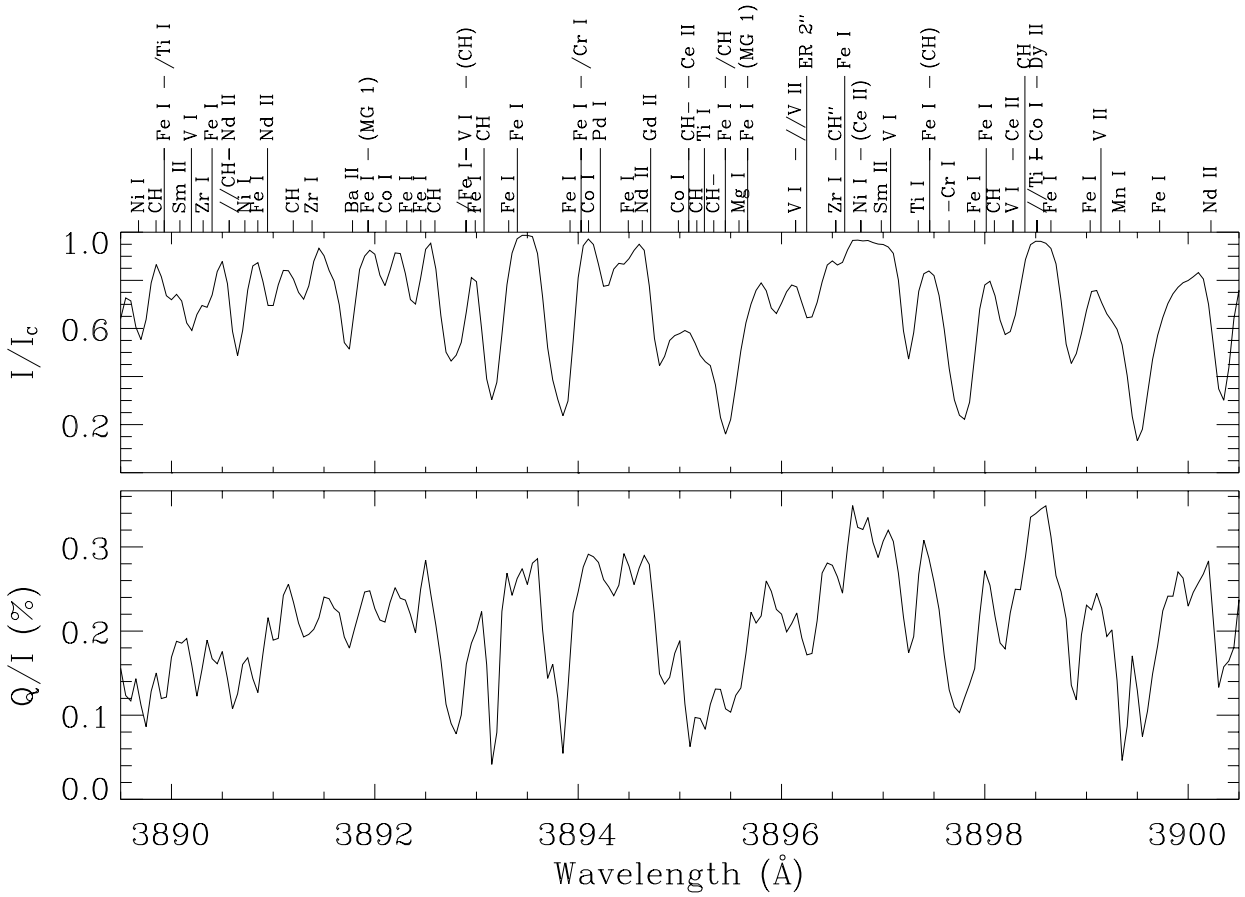

I/I_c
Q/I (%)
Wavelength (Å)
3840
3842
3844
3846
3848
3850
1.0
0.6
0.2
0.4
0.3
0.2
0.1
0.0

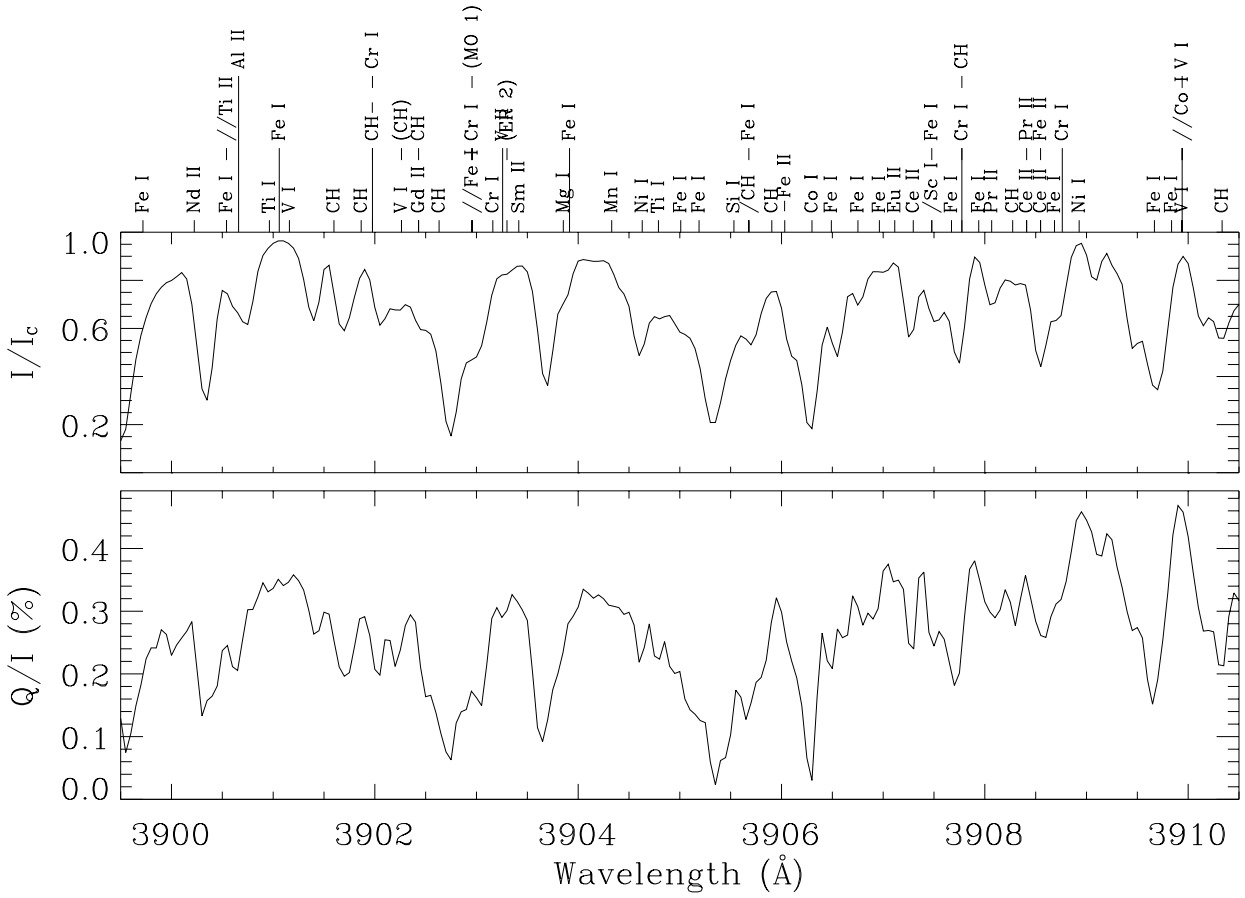

I/I_c
Q/I (%)
Wavelength (Å)
3850
3852
3854
3856
3858
3860

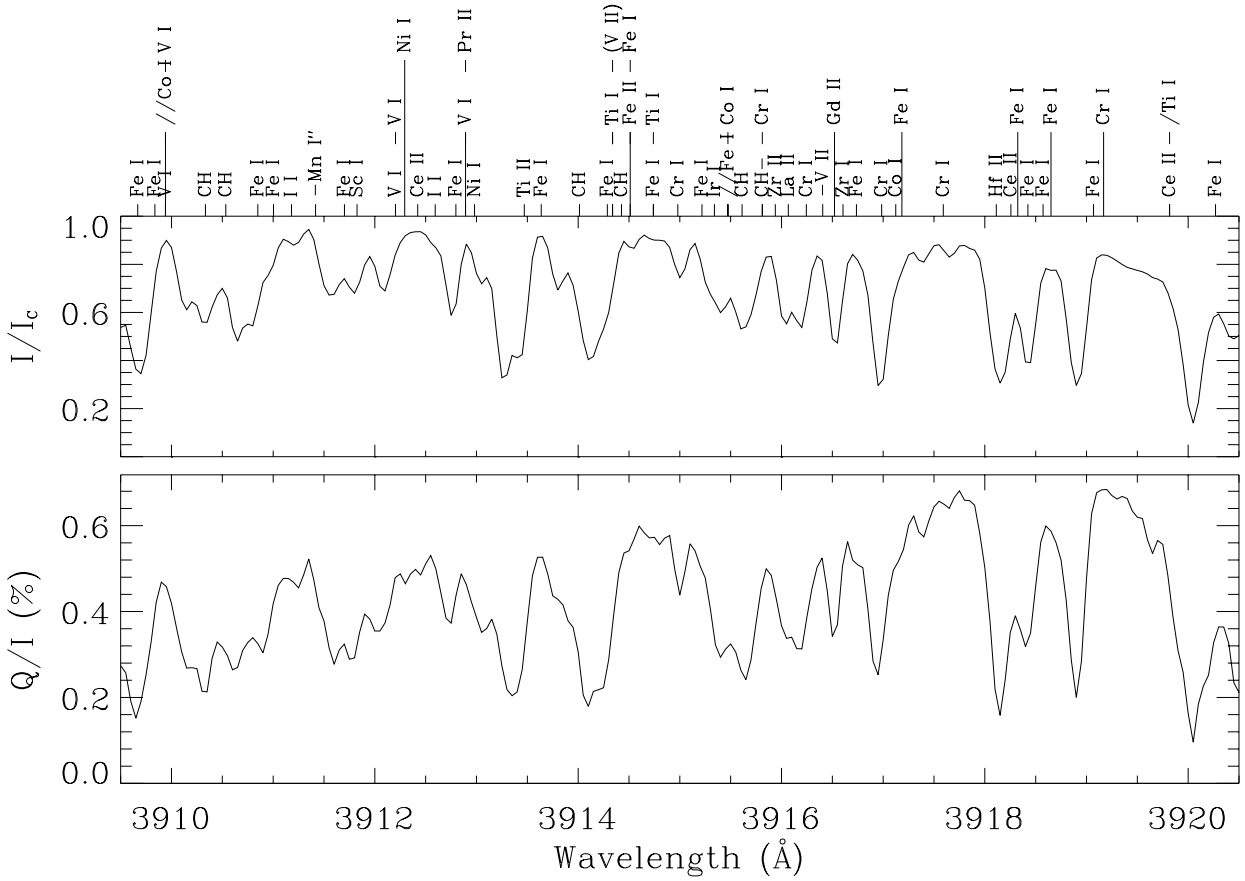

I/I_c
Q/I (%)
Wavelength (Å)
3860
3862
3864
3866
3868
3870

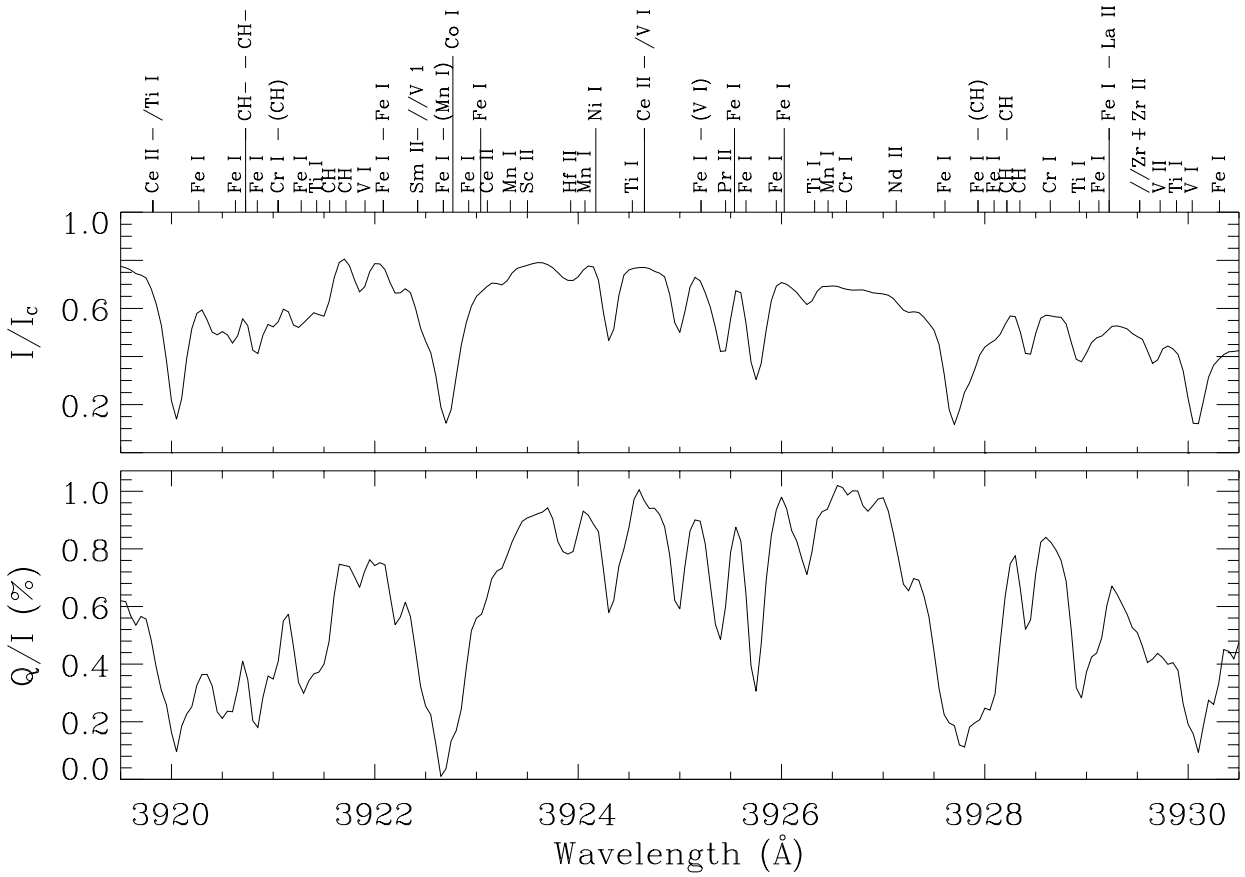

I/I_c
Q/I (%)
Wavelength (Å)
3870
3872
3874
3876
3878
3880

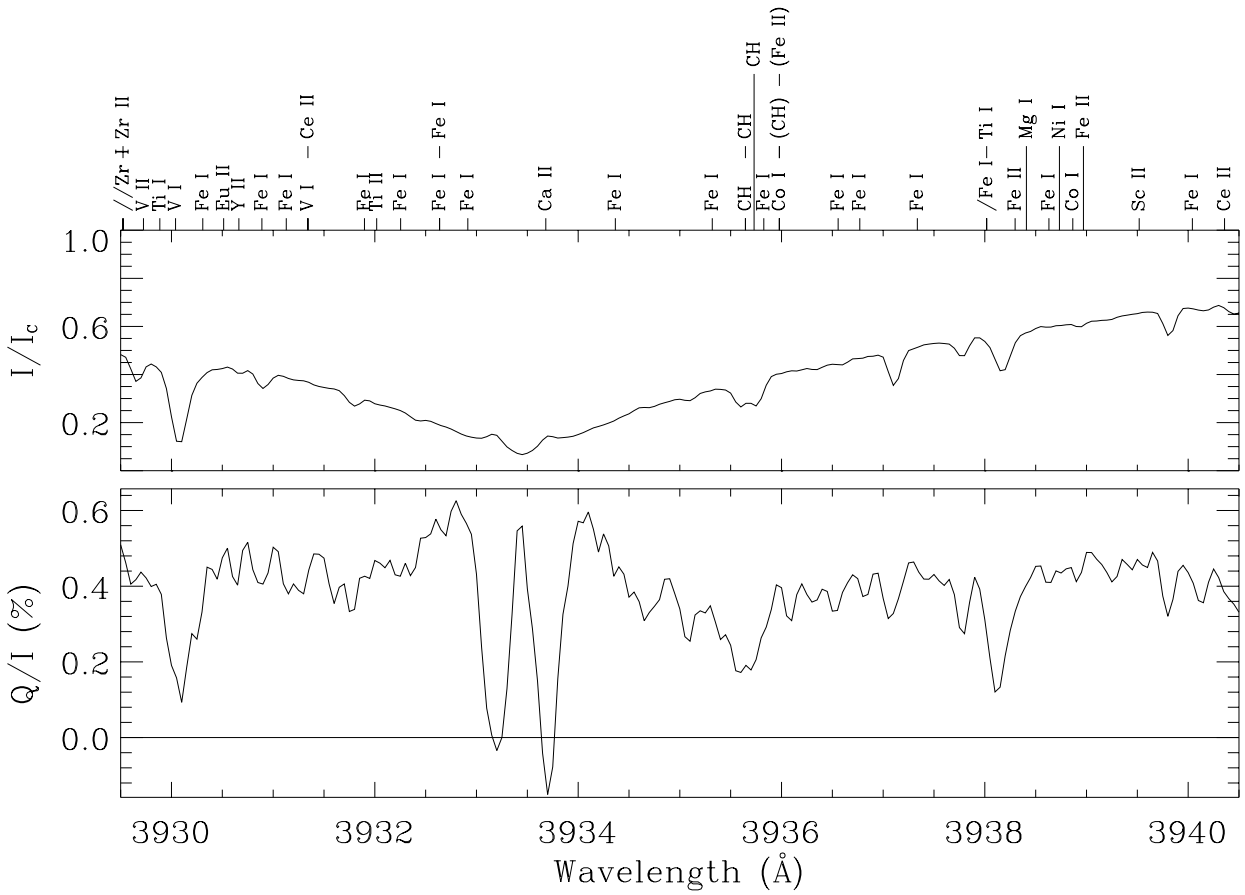

I/I_c
Q/I (%)
Wavelength (Å)
3880
3882
3884
3886
3888
3890

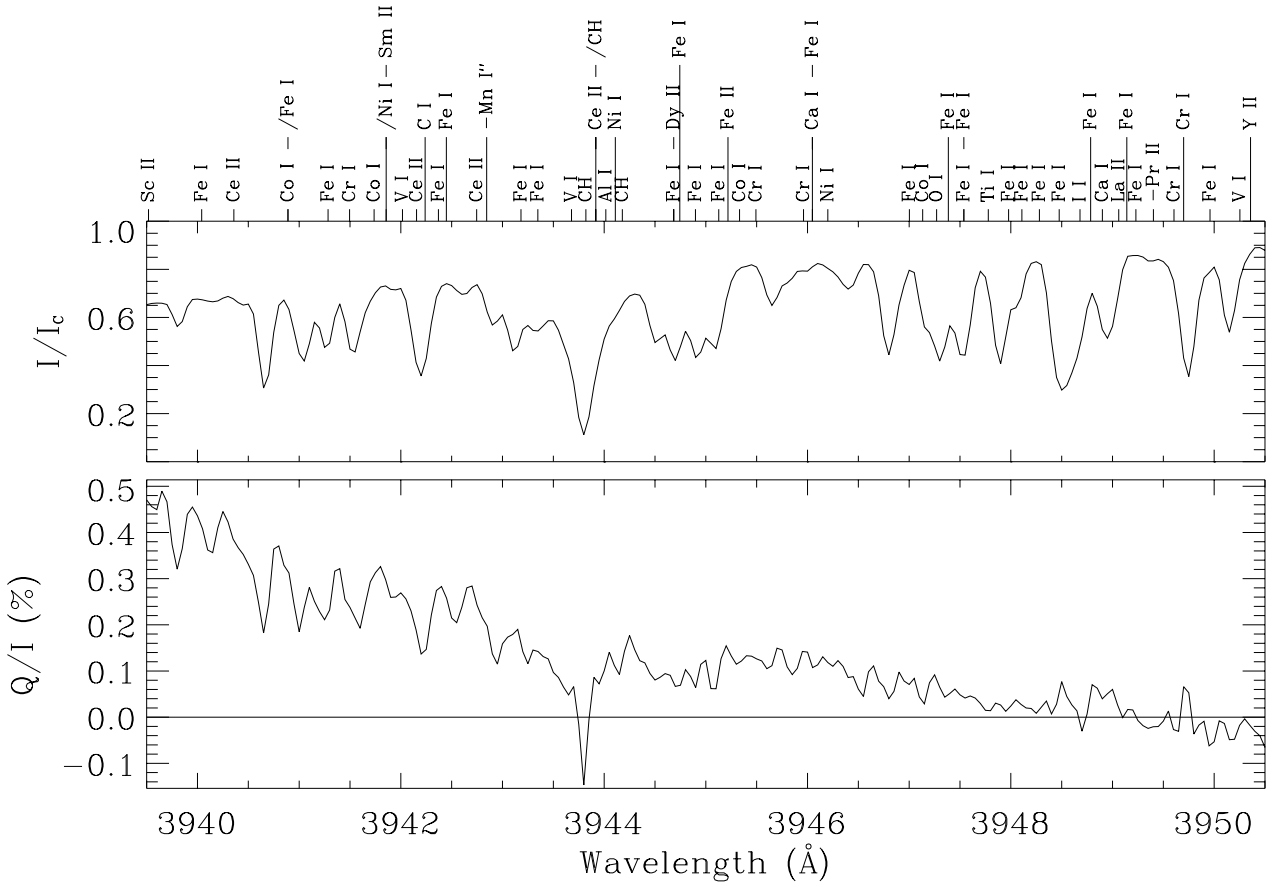

Ni I
CH
Fe I – /Ti I
Sm II
V I
Zr I
Fe I
/CH–
Nd II
Ni I
Fe I
Nd II
CH
Zr I
Ba II
Fe I – (MG 1)
Co I
Fe I
Fe I
CH
/Fe I – V I – (CH)
Fe I
CH
Fe I
Fe I
Fe I – /Cr I
Co I
Pd I
Fe I
Nd II
Gd II
Co I
CH– – Ce II
CH
Ti I
CH–
Fe I – /CH
Mg I
Fe I – (MG 1)
V I – //V II
ER 2''
Zr I – CH''
Fe I
Ni I – (Ce II)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

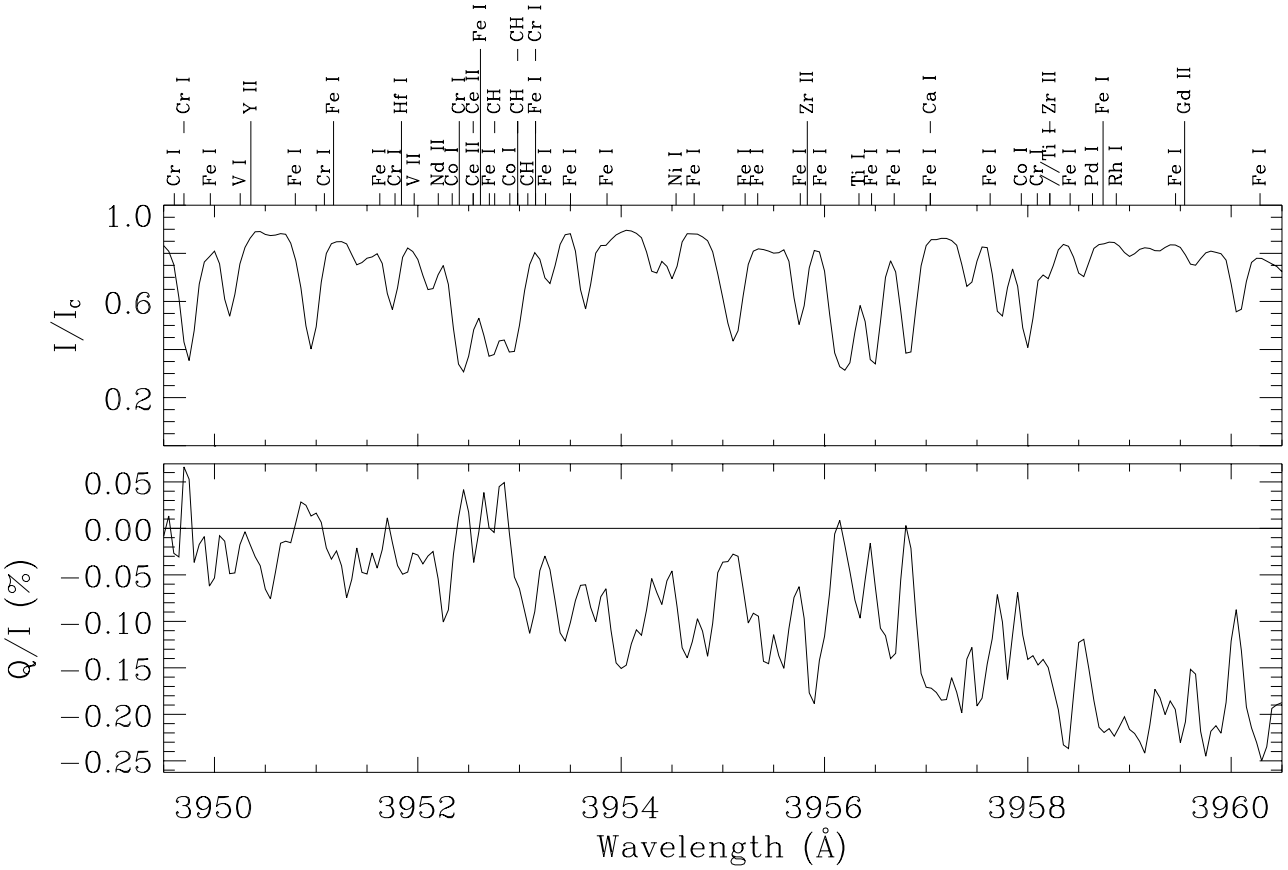

Fe I
Nd II
Fe I
Al II
Ti I
Fe I
V I
CH
CH
CH
Cr I
V I
(CH)
Gd II
CH
CH
Fe I
Cr I
(MO 1)
Cr I
(EH 2)
Sm II
Mg I
Fe I
Mn I
Ni I
Ti I
Fe I
Fe I
Si I
CH
Fe I
CH
Fe II
Co I
Fe I
Fe I
Fe I
Eu II
Ce II
Sc I
Fe I
Fe I
Cr I
CH
Fe I
Pr II
CH
Ce II
Pr II
Ce II
Fe I
Fe I
Cr I
Ni I
Fe I
Fe I
V I
Co I
V I
CH
1.0
0.6
0.2
I/I_c
0.4
0.3
0.2
0.1
0.0
Q/I (%)
3900
3902
3904
3906
3908
3910
Wavelength (Å)

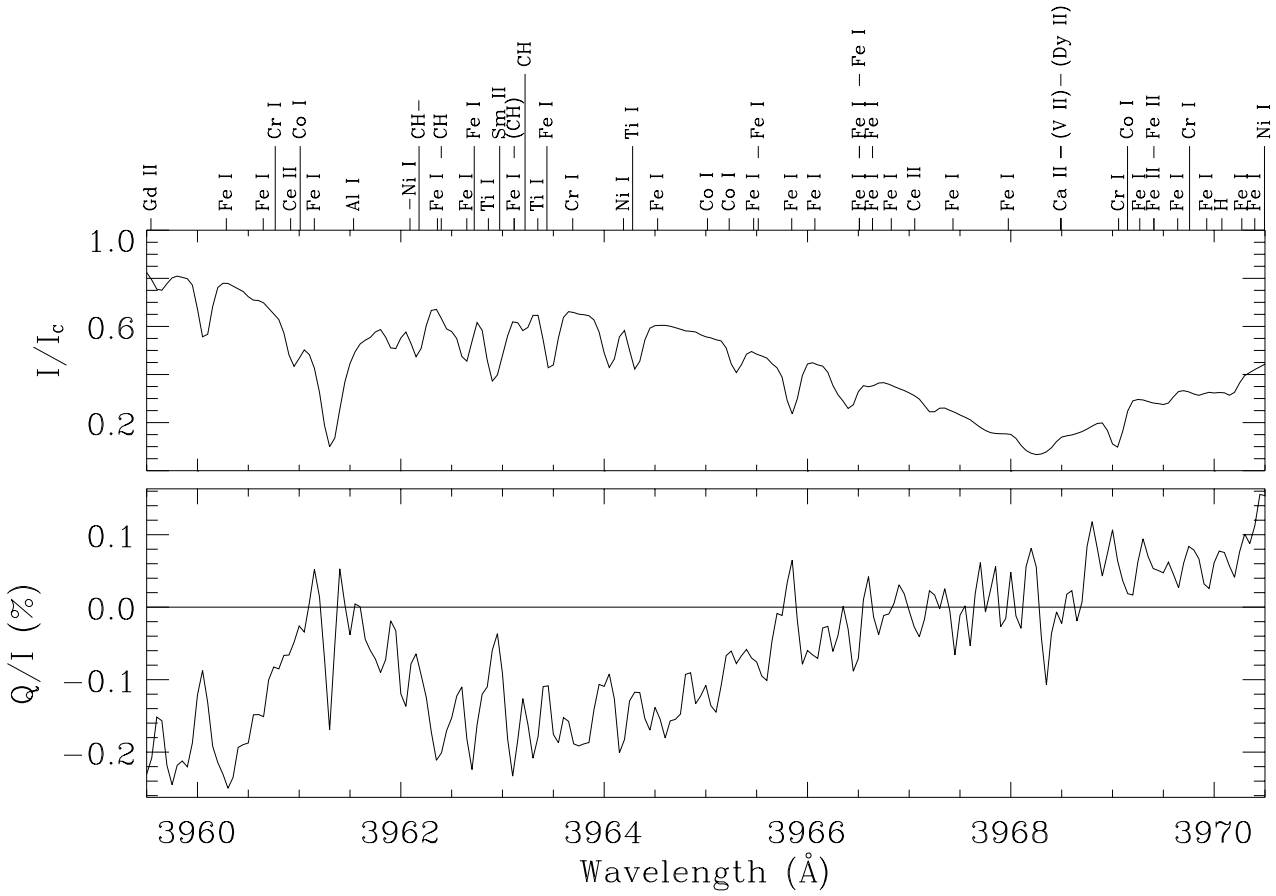

Fe I
Fe I
V I
//Co + V I
CH
CH
Fe I
Fe I
I I
Mn I''
Fe I
Sc I
V I
V I
Ni I
Ce II
I I
Fe I
Ni I
V I
Pr II
Ti II
Fe I
CH
Fe I
Ti I
(V II)
CH
Fe II
Fe I
Fe I
Ti I
Cr I
Fe I
Ir I
Fe + Co I
CH
CH
Cr I
Zr II
La II
Cr I
V II
Gd II
Zr I
Fe I
Cr I
Co I
Fe I
Cr I
Hf II
Ce II
Fe I
Fe I
Fe I
Fe I
Cr I
Ce II
Ti I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

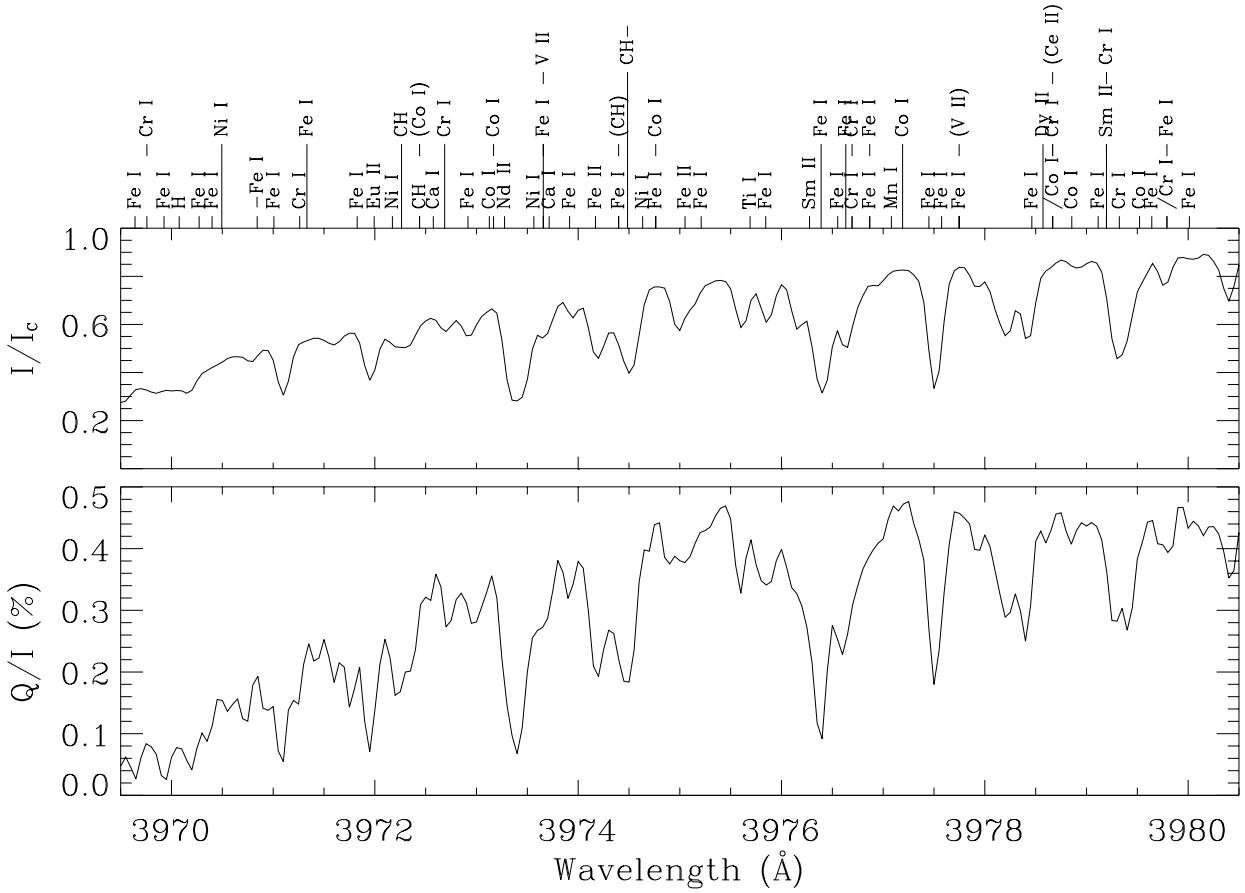

Ce II – /Ti I
Fe I
Fe I
CH– – CH–
Fe I
Cr I – (CH)
Fe I
Ti I
CH
CH
V I
Fe I – Fe I
Sm II– //V 1
Fe I – (Mn I) Co I
Fe I
Ce II
Fe I
Mn I
Sc II
Hf II
Mn I
Ni I
Ti I
Ce II – /V I
Fe I – (V I)
Pr II
Fe I
Fe I
Fe I
Ti I
Mn I
Cr I
Nd II
Fe I
Fe I – (CH)
Fe I
CH
CH
CH
Cr I
Ti I
Fe I
Fe I – La II
//Zr + Zr II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

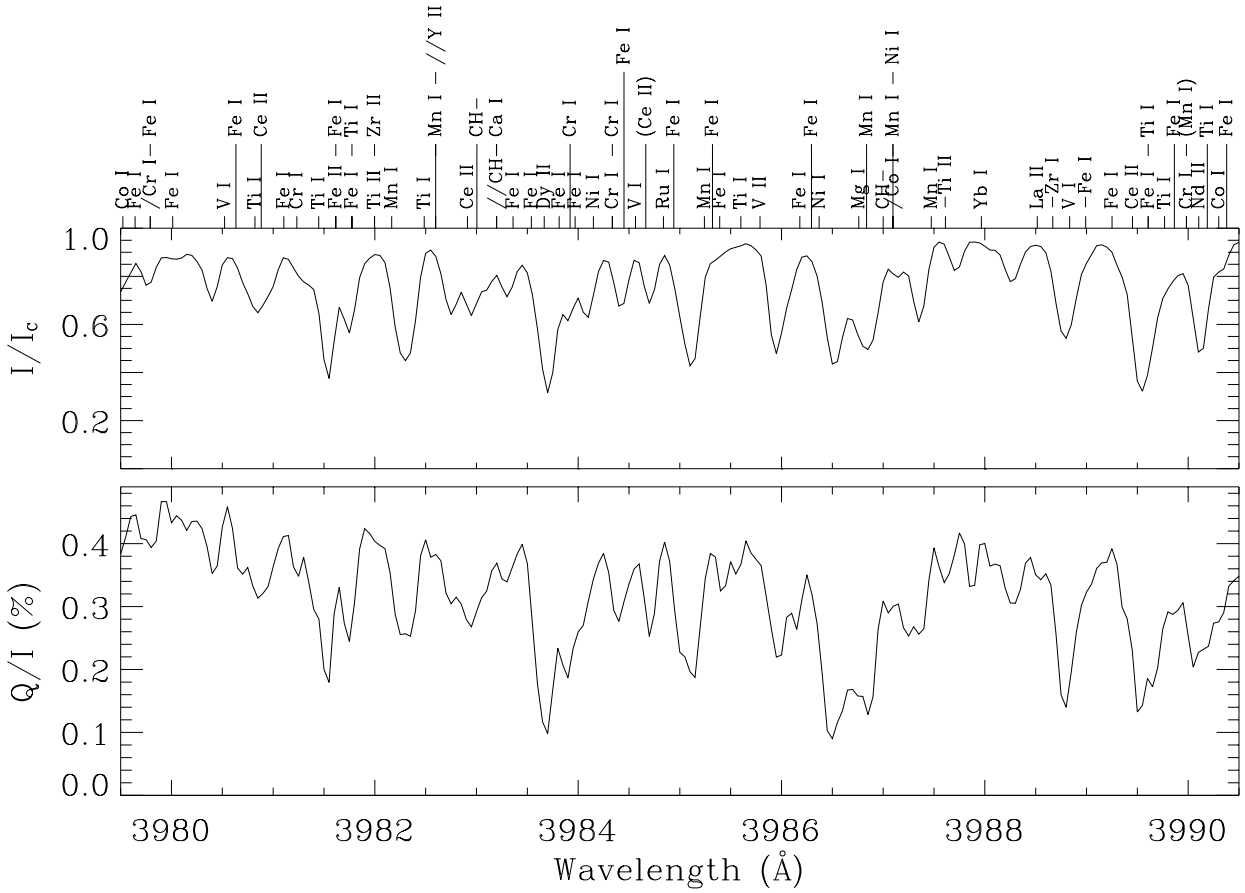

//Zr + Zr II
V II
Ti I
V I
Fe I
Eu II
Y II
Fe I
Fe I
V I
Ce II
Fe I
Ti II
Fe I
Fe I
Fe I
Fe I
Ca II
Fe I
Fe I
CH
CH
CH
Fe I
Co I
(CH)
(Fe II)
Fe I
Fe I
Fe I
/Fe I
Ti I
Fe II
Mg I
Fe I
Ni I
Co I
Fe II
Sc II
Fe I
Ce II
1.0
0.6
0.2
I/I$_c$
0.6
0.4
0.2
0.0
Q/I (%)
3930
3932
3934
3936
3938
3940
Wavelength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

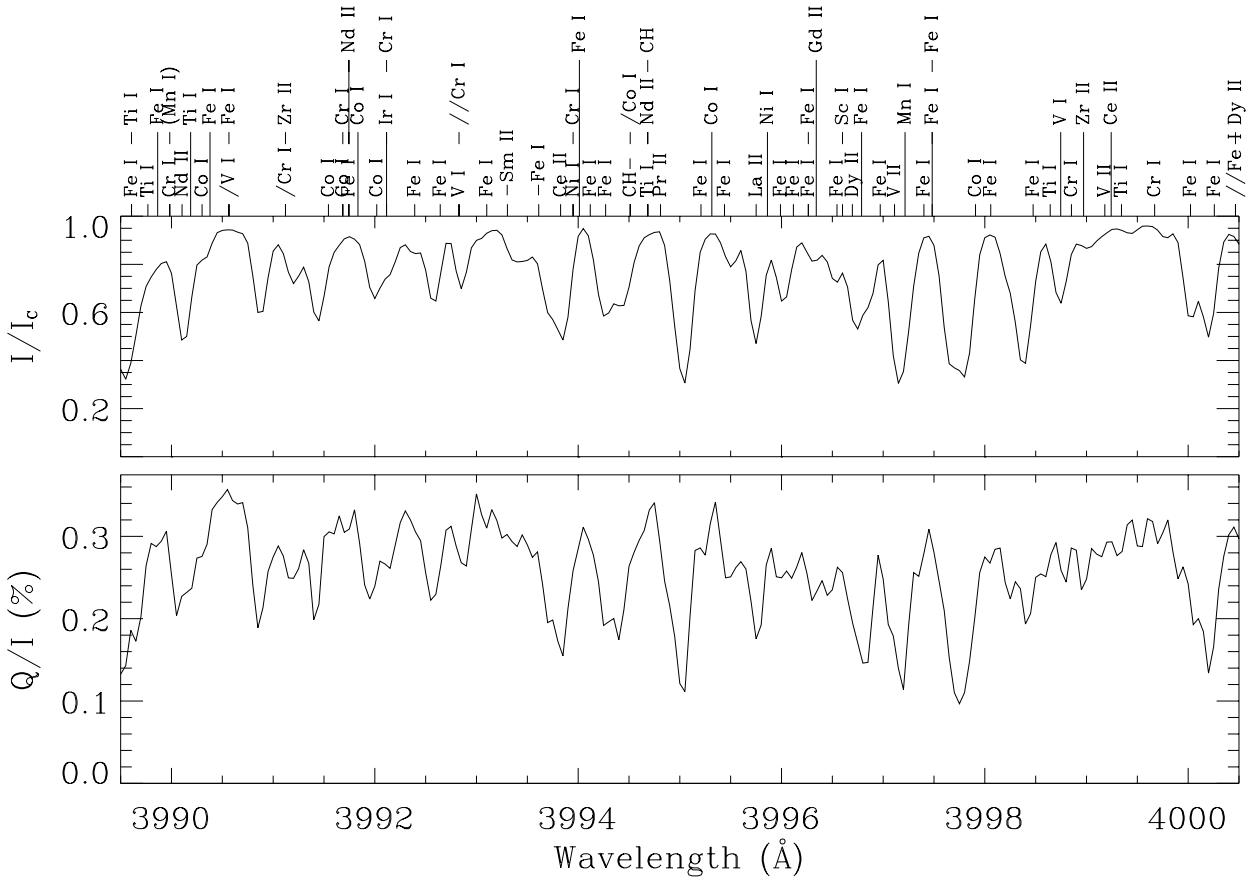

Sc II
Fe I
Ce II
Co I – /Fe I
Fe I
Cr I
Co I
/Ni I – Sm II
V I
Ce II
C I
Fe I
Fe I
Ce II
–Mn I"
Fe I
Fe I
V I
CH
Ce II – /CH
Al I
Ni I
CH
Fe I – Dy II – Fe I
Fe I
Fe I
Fe II
Co I
Cr I
Cr I
Ca I – Fe I
Ni I
Fe I
Co I
O I
Fe I
Fe I – Fe I
Ti I
Fe I
Fe I
Fe I
Fe I
I I
Fe I
Ca I
La II
Fe I
Fe I
–Pr II
Cr 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)

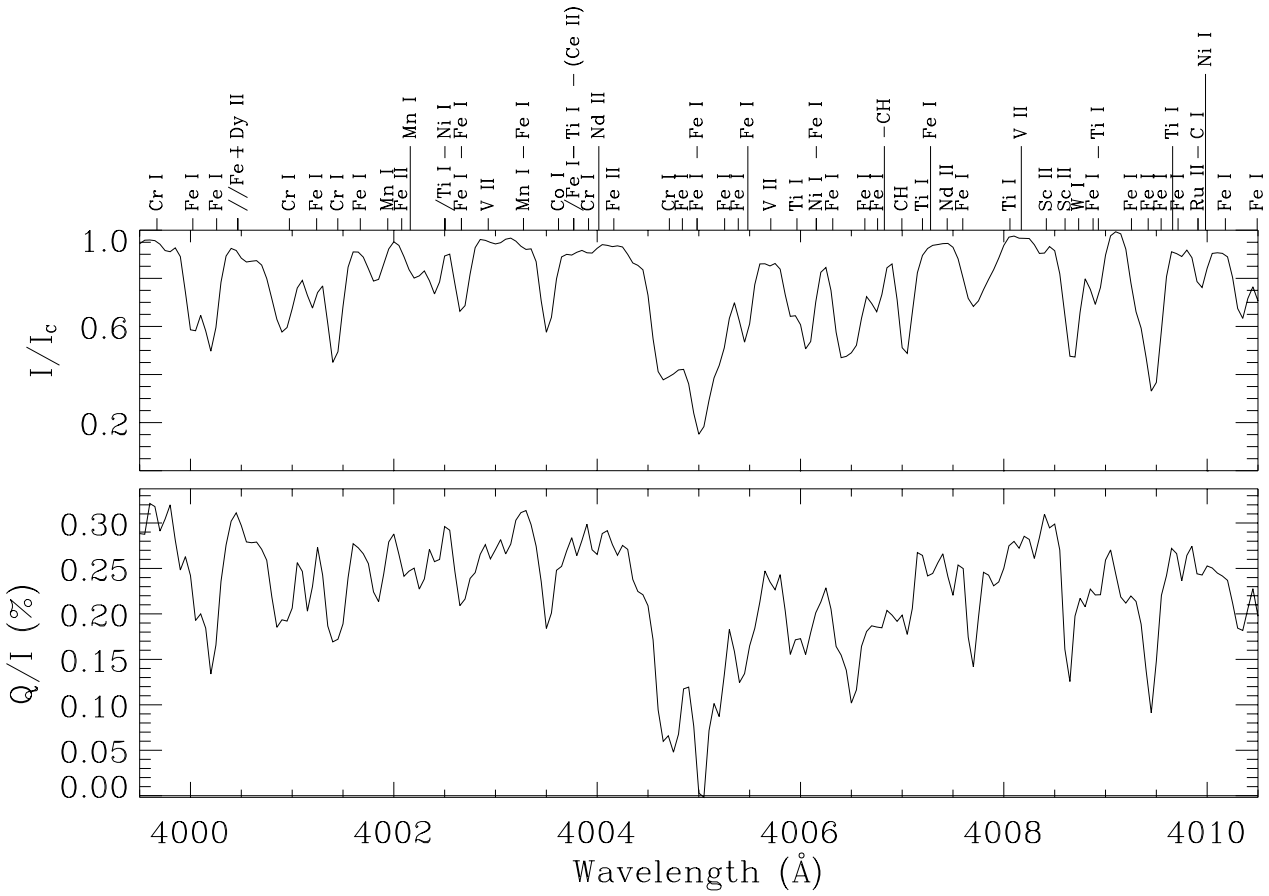

Cr I
Fe I
V I
Y II
Fe I
Cr I
Fe I
Cr I
Hf I
V II
Nd II
Co I
Cr I
Ce II
Ce II
Fe I
Fe I
CH
Co I
CH
CH
Fe I
Cr I
Fe I
Fe I
Fe I
Ni I
Fe I
Fe I
Fe I
Fe I
Zr II
Fe I
Ti I
Fe I
Fe I
Fe I
Ca I
Fe I
Co I
Cr I
Ti I
Zr II
Fe I
Pd I
Rh I
Fe I
Gd II
Fe I
1.0
0.6
0.2
I/I_c
0.05
0.00
−0.05
−0.10
−0.15
−0.20
−0.25
Q/I (%)
3950
3952
3954
3956
3958
3960
Wavelength (Å)

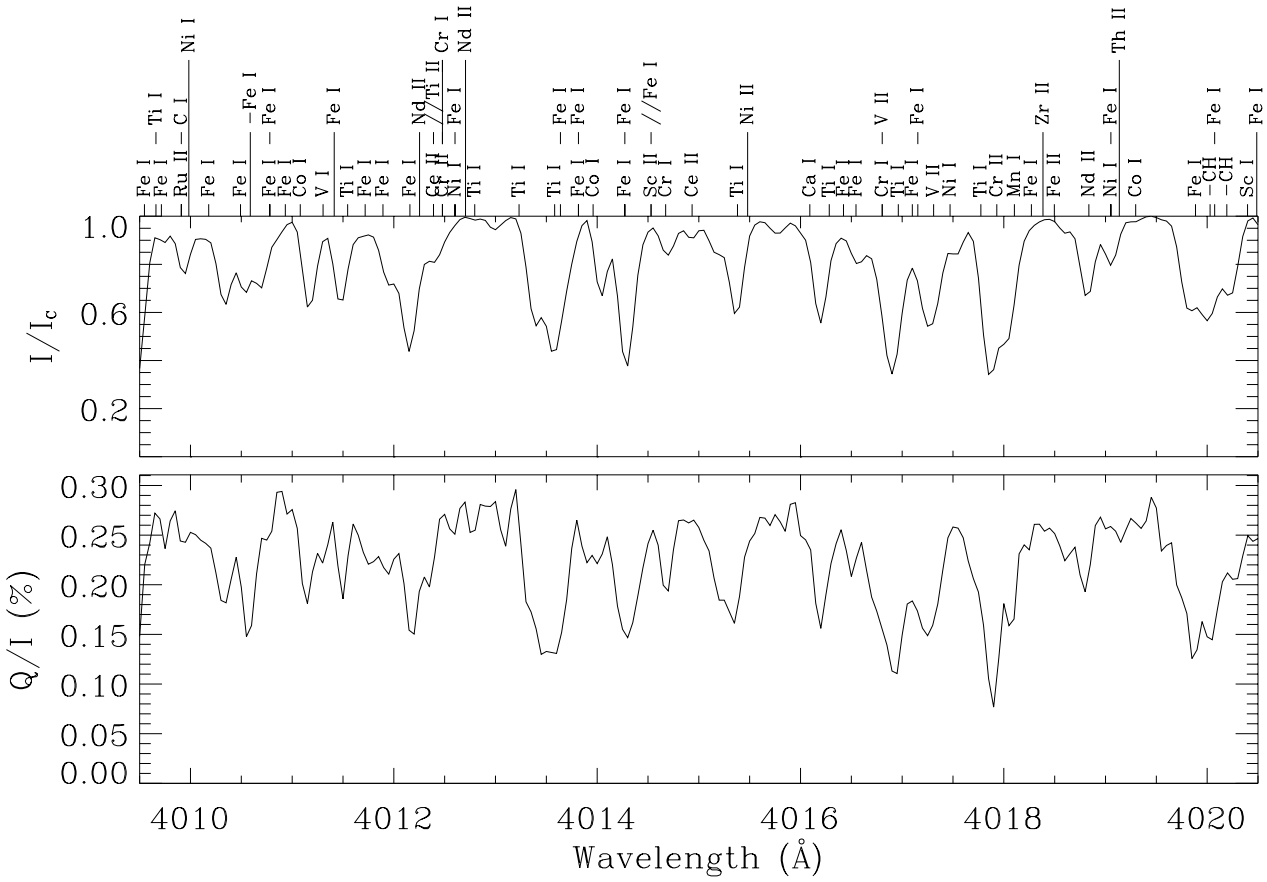

Gd II
Fe I
Fe I
Cr I
Ce II
Co I
Fe I
Al I
Ni I
CH
Fe I
CH
Fe I
Ti I
Sm II
Fe I
(CH)
CH
Ti I
Fe I
Cr I
Ni I
Ti I
Fe I
Co I
Co I
Fe I
Fe I
Fe I
Fe I
Fe I
Fe I
Fe I
Fe I
Ce II
Fe I
Fe I
Ca II
(V II)
(Dy II)
Cr I
Co I
Fe I
Fe II
Fe II
Fe I
Cr I
Fe I
H
Fe I
Fe I
Ni I
1.0
0.6
0.2
I/I_c
0.1
0.0
−0.1
−0.2
Q/I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

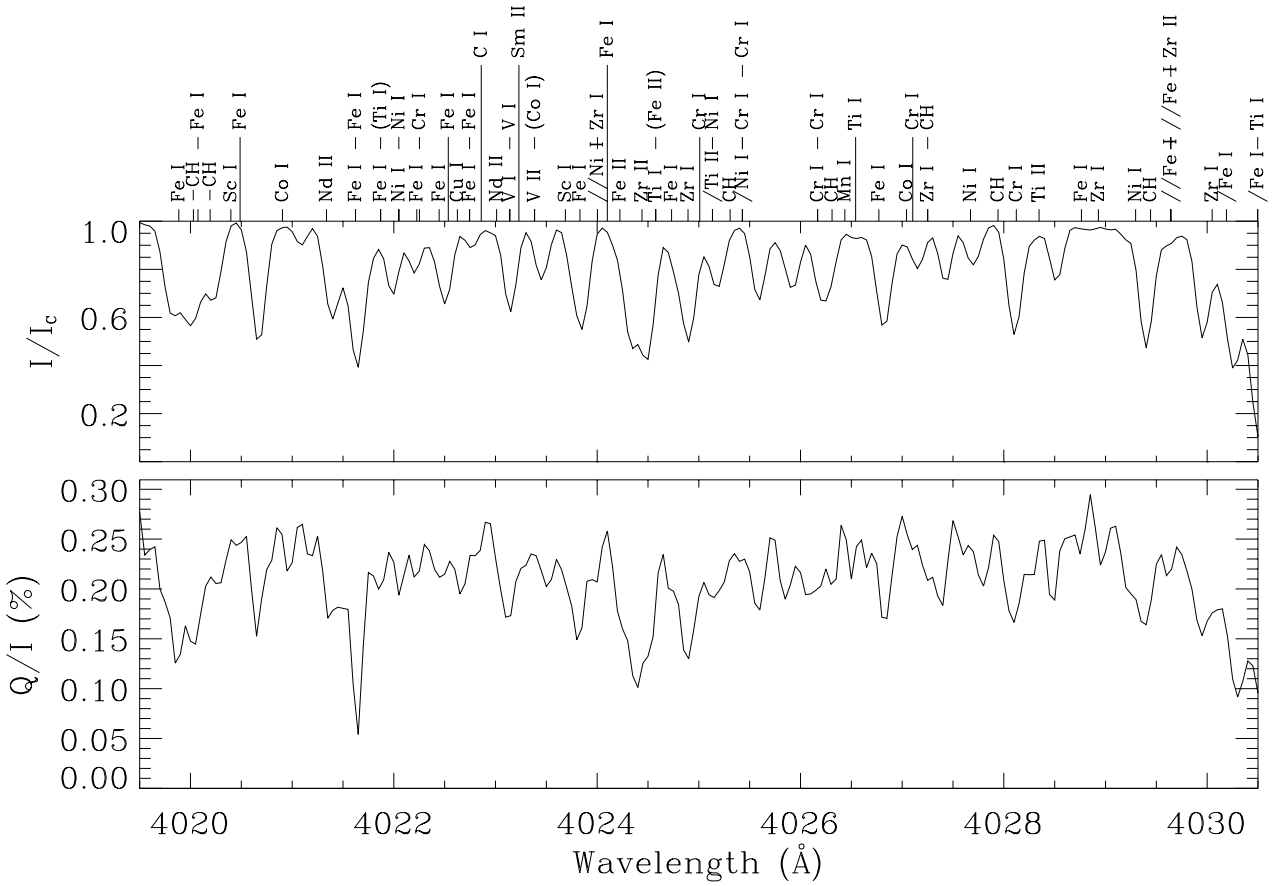

Fe I
Cr I
Fe I
H
Fe I
Fe I
Ni I
Fe I
Fe I
Cr I
Fe I
Fe I
Eu II
Ni I
CH
(Co I)
CH
Ca I
Cr I
Fe I
Co I
Co I
Nd II
Ni I
Fe I
V II
Ca I
Fe I
Fe II
Fe I
(CH)
CH
Ni I
Fe I
Co I
Fe II
Fe I
Ti I
Fe I
Sm II
Fe I
Fe I
Cr I
Fe I
Fe I
Mn I
Co I
Fe I
Fe I
Fe I
(V II)
Fe I
Dy II
(Ce II)
Co I
Co I
Fe I
Sm II
Cr I
Cr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

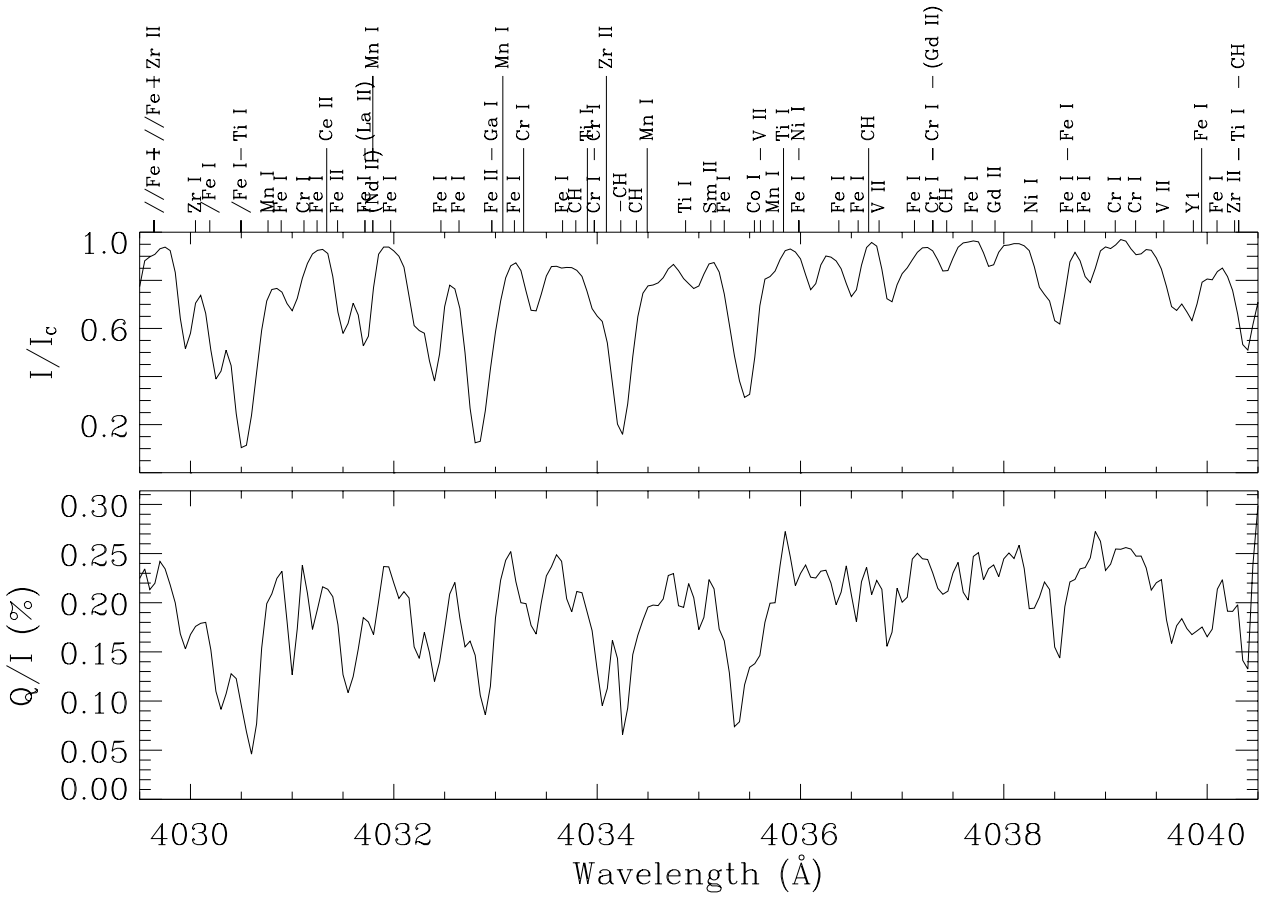

Co I
Fe I
/Cr I – Fe I
Fe I
V I
Fe I
Ti I
Ce II
Fe I
Cr I
Ti I
Fe II – Fe I
Fe I – Ti I
Ti II – Zr II
Mn I
Ti I
Mn I – //Y II
Ce II
CH –
//CH – Ca I
Fe I
Fe I
Dy II
Fe I
Fe I
Cr I
Ni I
Cr I – Cr I
Fe I
V I
(Ce II)
Ru I
Fe I
Mn I
Fe I
Fe I
Ti I
V II
Fe I
Fe I
Ni I
Mg I
Mn I
CH –
/Co I – Mn I – Ni I
Mn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

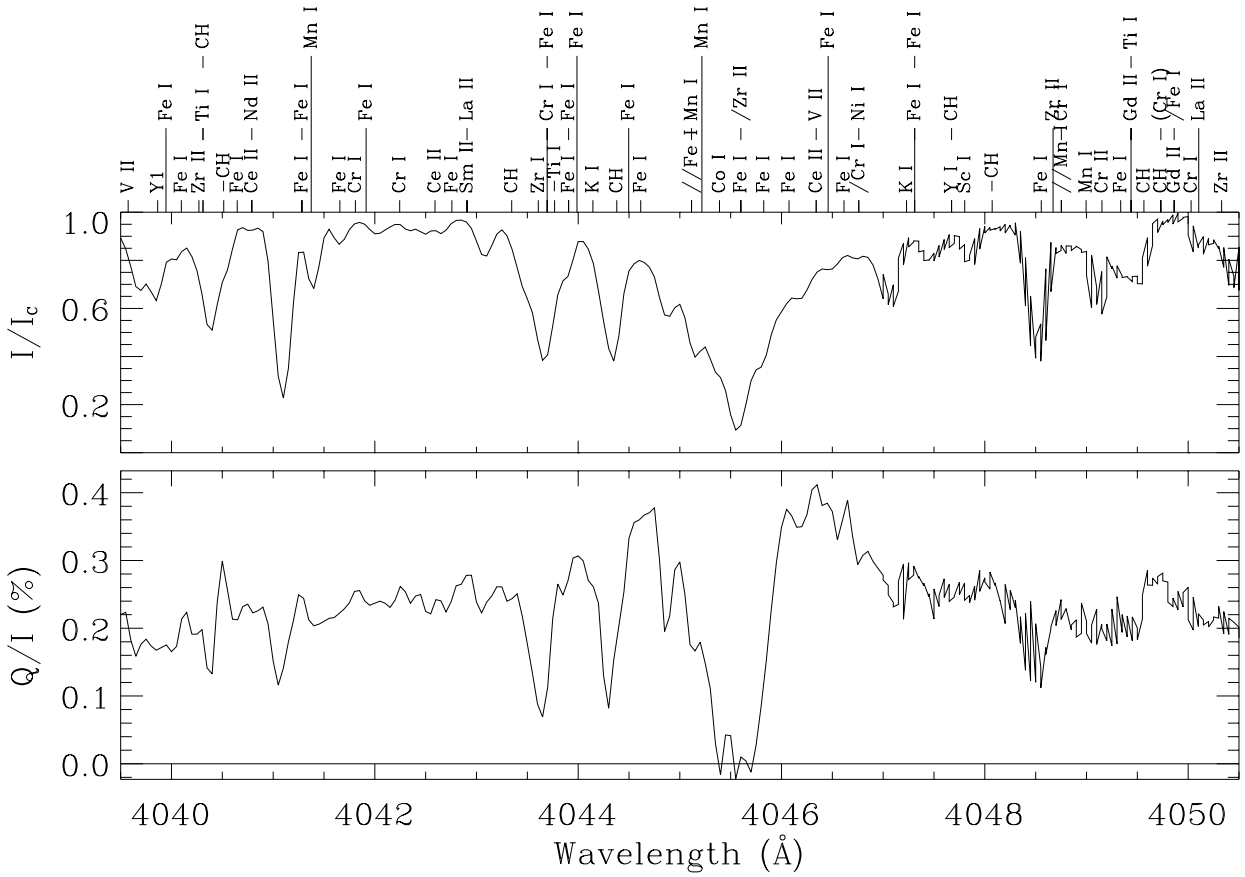

Fe I
Ti I
Cr I
(Mn I)
Fe I
Nd II
Ti I
Co I
Fe I
/V I
Fe I
/Cr I
Zr II
Co I
Cr I
Nd II
Fe I
Co I
Ir I
Cr I
Fe I
Fe I
V I
//Cr I
Fe I
Sm II
Fe I
Ce II
Ni I
Cr I
Fe I
Fe I
Fe I
CH
/Co I
Ti I
Nd II
CH
Pr II
Fe I
Co I
Fe I
La II
Ni I
Fe I
Fe I
Fe I
Gd II
Fe I
Sc I
Dy II
Fe I
Fe I
V II
Mn I
Fe I
Fe I
Co I
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)

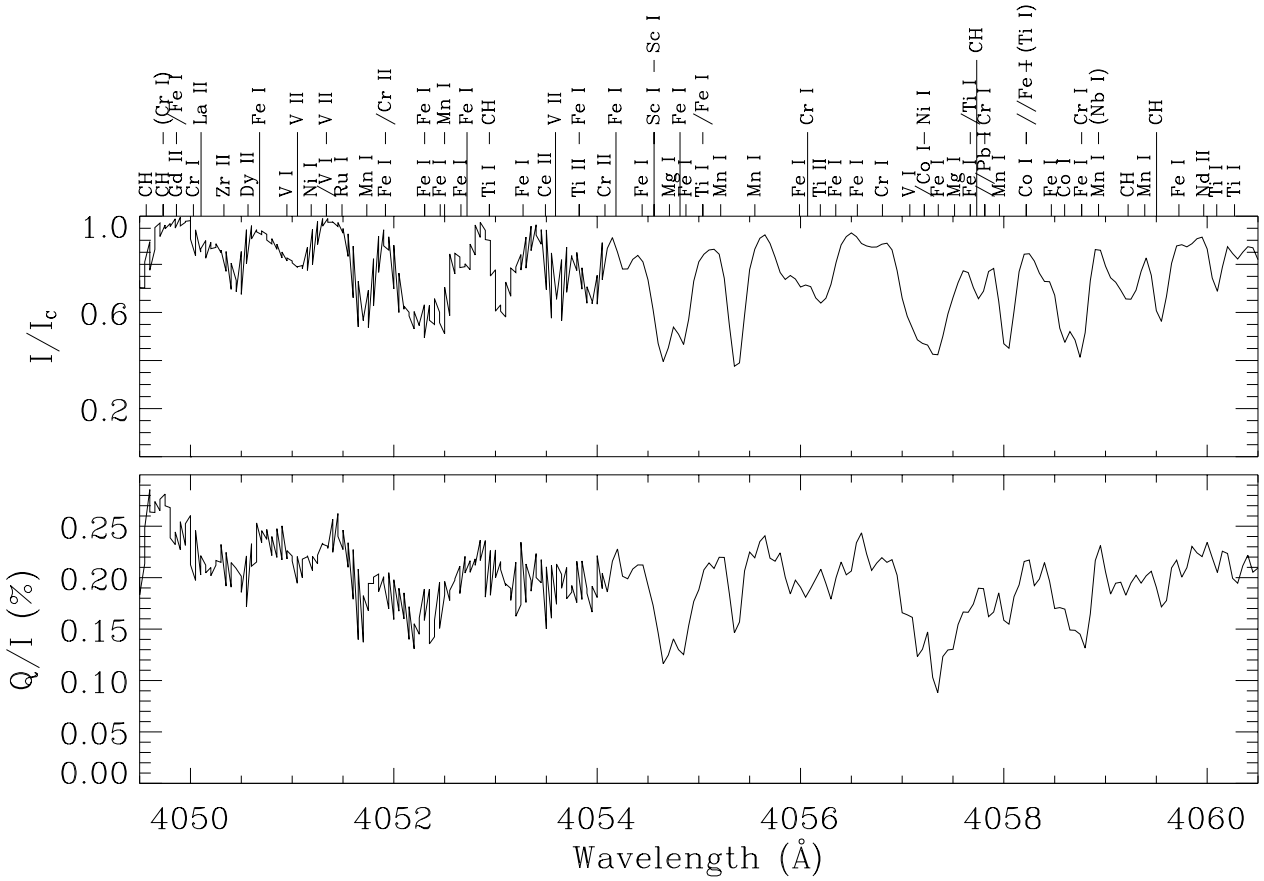

Cr I
Fe I
Fe I
Fe I + Dy II
Cr I
Fe I
Cr I
Fe I
Mn I
Fe II
Mn I
Ti I
Ni I
Fe I
V II
Mn I
Fe I
Co I
Fe I
Ti I
(Ce II)
Cr I
Nd II
Fe II
Cr I
Fe I
Fe I
Fe I
Fe I
Fe I
V II
Ti I
Ni I
Fe I
Fe I
Fe I
CH
Ti I
Fe I
Nd II
Fe I
Ti I
V II
Sc II
Sc II
W I
Fe I
Ti I
Fe I
Fe I
Fe I
Fe I
Ti I
Ru II
C I
Ni I
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4000
4002
4004
4006
4008
4010
Wavelength (Å)

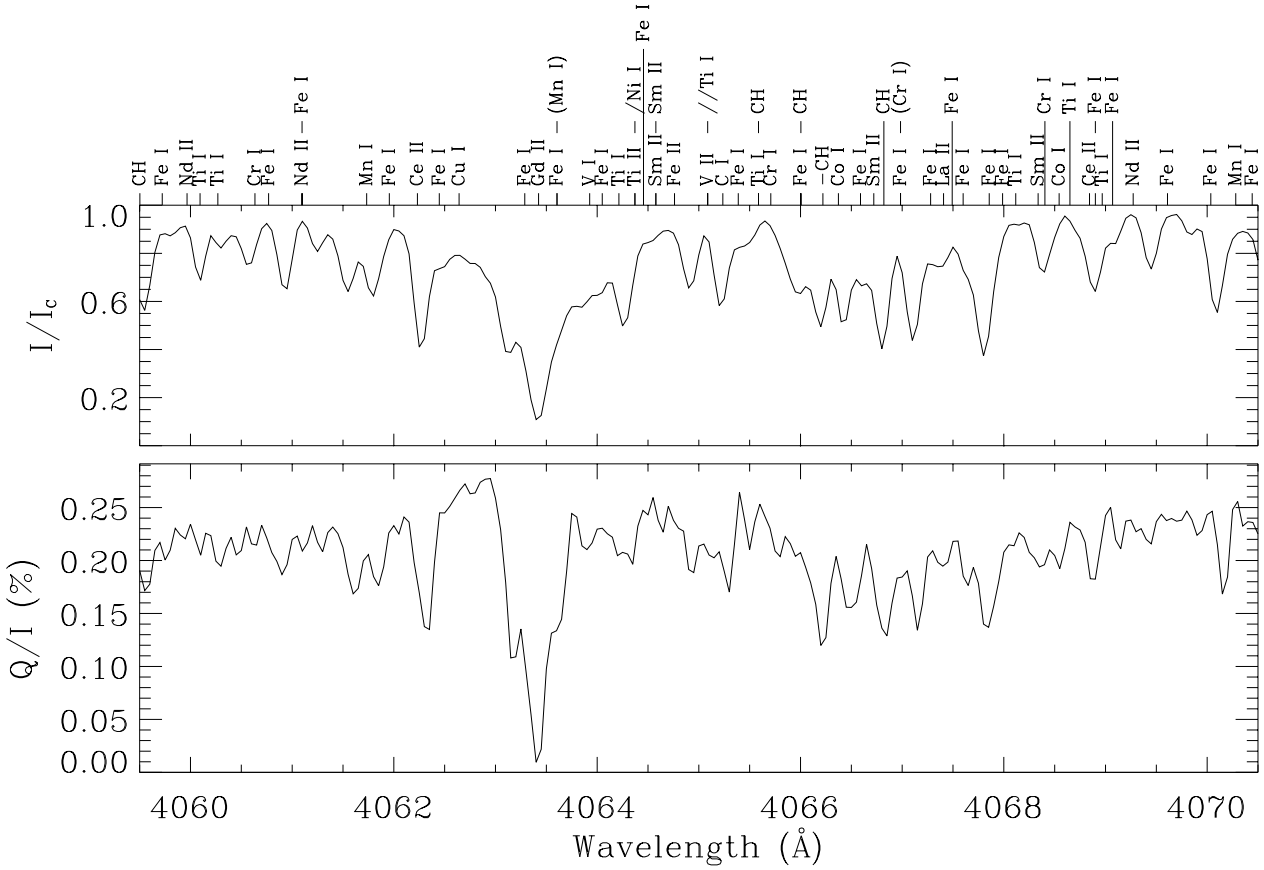

Fe I
Fe I
Ti I
Ru II
C I
Ni I
Fe I
Fe I
Fe I
Fe I
Fe I
Co I
V I
Fe I
Ti I
Fe I
Fe I
Fe I
Nd II
Ce II
Cr II
Ti II
Cr I
Ni I
Fe I
Nd II
Ti I
Ti I
Ti I
Fe I
Fe I
Co I
Fe I
Fe I
Sc II
Cr I
//Fe I
Ce II
Ti I
Ni II
Ca I
Ti I
Fe I
Fe I
Cr I
V II
Ti I
Fe I
Fe I
V II
Ni I
Ti I
Cr II
Mn I
Fe I
Fe II
Zr II
Nd II
Ni I
Fe I
Th II
Co I
Fe I
CH
CH
Fe I
Sc I
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 (%)
4010
4012
4014
4016
4018
4020
Wavelength (Å)

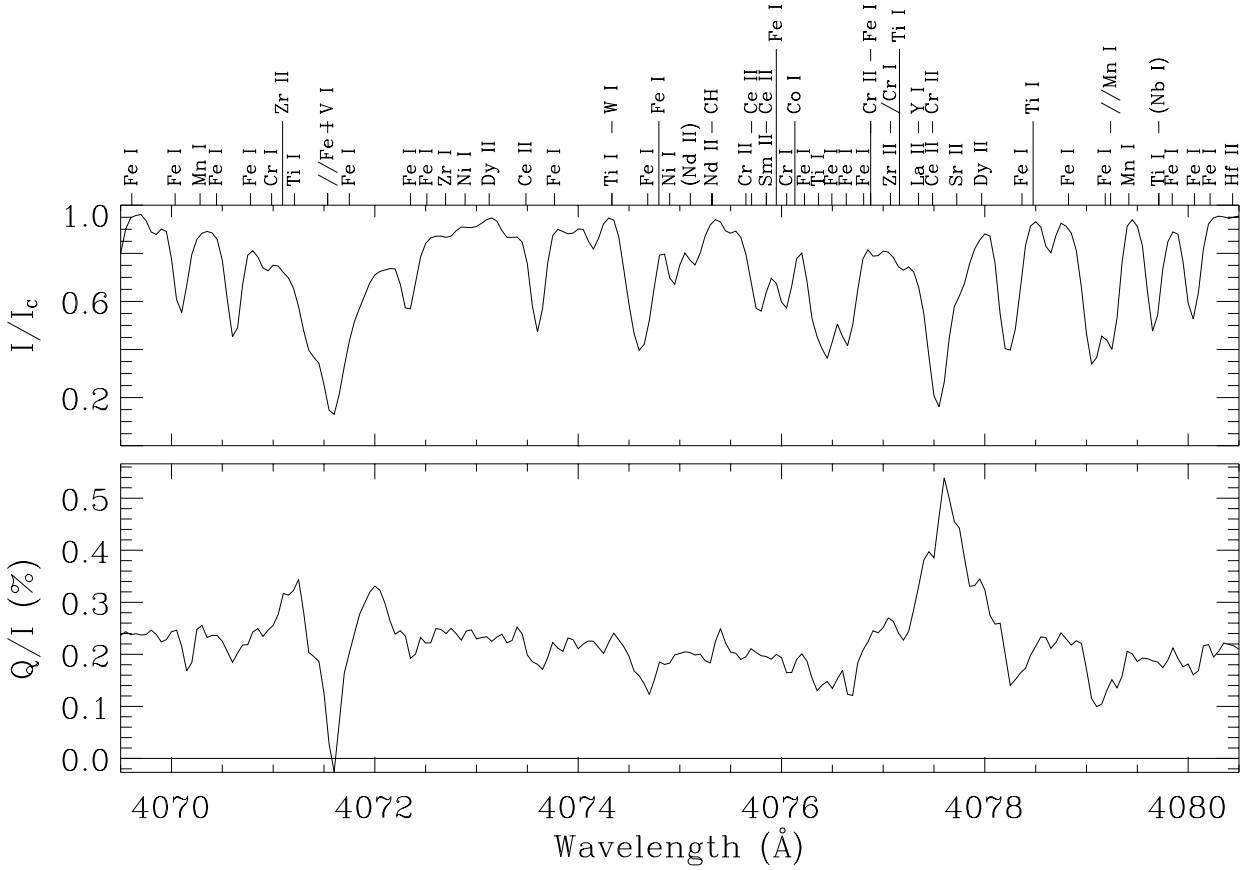

Fe I
CH
CH
Sc I
Fe I
Co I
Nd II
Fe I
Fe I
(Ti I)
Ni I
Ni I
Cr I
Fe I
Fe I
Cu I
Fe I
Fe I
C I
Nd II
V I
V I
(Co I)
Sm II
V II
Sc I
Fe I
//Ni I
Zr I
Fe I
Fe II
Zr II
Ti I
(Fe II)
Fe I
Zr I
Cr I
Ti II
Ni I
CH
Ni I
Cr I
Cr I
Cr I
CH
Mn I
Ti I
Fe I
Co I
Cr I
Zr I
CH
Ni I
CH
Cr I
Ti II
Fe I
Zr I
Ni I
CH
//Fe I //Fe I Zr II
Zr I
Fe I
Fe I
Ti I
1.0
0.6
0.2
I/I_c
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4020
4022
4024
4026
4028
4030
Wavelength (Å)

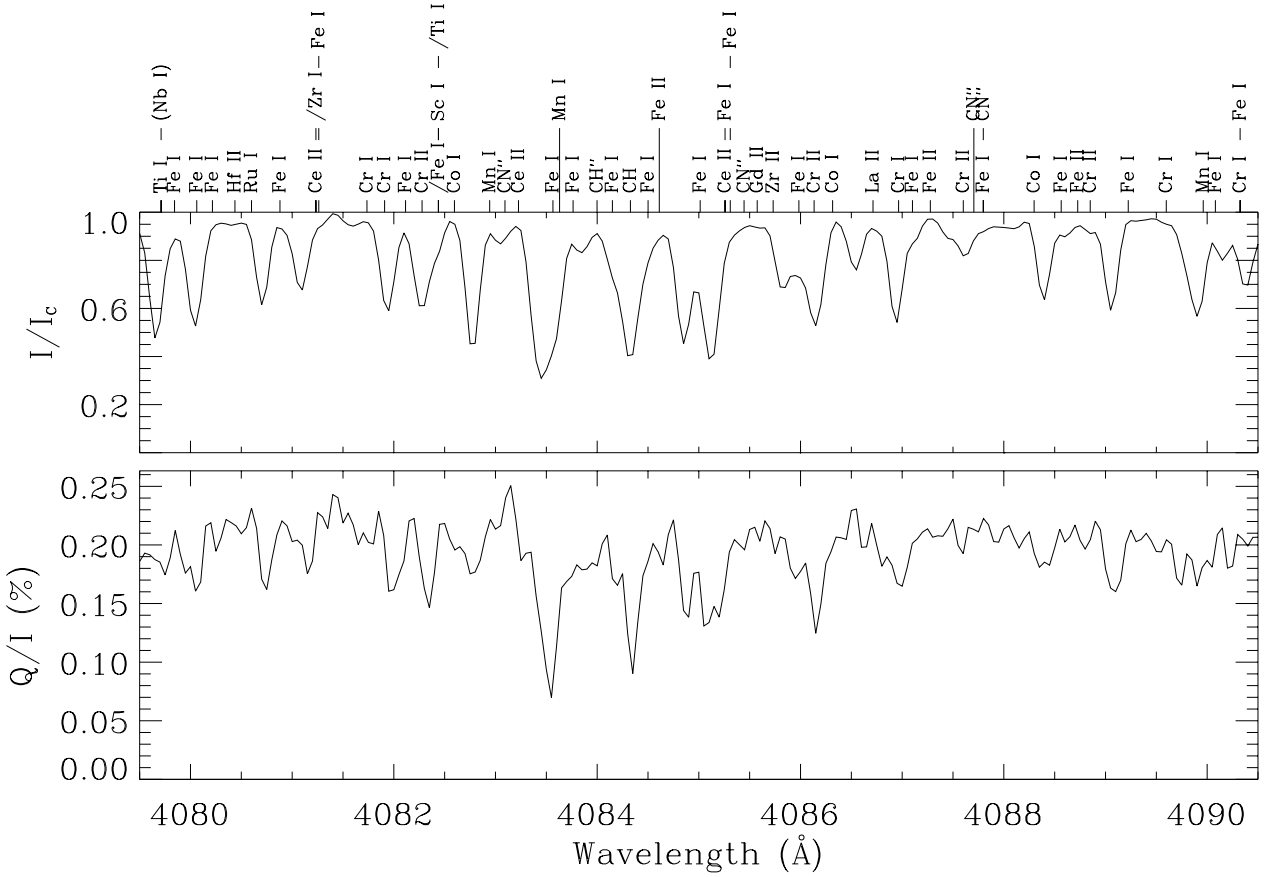

//Fe + //Fe + Zr II
Zr I
/Fe I
/Fe I – Ti I
Mn I
Fe I
Cr I
Fe I
Ce II
Fe II
Fe I
(Nd II)
(La II)
Mn I
Fe I
Fe I
Fe I
Fe II – Ga I
Mn I
Fe I
Cr I
Fe I
CH
Cr I
Ti I
Cr I
Zr II
–CH
CH
Mn I
Ti I
Sm II
Fe I
Co I – V II
Mn I
Ti I
Fe I – Ni I
Fe I
Fe I
CH
V II
Fe I
Cr I – (Gd II)
CH
Fe I
Gd II
Ni I
Fe I – Fe I
Fe I
Cr I
Cr I
V II
Y1
Fe I
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)

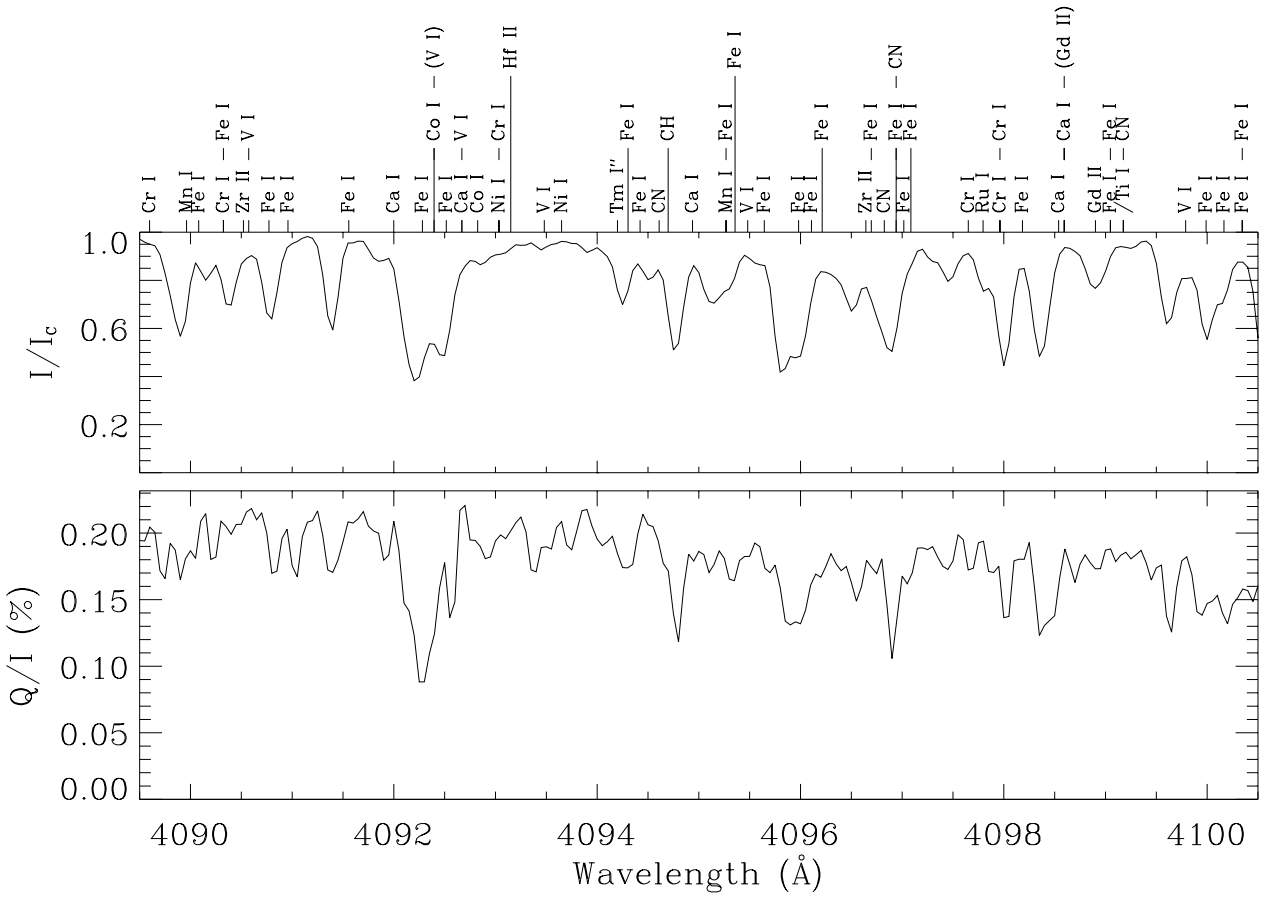

V II
Y1
Fe I
Fe I
Zr II
Ti I
CH
CH
Fe I
Ce II
Nd II
Fe I
Fe I
Mn I
Fe I
Fe I
Cr I
Fe I
Cr I
Ce II
Fe I
Sm II
La II
CH
Zr I
Cr I
Ti I
Fe I
Fe I
Fe I
K I
CH
Fe I
Fe I
Mn I
Mn I
Co I
Fe I
Zr II
Fe I
Fe I
Ce II
V II
Fe I
Fe I
Cr I
Ni I
K I
Fe I
Fe I
Y I
Sc I
CH
CH
Fe I
Zr II
Mn I
Mn I
Cr II
Fe I
Gd II
Ti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

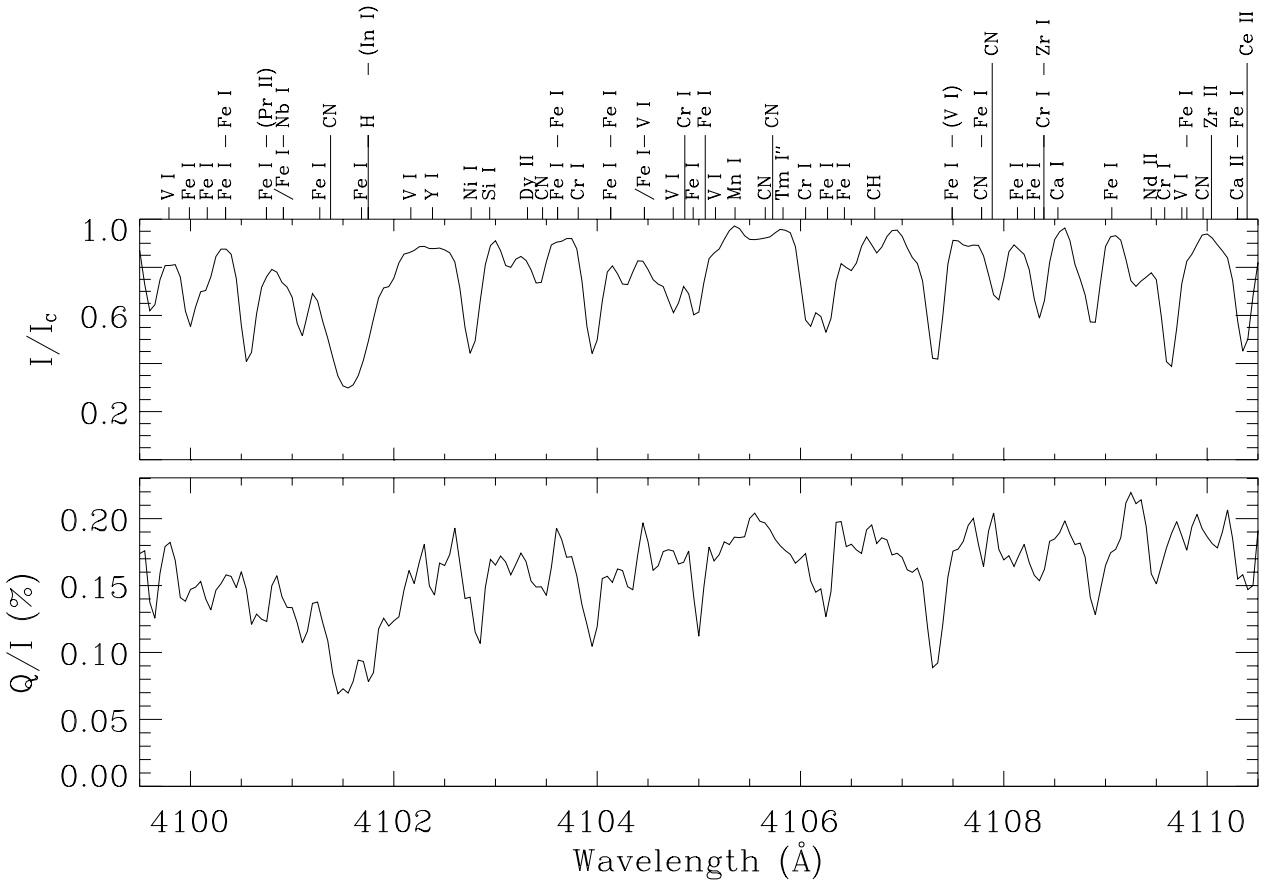

CH
CH
Gd II
Cr I
Zr II
Dy II
V I
Ni I
V I
Ru I
Mn I
Fe I
Fe I
Fe I
Fe I
Fe I
Ti I
Fe I
Ce II
Ti II
Cr II
Fe I
Fe I
Mg I
Fe I
Ti I
Mn I
Mn I
Fe I
Ti II
Fe I
Fe I
Cr I
V I
Co I
Fe I
Mg I
Fe I
Mn I
Co I
Fe I
Co I
Fe I
Mn I
CH
Mn I
Fe I
Nd II
Ti I
Ti I
(Cr I)
Fe I
Cr II
Sc I
Fe I
Fe I
Cr I
Ni I
Fe I
Ti I
CH
Cr I
Ti I
Fe I
Cr I
Fe I
(Ti I)
Cr I
(Nb I)
1.0
0.6
0.2
I/I_c
0.25
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4050
4052
4054
4056
4058
4060
Wavelength (Å)

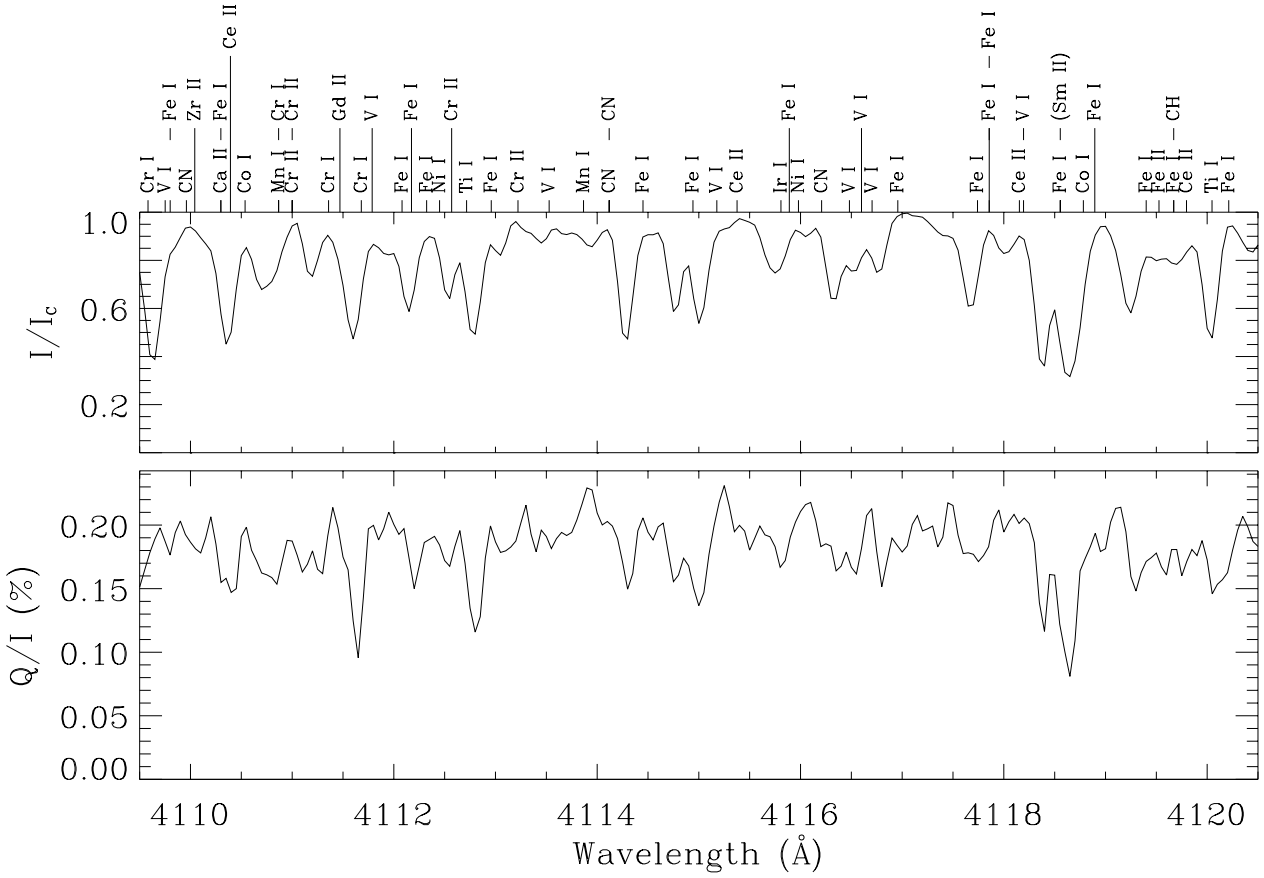

CH
Fe I
Nd II
Ti I
Ti I
Cr I
Fe I
Nd II – Fe I
Mn I
Fe I
Ce II
Fe I
Cu I
Fe I
Gd II
Fe I – (Mn I)
V I
Fe I
Ti I
Ti II – /Ni I
Fe I
Sm II– Sm II
Fe II
V II – //Ti I
C I
Fe I
Ti I – CH
Cr I
Fe I – CH
–CH
Co I
Fe I
Sm II
CH
Fe I – (Cr I)
Fe I
La II
Fe I
Fe I
Fe I
Ti I
Sm II
Cr I
Co I
Ti I
Ce II – Fe I
Ti I
Fe I
Nd II
Fe I
Fe I
Mn I
Fe I
1.0
0.6
0.2
I/I_c
0.25
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4060
4062
4064
4066
4068
4070
Wavelength (Å)

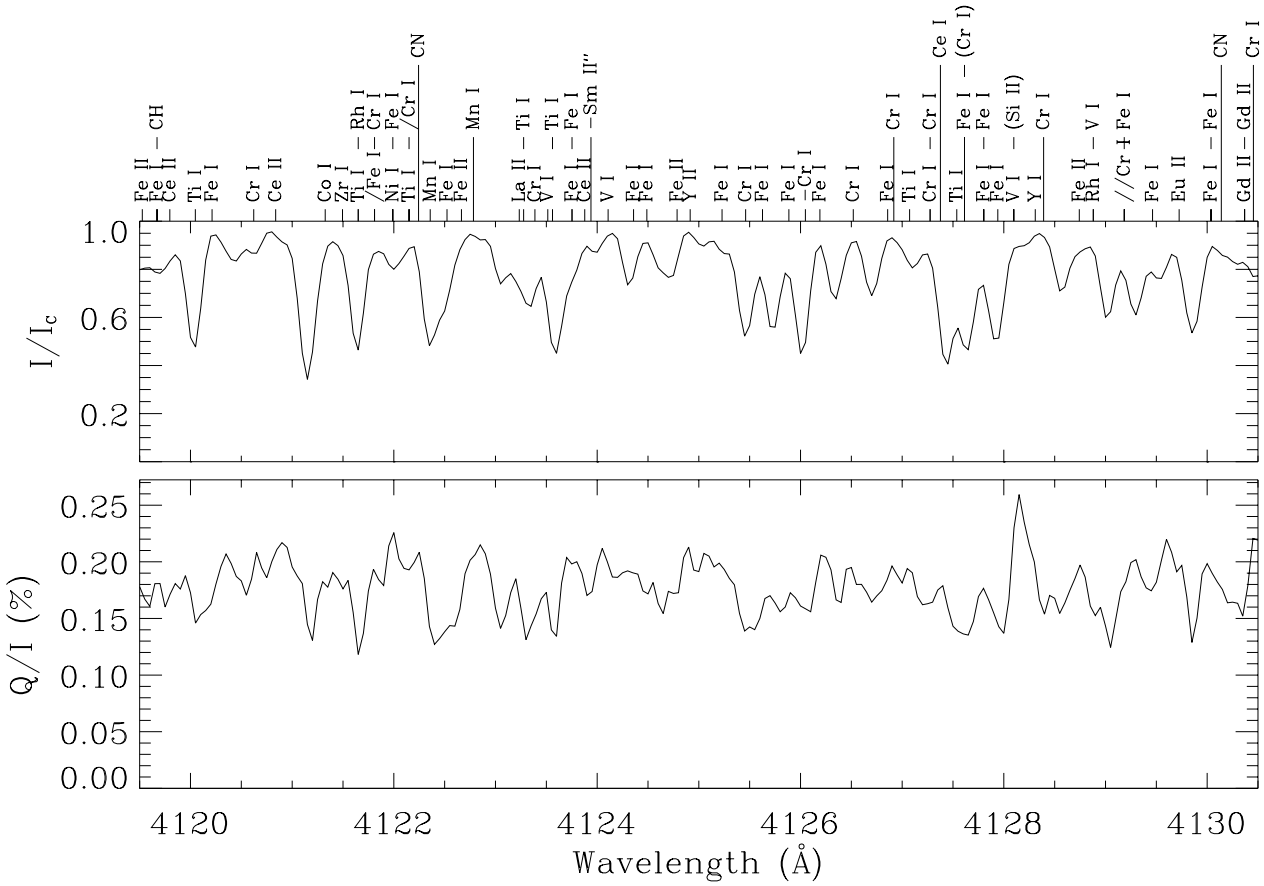

Fe I
Fe I
Mn I
Fe I
Fe I
Cr I
Zr II
Ti I
//Fe I + V I
Fe I
Fe I
Fe I
Zr I
Ni I
Dy II
Ce II
Fe I
Ti I – W I
Fe I
Fe I
Ni I
(Nd II)
Nd II – CH
Cr II – Ce II
Sm II – Ce II
Fe I
Cr I
Co I
Fe I
Ti I
Fe I
Fe I
Fe I
Cr II – Fe I
Zr II – /Cr I
Ti I
La II – Y I
Ce II – Cr II
Sr II
Dy II
Fe I
Ti I
Fe I
Fe I – //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
0.5
0.4
0.3
0.2
0.1
0.0
Q/I (%)
4070
4072
4074
4076
4078
4080
Wavelength (Å)

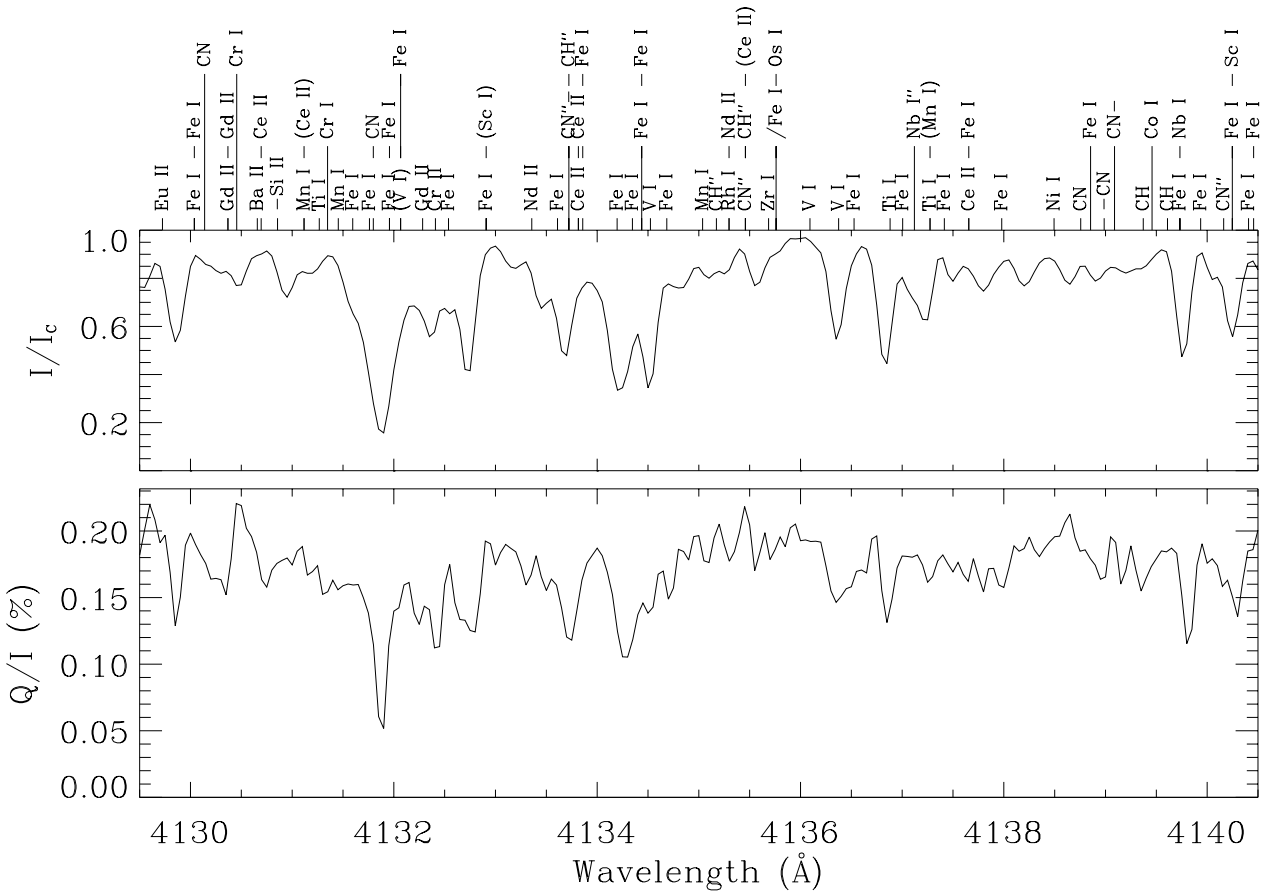

Ti I – (Nb I)
Fe I
Fe I
Fe I
Hf II
Ru I
Fe I
Ce II = /Zr I – Fe I
Cr I
Cr I
Fe I
Cr II
/Fe I – Sc I – /Ti I
Co I
Mn I
CN''
Ce II
Fe I
Mn I
Fe I
CH''
Fe I
CH
Fe I
Fe II
Fe I
Ce II = Fe I – Fe I
CN''
Gd II
Zr II
Fe I
Cr II
Co I
La II
Cr I
Fe I
Fe II
Cr II
Fe I – CN''
CN''
Co I
Fe I
Fe II
Cr II
Fe I
Cr I
Mn I
Fe I
Cr I – Fe I
1.0
0.6
0.2
I/I_c
0.25
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4080
4082
4084
4086
4088
4090
Wavelength (Å)

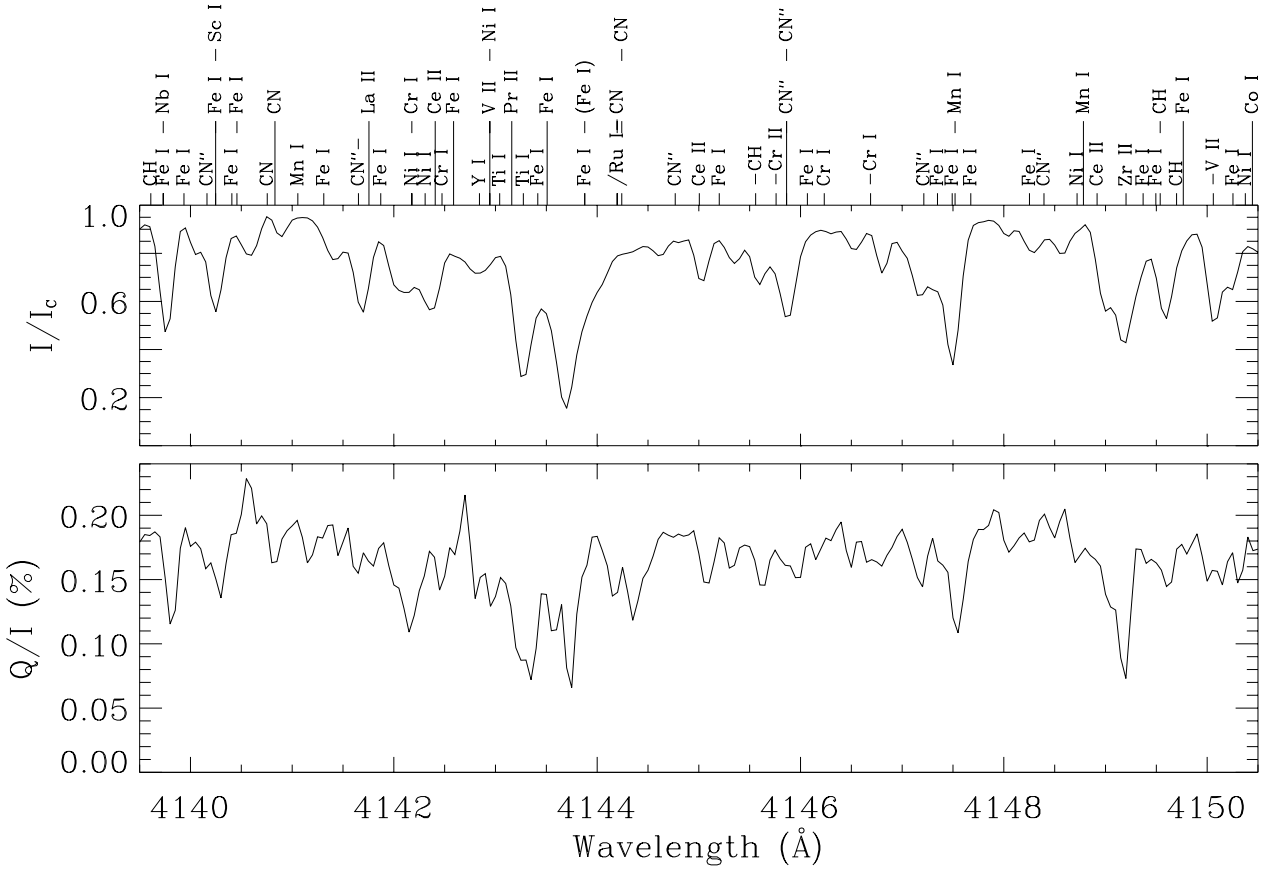

Cr I
Mn I
Fe I
Cr I – Fe I
Zr II – V I
Fe I
Fe I
Fe I
Ca I
Fe I
Co I – (V I)
Fe I
Ca I – V I
Co I
Ni I – Cr I
Hf II
V I
Ni I
Tm I''
Fe I
Fe I
CN
CH
Ca I
Mn I – Fe I
Fe I
V I
Fe I
Fe I
Fe I
Fe I
Zr II – Fe I
CN
Fe I – CN
Fe I
Cr I
Ru I
Cr I – Cr I
Fe I
Ca I – Ca I – (Gd II)
Gd II
Fe I – Fe I
Ti I – CN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

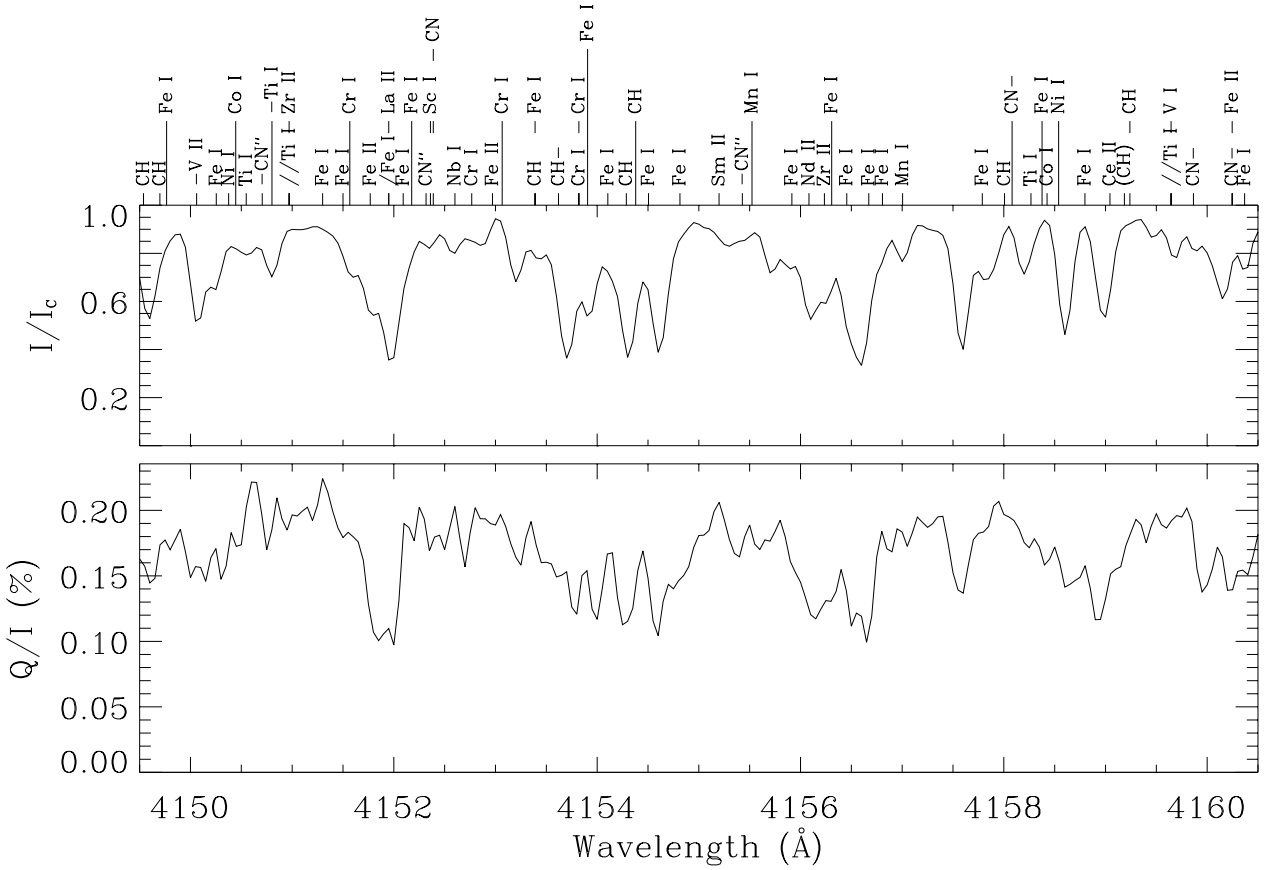

V I
Fe I
Fe I
Fe I – Fe I
Fe I – (Pr II)
/Fe I – Nb I
Fe I
CN
Fe I
H
– (In I)
V I
Y I
Ni I
Si I
Dy II
CN
Fe I – Fe I
Cr I
Fe I – Fe I
/Fe I – V I
V I
Cr I
Fe I
Fe I
V I
Mn I
CN
CN
Tm I''
Cr I
Fe I
Fe I
CH
Fe I – (V I)
CN
CN
– Fe I
Fe I
Fe I
Cr I – Zr I
Ca I
Fe I
Nd II
Cr I
V I
– Fe I
CN
Zr II
Ca II –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

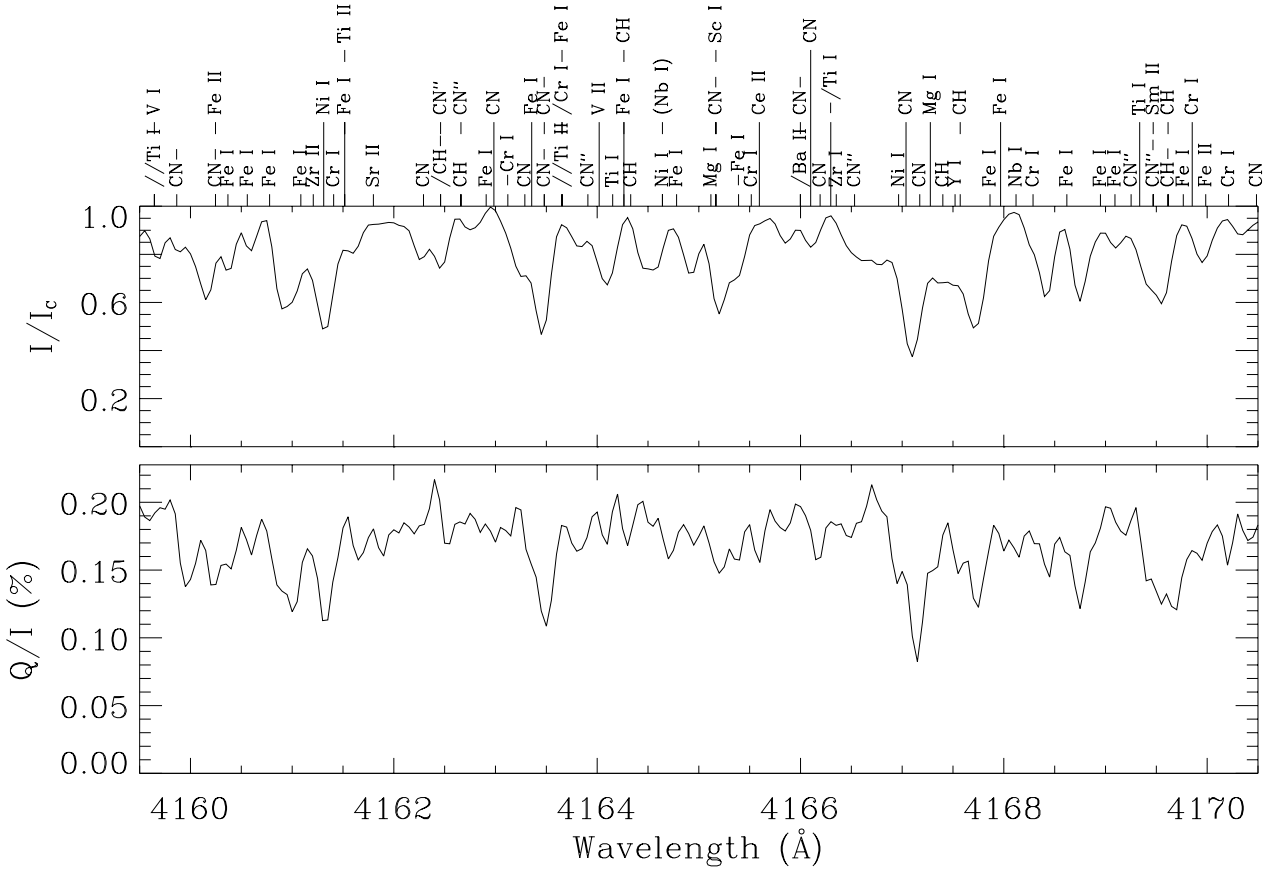

Cr I
V I
Fe I
CN
Zr II
Ca II
Fe I
Ce II
Co I
Mn I
Cr II
Cr I
Gd II
Cr I
V I
Fe I
Fe I
Ni I
Cr II
Ti I
Fe I
Cr II
V I
Mn I
CN
CN
Fe I
Fe I
V I
Ce II
Ir I
Fe I
Ni I
CN
V I
V I
V I
Fe I
Fe I
Fe I
Ce II
V I
Fe I
(Sm II)
Co I
Fe I
Fe I
Fe I
Fe II
Ce II
CH
Ti I
Fe I
1.0
0.6
0.2
I/I_c
0.20
0.15
0.10
0.05
0.00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

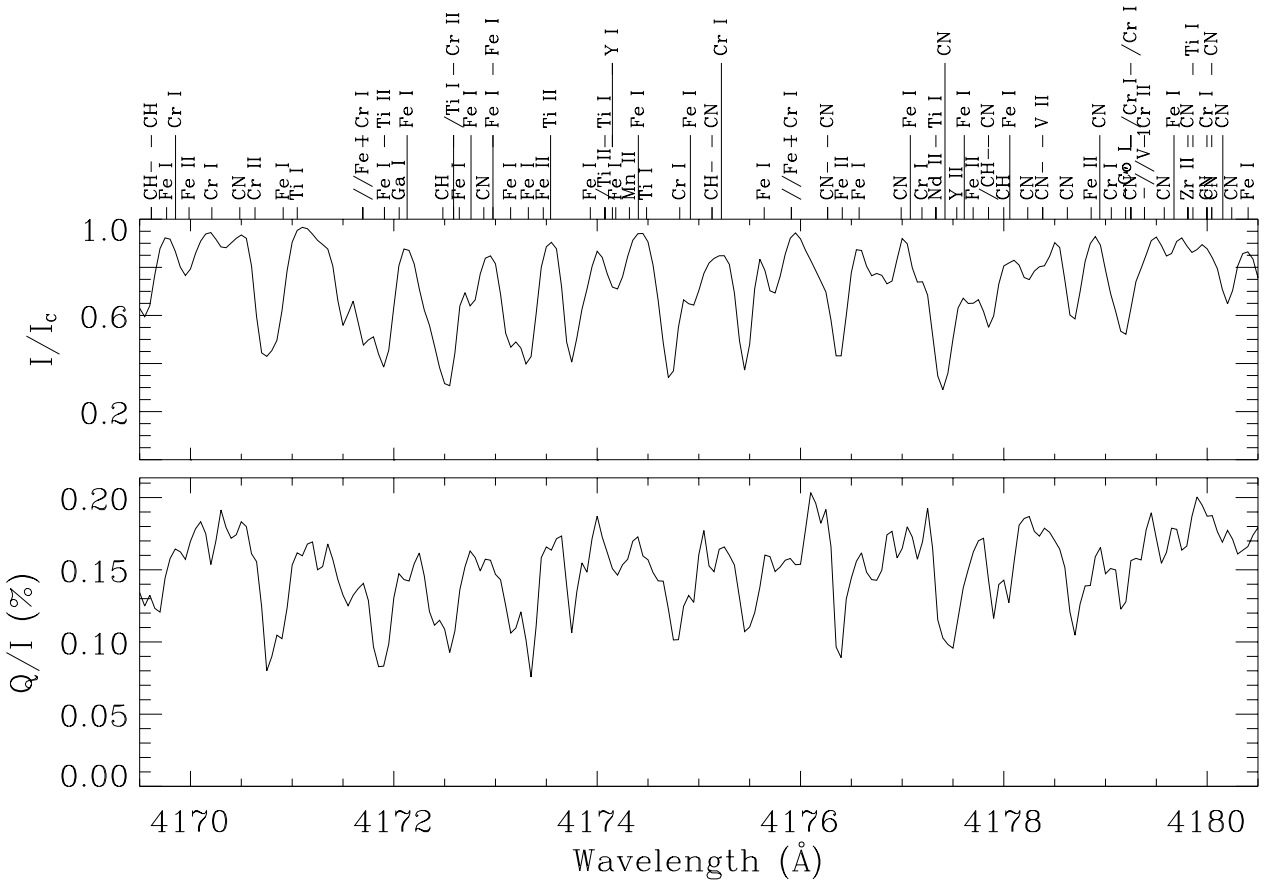

Fe II
Fe I – CH
Ce II
Ti I
Fe I
Cr I
Ce II
Co I
Zr I
Ti I – Rh I
/Fe I – Cr I
Ni I – Fe I
Ti I – /Cr I
CN
Mn I
Fe I
Fe II
Mn I
La II – Ti I
Cr I
V I – Ti I
Fe I – Fe I
Ce II – Sm II"
V I
Fe I
Fe I
Fe II
Y II
Fe I
Cr I
Fe I
Fe I
Cr I
Fe I
Cr I
Fe I – Cr I
Ti I
Cr I – Cr I
Ce I
Ti I – Fe I – (Cr I)
Fe 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
0.25
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4120
4122
4124
4126
4128
4130
Wavelength (Å)

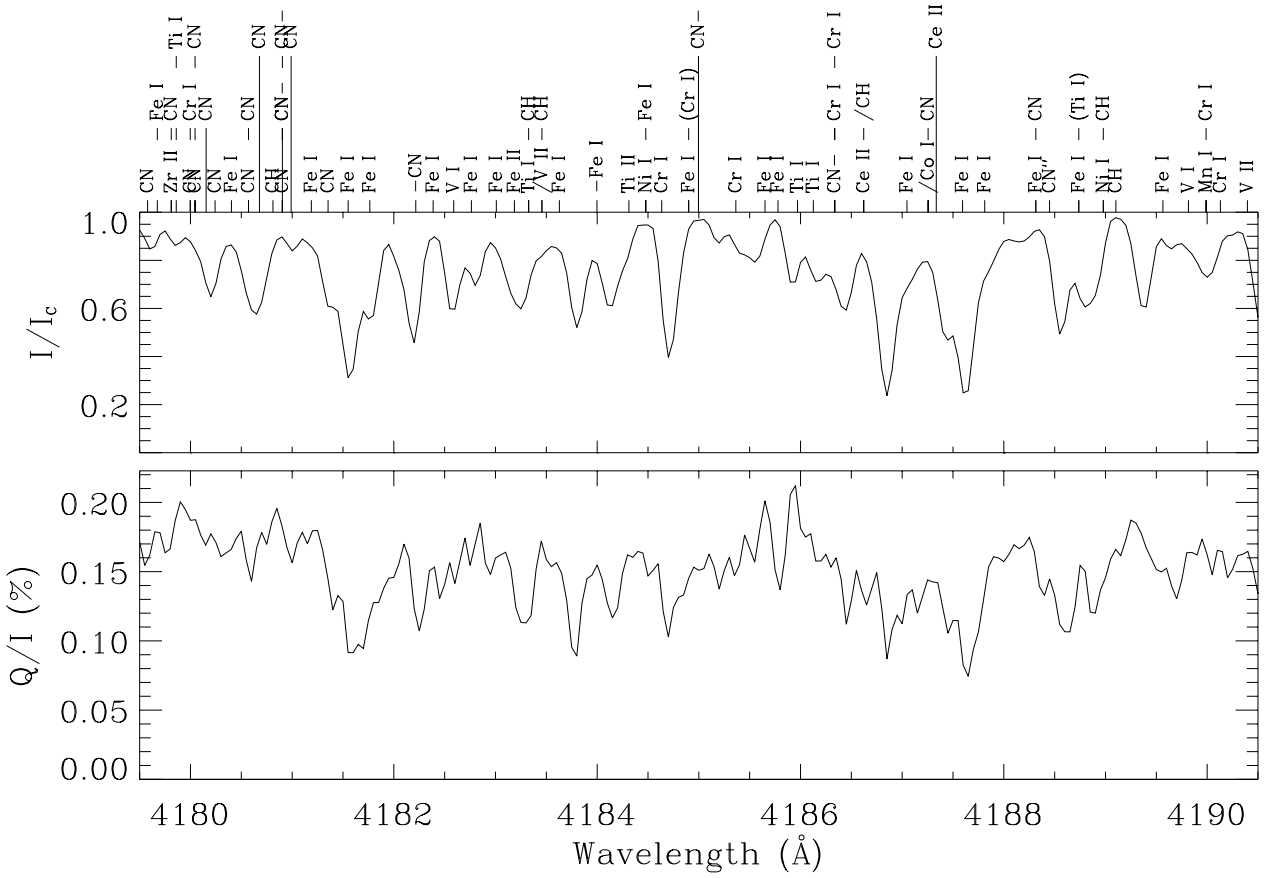

Eu II
Fe I
Fe I
CN
Gd II
Gd II
Cr I
Ba II
Ce II
Si II
Mn I
(Ce II)
Ti I
Cr I
Mn I
Fe I
Fe I
CN
Fe I
Fe I
(V I)
Gd II
Cr I
Fe I
Fe I
(Sc I)
Nd II
Fe I
CN''
Ce II
Ce II
CH''
Fe I
Fe I
Fe I
Fe I
Fe I
V I
Fe I
Mn I
CH''
Rh I
Nd II
CN''
CH''
(Ce II)
Zr I
Fe I
Os I
V I
V I
Fe I
Ti I
Fe I
Nb I''
Ti I
(Mn I)
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''
Sc 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 (%)
4130
4132
4134
4136
4138
4140
Wavelength (Å)

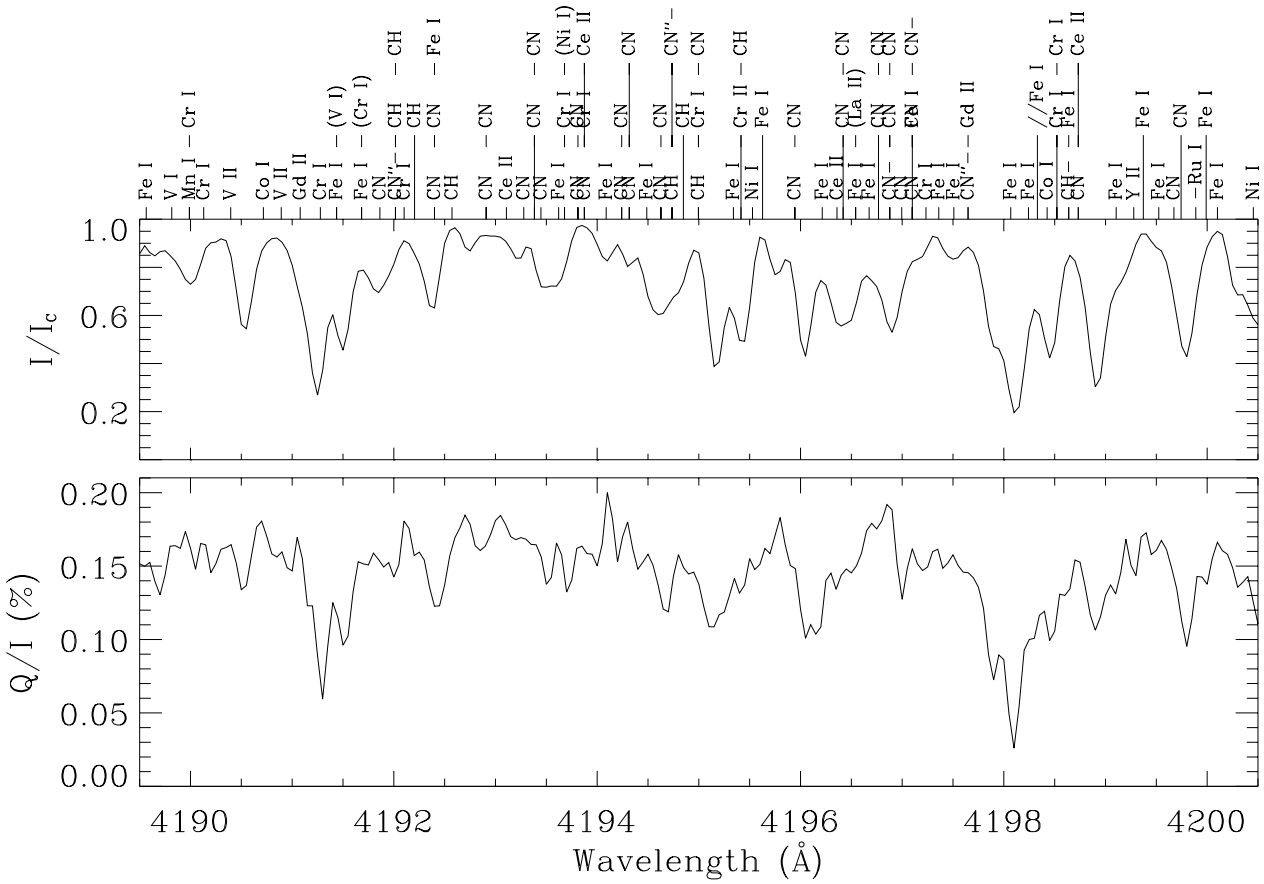

CH
Fe I – Nb I
Fe I
CN''
Fe I – Sc I
Fe I – Fe I
CN
CN
Mn I
Fe I
CN'' –
Fe I
La II
Ni I – Cr I
Ni I
Ni I
Cr I
Ce II
Fe I
Y I
V II – Ni I
Ti I
Pr II
Ti I
Fe I
Fe I
Fe I – (Fe I)
/Ru I – CN
– CN
CN''
Ce II
Fe I
– CH
– Cr II
CN'' – CN''
Fe I
Cr I
– Cr I
CN''
Fe I
Fe I – Mn I
Fe I
Fe I
CN''
Ni I
Mn I
Ce 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
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4140
4142
4144
4146
4148
4150
Wavelength (Å)

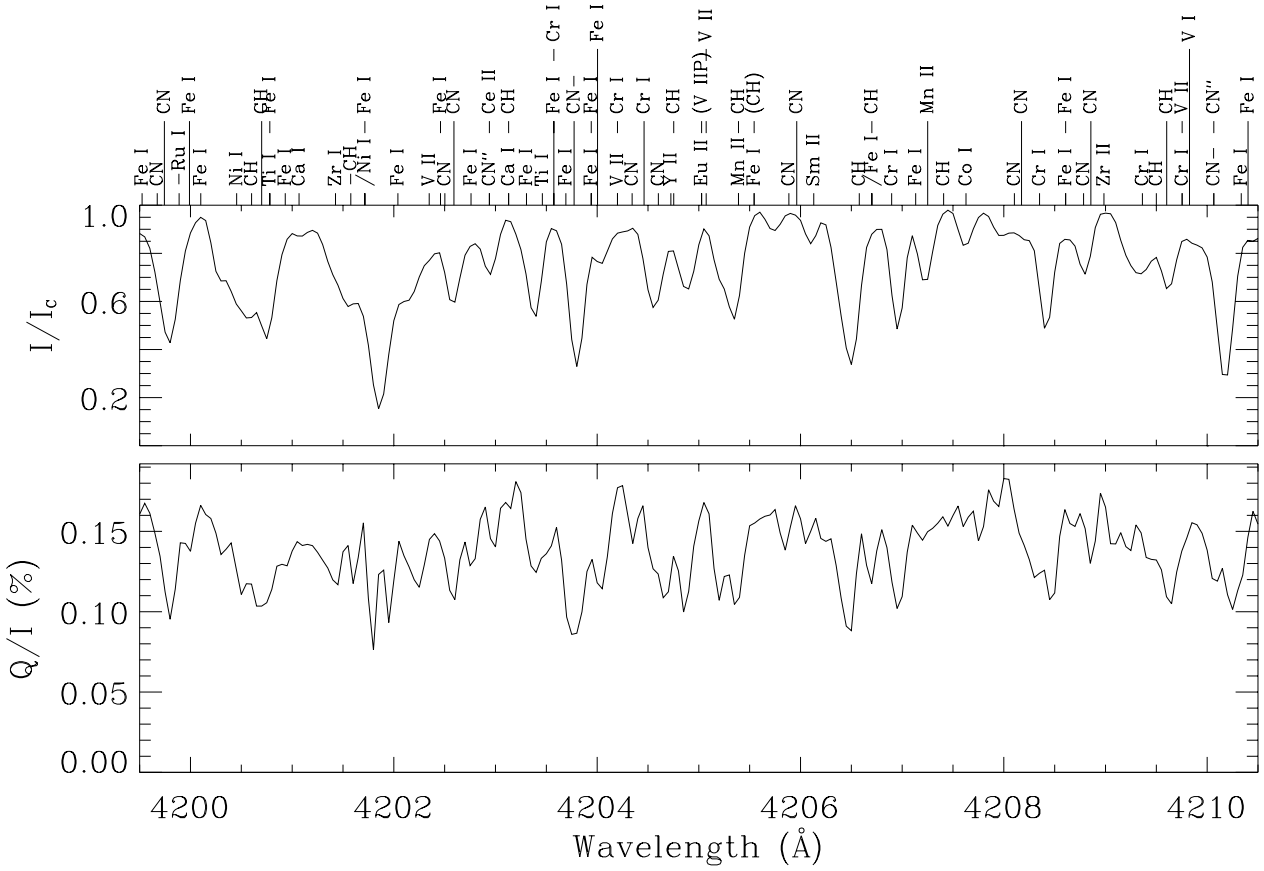

CH
CH
Fe I
V II
Fe I
Ni I
Co I
Ti I
CN''
Ti I
//Ti I
Zr II
Fe I
Fe I
Cr I
Fe II
/Fe I
La II
Fe I
Fe I
CN''
Sc I
CN
Nb I
Cr I
Fe II
Cr I
CH
Fe I
CH
Cr I
Cr I
Fe I
Fe I
CH
Fe I
Fe I
Sm II
CN''
Mn I
Fe I
Nd II
Zr II
Fe I
Fe I
Fe I
Mn I
Fe I
CH
CN
Ti I
Co I
Fe I
Ni I
Fe I
Ce II
(CH)
CH
//Ti I
V I
CN
CN
Fe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

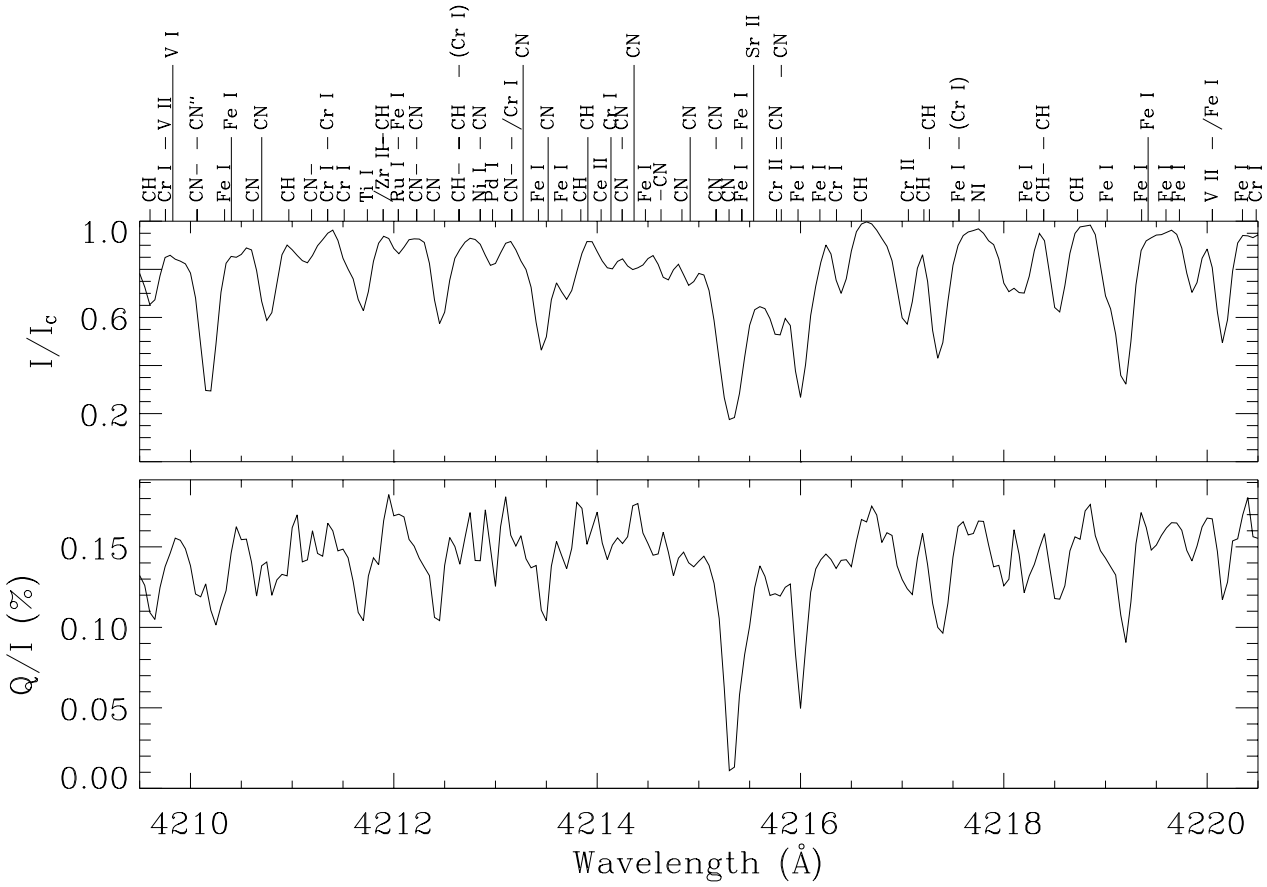

//Ti I + V I
CN
CN
Fe II
Fe I
Fe I
Fe I
Fe I
Zr II
Ni I
Cr I
Fe I
Ti II
Sr II
CN
CN''
/CH
CN''
CH
Fe I
CN
Cr I
CN
Fe I
CN
CN
//Ti II /Cr I
Fe I
CN''
V II
Ti I
Fe I
CH
CH
Ni I
(Nb I)
Fe I
Mg I
CN
Sc I
Fe I
Cr I
Ce II
/Ba II
CN
CN
CN
Zr I
Ti I
CN''
Ni I
CN
CN
Mg I
CH
Y I
CH
Fe I
Fe I
Nb I
Cr I
Fe I
Fe I
Fe I
CN''
Ti I
Sm II
CH
CH
Fe I
Cr I
Fe II
Cr I
CN
1.0
0.6
0.2
I/I_c
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4160
4162
4164
4166
4168
4170
Wavelength (Å)

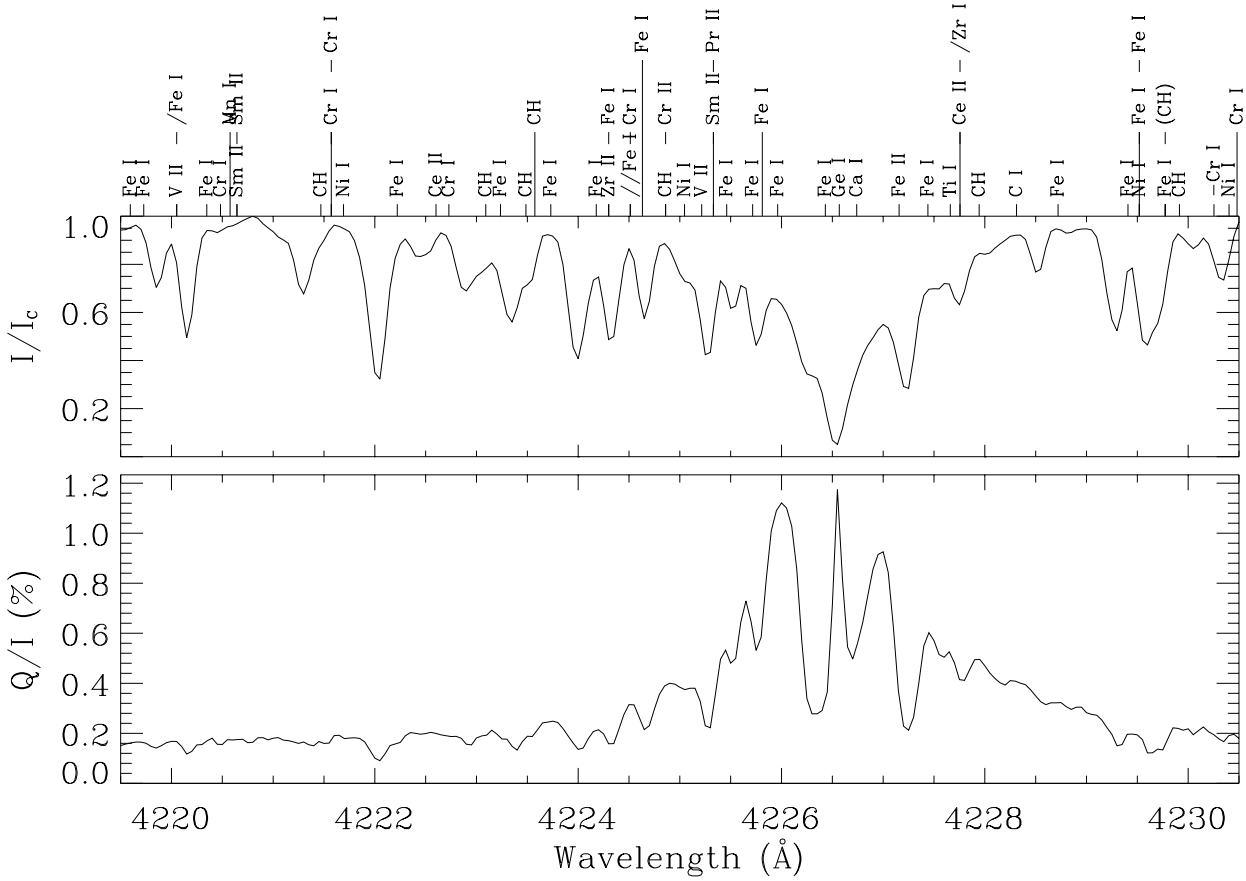

CH
Fe I
Cr I
Fe II
Cr I
CN
Cr II
Fe I
Ti I
Fe I
Cr I
Ti II
Fe I
Ga I
CH
Ti I
Cr II
Fe I
Fe I
CN
Fe I
Fe I
Fe I
Fe II
Ti II
Fe I
Ti II
Ti I
Y I
Fe I
Mn II
Fe I
Ti I
Cr I
Fe I
CH
CN
Cr I
Fe I
Fe I
Cr I
CN
Fe I
CN
Fe II
Fe I
CN
Cr I
Nd II
Ti I
CN
Y II
Fe I
Fe II
CN
CH
Fe I
CN
CN
V II
CN
Fe II
CN
Cr I
CN
Cr I
Cr I
V I
Cr II
CN
Fe I
Zr II
CN
Ti I
Cr I
CN
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 (%)
4170
4172
4174
4176
4178
4180
Wavelength (Å)

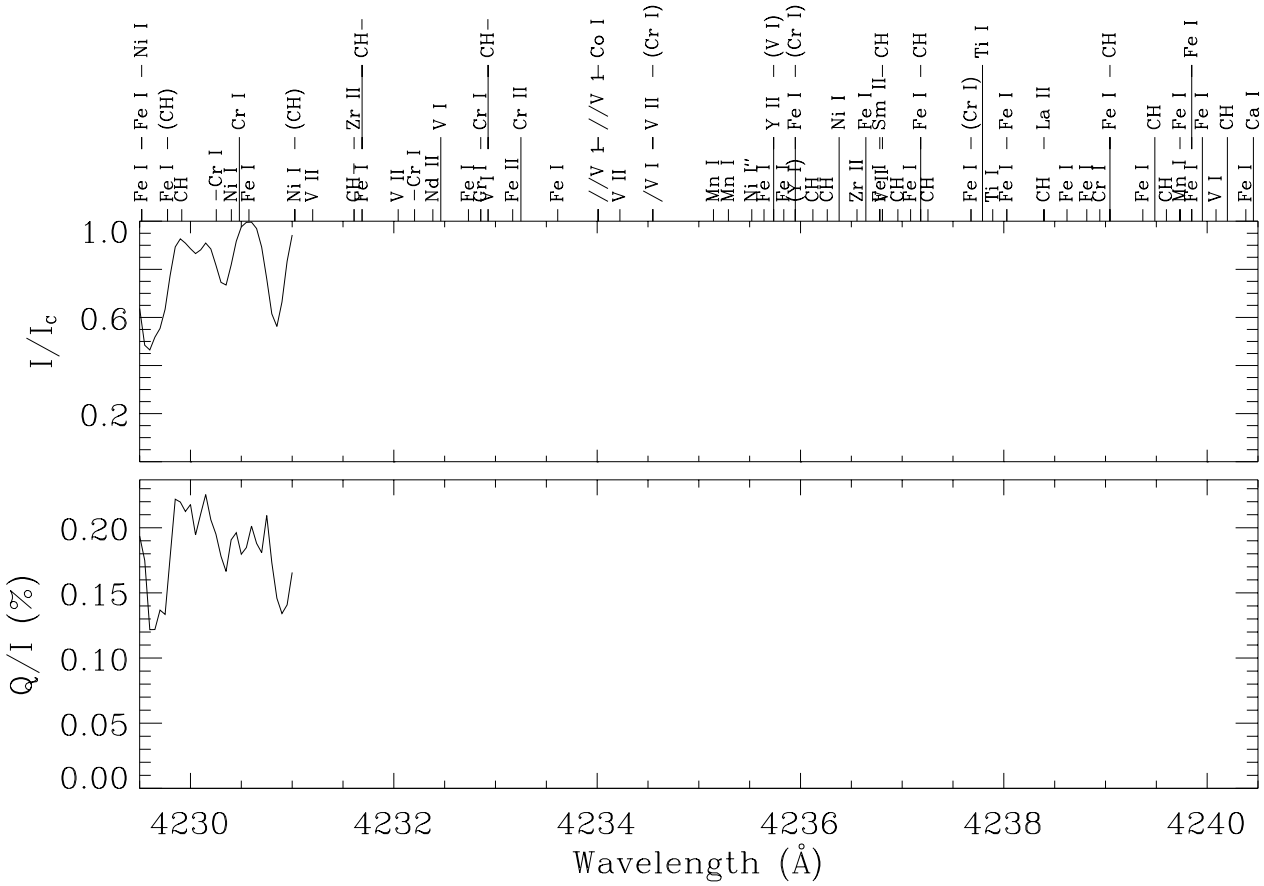

I/I_c
Q/I (%)
Wavelength (Å)
4180
4182
4184
4186
4188
4190
1.0
0.6
0.2
0.20
0.15
0.10
0.05
0.00


Fe I
V I
Mn I
Cr I
V II
Co I
V II
Gd II
Cr I
Fe I
Fe I
CN
CN
CN


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
Fe I
CN
Fe I
Fe I
V II
CN
Cr I
Cr I
CN
V 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
CN
Cr I
Fe I
CN
CN
Zr II
Cr I
CH
CH
Cr I
V II
V I
CN
CN
Fe I
Fe I
1.0
0.6
0.2
I/I_c
0.15
0.10
0.05
0.00
Q/I (%)
4200
4202
4204
4206
4208
4210
Wavelength (Å)


CH
Cr I
V II
V I
CN
CN"
Fe I
CN
CH
CN
Cr I
Cr I
Ti I
Zr II
CH
Fe I
Ru I
CN
CN
CH
(Cr I)
Pd I
CN
CN
/Cr I
CN
Fe I
CN
Fe I
CH
Ce II
Cr I
CN
CN
Fe I
CN
CN
CN
CN
Fe I
Sr II
Cr II
CN
CN
Fe I
Fe I
Cr I
CH
Cr II
CH
CH
Fe I
(Cr I)
NI
Fe I
CH
CH
CH
Fe I
Fe I
Fe I
Fe I
V II
/Fe I
Fe I
Cr I
1.0
0.6
0.2
I/I_c
0.15
0.10
0.05
0.00
Q/I (%)
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
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 (%)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
4220
4222
4224
4226
4228
4230
Wavelength (Å)


Fe I
Ni I
Fe I
(CH)
CH
Cr I
Ni I
Cr I
Fe I
Ni I
(CH)
V II
CH
Zr II
CH
V II
Cr I
Nd II
V I
Fe I
Cr I
Cr I
CH
Fe II
Cr II
Fe I
V I
Co I
V II
V I
(Cr I)
V II
Mn I
Mn I
Ni I
Fe I
Y II
(V I)
Fe I
(Cr I)
CH
CH
Ni I
Zr II
Fe I
Sm II
CH
CH
Fe I
CH
Fe I
CH
Fe I
(Cr I)
Ti I
Ti I
Fe I
Fe I
La II
CH
Fe I
Fe I
Cr I
Fe I
CH
Fe I
CH
CH
Mn I
Fe I
Fe I
V I
CH
Fe I
Ca I
1.0
0.6
0.2
I/I$_c$
0.20
0.15
0.10
0.05
0.00
Q/I (%)
4230
4232
4234
4236
4238
4240
Wavelength (Å)