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Abstracts of Presented Papers

13 JULY 1993
TUESDAY

Welcoming Address
Charles Kruger, Stanford Dean of Research
Kresge Auditorium

Session 1: Yohkoh
Chair: Keith Strong
Kresge Auditorium

1.01
Highlights of the Initial Results from the Yohkoh Mission
S. Tsuneta (U. of Tokyo)
The highlights of the solar observations from Yohkoh ("sun beam" or "sun light"), are presented with emphasis on the results from its Soft X-ray Telescope (SXT). The highly dynamical and transient nature of the coronal magnetic fields revealed by SXT is drastically changing our view of the solar corona and behavior of magnetized plasma in general. Some of the initial discoveries are presented.

1.02
Impulsive Soft X-Ray Emission in Solar Flares
H.S. Hudson (IFLA), K.T. Strong (LPARL), B.R. Dennis (GSFC), D. Zarro (ARC), M. Inda (Toyama U.), T. Kosugi (NAOJ), and T. Sakao (NAOJ)
Observations of solar flares from Yohkoh show the existence of impulsive soft X-ray bursts that coincide, in space and time, with hard X-ray bursts at the footpoints of flaring loops. This observation strikingly confirms the general scenario of chromospheric evaporation during the impulsive phase as the origin of the material filling the hot, dense coronal loops observed in solar flares. We illustrate this effect, including the direct observation of the upward flow of hot gas from the chromosphere, with data from a 3B/X1 flare of 26 January 1992. We have found that this phenomenon is the rule in flare development, rather than the exception: a survey of the 10 solar flares listed by Acton et al. (P.A.S.J. 44, L71, 1992) from early in the Yohkoh data base shows six clear examples of impulsive soft X-ray footpoint emissions; the remaining four were poorly observed or (in one case) originated over the limb. The effect observed here helps to explain the "Neupert Effect", in which the soft X-ray light curve of a solar flare correlates loosely with the integral of the hard X-ray light curve.

1.03
Evidence for Both Electron Acceleration and Direct Heating in Solar Flares.
B.R. Dennis, G.D. Holman (NASA/GSFC), H.S. Hudson (U. Hawaii), T. Kosugi (NAOJ), K.T. Strong (LPARL), and D. Zarro (ARC)
It is well known that in many impulsive solar flares, the time profile of the total soft X-ray flux closely matches the time integral of the hard X-ray profile, the so-called Neupert Effect. We have selected two flares detected by the X-ray telescopes on Yohkoh that clearly show this effect and examined the time profiles for different spatial locations throughout the flaring region. We find that footpoint locations show coincident impulsive bursts in both soft and hard X-ray emissions whereas loop-top locations show more gradually varying soft X-ray emission with weaker hard X-ray emission. We interpret these observations in terms of an electric field model in which both Joule heating and electron runaway acceleration take place, with the ratio of the two dependent on how strong the field is compared to the local Dreicer field. The pre-impulsive phase emissions and the early gradually-varying soft X-ray emission can be attributed to the direct heating by the electric field in the coronal part of the loop and the impulsive footpoint emission is consistent with a combination of both enhanced Joule heating and electron precipitation.

1.04
Upflowing Multimillion Degree Plasma During Solar Flares
G.A. Doschek, J.T. Mariska (NRL), and M. Rilee (Cornell)
During the rise phase of the soft X-ray emitting flare plasma, profiles of X-ray spectral lines frequently exhibit a blueshifted component, typically indicating upflowing plasma at line-of-sight speeds ranging from a few km s\(^{-1}\) to about 800 km s\(^{-1}\). This blueshifted component was extensively observed by spectrometers flown on the P78-1 spacecraft, the Solar Maximum Mission, and the Hinotori spacecraft, but the sensitivity of these instruments was not high enough to observe it at flare onset, and with high time resolution. Some workers believe the upflowing plasma is a direct signature of chromospheric evaporation, although other explanations have been proposed.

The bent crystal spectrometers flown on the Japanese Yohkoh spacecraft have about an order of magnitude more sensitivity than previous instrumentation. This frequently allows us to investigate the temporal behavior of the blueshifted emission with three second time resolution, and to observe it very close to flare onset. In this talk we describe techniques for analyzing the blueshifted component and relating it to other flare phenomena, such as the stationary (non-moving) component and hard X-ray bursts. We give results for several events.

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