17.07 Relative Contribution of Lines and Continua to Solar Far Ultraviolet Variability, J.W. COOK and M.E. VANDERHORST, Naval Research Lab - An absolutely calibrated solar spectrum over 1175-2100 A has been published as NRL Report 8056 (1977). Intensities from this atlas were among the observations used in a model of solar far UV variability based on the changing surface conditions on the solar photosphere vs. the sunspot cycle. The contrast in intensity vs. the inherently greater flux contribution from the lower contrast continuum. We give new quantitative estimates of the importance of lines vs. continua in solar UV variability, and compare with the earlier estimates in Cook et al. (1980).

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17.08 Covariance of Ca II line area and inferred coronal mass, by M. W. Fisher, D. T. Sims, HAO, and M. K. McCabe, and D. L. Mickey, U of H.

During the summer of 1982, observations of Ca II K-line area, sunspot number, inferred coronal mass, and soft (1-8 A) X-ray emission were collected with the aim of defining the relationship between the observed chromospheric variation and other parameters characteristic of solar activity. At this time, it was found that simple relationships between these photospheric, chromospheric and coronal observables, and it was possible to write expressions for total X-ray flux using the Ca II K-line area as the single observed quantity. Because of the unusual distribution of solar activity over the surface at the time of this initial study, rotational modulation of the sunspot number ranged between values characteristic of both solar minimum and maximum. It was therefore suspected that these relationships might have more general application to other phases of the solar cycle. To test this notion, the instruments of the Mauna Loa Solar Observatory (HAO) and the Mees Solar Observatory (U. of H.) were used for a second observing period centered on the total solar eclipse of 11 June 1983. Reduction of data taken at this later period shows that at this different, and less remarkable, phase of the solar cycle, the previously discovered relationship between active regions and coronal mass is indeed valid. This observational fact tends to support the view that cyclic variation of the integrated Ca II K-line flux from stars other than the sun may be used as an indirect measure of photospheric and coronal variability.

We find no limb darkening variation with an amplitude greater than 0.1% during six observing runs in 1980-1982, nor greater than 0.7% between these observations and a single scan taken in 1974. Day-to-day intensity variations are consistent with a combination of granulation noise, image motion, and low-level residual facular signal. A reported detection of limb darkening variation from these observations (Ap. J. 253, L89) was caused by unrecognized faculae. The 1980-82 observations constrain the photospheric effective temperature to change by less than 15 K or, equivalently, the luminosity to change by less than 1%. A convective atmosphere is constrained to have a temperature smaller than 0.3 at constant effective temperature for either time base. This is the size of the U/V variation suggested by Livingston and Holweger (Ap. J. 252, 375) to account for Fraunhofer line equivalent width variations between 1976-1980. This apparent discrepancy may be accounted for by differences in time base (1980-1982) or noise in the single 1974 scan. In any case, the 0.2-0.3 micron flux variation due specifically to global U/V changes between 1980-82 is inferred to be less than 1%. This is substantially less than the observed variation in this band due to plage area changes between 1980-1982. This research was supported by NSF grant ATM-8112339.


Atmospheric and instrumental stray light effects have been studied with the San Fernando Observatory (SFO) 61/28 cm vacuum solar telescopes and spectroheliograph. Observations of the sky and solar limb were made with the SFO 512 element Reticon linear diode array, with the SFO Extreme Limb Photometer, and with a low resolution (several arc min) stray light photometer. It is found that the scattering at our site can be represented by the sum of two Gaussian and a Lorentzian spread functions, and a procedure for finding the instrumental parameters is given. Stray light causes photometric measurements of the fractional contributions, whether positive or negative, of active regions to solar irradiance to be underestimated by 15%-25%, depending upon the photometric data analysis procedures used.

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17.11 Upper Limits on the Internal Rotation Rate of the Sun, M.F. Woodard and H.S. Hudson, UC San Diego.

The power spectrum of solar total irradiance (bolometric flux) variations from the SMM/ACRIM satellite experiment shows significant 5-minute p-mode oscillations of spherical harmonic degree n=0-2 and radial order m=16-26. To each (n,A) value corresponds in principle a multiplet of oscillation modes distinguished by azimuthal quantum number m. The frequency splitting of these m-substates (degenerate in a non-rotating star) measures the mean internal rotation rate of the Sun. Although we cannot distinguish individual m-states in the spectrum of ACRIM...