Mon. Not. R. astr. Soc. (1986) **222,** 683–688 and *Microfiche* MN 222/1

The variation of the 5200 feature in HD 34452

B. S. Shylaja and G. S. D. Babu *Indian Institute of Astrophysics, Bangalore 560034, India*

Accepted 1985 July 25. Received 1985 July 11; in original form 1984 August 7

Summary. Spectrophotometric observations of the hot Si star HD 34452≡ HR 1732 obtained over a duration of four years, from 1979 to 1983, are presented. The period of variation in the broad-band feature centred around λ5200 is found to be 2.4660 day and the variation curve shows a double hump. This matches closely with the one found earlier by Deutsch (1947) for the variation of the He I line intensities and by a few more authors subsequently, for several other spectral features. The variation of the 5200 feature, while being in phase with other spectral variations, is in antiphase with the light variation. The elements of variation are I_{5200} (Max I)=(HJD 2444148.236±0.002)+(2.4660E±0.0001).

1 Introduction

HD 34452 (≡HR 1732≡BD+33° 1008) is an Ap star and is perhaps the hottest among the known members of this class. A variation in the intensity of He I lines of this star was first reported by Westgate (1933). Deutsch (1947) found that this variation can be best fitted with a period of 2.466 day. He also classified this as a typical Si star. Later on, Pavlova, Khokhlova & Aslanov (1977) confirmed the spectrum variability with the same period. The photometric observations made by Rakos (1962) and by Nikolov (1977) showed the same period in light variations.

The recent spectrophotometric observations by us (Babu & Shylaja 1980, Paper I) have clearly shown a broad depression in its spectrum around λ5200, which is also seen in several other Ap stars and which we will refer to as the 5200 feature. This feature was noticed by Adelman (1977) who analysed Wolff's (1967) spectrophotometric data of this star. Adelman & White (1980) pointed out the other feature around λ4200 which was, however, comparatively weaker. They made a suggestion of the variability of the 5200 feature but this aspect was not convincingly proved (Adelman & White 1980; Adelman 1981). However, in a recent investigation Pyper & Adelman (1984) have found that the 5200 feature shows structure and the corresponding indices do not show any appreciable variation.

In this paper, we present observational evidences for the variation of the 5200 feature which is in agreement with the period of spectral variations found by Deutsch, several years ago.

2 Observations and results

This star was observed on 20 different occasions over a duration of about four years from 1979 to 1983, using the photoelectric spectrum scanner (Bappu 1977) mounted on the Kavalur 102-cm telescope. In all these observations, a refrigerated photomultiplier tube of type either EMI 9558B or 9658B was used, the integration time on each spectral element being 1 s. The width of the exit slit was kept the equivalent of 20 Å (sometimes 40 Å) and the range covered was generally

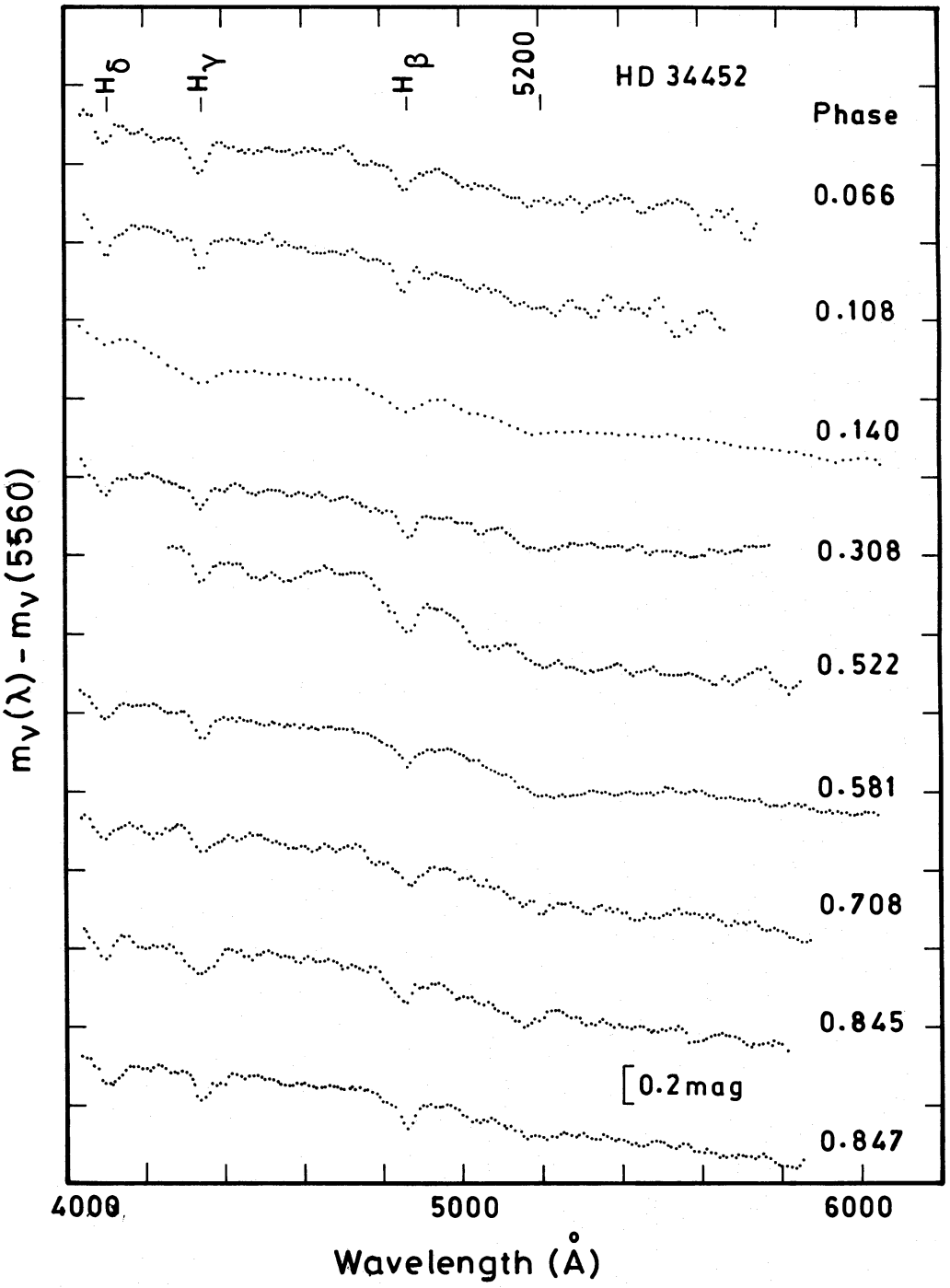

Figure 1. A sample of the energy distribution curves of the star HD 34452 in the blue and visual regions over a duration of four years, arranged in the order of phase. Note especially the variation in the profile of the feature around λ5200. The width of the exit slit was equivalent of 20 Å and the interval between the consecutive points is 10 Å except for the scan at phase=0.140.

$\lambda\lambda$4000–7800 Å. Each observation was divided into two parts – one from $\lambda\lambda$4000–6000 Å with a Schott GG13 filter and the other from $\lambda\lambda$5800–7800 Å with either a Wratten W 25 or Schott OG1 filter. Each part covering 2000 Å consisted of an integration over 10 consecutive scans, with a counting interval over a given spectral element of 100 millisec per scan. It took about 4.5 min to complete one such run. The observations have been corrected for the atmospheric extinction by using the mean extinction coefficients. At least one, in many cases two, of the standard stars listed by Hayes (1970) were observed on each night, to standardize the magnitudes. The magnitudes of these standard stars were found to be self-consistent to 0.01 mag accuracy. The point-by-point standardized magnitudes ($-2.5 \log F_v/F_{5560}$) at 10 Å (sometimes 20 Å) intervals for all the 20 scans are given in Table 1 (on *Microfiche* MN 222/1). On some occasions, the second part $\lambda\lambda$5800–7800 Å, could not be observed due to unavoidable circumstances.

Fig. 1 shows a sample of these curves arranged in the order of phase to facilitate a better comparison. Both the 4200 and the 5200 features are noticeable with the latter being conspicuously stronger and showing some structures. These features can be seen varying in profile as well as in magnitude. Pyper & Adelman (1984) also have observed that a structure exists for the 5200 feature, with a possible secondary minimum at 5470 Å.

3 Period of variation

It may be noticed in Fig. 1 that the maximum width of the 5200 feature is about 600 Å. The depth of this feature is found to be varying by up to about 0.2 mag. To enable comparison of the strength of the feature at different phases, an index, I_{5200}, was introduced in the following manner. The observed energy distribution curves of the star have been individually compared with the theoretical models taken from Kurucz (1979) for the case of $\log g = 4.0$. The model curves showing the best fit have been deemed to represent the respective continua. Then the area contained in the 'absorption' feature around $\lambda 5200 \pm 300$ Å under this 'continuum' is measured and divided by 600 to give the required index. These values are listed in Table 2, along with the corresponding times of observations.

We attempted all possible periods between 0.8 and 5.0 day in steps of 0.1 day to obtain the best fit for the time-dependent variation of these indices, employing the method of period determination used by Raveendran, Mekkaden & Mohin (1982). This resulted in a period of 2.4660 day which is exactly equal to that given by Deutsch (1947) for the He I line strength variation. When Deutsch's epoch of phase zero is used for our observations, we find that the second of the two humps in the curve, which appears near phase=0.5 is more pronounced than the marginal one of Deutsch's data as seen in Fig. 2(a) and (d) respectively. The lack of data between phases 0.87 and 1.06 in our observations makes it difficult to fix the height of the curve at the zero phase. However, we get the elements of variation as

$$I_{5200}\,(\text{Max } I)\,\text{HJD} = (2444148.236 \pm 0.002) + (2.4660\text{E} \pm 0.0001)$$

which is in total agreement with that given by Deutsch (1947). The phases thus obtained are included in Table 2.

It is interesting to note that a similar index for the 4200 feature, which is termed as I_{4200}, given in Fig. 2(c) also shows a variation with the same period as that of the 5200 feature, in spite of being the relatively weaker 'absorption' feature. The width of this feature has been taken as 100 Å.

4 Discussion

Fig. 1 shows that the strength of the 5200 feature correspondingly affects the total flux emitted in that wavelength region. Therefore, the V magnitude of the star is inversely related to the strength

Table 2. The values of the I_{5200} index and the corresponding times of observations. The phases are calculated with a period of 2.466 day.

Scan No.	HJD 2440000+	Phase	I_{5200}
1	4149.499	0.522	1.203±0.033
2	4542.397	0.847	0.292±0.038
3	4594.191	0.852	0.347±0.040
4	4663.278	0.867	0.357±0.041
5	4685.078	0.708	0.425±0.033
6	5004.178	0.108	0.720±0.036
7	5036.133	0.066	0.710±0.034
8	5070.113	0.845	0.295±0.033
9	5330.183	0.308	0.465±0.033
10	5370.117	0.502	0.637±0.038
11	5649.437	0.770	0.290±0.031
12	5649.483	0.789	0.335±0.041
13	5650.339	0.136	0.757±0.062
14	5650.349	0.140	0.748±0.058
15	5650.458	0.184	0.520±0.066
16	5650.462	0.186	0.587±0.059
17	5651.278	0.517	0.783±0.042
18	5651.399	0.566	0.905±0.047
19	5651.437	0.581	0.870±0.036
20	5676.216	0.630	0.648±0.071

of this feature because the bandwidth of the standard V filter covers the entire region around 5200 Å. Thus, the variation in the 5200 feature shown in Fig. 2(a) is in perfect antiphase of the variation in light, observed by Rakos (1962) through the V filter (*cf.* Fig. 2b). On the same grounds, the variation in the 4200 feature (*cf.* Fig. 2c), being in phase with that of the 5200 feature, is also found to be in antiphase with the variation in light through the B filter. As a consequence of this, the $(B-V)$ and the $(b-y)$ colours are not expected to show a distinct variation in phase. However, $(u-b)$ may indicate the variation of the 4200 feature; such a variation is seen in the fig. 3 of Adelman & White (1980). Subsequent spectrophotometry by Pyper & Adelman (1984) shows a small-amplitude variation of $(b-y)$; but $(u-b)$ variation is not clear. This may also indicate that the 4200 feature is weak and its variation is not very strong.

From our Fig. 1, we see that on several occasions the depression around λ5200 Å includes Hβ or at least a part of it. This is likely to introduce a degree of uncertainty in the h index (*cf.* Crawford *et al.* 1972), which is an indicator of Hβ strength. In the same manner, all the wavelengths chosen for Δa index (*cf.* Adelman 1979) are very much inside the depression and cannot be expected to show much variation with respect to each other.

It may be seen in Fig. 1 that the slope of the Paschen continuum is apparently affected by the strength of the 5200 feature. Therefore, in order to estimate a fairly realistic temperature of this star, the energy curves with the weakest 5200 feature have been chosen, which happen to be between the phases of 0.75 to 0.90. These observed curves, when compared with Kurucz's

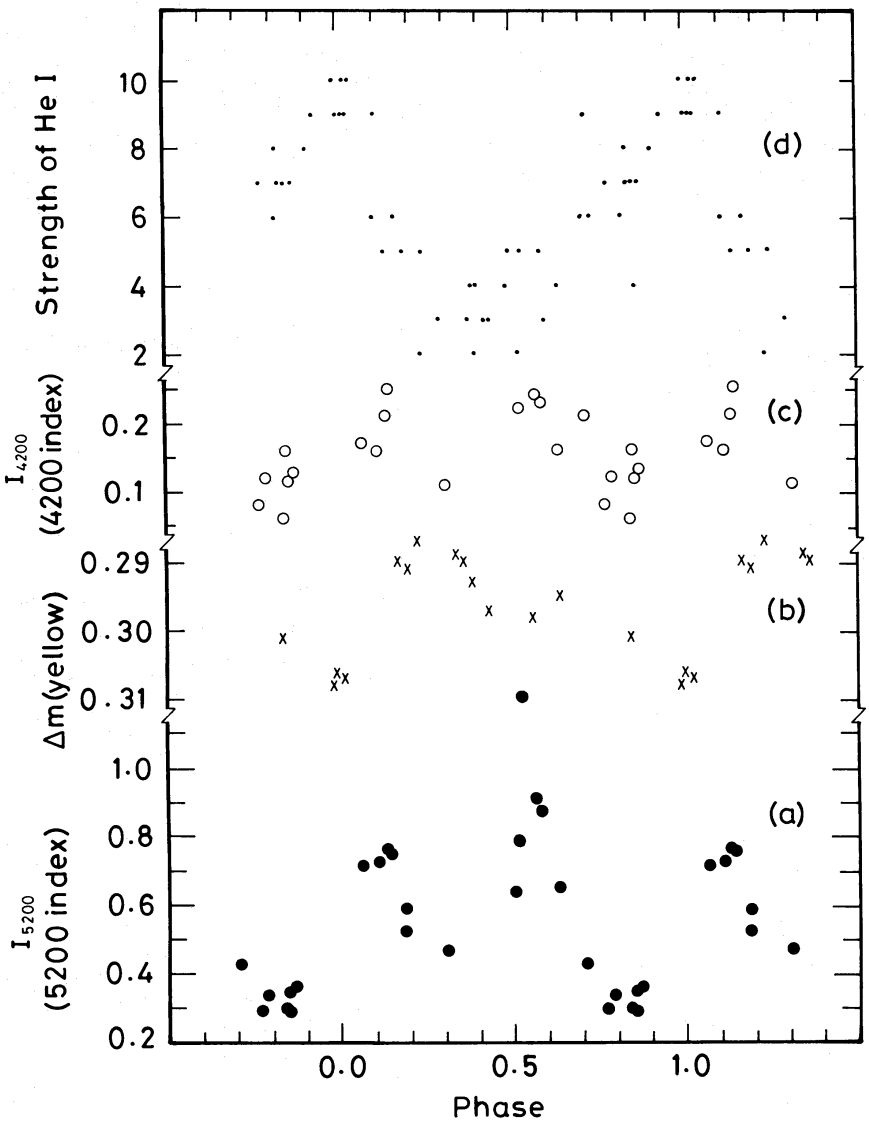

Figure 2. The variation in the various features of the star HD 34452. (a) The variation of the 5200 index I_{5200} (see text). The phases have been calculated from the elements, phase=0 at (HJD 244148.236±0.002)+(2.4660E± 0.0001). (b) Mean light curve in yellow light (Rakos 1962). (c) The variation of the 4200 index, I_{4200}, as found from our observations. The larger scatter is due to the uncertainties inherent in obtaining the index. (d) Intensity variation of the He I line strengths (Deutsch 1947).

models, yielded a temperature of 17000±500 K. This estimate is very close to the ones suggested by Tomley, Wallerstein & Wolff (1970) and by Pavlova *et al.* (1977). However, it apparently differs from those obtained by Adelman & White (1980) and by Pyper & Adelman (1984), which may be due to the fact that the temperature estimated on the basis of any energy curve would systematically depend on the phases considered.

5 Conclusions

The 5200 feature in HD 34452 is found to be varying with a period of 2.466 day, which is same as that for the variation in the strength of the He I lines (Deutsch 1947). This is also the same as the periodicity shown by the light variations and by several other spectral features. These spectral variations have been attributed to the inhomogeneity of the chemical composition on the surface

of the star by Pavlova *et al.* (1977). Thus, it is quite likely that the variations in the 5200 feature also are caused by a similar inhomogeneity. And since all these variations show the same periodicity, the corresponding elements are probably located on the surface of the star as spots and are linked to the rotation of the star. However, a discussion on the origin and the composition of these spots is beyond the scope of this paper.

Acknowledgments

We are grateful to Professor J. C. Bhattacharyya for his guidance, encouragement and immensely helpful suggestions during the course of this work. We also thank the anonymous referees for their comments and useful suggestions.

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Monthly Notices
of the
ROYAL
ASTRONOMICAL SOCIETY

VOL. 222, NO. 4, 1986

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Published for
the Royal Astronomical Society
by
Blackwell Scientific Publications Ltd
Osney Mead
Oxford
OX2 0EL

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Continuous energy distribution of HD 34452 in
(-2.5 log F_ν/F5560) units

Scan No. Wave length	1	2	3	4	5
4040		-0.448	-0.520	-0.496	-0.477
4050		-0.440	-0.519	-0.532	-0.488
4060		-0.433	-0.519	-0.542	-0.464
4070		-0.400	-0.494	-0.480	-0.423
4080		-0.360	-0.438	-0.420	-0.397
4090		-0.330	-0.396	-0.393	-0.377
4100		-0.308	-0.373	-0.373	-0.371
4110		-0.312	-0.377	-0.376	-0.388
4120		-0.331	-0.407	-0.409	-0.406
4130		-0.358	-0.423	-0.458	-0.417
4140		-0.374	-0.452	-0.480	-0.427
4150		-0.390	-0.447	-0.473	-0.436
4160		-0.381	-0.464	-0.496	-0.448
4170		-0.394	-0.448	-0.480	-0.436
4180		-0.384	-0.433	-0.478	-0.425
4190		-0.385	-0.437	-0.476	-0.433
4200		-0.379	-0.445	-0.480	-0.400
4210		-0.400	-0.460	-0.459	-0.399
4220		-0.385	-0.434	-0.457	-0.367
4230		-0.406	-0.428	-0.461	-0.395
4240		-0.403	-0.430	-0.475	-0.393
4250		-0.387	-0.425	-0.467	-0.424
4260	-0.644	-0.370	-0.414	-0.441	-0.410
4270	-0.650	-0.369	-0.403	-0.455	-0.423
4280	-0.642	-0.364	-0.425	-0.459	-0.439
4290	-0.647	-0.375	-0.420	-0.454	-0.439
4300	-0.626	-0.364	-0.407	-0.397	-0.423
4310	-0.610	-0.351	-0.364	-0.358	-0.399
4320	-0.550	-0.332	-0.315	-0.333	-0.369
4330	-0.505	-0.241	-0.290	-0.303	-0.321
4340	-0.468	-0.224	-0.261	-0.263	-0.307
4350	-0.484	-0.240	-0.288	-0.276	-0.307
4360	-0.516	-0.267	-0.311	-0.310	-0.326
4370	-0.547	-0.315	-0.365	-0.358	-0.340
4380	-0.550	-0.302	-0.388	-0.365	-0.348
4390	-0.564	-0.312	-0.387	-0.385	-0.356
4400	-0.562	-0.318	-0.369	-0.368	-0.378
4410	-0.567	-0.342	-0.370	-0.379	-0.390
4420	-0.558	-0.362	-0.381	-0.373	-0.379
4430	-0.560	-0.360	-0.391	-0.387	-0.374
4440	-0.559	-0.352	-0.384	-0.389	-0.364
4450	-0.536	-0.343	-0.375	-0.382	-0.382
4460	-0.510	-0.348	-0.361	-0.373	-0.388
4470	-0.487	-0.352	-0.374	-0.382	-0.386
4480	-0.487	-0.389	-0.376	-0.401	-0.386
4490	-0.480	-0.340	-0.375	-0.403	-0.390
4500	-0.491	-0.333	-0.342	-0.410	-0.373

Scan No. / Wave length	1	2	3	4	5
4510	-0.497	-0.338	-0.327	-0.398	-0.368
4520	-0.513	-0.335	-0.335	-0.397	-0.355
4530	-0.500	-0.325	-0.347	-0.396	-0.357
4540	-0.480	-0.313	-0.342	-0.397	-0.348
4550	-0.467	-0.305	-0.338	-0.399	-0.343
4560	-0.478	-0.307	-0.330	-0.390	-0.328
4570	-0.480	-0.304	-0.342	-0.393	-0.323
4580	-0.488	-0.313	-0.339	-0.400	-0.321
4590	-0.490	-0.314	-0.352	-0.362	-0.331
4600	-0.512	-0.315	-0.355	-0.354	-0.330
4610	-0.521	-0.302	-0.353	-0.342	-0.323
4620	-0.517	-0.298	-0.350	-0.356	-0.311
4630	-0.523	-0.293	-0.346	-0.372	-0.317
4640	-0.533	-0.299	-0.354	-0.389	-0.326
4650	-0.551	-0.300	-0.346	-0.409	-0.343
4660	-0.545	-0.301	-0.326	-0.400	-0.336
4670	-0.537	-0.299	-0.308	-0.380	-0.322
4680	-0.525	-0.298	-0.321	-0.369	-0.303
4690	-0.515	-0.287	-0.331	-0.355	-0.317
4700	-0.513	-0.286	-0.330	-0.352	-0.327
4710	-0.510	-0.288	-0.312	-0.334	-0.338
4720	-0.517	-0.298	-0.300	-0.335	-0.329
4730	-0.515	-0.289	-0.290	-0.325	-0.348
4740	-0.519	-0.297	-0.296	-0.320	-0.330
4750	-0.515	-0.276	-0.284	-0.300	-0.313
4760	-0.501	-0.279	-0.276	-0.285	-0.279
4770	-0.482	-0.268	-0.251	-0.282	-0.255
4780	-0.454	-0.264	-0.250	-0.271	-0.236
4790	-0.436	-0.243	-0.268	-0.260	-0.257
4800	-0.386	-0.223	-0.267	-0.254	-0.242
4810	-0.358	-0.217	-0.257	-0.249	-0.252
4820	-0.330	-0.204	-0.244	-0.220	-0.222
4830	-0.314	-0.182	-0.193	-0.196	-0.213
4840	-0.278	-0.146	-0.166	-0.133	-0.199
4850	-0.242	-0.111	-0.154	-0.167	-0.175
4860	-0.214	-0.079	-0.134	-0.102	-0.136
4870	-0.222	-0.108	-0.160	-0.159	-0.137
4880	-0.255	-0.150	-0.173	-0.227	-0.145
4890	-0.303	-0.190	-0.215	-0.264	-0.185
4900	-0.338	-0.199	-0.217	-0.280	-0.187
4910	-0.355	-0.200	-0.209	-0.250	-0.186
4920	-0.348	-0.203	-0.207	-0.232	-0.213
4930	-0.340	-0.194	-0.200	-0.203	-0.225
4940	-0.337	-0.190	-0.204	-0.182	-0.233
4950	-0.333	-0.190	-0.205	-0.170	-0.215
4960	-0.317	-0.199	-0.195	-0.158	-0.219
4970	-0.307	-0.200	-0.185	-0.197	-0.213
4980	-0.289	-0.182	-0.161	-0.203	-0.200
4990	-0.277	-0.172	-0.143	-0.204	-0.165
5000	-0.237	-0.150	-0.135	-0.203	-0.172

Scan. No. / Wave length	1	2	3	4	5
5010	-0.213	-0.136	-0.151	-0.225	-0.173
5020	-0.166	-0.117	-0.167	-0.184	-0.181
5030	-0.154	-0.120	-0.167	-0.207	-0.157
5040	-0.146	-0.114	-0.142	-0.163	-0.136
5050	-0.145	-0.125	-0.134	-0.164	-0.130
5060	-0.146	-0.122	-0.122	-0.125	-0.162
5070	-0.124	-0.135	-0.123	-0.120	-0.123
5080	-0.147	-0.124	-0.126	-0.121	-0.118
5090	-0.139	-0.106	-0.115	-0.123	-0.127
5100	-0.151	-0.098	-0.104	-0.164	-0.109
5100	-0.154	-0.086	-0.069	-0.140	-0.094
5120	-0.154	-0.094	-0.058	-0.129	-0.074
5130	-0.156	-0.075	-0.055	-0.094	-0.074
5140	-0.122	-0.068	-0.045	-0.097	-0.045
5150	-0.113	-0.045	-0.031	-0.067	-0.022
5160	-0.083	-0.037	-0.012	-0.061	-0.040
5170	-0.073	-0.042	-0.011	-0.045	-0.055
5180	-0.053	-0.048	-0.033	-0.046	-0.049
5190	-0.052	-0.045	-0.050	-0.052	+0.011
5200	-0.040	-0.039	-0.052	-0.047	+0.011
5210	-0.042	-0.037	-0.033	-0.054	-0.007
5220	-0.051	-0.043	-0.023	-0.051	-0.035
5230	-0.065	-0.045	-0.047	-0.076	-0.027
5240	-0.069	-0.052	-0.067	-0.066	-0.047
5250	-0.058	-0.065	-0.083	-0.041	-0.044
5260	-0.041	-0.059	-0.073	-0.040	-0.044
5270	-0.044	-0.042	-0.051	-0.050	-0.050
5280	-0.040	-0.035	-0.044	-0.084	-0.026
5290	-0.026	-0.041	-0.049	-0.089	-0.019
5300	-0.021	-0.053	-0.047	-0.058	-0.002
5310	-0.018	-0.044	-0.023	-0.048	+0.015
5320	-0.026	-0.037	-0.002	-0.045	+0.010
5330	-0.019	-0.028	-0.003	-0.055	-0.014
5340	-0.023	-0.032	+0.002	-0.035	-0.024
5350	-0.025	-0.045	-0.004	-0.020	-0.034
5360	-0.036	-0.042	-0.004	-0.016	-0.010
5370	-0.042	-0.031	-0.011	-0.008	-0.019
5380	-0.056	-0.024	-0.016	+0.008	+0.005
5390	-0.057	-0.022	-0.056	+0.018	-0.009
5400	-0.053	-0.020	-0.041	+0.020	+0.012
5410	-0.023	-0.011	-0.034	-0.017	+0.010
5420	-0.011	-0.003	-0.016	+0.020	+0.034
5430	-0.003	+0.000	-0.048	-0.048	+0.040
5440	-0.015	+0.007	-0.037	-0.031	+0.042
5450	-0.013	+0.005	-0.035	-0.032	+0.030

Scan No. Wave length	1	2	3	4	5
5460	-0.021	-0.004	-0.029	-0.014	+0.008
5470	-0.028	-0.013	-0.040	-0.011	+0.022
5480	-0.039	-0.019	-0.032	+0.000	+0.030
5490	-0.018	-0.016	-0.022	+0.010	+0.033
5500	-0.005	-0.010	-0.020	+0.008	+0.021
5510	-0.004	+0.000	-0.010	-0.010	+0.011
5520	-0.002	+0.017	+0.001	-0.005	+0.007
5530	-0.002	+0.016	+0.014	-0.009	-0.008
5540	-0.003	+0.015	-0.002	+0.000	-0.016
5550	-0.002	+0.008	-0.009	+0.007	+0.010
5560	0.000	+0.000	+0.000	+0.000	+0.000
5570	-0.009	+0.015	+0.009	+0.009	+0.013
5580	-0.006	+0.039	+0.003	+0.016	+0.009
5590	+0.007	+0.038	-0.006	+0.038	+0.012
5600	+0.016	+0.039	-0.014	+0.061	+0.016
5610	+0.023	+0.034	-0.032	+0.026	+0.009
5620	+0.034	+0.042	-0.027	+0.013	+0.032
5630	+0.053	+0.047	-0.039	-0.016	+0.017
5640	+0.043	+0.063	-0.030	+0.012	+0.041
5650	+0.024	+0.057	-0.023	-0.001	+0.054
5660	+0.011	+0.065	-0.003	+0.021	+0.068
5670	+0.039	+0.063	+0.025	+0.029	+0.072
5680	+0.047	+0.054	+0.037	+0.052	+0.036
5690	+0.031	+0.055	+0.037	+0.020	+0.057
5700	+0.022	+0.054	+0.003	+0.026	+0.058
5710	+0.011	+0.060	+0.000	+0.039	+0.063
5720	+0.001	+0.066	+0.021	+0.077	+0.050
5730	-0.015	+0.068	+0.044	+0.083	+0.047
5740	-0.032	+0.062	+0.060	+0.081	+0.078
5750	-0.033	+0.060	+0.046	+0.082	+0.092
5760	-0.036	+0.068	+0.039	+0.099	+0.092
5770	-0.012	+0.093	+0.022	+0.092	+0.091
5780	+0.021	+0.100	+0.010	+0.076	+0.081
5790	+0.030	+0.101	+0.027	+0.056	+0.092
5800	+0.049	+0.101	+0.041	+0.082	+0.100
5810	+0.062	+0.111	+0.082	+0.099	+0.113
5820	+0.095	+0.114	+0.081	+0.103	+0.131
5830	+0.064	+0.101	+0.071	+0.097	+0.128
5840	+0.054	+0.070	+0.035	+0.087	+0.141
5850	+0.034		+0.070		+0.150
5860			+0.058		+0.151
5870			+0.098		+0.141
5880			+0.080		
5890			+0.073		
5900			+0.055		
5910			+0.056		
5920			+0.104		
5930			+0.131		
5940			+0.126		
5950			+0.125		

Scan No. Wave length	6	7	8	9	10
4040	-0.536	-0.431	-0.511	-0.484	-0.460
4050	-0.523	-0.461	-0.507	-0.457	-0.450
4060	-0.520	-0.435	-0.474	-0.410	-0.414
4070	-0.475	-0.426	-0.444	-0.397	-0.396
4080	-0.402	-0.343	-0.411	-0.360	-0.369
4090	-0.343	-0.315	-0.375	-0.332	-0.331
4100	-0.342	-0.286	-0.372	-0.313	-0.311
4110	-0.390	-0.296	-0.376	-0.324	-0.340
4120	-0.433	-0.326	-0.429	-0.372	-0.376
4130	-0.446	-0.377	-0.455	-0.384	-0.397
4140	-0.447	-0.371	-0.480	-0.384	-0.404
4150	-0.468	-0.373	-0.475	-0.385	-0.412
4160	-0.490	-0.350	-0.474	-0.413	-0.413
4170	-0.490	-0.330	-0.446	-0.398	-0.412
4180	-0.473	-0.338	-0.420	-0.399	-0.412
4190	-0.482	-0.344	-0.417	-0.402	-0.423
4200	-0.481	-0.353	-0.414	-0.412	-0.423
4210	-0.477	-0.325	-0.420	-0.418	-0.414
4220	-0.470	-0.317	-0.426	-0.407	-0.424
4230	-0.462	-0.291	-0.425	-0.402	-0.416
4240	-0.452	-0.304	-0.421	-0.389	-0.415
4250	-0.465	-0.312	-0.412	-0.374	-0.408
4260	-0.456	-0.305	-0.436	-0.379	-0.409
4270	-0.429	-0.313	-0.422	-0.368	-0.399
4280	-0.411	-0.303	-0.390	-0.360	-0.378
4290	-0.417	-0.310	-0.389	-0.352	-0.346
4300	-0.422	-0.289	-0.356	-0.352	-0.330
4310	-0.415	-0.252	-0.333	-0.331	-0.310
4320	-0.343	-0.214	-0.308	-0.294	-0.270
4330	-0.268	-0.159	-0.291	-0.257	-0.239
4340	-0.233	-0.138	-0.289	-0.236	-0.237
4350	-0.348	-0.147	-0.299	-0.257	-0.276
4360	-0.396	-0.200	-0.309	-0.287	-0.314
4370	-0.410	-0.238	-0.315	-0.324	-0.346
4380	-0.409	-0.277	-0.355	-0.339	-0.351
4390	-0.422	-0.287	-0.384	-0.334	-0.347
4400	-0.412	-0.285	-0.408	-0.331	-0.353
4410	-0.416	-0.276	-0.414	-0.344	-0.353
4420	-0.417	-0.259	-0.407	-0.360	-0.357
4430	-0.418	-0.264	-0.405	-0.364	-0.346
4440	-0.398	-0.246	-0.407	-0.353	-0.347
4450	-0.399	-0.254	-0.372	-0.340	-0.351
4460	-0.412	-0.235	-0.370	-0.318	-0.348
4470	-0.409	-0.252	-0.357	-0.312	-0.329
4480	-0.394	-0.237	-0.386	-0.306	-0.349
4490	-0.404	-0.244	-0.387	-0.326	-0.360
4500	-0.438	-0.245	-0.397	-0.327	-0.339

Scan No. Wave length	6	7	8	9	10
4510	-0.450	-0.261	-0.401	-0.333	-0.323
4520	-0.415	-0.267	-0.396	-0.335	-0.313
4530	-0.384	-0.256	-0.386	-0.328	-0.313
4540	-0.391	-0.247	-0.377	-0.328	-0.323
4550	-0.404	-0.245	-0.373	-0.319	-0.323
4560	-0.392	-0.245	-0.370	-0.312	-0.322
4570	-0.375	-0.253	-0.362	-0.305	-0.299
4580	-0.382	-0.234	-0.345	-0.315	-0.301
4590	-0.381	-0.240	-0.347	-0.316	-0.302
4600	-0.380	-0.242	-0.362	-0.320	-0.307
4610	-0.363	-0.259	-0.366	-0.304	-0.299
4620	-0.354	-0.268	-0.356	-0.298	-0.311
4630	-0.353	-0.257	-0.343	-0.304	-0.319
4640	-0.353	-0.249	-0.354	-0.319	-0.331
4650	-0.352	-0.255	-0.353	-0.310	-0.327
4660	-0.355	-0.232	-0.360	-0.299	-0.311
4670	-0.358	-0.235	-0.353	-0.283	-0.303
4680	-0.358	-0.233	-0.341	-0.283	-0.299
4690	-0.353	-0.253	-0.324	-0.288	-0.303
4700	-0.340	-0.264	-0.317	-0.293	-0.309
4710	-0.335	-0.273	-0.322	-0.296	-0.304
4720	-0.361	-0.242	-0.333	-0.286	-0.299
4730	-0.370	-0.219	-0.323	-0.271	-0.275
4740	-0.359	-0.195	-0.315	-0.264	-0.274
4750	-0.328	-0.176	-0.304	-0.254	-0.267
4760	-0.320	-0.177	-0.293	-0.244	-0.268
4770	-0.315	-0.176	-0.320	-0.229	-0.252
4780	-0.321	-0.195	-0.311	-0.234	-0.245
4790	-0.324	-0.179	-0.296	-0.230	-0.242
4800	-0.311	-0.172	-0.266	-0.217	-0.238
4810	-0.299	-0.174	-0.245	-0.227	-0.220
4820	-0.289	-0.164	-0.214	-0.225	-0.207
4830	-0.257	-0.141	-0.191	-0.201	-0.172
4840	-0.195	-0.105	-0.168	-0.160	-0.134
4850	-0.157	-0.063	-0.155	-0.121	-0.089
4860	-0.152	-0.048	-0.145	-0.092	-0.059
4870	-0.205	-0.050	-0.195	-0.097	-0.080
4880	-0.259	-0.090	-0.225	-0.124	-0.123
4890	-0.280	-0.108	-0.217	-0.167	-0.158
4900	-0.249	-0.130	-0.221	-0.194	-0.203
4910	-0.220	-0.126	-0.221	-0.200	-0.202
4920	-0.220	-0.141	-0.239	-0.199	-0.202
4930	-0.247	-0.146	-0.239	-0.191	-0.190
4940	-0.252	-0.151	-0.244	-0.184	-0.192
4950	-0.236	-0.147	-0.227	-0.187	-0.187
4960	-0.225	-0.131	-0.209	-0.194	-0.169
4970	-0.228	-0.126	-0.190	-0.188	-0.167
4980	-0.220	-0.114	-0.177	-0.170	-0.161
4990	-0.212	-0.100	-0.166	-0.169	-0.150

Scan No. Wave length	6	7	8	9	10
5000	-0.213	-0.087	-0.171	-0.168	-0.161
5010	-0.190	-0.059	-0.171	-0.168	-0.137
5020	-0.173	-0.070	-0.173	-0.161	-0.120
5030	-0.167	-0.052	-0.148	-0.127	-0.116
5040	-0.157	-0.080	-0.142	-0.111	-0.116
5050	-0.171	-0.067	-0.139	-0.110	-0.174
5060	-0.188	-0.069	-0.141	-0.128	-0.172
5070	-0.168	-0.054	-0.131	-0.133	-0.106
5080	-0.155	-0.065	-0.114	-0.130	-0.111
5090	-0.161	-0.053	-0.104	-0.140	-0.110
5100	-0.153	-0.048	-0.095	-0.141	-0.099
5110	-0.130	-0.023	-0.084	-0.115	-0.168
5120	-0.119	-0.009	-0.072	-0.107	-0.089
5130	-0.101	-0.012	-0.054	-0.086	-0.076
5140	-0.092	-0.014	-0.040	-0.064	-0.056
5150	-0.092	-0.007	-0.016	-0.048	-0.036
5160	-0.099	+0.023	-0.025	-0.041	-0.043
5170	-0.078	+0.040	-0.041	-0.048	-0.034
5180	-0.066	+0.037	-0.060	-0.044	-0.033
5190	-0.070	+0.008	-0.057	-0.030	-0.007
5200	-0.075	+0.009	-0.068	-0.026	-0.010
5210	-0.080	-0.008	-0.096	-0.026	-0.010
5220	-0.067	+0.024	-0.106	-0.035	-0.010
5230	-0.043	+0.008	-0.104	-0.038	-0.006
5240	-0.033	+0.027	-0.096	-0.035	-0.009
5250	-0.056	+0.015	-0.091	-0.040	-0.020
5260	-0.090	+0.027	-0.075	-0.051	-0.024
5270	-0.113	-0.002	-0.075	-0.059	-0.027
5280	-0.120	-0.013	-0.072	-0.060	-0.036
5290	-0.070	-0.004	-0.067	-0.054	-0.035
5300	-0.063	+0.019	-0.047	-0.053	-0.038
5310	-0.065	+0.061	-0.032	-0.060	-0.033
5320	-0.046	+0.043	-0.036	-0.060	-0.031
5330	-0.022	+0.032	-0.034	-0.051	-0.025
5340	-0.028	+0.016	-0.041	-0.039	-0.010
5350	-0.060	+0.009	-0.048	-0.039	-0.016
5360	-0.107	-0.004	-0.041	-0.044	-0.014
5370	-0.134	-0.014	-0.031	-0.050	-0.026
5380	-0.124	+0.018	-0.020	-0.049	-0.026
5390	-0.079	+0.003	-0.031	-0.046	-0.015
5400	-0.057	+0.008	-0.020	-0.039	-0.017
5410	-0.072	-0.023	-0.020	-0.030	-0.017
5420	-0.095	-0.005	-0.012	-0.032	-0.023
5430	-0.067	-0.004	-0.021	-0.039	-0.026
5440	-0.066	+0.017	-0.025	-0.045	-0.006
5450	-0.072	+0.067	-0.025	-0.037	-0.001

Scan No. / Wave length	6	7	8	9	10
5460	-0.045	+0.068	-0.005	-0.017	+0.000
5470	-0.028	+0.065	+0.012	-0.010	-0.010
5480	-0.071	+0.045	+0.005	-0.012	-0.016
5490	-0.111	+0.049	+0.010	-0.024	-0.002
5500	-0.121	+0.034	-0.008	-0.031	-0.007
5510	-0.077	+0.032	+0.001	-0.024	-0.008
5520	-0.003	+0.026	-0.015	-0.015	-0.010
5530	+0.048	+0.006	-0.006	-0.003	+0.002
5540	+0.077	+0.009	-0.020	-0.021	-0.010
5550	+0.069	-0.003	-0.018	-0.011	-0.013
5560	+0.000	+0.000	+0.000	+0.000	+0.000
5570	+0.041	+0.021	+0.027	+0.000	+0.002
5580	+0.048	+0.031	+0.058	+0.003	-0.004
5590	+0.016	+0.049	+0.057	-0.005	-0.014
5600	-0.042	+0.081	+0.058	-0.010	-0.004
5610	-0.050	+0.123	+0.050	-0.011	+0.000
5620	-0.061	+0.154	+0.041	-0.022	+0.016
5630	-0.049	+0.152	+0.029	-0.030	+0.036
5640	+0.001	+0.089	+0.024	-0.043	+0.053
5650	+0.043	+0.053	+0.020	-0.037	+0.051
5660	+0.048	+0.058	+0.018	-0.028	+0.033
5670		+0.084	+0.019	-0.023	+0.032
5680		+0.055	+0.026	-0.015	+0.072
5690		+0.047	+0.037	-0.017	+0.078
5700		+0.106	+0.056	-0.014	+0.076
5710		+0.171	+0.073	-0.020	+0.066
5720		+0.200	+0.083	-0.027	+0.061
5730		+0.205	+0.064	-0.024	+0.060
5740		+0.148	+0.064	-0.018	+0.073
5750		+0.122	+0.066	-0.015	+0.077
5760			+0.065	-0.026	+0.088
5770			+0.068	-0.045	+0.096
5780			+0.054	-0.045	+0.114
5790			+0.060	-0.043	+0.110
5800			+0.073	-0.038	+0.097
5810			+0.100	-0.032	
5820				-0.018	
5830				-0.004	
5840				-0.010	

Scan No. Wave length	11	12	17	18	19
4040	-0.539	-0.521	-0.376	-0.489	-0.522
4050	-0.538	-0.535	-0.356	-0.485	-0.497
4060	-0.513	-0.527	-0.360	-0.458	-0.490
4070	-0.493	-0.497	-0.333	-0.426	-0.454
4080	-0.443	-0.451	-0.288	-0.390	-0.432
4090	-0.415	-0.391	-0.267	-0.351	-0.390
4100	-0.381	-0.360	-0.257	-0.322	-0.381
4100	-0.403	-0.362	-0.275	-0.325	-0.384
4120	-0.409	-0.391	-0.300	-0.355	-0.413
4130	-0.417	-0.428	-0.321	-0.365	-0.430
4140	-0.429	-0.465	-0.336	-0.387	-0.444
4150	-0.451	-0.482	-0.355	-0.396	-0.453
4160	-0.469	-0.483	-0.341	-0.390	-0.449
4170	-0.469	-0.458	-0.321	-0.396	-0.444
4180	-0.470	-0.444	-0.335	-0.395	-0.447
4190	-0.463	-0.450	-0.347	-0.407	-0.453
4200	-0.466	-0.445	-0.346	-0.399	-0.456
4210	-0.468	-0.455	-0.346	-0.397	-0.455
4220	-0.469	-0.455	-0.331	-0.382	-0.452
4230	-0.470	-0.450	-0.325	-0.388	-0.444
4240	-0.457	-0.453	-0.328	-0.390	-0.436
4250	-0.456	-0.448	-0.337	-0.383	-0.427
4260	-0.441	-0.456	-0.332	-0.384	-0.414
4270	-0.450	-0.441	-0.316	-0.369	-0.412
4280	-0.449	-0.440	-0.306	-0.374	-0.408
4290	-0.455	-0.424	-0.303	-0.372	-0.418
4300	-0.442	-0.417	-0.285	-0.377	-0.411
4310	-0.405	-0.399	-0.270	-0.373	-0.388
4320	-0.364	-0.367	-0.246	-0.361	-0.362
4340	-0.296	-0.283	-0.199	-0.295	-0.276
4350	-0.306	-0.293	-0.201	-0.267	-0.277
4360	-0.341	-0.319	-0.220	-0.266	-0.301
4370	-0.377	-0.367	-0.254	-0.278	-0.349
4380	-0.397	-0.404	-0.274	-0.296	-0.367
4390	-0.418	-0.409	-0.297	-0.318	-0.379
4400	-0.422	-0.410	-0.313	-0.336	-0.384
4410	-0.420	-0.407	-0.320	-0.340	-0.379
4420	-0.398	-0.408	-0.319	-0.344	-0.383
4430	-0.389	-0.409	-0.301	-0.388	-0.375
4440	-0.391	-0.404	-0.299	-0.353	-0.388
4450	-0.392	-0.390	-0.293	-0.340	-0.377
4460	-0.391	-0.379	-0.298	-0.343	-0.371
4470	-0.387	-0.380	-0.293	-0.321	-0.377
4480	-0.382	-0.376	-0.295	-0.314	-0.362
4490	-0.379	-0.365	-0.288	-0.316	-0.359
4500	-0.368	-0.348	-0.281	-0.319	-0.350
4510	-0.366	-0.346	-0.284	-0.337	-0.353
4520	-0.366	-0.345	-0.286	-0.323	-0.364
4530	-0.368	-0.347	-0.302	-0.323	-0.360
4540	-0.363	-0.338	-0.303	-0.311	-0.351
4550	-0.353	-0.334	-0.294	-0.308	-0.339
4330	-0.313	-0.330	-0.218	-0.333	-0.316

Scan No. Wavelength	11	12	17	18	19
4560	-0.375	-0.324	-0.278	-0.307	-0.348
4570	-0.333	-0.318	-0.258	-0.303	-0.343
4580	-0.335	-0.302	-0.266	-0.272	-0.352
4590	-0.335	-0.295	-0.265	-0.277	-0.339
4600	-0.337	-0.300	-0.273	-0.279	-0.342
4610	-0.331	-0.309	-0.273	-0.318	-0.333
4620	-0.323	-0.316	-0.265	-0.316	-0.340
4630	-0.323	-0.315	-0.261	-0.311	-0.336
4640	-0.338	-0.314	-0.262	-0.312	-0.336
4650	-0.345	-0.327	-0.270	-0.309	-0.339
4660	-0.349	-0.329	-0.282	-0.313	-0.338
4670	-0.350	-0.330	-0.275	-0.311	-0.340
4680	-0.350	-0.319	-0.275	-0.303	-0.336
4690	-0.352	-0.316	-0.265	-0.297	-0.331
4700	-0.335	-0.315	-0.274	-0.298	-0.336
4710	-0.314	-0.311	-0.263	-0.305	-0.334
4720	-0.307	-0.318	-0.254	-0.311	-0.328
4730	-0.320	-0.312	-0.238	-0.300	-0.313
4740	-0.321	-0.304	-0.233	-0.289	-0.312
4750	-0.320	-0.287	-0.228	-0.265	-0.310
4760	-0.300	-0.281	-0.222	-0.248	-0.307
4770	-0.303	-0.274	-0.222	-0.236	-0.293
4780	-0.294	-0.266	-0.210	-0.240	-0.283
4790	-0.288	-0.265	-0.200	-0.235	-0.270
4800	-0.271	-0.268	-0.191	-0.228	-0.263
4810	-0.265	-0.264	-0.188	-0.219	-0.248
4820	-0.251	-0.241	-0.176	-0.220	-0.244
4830	-0.229	-0.205	-0.150	-0.198	-0.222
4840	-0.195	-0.152	-0.106	-0.161	-0.199
4850	-0.162	-0.123	-0.083	-0.115	-0.179
4860	-0.155	-0.121	-0.073	-0.107	-0.135
4870	-0.171	-0.150	-0.096	-0.108	-0.162
4880	-0.208	-0.178	-0.120	-0.134	-0.191
4890	-0.231	-0.209	-0.142	-0.157	-0.201
4900	-0.243	-0.231	-0.148	-0.183	-0.214
4910	-0.258	-0.236	-0.148	-0.197	-0.223
4920	-0.239	-0.232	-0.148	-0.201	-0.226
4930	-0.244	-0.230	-0.151	-0.203	-0.220
4940	-0.250	-0.225	-0.156	-0.204	-0.221
4950	-0.243	-0.212	-0.159	-0.199	-0.222
4960	-0.232	-0.199	-0.160	-0.189	-0.229
4970	-0.227	-0.191	-0.152	-0.189	-0.213
4980	-0.225	-0.193	-0.146	-0.180	-0.220
4990	-0.221	-0.183	-0.143	-0.177	-0.200
5000	-0.206	-0.174	-0.143	-0.154	-0.194
5010	-0.188	-0.161	-0.140	-0.144	-0.179
5020	-0.180	-0.152	-0.129	-0.138	-0.173
5030	-0.170	-0.141	-0.125	-0.129	-0.168

Scan No. / Wave length	11	12	17	18	19
5040	-0.177	-0.144	-0.113	-0.122	-0.162
5050	-0.169	-0.143	-0.115	-0.113	-0.144
5060	-0.169	-0.151	-0.108	-0.112	-0.132
5070	-0.170	-0.149	-0.103	-0.103	-0.122
5080	-0.172	-0.158	-0.084	-0.098	-0.114
5090	-0.166	-0.147	-0.071	-0.088	-0.106
5100	-0.139	-0.140	-0.062	-0.076	-0.096
5110	-0.119	-0.123	-0.065	-0.062	-0.100
5120	-0.105	-0.119	-0.060	-0.047	-0.082
5130	-0.105	-0.100	-0.062	-0.035	-0.060
5140	-0.093	-0.082	-0.048	-0.023	-0.035
5150	-0.087	-0.072	-0.020	-0.004	-0.029
5160	-0.078	-0.056	+0.012	+0.012	-0.027
5170	-0.077	-0.055	+0.045	+0.028	-0.010
5180	-0.072	-0.052	+0.043	+0.035	+0.003
5190	-0.077	-0.054	+0.046	+0.038	+0.013
5200	-0.082	-0.056	+0.039	+0.038	+0.008
5210	-0.086	-0.056	+0.048	+0.044	+0.009
5220	-0.073	-0.055	+0.052	0.049	+0.015
5230	-0.064	-0.062	+0.063	0.046	+0.019
5240	-0.057	-0.067	0.063	0.041	+0.017
5250	-0.062	-0.062	0.065	0.039	+0.013
5260	-0.066	-0.066	0.057	0.050	+0.013
5270	-0.070	-0.054	0.053	0.045	+0.008
5280	-0.071	-0.071	0.054	0.038	+0.005
5290	-0.070	-0.067	0.052	0.021	+0.007
5300	-0.068	-0.066	0.029	0.017	+0.004
5310	-0.069	-0.059	0.016	0.019	+0.000
5320	-0.073	-0.043	0.016	0.020	-0.011
5330	-0.076	-0.044	0.037	0.020	-0.010
5340	-0.068	-0.034	0.042	0.025	-0.011
5350	-0.071	-0.040	0.042	0.025	-0.008
5360	-0.062	-0.041	0.029	0.031	-0.006
5370	-0.076	-0.042	0.028	0.016	-0.004
5380	-0.065	-0.041	0.025	0.024	+0.002
5390	-0.064	-0.038	0.018	0.018	+0.003
5400	-0.064	-0.039	0.019	0.021	-0.006
5410	-0.056	-0.040	0.023	0.005	-0.010
5420	-0.052	-0.041	0.032	0.003	-0.010
5430	-0.046	-0.036	0.025	0.007	-0.005
5440	-0.035	-0.022	0.018	0.008	+0.002
5450	-0.034	-0.014	0.025	0.020	-0.001
5460	-0.038	-0.013	0.027	0.032	+0.001
5470	-0.047	-0.008	0.022	0.044	+0.000
5480	-0.045	-0.002	0.011	0.032	+0.006
5490	-0.036	-0.004	0.012	0.014	-0.003
5500	-0.019	+0.011	0.012	0.008	-0.014

Scan No. Wavelength	11	12	17	18	19
5510	-0.030	+0.001	0.007	0.000	-0.031
5520	-0.026	+0.003	0.004	-0.001	-0.028
5530	-0.029	-0.018	0.004	-0.001	-0.028
5540	-0.009	-0.023	+0.006	-0.004	-0.009
5550	-0.006	-0.011	-0.001	+0.004	-0.006
5560	+0.000	+0.000	+0.000	0.000	+0.000
5570	+0.003	+0.016	+0.012	0.017	-0.009
5580	-0.001	+0.009	0.022	0.017	-0.013
5590	+0.001	-0.002	0.024	0.028	-0.010
5600	-0.004	+0.000	0.012	0.024	-0.010
5610	-0.011	-0.009	0.010	0.019	+0.001
5620	-0.013	+0.017	0.017	0.018	+0.007
5630	+0.002	+0.012	0.028	0.023	+0.015
5640	0.021	+0.033	0.040	0.035	+0.025
5650	0.015	0.038	0.040	0.039	+0.022
5660	0.013	0.052	0.044	0.039	+0.021
5670	0.019	0.051	0.042	0.039	+0.020
5680	0.031	0.040	0.050	0.041	+0.022
5690	0.026	0.035	0.056	0.046	+0.030
5700	0.029	0.034	0.058	0.047	+0.029
5710	0.022	0.044	0.058	0.056	+0.038
5720	0.030	0.053	0.045	0.057	+0.033
5730	0.031	0.069	0.054	0.067	+0.037
5740	0.037	0.067	0.060	0.068	+0.033
5750	0.044	0.066	0.069	0.060	+0.044
5760	0.044	0.073	0.063	0.059	+0.058
5770	0.054		0.065	0.070	+0.059
5780			0.072	0.088	+0.059
5790			0.082	0.089	+0.062
5800			0.091	0.074	+0.054
5810			0.094	0.063	+0.044
5820			0.089	0.067	+0.054
5830			0.079	0.068	+0.049
5840			0.072	0.076	0.065
5850			0.073	0.083	0.058
5860			0.078	0.091	0.078
5870			0.092	0.100	0.076
5880			0.109	0.101	0.091
5890			0.119	0.091	0.090
5900			0.116	0.098	0.091
5910			0.111	0.117	0.091
5920			0.109	0.116	0.085
5930			0.114	0.121	0.099
5940			0.126	0.133	0.089
5950			0.127	0.129	0.099

Scan No. / Wavelength	11	12	17	18	19
5960			0.121	0.129	0.096
5970			0.110	0.111	0.114
5980			0.107	0.117	0.117
5990			0.123	0.110	0.107
6000			0.127	0.116	0.103
6010			0.112	0.118	0.089
6020			0.096	0.140	0.093
6030			0.091	0.151	0.105

Scan No. / Wavelength	13	14	15	16	20
4040	-0.557	-0.566	-0.552	-0.552	-0.435
4060	-0.553	-0.532	-0.502	-0.508	-0.366
4080	-0.547	-0.507	-0.467	-0.478	-0.355
4100	-0.516	-0.472	-0.466	-0.476	-0.352
4120	-0.576	-0.488	-0.472	-0.497	-0.409
4140	-0.568	-0.498	-0.495	-0.490	-0.369
4160	-0.493	-0.500	-0.493	-0.489	-0.353
4180	-0.486	-0.487	-0.500	-0.472	-0.402
4200	-0.457	-0.455	-0.463	-0.475	-0.395
4220	-0.430	-0.436	-0.442	-0.441	-0.420
4240	-0.394	-0.407	-0.426	-0.409	-0.435
4260	-0.364	-0.371	-0.405	-0.377	-0.441
4280	-0.352	-0.357	-0.375	-0.376	-0.402
4300	-0.329	-0.331	-0.342	-0.360	-0.375
4320	-0.285	-0.302	-0.304	-0.322	-0.346
4340	-0.266	-0.280	-0.272	-0.285	-0.273
4360	-0.276	-0.291	-0.278	-0.292	-0.277
4380	-0.311	-0.317	-0.308	-0.313	-0.310
4400	-0.338	-0.337	-0.335	-0.339	-0.305
4420	-0.344	-0.342	-0.346	-0.354	-0.328
4440	-0.335	-0.342	-0.342	-0.353	-0.320
4460	-0.335	-0.341	-0.345	-0.347	-0.312
4480	-0.333	-0.340	-0.344	-0.346	-0.332
4500	-0.333	-0.334	-0.341	-0.339	-0.334
4520	-0.325	-0.333	-0.332	-0.335	-0.328
4540	-0.313	-0.331	-0.321	-0.322	-0.309
4560	-0.308	-0.328	-0.313	-0.312	-0.290
4580	-0.303	-0.322	-0.310	-0.313	-0.300
4600	-0.311	-0.314	-0.305	-0.310	-0.284
4620	-0.307	-0.305	-0.300	-0.314	-0.293
4640	-0.305	-0.304	-0.298	-0.312	-0.287
4660	-0.299	-0.307	-0.298	-0.316	-0.290
4680	-0.294	-0.304	-0.293	-0.316	-0.285
4700	-0.288	-0.300	-0.286	-0.308	-0.280
4720	-0.279	-0.289	-0.278	-0.289	-0.287
4740	-0.267	-0.275	-0.272	-0.272	-0.292
4760	-0.251	-0.251	-0.257	-0.260	-0.283
4780	-0.229	-0.225	-0.239	-0.249	-0.270
4800	-0.206	-0.209	-0.212	-0.233	-0.246
4820	-0.171	-0.18[illegible]	-0.184	-0.197	-0.216
4840	-0.136	-0.148	-0.147	-0.168	-0.182
4860	-0.120	-0.134	-0.128	-0.147	-0.122
4880	-0.137	-0.151	-0.132	-0.158	-0.225
4900	-0.156	-0.172	-0.155	-0.176	-0.165
4920	-0.178	-0.190	-0.176	-0.192	-0.198
4940	-0.178	-0.191	-0.182	-0.195	-0.208
4960	-0.168	-0.187	-0.176	-0.192	-0.202
4980	-0.149	-0.169	-0.164	-0.178	-0.193
5000	-0.133	-0.149	-0.144	-0.157	-0.175

Scan No. Wave length	13	14	15	16	20
5020	-0.120	-0.132	-0.135	-0.137	-0.159
5040	-0.111	-0.126	-0.125	-0.125	-0.143
5060	-0.101	-0.114	-0.115	-0.125	-0.133
5080	-0.095	-0.107	-0.101	-0.121	-0.132
5100	-0.083	-0.091	-0.088	-0.107	-0.129
5120	-0.068	-0.073	-0.078	-0.089	-0.102
5140	-0.047	-0.055	-0.067	-0.065	-0.066
5160	-0.034	-0.037	-0.045	-0.050	-0.044
5180	-0.022	-0.027	-0.029	-0.031	-0.045
5200	-0.019	-0.026	-0.016	-0.024	-0.031
5220	-0.015	-0.029	-0.020	-0.023	-0.024
5240	-0.016	-0.035	-0.019	-0.027	-0.017
5260	-0.021	-0.033	-0.029	-0.033	-0.031
5280	-0.025	-0.034	-0.032	-0.042	-0.043
5300	-0.031	-0.037	-0.034	-0.047	-0.049
5320	-0.029	-0.034	-0.025	-0.042	-0.050
5340	-0.030	-0.031	-0.025	-0.037	-0.045
5360	-0.024	-0.027	-0.030	-0.029	-0.037
5380	-0.013	-0.031	-0.029	-0.031	-0.024
5400	-0.008	-0.025	-0.023	-0.022	-0.007
5420	-0.004	-0.025	-0.014	-0.020	-0.017
5440	-0.004	-0.021	-0.005	-0.015	-0.023
5460	-0.004	-0.019	-0.004	-0.019	-0.034
5480	-0.004	-0.016	-0.003	-0.016	-0.020
5500	-0.008	-0.017	-0.001	-0.017	-0.008
5520	-0.014	-0.020	-0.004	-0.012	-0.004
5540	-0.008	-0.015	-0.002	-0.012	-0.002
5560	0.000	0.000	0.000	0.000	0.000
5580	+0.003	+0.005	+0.004	-0.003	+0.003
5600	0.002	0.007	0.009	+0.004	-0.012
5620	0.005	0.008	0.015	0.010	-0.020
5640	0.015	0.016	0.026	0.022	-0.014
5660	0.021	0.027	0.030	0.027	+0.013
5680	0.024	0.035	0.033	0.027	0.015
5700	0.037	0.041	0.046	0.030	0.020
5720	0.044	0.042	0.051	0.043	0.024
5740	0.049	0.048	0.061	0.048	0.033
5760	0.045	0.052	0.060	0.051	0.052
5780	0.047	0.059	0.060	0.049	0.054
5800	0.053	0.056	0.055	0.052	0.050
5820	0.063	0.065	0.061	0.060	0.045
5840	0.080	0.069	0.070	0.058	0.051
5860	0.096	0.080	0.087	0.071	0.068
5880	0.103	0.082	0.101	0.081	0.080
5900	0.108	0.095	0.108	0.096	0.101

Scan No. Wave length	13	14	15	16	20
5920	0.113	0.104	0.104	0.101	0.133
5940	0.121	0.111	0.108	0.100	0.140
5960	0.111	0.107	0.110	0.092	0.121
5980	0.106	0.105	0.113	0.094	0.102
6000	0.109	0.095	0.118	0.100	0.086
6020	0.121	0.098	0.112	0.116	0.100