181st AAS MEETING, PHOENIX, ARIZONA

54.05
Optical Spectroscopy of Luminous Infrared Galaxies: The Nature of the Energy Source
S. Veilleux, D.-C. Kim, & D. B. Sanders (IfA, U. Hawaii)

A spectroscopic survey of a large sample of luminous infrared galaxies was carried out to determine the primary energy source responsible for ionizing the line-emitting gas in these objects. Long-slit Palomar 5-m spectra covering 3750–8000 Å at a resolution of about 10 Å were obtained of 140 IRAS galaxies, including 80 objects from the IRAS Bright Galaxy Survey of Soifer et al. (1986) and 60 objects selected on the basis of their “warm” infrared (60 μm/100μm) colors. The high signal-to-noise ratio of these data allowed us to derive information on the line emission of these objects as well as the underlying stellar population of their host galaxies. Diagnostic diagrams involving a large number of emission-line ratios were used to classify all of the galaxies as “HII region-like” or “AGN-like.” The emission-line spectra of most AGN-like objects were found to be of relatively low ionization level and were therefore classified as LINERs. The [O III] profiles of some of these LINERs are very broad, with widths of up to 1000 km s⁻¹ (FWHM). There is also a tendency for the emission-line spectrum of the objects in our sample to become more AGN-like at larger infrared luminosity. However, the nature of the line emission appears to depend on the radial distance from the nucleus. These results were combined with our analysis of the stellar absorption features and continuum colors to determine the importance of shock ionization and photoionization by a stellar or non-thermal (AGN) continuum as a function of the infrared luminosity of these galaxies.

55.02
Yohkoh/SXT Observations and Models For An Eruptive Flare
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On Dec. 2, 1991 Yohkoh/SXT obtained a unique sequence of high quality X-ray images of what appeared to be a plasmoid ejection and two-ribbon flare, viewed in cross-section on the Solar limb. We will show a movie displaying the preflare plasmoid formation, the eruption of the plasmoid followed by the onset of the flare, and finally what appears to be the formation of postflare loops in a quadrupole type field configuration.

We have modeled this sequence of events with a simple Martens-Kinin circuit approach, approximating the plasmoid filament as a line current, added to a background field consisting of three line-dipoles. Overlays of the X-ray movie with the calculated magnetic field morphology show excellent agreement, and thus lend further credence to the two-ribbon flare scenario developed by Carmichael, Sturrock, Hirayama and many others thereafter.

55.03
Correlation between X-ray Temporal Variability and Magnetic Environment in Solar Flares

The X-ray time history of a solar flare can reflect basic processes of heating and/or acceleration, which in turn may depend on the magnetic environment of the site. Some flares show a simple rise and fall temporal behavior, whereas others show more than one peak. Comparisons of images taken by the Soft X-ray Telescope (SXT) aboard the Yohkoh spacecraft with ground-based magnetic data (Hawaii, Kitt Peak and Mtaka) reveal that, at least for a flare-productive active region (NOAA 7260), flares with double-peaked and single-peaked time profiles occurred at systematically different locations within the region. We discuss this result in terms of theoretical models, especially those of coalescence of two current loops.

55.04
X-ray Observations from Yohkoh of the Energy Release Topologies in Solar Active Regions
C.-C. Cheng (NRL), L. Acton (Lockheed), Yohkoh Team

The Soft X-ray Telescope (SXT), on the Japanese solar satellite Yohkoh, with its high time (up to ms) and spatial resolution (up to 2.5″), obtains images of the Sun in sufficient detail to enable us to study fast time changes and energy release processes in flares and active regions. Here we present SXT observations of several active regions obtained from February through April 1992. These images show a variety of morphological changes in the active region loop structures and their interaction within a time interval of 10 to 20 minutes. In particular, we will show examples of dramatic topological changes in the active regions accompanied by the reconfiguration of loop structures and brightness variations. These examples provide clear evidence of loop interaction and can be best interpreted as being due to magnetic reconnection. Implications of observations on coronal heating mechanisms will be discussed.