37.06
Absolute Starspot Area and Temperature Measurements on Single-Lined RS CVn's

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We are using the absolute and relative strengths of TIO absorption bands in the spectra of late-type stars to directly measure the total area and mean temperature of magnetically-active regions in their photospheres, which are analogous to sunspots. We have observed a large number of comparison stars whose spectra are presumed to represent the unspotted and spotted photospheres. We vary the fractional area coverage of each component in order to synthesize a fit to the observed spectra. The power of this technique arises from the use of several absorption bands simultaneously. The absolute strength of each band is a strong constraint on the spot area, while the relative strength of the bands provides an independent constraint on the spot temperature.

Our target stars consist of rapidly-rotating, late-type stars, primarily of BY Dra and RS CVn-type. We are also working on a catalog of stars of various activity levels, for our measurement technique works equally well with relatively unspotted stars. Our technique is independent of the symmetry of the spot distribution. Our data were obtained with the McMath telescope at the National Solar Observatory. They consist of medium-resolution (Δλ/λ ~ 20,000), high-S/N (200-300) spectra with a range of approximately 100 Å centered on the TIO bands clustered near 7100 Å and on the band at 8860 Å.

We will present preliminary results for the single-lined, rapidly-rotating giant stars HD 199178, Sigma Gem, and El Eri. These stars have been observed at many rotational phases in order to measure the rotational modulation of the TIO bands induced by the asymmetry of their spot distributions. These results will be used to interpret the more detailed surface maps derived from light-curve modeling and Doppler imaging.

37.07
Observations of the RS CVn System HR 1099 with the Hopkins Ultraviolet Telescope


The Hopkins Ultraviolet Telescope (HUT), part of the Astro observatory, observed the RS CVn system HR 1099 (V711 Tau) for some 1600 seconds during its flight in 1990 December. HUT's spectral coverage shortward of Lyman α provides the first observation of a number of important chromospheric and transition region emission lines from this system, including C III λ977, N III λ991, O VI λλ1032,1038, N II λ1086, and C III λ1176. Using these lines to determine electron densities, we have carried out emission measure modeling of the star. The availability of the high-temperature O VI doublet allows the models to be carried to higher temperatures in the stellar atmosphere than has been previously possible, producing models that are more concordant with the coronal X-ray emission than earlier IUE-based models. In addition, a previously unknown, unexpectedly strong far UV continuum is seen in the HUT spectrum all the way to the Lyman limit. We show that this radiation must originate from below the 20,000 K level of the atmosphere, although its exact origin remains unknown.

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37.08
The Sun as a Star: High Spectral Resolution Solar Data Degraded to Low Dispersion IUE Resolution

J.W. Cook (Naval Research Lab) and J.G. Doyle (Armagh Observatory)

The short wavelength region covered by the SWP camera onboard the International Ultraviolet Explorer (IUE) satellite, 1150-1950 Å, can give valuable information on the chromospheres and transition regions of late type stars. We present high spectral resolution (0.06 Å) solar spectra over 1160-1960 Å, from the NRL 5082B spectrograph carried on Skylab, of an active region and a large double ribbon flare, and the same spectrographs degraded to low resolution (<5 Å) spectra from the IUE satellite. This comparison clearly shows the high resolution detail yet missing in low resolution spectra and aids in identifications of lines where blending is a problem. We illustrate an example with IUE data from a flare spectrum of the active RS CVn star II Peg (observed in September 1990 by JGD, unpublished), where several weak emission features can now be identified.

Several previous solar atlases of this wavelength region are available. A flare spectrum is highly desirable to show emission lines, including weaker lines, at their strongest in emission strength. The new point of our work is the convenient combination of absolutely calibrated flare and active region spectra, together with a direct comparison to the wavelength degraded flare spectrum, and with a number of line identifications presented directly as captions on the plots.

37.09
Precision Differential Analysis of Four Solar Neighborhood, Solar-like Stars

T. Meylan, P.T. Meylan (CSC), T. Furenlid (GSU)

Differential chemical analysis of four solar-like stars has been carried out, with typical precisions in the determinations of 0.03 to 0.05 dex. The stars are HR 483, HR 3881, HR 4277, and HR 5459 (alpha Cen A). Elements representing all major groups of nucleosynthesis products, except the x elements, have been analyzed. Results are presented in the context of stellar nucleosynthesis theory, and galactic chemical evolution.

37.10
On Differential Abundance Studies

I. Furenlid (GSU) and T. Meylan (IUE/CSC)

The assumption that a differential chemical abundance study gives reliable values for abundance differences between standard and program objects is scrutinised in the light of modern, high S/N spectroscopy. Analyses of Alpha Cen A are used and the results form the basis for the discussion.