HIGH RESOLUTION SOLAR SPECTRA FROM 1780 TO 1950 Å

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Excellent spectrograms in the region from 1780 to 1950 ängströms were obtained from the flight of a high resolution spectrograph in an Aerobee 150 rocket at White Sands Missile Range on June 14, 1971. The instrument's dispersing system, consisting of a 79 line mm^{-1} echelle crossed with a 1200 line mm^{-1} grating, was incorporated in a Czerny-Turner arrangement using spherical mirrors of one meter focal length. Spectral resolution was limited to 13 mÅ by a slit width of 25 μ. The plate factor was 0.5 Å mm^{-1}. Spectra were recorded on Kodak type 101-01 film.

A solar image 1.7 mm in diameter, in focus at 1875 Å, was formed at the entrance slit by means of a LiF lens. Longitudinal dispersion of the LiF lens together with germanium-type coating (prepared by the Perkin-Elmer Corporation) on the collimating mirror of the system reduced scattered light to acceptable levels. Both the echelle and grating were used in-blaze, further enhancing the effectiveness of the system.

The instrument, pointed by means of SPARCS, was oriented so that the slit extended from the center of the Sun to the north limb. No active regions were present in that area of the Sun.

Ten exposures of the spectral region from 1780 to 1950 Å were obtained, with exposure times ranging from 2 s to 50 s. Although these spectrograms have not been fully analyzed in the short time since they were obtained, several observations can be reported here.

The Al I autoionization features at 1932–1937 Å were well recorded on the longer exposures, enabling determination of center-to-limb variation of these features with a spatial resolution of 2′.

The emission lines due to S I at 1900.27 Å and 1914.68 Å are present, with the first of these being fairly uniform in character from center-to-limb, brightening slightly at the limb. The second is quite weak, barely recognizable as an emission feature except at the limb, where the line brightens appreciably.

The well-known emission feature due to Si III at 1892.03 Å is conspicuous. Its strength shows considerable spatial variation from center to limb, being bright at the center, decreasing in intensity to brighten again about half-way to the limb, decreasing again and brightening strongly at the limb. None of the other features of the spectra obtained show such striking spatial variation.

The three Si II emission features at 1816.94, 1817.42 and 1808.01 Å are present on all of the exposures obtained, providing a means of determining the profile of the lines with considerable accuracy. Although analysis is not yet complete, preliminary profiles of the two at longer wavelength have been obtained from six of the exposures

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and four of the exposures have been analyzed for the 1808.01 Å line. None of the lines shows any indication of self-reversal; intensity distribution in all three lines is essentially gaussian. The widths at half intensity of the two stronger lines (1808.01 and 1816.94 Å) are both 0.10 Å. Width at half-intensity of the 1817.42 Å line is 0.07 Å. The reason for this difference is not apparent at this time.

If the line width is attributed to gaussian-distributed macroturbulent velocities, the 0.10 Å value corresponds to a mean macroturbulent velocity of 6.8 km s^{-1}, whereas the 0.07 Å value corresponds to 4.8 km s^{-1}.

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DISCUSSION

C. Jordan: If the processes populating and depopulating the $3s3p\ ^3P$ in Si III are similar to these in C III, then the intensity of the intercombination line $3s3p\ ^3P \rightarrow 3s^2\ ^1S_0$ will have a different density dependence from that of permitted resonance lines.