ABSTRACTS

04.02 Long Term Solar Variability Studies Using 1986 and 1987 Differential Radius Observations
B. Beardsley, C. Cornuelle, R. Kroll, and H. A. Hill (Department of Physics, University of Arizona)

Climatically significant solar luminosity variations can be monitored either from space or from a ground-based observatory. The indirect diagnosis of luminosity used at SCLERA (The Santa Catalina Laboratory for Experimental Relativity by Astrometry) employs the study of changes in the solar shape, diameter and limb darkening function. At SCLERA, diameter and/or differential radius observations were made in 1973, 1976, 1979, 1981, 1983, 1986, 1987 and 1988. Analysis for long term changes in the shape of the solar limb darkening function has begun. Preliminary results based on the 1986 and 1987 observations show both linear and periodic variations (with time) associated with the location of the FFDK edge definition (Hill, Stebbins and Olson 1975, Ap. J. 200, 484). The linear variation of $2^o$ cannot be understood by terrestrial atmospheric phenomena.

The ratio between the fractional change in luminosity to the normalized change in differential radius \( (d/L)/(dR/R) \) is inferred to be $5$ from the work of Hill and Kroll (1986, SCLERA Monograph Series in Astrophysics, No. 5). If $5$ is adopted as the ratio between long term luminosity changes and the normalized differential radius changes, then the inferred average of $(d(\ln L)/dt)$ for 1986 and 1987 is $(d(\ln L)/dt) = (6.9 \pm 2.9) \times 10^{-5}$ per year. Satellite total irradiance observations (Willson 1987, Proceed. of Workshop on "Solar Radiative Output Variations", Nov. 9-11, 1987, at NCAR) indicate that the Sun was nearly constant in 1986 and early 1987 while starting to increase in luminosity late in 1987.

If $(d/L)/(dR/R)$ is $5$ for long term differential radius and luminosity changes, then these results indicate the potential of differential radius observations as a probe of the solar luminosity variability.

This work was supported by the Department of Energy.

04.03 Ultraviolet Fluorescence Lifetime Measurements for Solar Diagnostics with Si$^+$ Ions
W.H. Parkinson, Peter L. Smith, D.W. Duquette (Harvard-Smithsonian Center for Astrophysics)

Accurate $A$-values of allowed and inter system transitions in low $Z$ atoms are necessary for quantitative diagnostics and models of solar plasmas. Ultraviolet spectra of the Sun show prominent SiII features which provide valuable information about the middle and upper chromosphere. We present measurements of radiative lifetimes of the $^2P_1/2: ^2P_3/2$ levels in SiII by time-resolved laser-induced fluorescence on silicon ions held in a radio-frequency electrostatic ion trap. Tunable vacuum ultraviolet laser radiation used to excite the SiII resonance ($^2P: ^2P$) transitions at 180 nm is generated by stimulated anti-stokes Raman shifting in hydrogen of frequency-doubled dye laser light. The output wavelength is calibrated by optical coincidence detection in a silicon hollow-cathode discharge.

Supported in part by NASA Grant NGL 22-007-006.

04.04 Video Movies of 1987 Magne-to-Optical Filter Observations Recorded with the JPL 1024 x 1024 CCD Camera
E.J. Rhodes, Jr. (USC and JPL), A. Cacciari (U. Rome and JPL), G. Garneau (JPL), S. Forzemsk (UCLA), and D. Smith (USC)

We have begun an analysis of an extensive set of full-disk solar images obtained at the Mount Wilson Observatory with the JPL 1024 x 1024 pixel CCD camera. These images were obtained for up to 12 hours per day on 39 different days between August 1 and September 15, 1987. The images were obtained with a Na version of the magneto-optical filter.