and June 1982. We show that scattered light variations observed at the same time in the aureole could not have caused these changes, although they do contribute systematics errors at the 0.1% level. We are also able to show that photomultiplier hysteresis cannot account for these largest limb-darkening variations. Results are presented on the correlation between the integrated disc intensities calculated from our limb-darkening scans, and the ACRIM solar irradiance radiometry, corrected for the blocking effect of spots. We describe also a new detector and data acquisition package that has recently been put into operation to extend our observations to 10 channels covering two wavelengths simultaneously. This work is supported at AER under NSF grant ATM-8111239.

For this study, we derived a second order differential equation for radiative magnetohydrodynamic stability. Because the differential equation is not Hermitian, a complete solution has not been attempted. We made an approximation by neglecting inertial terms, which is valid for coronal loop conditions and if there is no singular surface in the plasma. The differential equation is simplified as follows:

\[ \frac{d^2u}{dx^2} - \frac{1}{x} \frac{du}{dx} + \left( \frac{2}{x^2} - \frac{A}{x^4} \right) u = 0 \]

where \( A \) is the magnetic field strength. The solutions for this equation are:

\[ u(x) = \frac{C_1}{x} + C_2 \]

where \( C_1 \) and \( C_2 \) are constants. The stability of the solutions depends on the values of \( A \), which is determined by the magnetic field. For large values of \( A \), the solutions are stable, while for small values, they are unstable. This work is supported at AER under NSF grant ATM-8111239.

23.09 Electric Fields in Coronal Magnetic Loops.

P. Forsyth, P. Miller, AER, L. Gilligan, SPO.

We analyze spectra taken with the 40 cm coronograph at Sacramento Peak Observatory, for evidence of Stark effect on Balmer lines formed in coronal magnetic structures. Spectral scans taken near the apex of a bright post-flare loop prominence show significant broadening from Hα to the limit of Balmer line visibility in these spectra, at about Hβ. The most likely interpretation of these observations is the Stark broadening, although unresolved blends of Balmer emissions with metallic lines could also contribute to the trend. Less significant broadening is seen in 3 other post-flare loops, and the data from 5 other active coronal conden-
sations observed in this study show no broadening tendency at all, over this range of Balmer number. The trend clearly observed in one post-flare loop requires an ion density of \( n_e \lesssim 2 \times 10^{15} \) cm\(^{-3} \), if it is to be explained entirely as Stark effect caused by pressure broadening. But mean electron densities measured directly from the Thomson scattering at 13875 in the same SPO spectra, yield \( n_e \lesssim 3 \times 10^{15} \) cm\(^{-3} \) for the same conden-
sations observed within that loop. Comparison of this evidence from electron scattering, with densi-
ties derived from emission measures and line-intensity ratios, argues against a volume filling factor small enough to reconcile the values of \( n_e \) and \( n_e \) derived in this study. This discrepancy leads us to suggest that the Stark effect observed in these loops, and possibly also in flares, could be caused by macroscopic elec-
tric fields, rather than by pressure broadening. The electric field required to explain the Stark broaden-
ing in the brightest post-flare loop observed here is approximately 170 volts cm\(^{-1} \). We suggest an origin for such an electric field and discuss its implica-
tions for coronal plasma dynamics. This work was sup-
ported at AER by NSF grants AST-792332 and AST-8001498.

23.10 Condensation Modes in Magnetized Coronal Loops

C.-H. Wang, AER, UCSC.

We have studied condensation modes in a cylindrical plasma to understand the formation and stability of solar prominences (filaments). The cylinder has potential (longitudinal) and non-potential (poloidal) magnetic field which form helically twisted field lines. We find that the twist of field lines has a significant effect on the stability of condensation modes; these modes are unstable if field lines are nearly straight, but becomes stable as the twist increases. Our results also predict that filaments are more likely to form in quiet sun regions than active regions.

23.11 Measurements of A-Values for UV Intersystem Lines Used in Density Diagnostics of Solar Transition Zone and Other Astrophysical Plasmas.

B. Carol Johnson, H.S. Kwong, Peter L. Smith, and W.R. Parkinson, Harvard-Smithsonian Center for Astrophysics.

The intensities of spectral lines produced in the radiative decay of collisionally-excited metastable levels of atomic ions are versatile indicators of electron density in many astrophysical plasmas as well as column densities in cases where the allowed transitions are saturated. We report the first measurements of transition probabilities for the inter-system lines at ultraviolet wavelengths that are used for such analyses, especially in the solar transition zone. Until now, unconfirmed, calculated values have been used. Our work complements the cross section measurements of Lafyatis and Kohl, which are also presented at this meeting.

The ions are created and excited by electron bombardment on gases and stored in an r.f. ion trap. This provides a low-field, collision-free environment in which the metastable ions can decay. The A-values are determined from direct measurement of the photons. Our result for the 3s 3p^3 P^0 - 3p 3d^2 F^2 line of S I II at 1892 Å is \( A = (1.65 \pm 0.11) \times 10^{10} \) sec\(^{-1} \). This value agrees with calculated values to within their quoted uncertainties, which range from \( \pm 20 \) to a factor of 2.

For the 2s^2 2p^2 1P^0 - 2s 2p 3P^0 lines of O III at 1666 Å, calculated values vary over a factor of 2. Our preliminary result is \( A = 10^{10} \) sec\(^{-1} \). Refinement of the work is underway. The 4s 4p multiplets of C II, S I II, and N III have also been observed, but the decays of the individual upper levels have not yet been determined.

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Absolute electron impact excitation cross sections of astrophysical interest are being measured in an inclined (\( \theta = 45^\circ \)) ion beam-electron beam apparatus. The excitation cross section is measured by collecting and counting a known fraction of the photons which result from the decay of electron impact excited ions. Measure-