ATOMIC SOLAR LINES IN THE REGION 1–2 μ OBSERVED FROM A BALLOON-BORNE SPECTROMETER*

It has been expected for many years that a number of infrared solar lines could be detected if the masking effects due to telluric lines were eliminated. Successful detection of such lines became possible with the data obtained during a balloon flight made in the summer of 1967. The variation with altitude of the infrared solar spectrum was observed with a resolution of 0.50 Å. The instrumentation used to obtain the data was recently described in detail by Murcray, Murcray, and Williams (1967).

On many of the spectra from this flight, it was possible to identify a number of multiplets in the region 1–2 μ that have been masked, either completely or partially, in previous publications on the solar spectrum (ground measurements by Mohler et al. 1950, at the Mount Wilson Observatory, and by Delbouille and Roland 1963, at the Jungfraujoch, and the spectra taken by Houghton et al. 1961 with an aircraft-borne spectrometer from an altitude up to 15 km). At the floating altitude of the balloon (30 km) the amount of water vapor is considerably reduced and many line absorptions are quite clear under the present resolution.

The identification of the lines was based on matching both the intensities and the positions. Most of the laboratory data used for the identifications are listed by Migeotte (1966). Line intensities for light and medium elements have been calculated by assuming LS coupling and by using the Coulomb approximation for the radial matrix elements according to Bates and Damgaard (1949). Line positions and effective quantum numbers have been calculated from empirical values for energy levels as compiled by Moore

* This research was supported in part by the Advanced Research Projects Agency and was monitored by Air Force Cambridge Research Laboratories.
(1949), taking into account many improvements of these values as reported in the literature. Relative line and multiplet strengths in $LS$ coupling were taken from the tables by Shore and Menzel (1965). Use was made of the compilation of atomic transition probabilities by Goldberg, Müller, and Aller (1960), by Griem (1964), and by Wiese, Smith, and Glennon (1966).

Sample multiplets identified as Mg $\text{I}$ and Al $\text{I}$ are shown in Figure 1. The work is in progress, and in the near future a detailed account of the identifications and intensities will be published, the new absorption features being mainly in the 0.94-, 1.14-, 1.38-, and 1.87-$\mu$ regions.

Part of the computer time required was made available by the National Center for Atmospheric Research, Boulder, Colorado. Unpublished compilations of atomic transition probabilities have been made available by Dr. W. L. Wiese of the National Bureau of Standards.

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February 5, 1968  
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REFERENCES


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