50.18 Observations of Photospheric Line Profiles in Plages, S. R. WALKOW, Inst. for Astron., Univ. of Hawaii. - Eleven photospheric lines and the inner wings of the Ca II K line have been observed in ten plages using the Optical Multichannel Analyzer at Mees Solar Observatory. Seven of the photospheric lines are magnetically insensitive lines selected to cover a wide range in wavelength (4065 to 7224 Å) and excitation potential (1 to 4.3 eV). The other four lines are used for plage diagnostics by other investigators—Mg I λ4571, Ca I λ4226, and Fe I λ5247 and λ5250. The observations have been calibrated to the same relative scale using quiet-sun disk center observations obtained the same day, and the instrumental profile has been removed. Variations in the line profiles with distance of the plage from disk center, and to a lesser extent from plage to plage are seen. An attempt has been made to reproduce these profiles using one-component models of plages, such as those of Morrison and Linky (1978, Ap.J. 222, 723), and using models which include a scattered photospheric light contribution, such as those of Chapman (1977, Ap.J.Suppl. 71, 1). Neither approach reproduced the observations well. Two component plage models, with the radiative transfer calculated using a "1-1/2 dimensional" approximation, are being pursued. This work was supported by NASA grant NGL 12-001-011.

50.27 Results of Ly-α Coronagraphic Observations Following the 1980 Eclipse, R. WEISER, J.L. KOHL, R.H. MUNRO, and G.L. WITHEBO, Harvard-Smithsonian Center for Astrophysics and the High Altitude Observatory—A Joint Rocket Payload consisting of the CFA Lyman Alpha Coronagraph and the HAO White Light Coronagraph was used to observe the corona on 16 February 1980, at 16 h 32 m UT, just 6 h 15 m after the natural solar eclipse over India. Measurements of the spectral line profile and intensity of resonantly scattered hydrogen Lyman alpha coronal radiation and the intensity of electron scattered white light were acquired in a polar hole and above the base of a streamer. The Lyman alpha intensities measured between 1.5 and 3.5 solar radii and corresponding white light measurements suggest that the solar wind was subsonic for r < 4 R_s in the observed coronal hole at solar maximum. Comparison to a fluid spherically symmetric coronal model implies an upper limit of 150 km s^-1 at 4 R_s. Since Lyman alpha is not sensitive to the apparently low flow velocities that appear to be present, the next rocket flight will measure the intensity of the 0 VI resonance doublet at λ1032 and 1037 Å which is sensitive to outflow velocities in the 25-100 km s^-1 range. An analysis of the widths of the Lyman alpha profiles indicates a nearly constant kinetic hydrogen temperature and evidence for either extended proton heating or for nonthermal contributions to the motion of hydrogen atoms and protons between 1.5 and 4 R_s from sun center. Implications of these results concerning solar wind models will be discussed.

Supported by NASA under research grant NSG-5128 to Harvard College and the Smithsonian Institution.

TRIJDAY AFTERNOON
Solar Physics Division/AAS
Session 51: Spicules and Flows; Late Solar Papers
1330–1630 (Duane G0-20)

51.01 Coronal Jets, Strong Shock Wave Heating of the Corona and a Cloud Model of the Solar Wind, G. E. BRUCKNER and J. -J. P. BARTON, NRL—High energetic events observed with high spatial resolution in transition zone lines from 20,000K to 200,000K are classified into: (1) turbulent events and (2) jets. (1) Turbulent events show velocities up to 250 km/sec in both the red and blue wings, confined in small (∼4 arc sec) areas. Their time behavior is stochastic with very short onset times (∼20 sec) and frequent disappearance and reappearance. They can be interpreted as confined magnetic reconnection processes. (2) Jets show predominant blueshifts. One observes a constant acceleration of 5 km/sec². The lifetime of the jets does not exceed 80 sec. The largest observed velocities are 400 km/sec when they disappear in the transition zone lines or out of the field of view. However, the acceleration does not decline at that point. It is possible that continuous acceleration will heat the jets to coronal temperatures. The differential emission measure shifts rapidly from lower to higher temperatures during the acceleration. The mass of the jets ranges from 5x10¹⁰ to 1x10¹³ gms, their energy range is 4x10²⁵ to 1x10²⁷ ergs, the birthrate can be estimated between 1 and 40 events per second over the whole solar surface. The velocities are supersonic in the corona and lead to strong shockwaves which heat the corona. Enough energy and mass can be supplied to the corona and the solar wind assuming a birthrate of one major jet per second over the whole solar surface. The fine structure in the solar wind at 1 A.U. can be explained by a cloud model of the wind. Jets are further accelerated above the escape velocity and are then coasting outward. The mass contained in fine structure elements observed at 1 A.U., as well as in the turbulent cells of the solar wind, can be supplied by a single large jet.

51.02 The Dynamics of Accelerating Coronal Bullets, J. T. KARLEN, E. S. GRAN, J. P. BORIS, J. T. MARISKA, and G. E. BRUCKNER, E. O. Hulbert Center for Space Research and Laboratory for Computational Physics, NRL.

Recent simulations of plasmas with pressures and temperatures typical of the solar corona and transition region have shown that, under certain conditions, a cold, dense plasma can exist of an extended period of time without evaporating in a hot tenuous plasma. This cold material can move if subjected to externally imposed forces. EUV spectroscopic observations of the Sun recently have revealed jets, or bullet type of dense plasma (T_e ~ 10⁶ K, n_e ~ 10¹⁷ cm⁻³), with lifetimes of order 60 s, which accelerate through the corona at velocities of 50 to 400 km s⁻¹. We present here the results of computer simulations of these jets, with particular emphasis on the following aspects: the sensitivity of the induced acceleration to the form in which energy is put into the system; a comparison of the observed and predicted physical characteristics of the high-velocity bullets; and the potential contribution of the bullets to the mass and energy balance of the solar corona.