M71: Velocity Dispersion and Binary Star Candidates from DAO and CFHT Radial Velocity Scanner Observations

C.P. Pyor (Rutgers), J.E. Hesser, R.D. McClure, M. Krismen, J.M. Fletcher (DAO/HIA/NRC)

For the last 8 years we have been using radial velocity scanners at the DAO 1.2-m and CFHT 3.6-m telescopes to monitor 61 giant stars in the globular cluster M71 (NGC 6838). Of these, 18 stars have measurements at 2 epochs, 12 stars at 3, and the remaining stars have more. The average time baseline is 4 years. The mean radial velocity is $-23.1 \pm 0.3$ km/s for the entire sample. The cluster velocity dispersion is $2.3 \pm 0.2$ km/s. Fitting a single-mass King models yields $M/L_v = 0.9.$ Fifteen of the stars with 3 or more observations have an rms scatter about their mean velocities greater than 1 km/s and are potentially velocity variables. A search for periodicities among the 6 of these stars with 10 or more observations has yielded four stars with possible orbital solutions: A4 ($P=1010$ d), I ($P=348$ d), 64 ($P=176$ d), and 71 ($P=1360$ d). These results will be presented and discussed in the context of both of the binary frequency in globular clusters and of the kinematic properties of M71.

Oxygen Abundances in NGC 6397 Giant Stars

R.A. Bell (College Park, MD)

The Anglo-Australian Telescope has been used to obtain spectra in the 2.0 micron region for two giant stars in the very metal poor globular cluster NGC 6397. The spectra show that the CO bands are very weak. Analysis of these bands indicates that the carbon abundances are very low e.g. [C/Fe] -0.8, confirming the results from an earlier analysis of the CH bands. In addition, the CO analysis gives oxygen abundances of [O/Fe] -0.4 with an error of about 0.4, in disagreement with analyses of extreme population II subdwarfs and halo giants, but in better agreement with results from high dispersion spectroscopy of some giants in two other low metallicity globular clusters.

Session 30: YOHKOH/HESP Display Session

Regency South

30.01 Time Variation of Solar Flare Temperatures Determined from Yohkoh BCS Spectra

A. C. Sterling (CPI, ISAS), G. A. Doschek, J. T. Mariska (NRL), C. D. Fike (RAL, ISAS), J. L. Culhane (MSST), E. Hiei, T. Watanabe (NAOJ), and the Yohkoh BCS Team

Bragg Crystal Spectrometer (BCS) X-ray spectra analysis from past satellite missions indicate that it is possible to estimate temperatures in highly ionized flare plasmas to within about 12%, using ratios of intensities of resonance lines in different He-like ions. This procedure is particularly valuable in cases where other temperature measuring methods are insufficient, such as during the rise phase of flares with strong X-ray spectra blue shifts. Here we examine this ratio variation in several flares using data from the Fe XXV, Ca XIX, and S XV channels of the BCS experiment onboard the Yohkoh satellite. We select flares for which we have good rise phase data, and calibrate the ratios using dielectron-to-resonance line ratios in selected Fe XXV spectra assuming constant elemental abundances in each event. The Yohkoh BCS is about an order of magnitude more sensitive than previous X-ray flare spectrometers, and is therefore able to examine the early stages of flare development in greater detail than previously possible. For this study we select events for which we have good rise phase data, but data well into the decay phase is available for a number of the selected events. This allows us, for the first time, to follow the evolution of flare spectra from relatively cool temperatures ($\approx 12$ MK in Fe XXV) to previously quoted "typical" flare temperatures ($\approx 17$ MK in Fe XXV).

30.02 Temperature Structure of Solar Flares Observed by the Yohkoh SXT

J. M. McTiernan, S. R. Kane, J. M. Loran (Space Sciences Laboratory, Univ. of California, Berkeley), J. R. Lemen, L. W. Acton (Lockheed Solar & Astrophysics Laboratory (LSAL)), H. Harra, S. Tsuneta (National Astronomical Observatory of Japan (NAOJ))

Hot plasmas from several solar flares have been observed by the Soft X-ray Telescope (SXT) on board the Yohkoh satellite. For a sample of flares observed by the SXT with a variety of X-ray filters, we have calculated temperature and emission measures as functions of space and time. Initial results from this analysis show the following: (1) The flare plasma range in temperature from several million degrees K up to greater than 20 million degrees K, depending on the individual event; (2) The region with the highest temperature does not coincide with the brightest region. For example, for the flare of 15 November 1991 (2238 UT) the temperature was typically 8-9 million degrees K on the bright kernels, with temperatures of 15-25 million degrees K on the edges of the bright region. The average temperature for the flare was approximately 10 million degrees K. A preliminary interpretation of these observational results in terms of the temperature and density structure inside a magnetic loop will be presented.


J.-P. Wüller (UHIFA), L. Acton (LAPRL), T. Sakao (NAOJ), R. Canfield (UHIFA), T. Kosugi (NAOJ), G. Slater (LAPRL), K. Strong (LAPRL), S. Tsuneta (NAOJ)

The X1.5/B flare on November 15, 1991, 22:33 UT was well observed by the Halpha Imaging Spectrograph and the Vector Magnetograph (Stokes Polarimeter) at Mees Solar Observatory, and by the Soft- and Hard X-ray Telescopes (SXT and HXT) aboard YOHKOH. We have combined this multispectral dataset into a series of temporally and spatially co-aligned video movies and analyzed the morphological and temporal relationships of the various flare emissions. The earliest manifestations of this flare include unresolved preflare SXR brightenings very close to the magnetic neutral line and preflare motions of filaments seen in Halpha. In the flare core, SXR and Halpha emission show moving and rotating coronal structures which we interpret as a succession of brightening of adjacent loops during the main phase of the flare. The HXR source shows much more dramatic variability than the SXR source, and they are clearly not coplanar. On the other hand, there is a close spatial relationship between the HXR and Halpha blue wing emission sites. The Halpha, HXR, and SXR images all point to acceleration and heating in a region that starts close to the neutral line and moves outward during each HXR burst and during the gradual phase. Spectroscopic mass ejections are seen in both SXR and Halpha, with clear unwinding of tightly coiled structures, acceleration of X-ray and Halpha material to velocities of order 1000 km/s, and a striking thermal bifurcation between hot and cold plasma.

30.04 Electric Currents and Coronal Structures in Two Flare- Productive Active Regions, AR 6859 and AR 6952


In this study, we examine the spatial and temporal relationship between coronal structures observed with the Soft X-Ray Telescope (SXT) on board the YOHKOH spacecraft and vertical electric currents derived from vector magnetograms obtained at the Mees Solar Observatory, Hahnlake, Hawaii. We have focused on two active regions, AR 6859 (October 1991) and AR 6952 (December 1991). In both active regions, we observed significant current structures which persisted over time scales of days. The SXR emitting coronal structures, however, changed on much shorter time scales, indicating that there is no compelling, direct spatial and temporal relationship between the non-flaring SXR structures and the long-lived electric current systems. We have seen at least