Theoretical Models of a Flare on AU Mic seen by EUVE Deep Survey Detectors

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The M-dwarf star AU Mic was observed by the EUVE Deep Survey Instrument from 1992 July 14-18. A large flare with a total radiated energy in the EUV of approximately 3 x 10^{44} erg was detected in the Lexor/Boron (65-190 Å) band at 12:38 UT on 15 July 1992. These observations are described further in a recent paper (Cully, Siegmund, Vedder and Valleria Ap. J. Lett., 1993, in press). We present an analysis of this data in terms of theoretical models of flaring loops.

Magnetic Fields on ε Eridani from High Quality FTS Spectra near 1.6 μm

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We present outstanding infrared spectra of the active star ε Eridani (K2V) and two inactive reference stars, 40 Eridani (K4V) and σ Draconis (K0V). The spectra are the result of 9 hours of observations per star with the IR FTS at the 4-m Mayall Telescope at Kitt Peak National Observatory. The noise is 0.5-1.0% with an unapodized spectral resolution of 120,000. The wavelength range covered is 1.54-1.59 μm (6290-6490 cm^{-1}) in air, which includes two dozen moderate strength lines, notably the Landé-g = 3 line at 1.5649 μm. This line is a superior magnetic diagnostic because of its high Landé-g factor, long wavelength, and large depth of formation. The Zeeman sensitivity of this line is at least a factor of 2-3 times greater than any optical line.

We employ a polarized radiative transfer code to simultaneously model the profiles of clear neutral iron lines in our infrared spectra and high quality optical spectra. The inactive stars are used to determine and check oscillator strengths and to assess the accuracy of our models. We then model ε Eridani both with and without a magnetic field. The observed wings of the magnetically sensitive 1.5649 μm line are clearly deeper than predicted by the B = 0 model. No such discrepancy is observed in the insensitve lines or in inactive stars. We then fit the ε Eridani profiles with various magnetic models. A model with depth independent magnetic fields yields a (preliminary) field strength of 1.9 kG covering 12% of the stellar surface. We also consider the observable effects of magnetic fields that vary with depth or across the stellar surface.

A Search for CO Absorption Bands in IUE Spectra of Cool Stars

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Observations of the red giant (M2 lab) α Ori with the Goddard High Resolution Spectrograph (GRHS) onboard the Hubble Space Telescope (HST) have provided an unambiguous detection of a far-UV continuum on which are superposed strong molecular absorption bands (Carpenter 1991, ASP Conf. Ser. 26, p. 17). The continuum is formed in the stellar chromosphere. The absorption bands, which appear in the 1300 - 1600 Å spectral region, have been identified with the (n,0) bands (n=0...8) of the A-X system of CO and are likely formed in the circumstellar shell. Comparison of these GRHS data with archival IUE spectra indicates that both the continuum and the CO absorption features can be seen with IUE, especially if multiple IUE spectra, reduced with the post-1981 IUESIPS extraction procedure (i.e., with an oversampling slit), are carefully co-added to increase the signal-to-noise over that obtainable with a single spectrum. We have therefore begun a program, utilizing both new and archival IUE spectra, to survey other cool, low-gravity stars for the presence of these new chromospheric and circumstellar shell diagnostics. We hope to identify promising targets for examination with HST spectrographs at the higher resolution and signal-to-noise needed for quantitative analysis. The initial results of this IUE survey are presented here.

GRHS Observations of the M-giant γ Cru

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The Goddard High Resolution Spectrograph (GRHS) on the Hubble Space Telescope has been used to obtain medium (R=20,000) and high (R=60,000) resolution UV spectra of chromospheric emission features for the M4.5 III star γ Cru. Large Science Aperture (LSA), medium resolution spectra were obtained to survey the 1980 - 2200 Å region with good signal-to-noise. Small Science