ABSTRACTS

23.03

Arcade Formation and the Non-Eruption of Disappearing Hα Filaments as Seen with the YOHKOH Soft X-Ray Telescope

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Several examples have been found of a type of initial structure made up of a group of nested arcade loops, at a large angle to the vertical, with long twisted threads emerging from between their foot points, giving the impression that the filaments dive into the mouth of a tunnel defined by the arches. These structures are often correlated with Hα dark filaments that are aligned along the long threads and extend under the arches. On at least two occasions, on the Sep. 28th 1991, and Feb. 21st 1992, there were brightenings in such structures associated with untwisting of the twisted threads while the arcade loops were replaced by an arcade, under which a bright axial thread is seen along the same line as the long twisted threads. During this time the Hα dark filaments disappear. We examined several of these events using image analysis techniques to bring out the fine structure, and show in detail the evolution of the new soft x-ray arcade perpendicular to the disappearing dark filament and of the bright axial thread that lies along the arcade. At a glance this thread seems to correspond to the locus of the reconnecting points in the inverse Y-shaped reconnection, in helmet-like configuration models (Sturrock, Hirayama, Kopp-Pneuman). We find, however, that 1) this bright thread seems to connect to the long untwisting threads, and that 2) it does not rise up through the overlying arcade. There is likewise no sign of reconnection in the overlying corona, as expected in those models. Therefore, it seems that at least the major part of the heated mass as well as the longitudinal field of the dark filament simply remained inside the arcade which stays intact, requiring a new way of explaining the phenomenon.

We present a more detailed discussion of this type of event and comment on the implications for existing theoretical models.

23.04

Thickness Variations Along Coronal Loops Observed By Yohkoh

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It has been suggested that observed coronal loops have a constant thickness. However, if plasma loops coincide with magnetic loops, then we might expect them to be significantly broader at their top than at their footpoints (since, on average, magnetic fields must diverge with height in the solar corona). It is important to understand how the thickness of individual loops varies along their length, since this variation is related to the distribution of electric currents in the corona and is therefore relevant to solar flares and coronal heating.

We here present preliminary results of our investigation of thickness variations along coronal loops observed with the Soft X-ray Telescope (SXT) on board the Yohkoh satellite.

This work is supported largely by a Lockheed subcontract with Stanford University under NASA prime contract NAS8-37334.

23.05

Solar Flare X-ray Spectroscopy from YOHKOH

G.A. Doschek (NRL), the BCS Team, and the SXT Team

The YOHKOH spacecraft contains four uncollimated Bragg crystal spectrometers (BCS) that observe narrow wavelength windows centered on X-ray emission lines of Fe XXI - Fe XXVII, Ca XIX, and S XIV - S XV. These lines are emitted from solar flare plasma at temperatures between about 8 and 40 million degrees. BCS is designed to be about an order of magnitude more sensitive than Bragg spectrometers flown on P78-1, SMM, and Hinotori. A primary objective of BCS is to investigate plasma dynamics and physical parameters such as electron temperature at preflare times and at flare onset. Another important objective is to relate the BCS results to flare images obtained by SXT and HXT. In this talk I will describe some of the highlights of BCS research since the launch of YOHKOH. After a brief survey, I will concentrate on two flares that occurred on 9 November 1991 and 3 January 1992. These events exhibit large blueshifted spectral components during the flare rise phase. I will discuss the dynamics and temperature behavior of the soft X-ray plasma as determined from BCS and attempt to relate these results to features observed in SXT flare images.

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23.06

White-Light Flares Observed by YOHKOH

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The Wide Band Spectrometer (WBS) on the YOHKOH satellite has spectroscopic capabilities for measuring solar X-ray and gamma-ray emission in the energy range from 3 keV to 100 MeV. The WBS consists of three different types of spectrometers, soft X-ray spectrometer (SXS: two gas proportional counters covering the 3-40 keV band), hard X-ray spectrometer (HXS: NaI scintillation counter covering the 20-600 keV band), and gamma-ray spectrometer (GRS: two BGO scintillation counters covering the 0.3-100 MeV band). The WBS provides light curves in ten energy bands and the wide band energy spectrum which are essential for understanding of particle acceleration and plasma heating during solar flares. To date the WBS has recorded about 300 flares since last October. Of these, the four impulsive X-class flares of 1991 Oct. 24, 1991 Oct. 27, 1991 Nov. 15, and 1991 Dec. 3 produced high-energy photons up to about 10 MeV. In particular, the 1991 Oct. 27 flare (X1.3/3B) showed intense gamma-ray lines resulting from nuclear deexcitation and neutron capture (this gives evidence that ions were accelerated to 10-100 MeV/nucleon), whereas the 1991 Dec. 3 flare (X2.0/2B) showed the intense gamma-ray spectrum which is dominated by electron bremsstrahlung. These spectral observations imply there are different types of particle acceleration processes in the flare sites. The time variation of hard X-ray spectral index is also discussed in connection with the electron acceleration.

23.07

Steroscopic Observations of a Solar Hard X-Ray Flare with Ulysses, PVO, GRO and Yohkoh Spacecraft

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Hard X-ray/gamma-ray spectrometers aboard two interplanetary spacecraft, Ulysses and Pioneer Venus Orbiter (PVO), and two near-Earth spacecraft, Yohkoh and Compton Gamma Ray Observatory (GRO/BATSE), are currently in operation. A unique set of circumstances have permitted the observation of the 15 November 1991 (2238 UT) flare by all four instruments. This intense flare (GOES class X 1.5) was associated with the bright (3B) H-alpha flare located on the disk (S13, W19) in the active region 6919. At the time of the flare, the Ulysses and PVO spacecraft were located respectively 101° and 52° west of the Sun-Earth line. Thus the view angles for the PVO and Ulysses instruments were quite different from those of the near-Earth instruments on GRO and Yohkoh. The preliminary photon energy spectra observed by the four instruments at different times during the flare will be presented and their implications regarding the directivity of hard X-ray sources in flares will be discussed.

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