studies of the continuum during flares have shown that single temperature models fit the data for all phases of flare development. For a typical flare observed with high time resolution (10 s), the temperature initially rises rapidly to reach a maximum prior to the peak of the light curve, while the emission measure (EM) initially decreases and then reaches a minimum after the light curve peak. During the cooling phase, it has been found that the temperature follows the relationship \( T(c) = T_{min} \exp(-c/c_0) \) and that the emission measure and temperature follow the relationship \( EM(c) = EM_{min} T(c)^{3/2} \) = constant. These relationships are discussed in terms of the thermodynamics of the flare plasma.

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22.10.03 Solar Flare X-Ray Line Studies. V. K. H. N. J. KU, W. H.-M. LENNER, J. A. NOVIC, R. L. NIXON, R., and PARKINSON, J. H., Columbia U. - The good spectral resolution (\( \lambda / \Delta \lambda < 1000 \)) and high time resolution (10 s) of the Columbia University crystal spectrometers on the OSO-8 satellite have enabled emission lines with \( \lambda < 6.7 \) Å to be studied under a variety of solar conditions. The line spectrum consists of emission from H-and He-like ions together with their related satellite line systems. Several satellite lines of the form \( 1s^2(2p) - \text{line}(np), n = 2, 3, 4 \) in Si XII and \( 1s^2(2p) - 2p(2p) \) in Si XIII have been studied for the first time and their temperature dependence is consistent with formation by the dielectronic recombination process. In some flares a decrease in the Si XVI forbidden intercombination line ratio occurs at the start of the event and lasts for approximately 1 min. If this is interpreted as a density enhancement, then an electron density \( \geq 10^{12} \text{ cm}^{-3} \) is indicated. A feature at 1.9 Å has a broad complex profile at the start of an event, indicating a range of Fe ions being present, but as the event progresses, the feature narrows to be consistent with emission from Fe XVIII-XXX.

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22.11.03 OSO-8, radio and x-ray observations of the 15 April 1977 flare. A. SKUMENICH, HAO/NCAR, Boulder, A. J. VIAL, L. P. JR. VIAL, M. R. MONNET, LPS, V. VIAL. We present a comparison of the flux history of the 19 April 1977 flare (McMath Reg. 14726) in soft (1.5-12 keV) and moderate (3-24 keV) X-rays, radio and UV resonance lines of Hydrogen Lyman \( \alpha \) (Lya) and Ionized Magnesium (Mg \( \beta \)). These show the flare to have a gradual rise and fall character. All flux curves, except for the soft X-rays (1.5-12 keV), show supersposed 'bursts'. The Lyman \( \alpha \) flux appears to decay slowly in a fashion similar to the moderate X-rays. At flare maximum the portion of the flare ribbon, observed to be 5° wide, crossing the 6° slit was 110 times brighter in integrated Lya (\( 1 \) Å) and 45 times brighter in integrated Mg \( \beta \) (\( 1.4 \) Å) than the quiet sun. Line profiles of Lya, and for the first time, Mg \( \beta \), show two components, which are more clearly recognized in Mg \( \beta \) than Lya. One is to the red by 16 km/s of the rest position, the other at a blue shift of 50 km/s. The latter may be the signature of an erupting 'neutral' filament and is present from the beginning as a weak signal which reaches maximum visibility at maximum phase. At this time its FWHM is 50 km/s while that of the red component is 90 km/s. A similar phenomenon was reported by Doschek, G. A., Feldman, V., and Rosenberg, F. D. (Ap. J. 215, 329 (1977)).

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**Laboratoire de Physique Stellaire et Planétaire du Centre National de la Recherche Scientifique.**

**Air Force Geophysics Laboratory.**

22.12.03 ATM Evidence for a Low Non-Thermal Proton/ Electron Energy Flux Ratio in Solar Flares. C. H. VANFIELD, R. C. USDC, COOK, J. W., NRL. We have carried out an observational search for asymmetry in the wings of \( \lambda \) during flares, produced by beams of non-thermal protons injected into the chromosphere from the corona as suggested by Orrall and Zirker (1976). The data base is the ATM/Skylab EUV spectrograms from the NRL S6028 spectograph. We first discuss the asymmetries we would expect to be present in the normal thermal profile. We consider in detail the 1551 UT 9 August 1973 flare, observed during the non-thermal phase. In this flare only very small \( \lambda \) asymmetries are observed; not large enough to be statistically significant. We show that this result, combined with microwave radio data for information on non-thermal electrons, implies that the energy flux of non-thermal protons injected into the chromosphere at energies above 20 keV is less than approximately \( 2 \times 10^{-5} \) that of electrons of the same energy range in the observed events. Another interesting possibility, which cannot be discounted, is that neither electrons nor protons are efficiently injected into the chromosphere. In this case, it is the upper limit to the input proton energy flux \( \Phi_{p} \) above 20 keV that is significant; for the 9 August flare we find \( \Phi_{p} \leq 2 \times 10^{-7} \text{ erg cm}^{-2} \text{s}^{-1} \).

22.13.03 OSO-8 Measurements of Rapid Downflow in the Transition Zone During the Impulsive Phase of Solar Flares. W. L. LITZ, Univ. of Colo., E. C. BRUNER, Lockheed Palo Alto Res. Lab., E. R. HANSEN, Univ. of Colorado. - The University of Colorado Ultraviolet Spectrometer aboard OSO-8 has been used to repeatedly scan the C IV resonance line at 1548 Å in active regions of probable flare activity using high spectral resolution and a time resolution of from 27 to 48 seconds. Several solar flares have been observed from their onset. The measurements indicate that: (1) the intensity of the C IV emission rises by factors of 80 in less than a minute, with evidence of brightening by a factor of 10 in less than 15 seconds; (2) the spectra show redshifted emission with effective velocities as high as 85 km/sec and the background intensity, due to scattered light between 1700 and 1900 Å, is seen to rise by a factor of 10. In one event the onset of UV brightening preceded the rise in soft X-rays by about 3 minutes.