6.04

Flares on 1992 September 6

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Active region NOAA 7270 produced several M and C class flares during 1992 September 5-7. The region grew dramatically on the 5th and formed the delta configuration on the next day. We have studied five M flares on the 6th, comparing

- Soft X-ray large scale images obtained by the Soft X-ray Telescope (SXT) aboard Yohkoh,
- High resolution H-alpha images from the DST of Hida Observatory,
- Hard X-ray images obtained by the Hard X-ray Telescope (HXT) aboard Yohkoh,
- High resolution soft X-ray spectrum obtained by the Bragg Crystal Spectrometer (BCS) aboard Yohkoh,
- Vector magnetograms from the Flare Telescope at Mitaka/NAOJ.

We will present the results of our analysis, emphasizing the relationship between flare energy in the form of radiation and mass motion.

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6.05

Survey of Loop-Footprint Brightenings during the Impulsive Phase of Flares

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The unique combination of high temporal and spatial resolution with large dynamic range and good sensitivity makes it possible for the Soft X-ray Telescope (SXT) on Yohkoh to investigate early in the onset phase of solar flares. We present the initial results of a survey of the impulsive phase images of many flares. We have discovered that, where the SXT started observing early enough to take several unsaturated images during the impulsive hard X-ray burst, a soft X-ray burst is always seen at the base of the flaring loops. There are just three exceptions to this general rule found to date and all of these events occurred at or behind the limb of the Sun where the footpoints were obscured. It should be noted that these footpoint brightenings are not the dominant source of emission throughout the flare nor, even, sometimes during the impulsive phase. Also the flare-flag threshold on Yohkoh is set fairly conservatively and generally does not trigger until a flare has reached the C5 level on GOES, so this may be a significant selection effect. After the impulsive phase of the flare the loop top becomes the dominant source in a large number of events (Acson et al. 1992, Feldman et al. 1993). As these results become more quantitative (Hudson et al. 1993) severe limitations can be put on energy transport and deposition mechanisms in flares and may pose a problem for many existing flare models.

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6.06

Evidence for Twisted Emerging Flux: NOAA AR 7260


We present evidence that the origin of shear and twist in an active region's magnetic flux tubes is not photospheric motions. Rather, we find that the magnetic flux which emerged in NOAA AR7260 over the period of 15-20 August 1992 was in a non-potential configuration at the time it appeared.

This active region rotated onto the disk as a mature bipole: a dominant negative-polarity spot with trailing plage and small scattered spots in attendance. For a period of seven days beginning 15 August 1992 the area displayed substantial evolution: at least fifteen bipoles emerged, increasing the magnetic flux by more than 10^22 Mx. The most substantial flux emergence occurred in the trailing plage of the large existing P spot, forming a complex βγδ configuration. Other emerging flux regions were scattered and short-lived. Close to eighty flares with soft X-ray counterparts, including eight M-class flares, accompanied this growth.

To study the emerging flux in this region we utilized white-light and Soft X-ray (SXR) observations from the Yohkoh satellite, University of Hawaii Mees Observatory data, specifically vector magnetograms from both the Stokes Polarimeter and the Imaging Vector Magnetograph instruments and Mees CCD Hα Imaging Spectroscopy observations, and finally Hα images from Hida Observatory. We analyzed the photospheric magnetic fields and sunspot proper motions, Hα fibril patterns and arch filament systems, and coronal images of both the new flux system and the older sunspot group in AR7260.

From the data we conclude that a) the new flux tubes emerged into the solar photosphere, chromosphere and corona with an inherent counter-clockwise twist; b) the old flux system exhibits the same sense of twist; c) this non-potential configuration was generated by a more global and organized mechanism than photospheric motions can provide.

6.07

Classification of Active Regions Based on X-ray Images I. Active Regions Appearing in Coronal Holes

N. Nitta (LPARL/ARC), K. Shibata (NAOJ), H. Hara (U. Tokyo)

Coronal structure of active regions appearing in coronal holes is studied using the Soft X-ray Telescope (SXT) on the Yohkoh mission. Many of them assume an appearance similar to a "sea-anemone", so we call them "anemone regions." An anemone region is a compact region that shows nearly symmetrically fanning loops from a center with an East-West asymmetry in brightness. During the period between November 1991 and March 1993, we identify in SXT full-disk images a total of 28 anemone regions. This is about a quarter of all the active regions in the period that were observed by the SXT from their birth. We will discuss characteristics of the anemone regions on a statistical basis, especially in terms of the magnetic polarity of underlying spots and surrounding coronal holes.

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6.08

Yohkoh-SXT Observations of AR Brightenings

G. A. Linford, J. R. Lemen (LPARL), and H. S. Hudson (IFA)

The response functions of the analysis filters convolved through the Soft X-ray Telescope (SXT) on board Yohkoh are such that the total signal is very sensitive to temperature changes below 10 MK (e.g. increasing 3 to 4 orders of magnitude between 1 and 10 MK). With this high sensitivity to coronal temperatures, we examine weak events observed with the SXT instrument to determine whether these brightenings result from flare-like temperature enhancements or are merely regions of an increased coronal plasma density. Preliminary results from one event has