Stellar Activity Cycles and Rotation in Cool Stars Observed from Mt. Wilson Observatory


At the Mt. Wilson Observatory 1.5m telescope we are measuring the Ca II H and K flux relative to the nearby stellar continuum in 99 lower main sequence stars and approximately 200 evolved stars. A span of 21 years of time series data for the lower main sequence stars, begun in 1966 at the 2.5m telescope of Mt. Wilson Observatory, detail long-term chromospheric activity variations. Nightly data obtained since 1980 for the lower main sequence stars exhibit rotation modulation over seven independent seasons. The analysis of those data reveal long-term variations, in some cases cyclic, stellar rotation and differential surface rotation. We will summarize results from the program time serial monitoring of chromospheric flux.

61 Cyg A (K5V)

Lyman Alpha Emission in the Late A-Type Stars

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The location along the main sequence where chromospheric and coronal activity begins provides an important constraint on models of stellar activity. IUE observations of C II (1335 A) and C IV (1549 A) and ground-based observations of He I (5876 A) have established that virtually all of the early F dwarfs show stronger chromospheric and transition region emission than do the cooler and more deeply convective dwarf stars like the Sun. To extend the search for UV chromospheric emission to A-type stars is observationally difficult because of the stronger photospheric continuum of the warmer stars. Nevertheless, the previous detection of X-ray and Ly alpha emission from the single A star, Altair (AV = 0.22), suggests that stellar activity may be present in warmer stars, before vanishing among the early and mid A-type stars.

Here we report on a program which makes use of new and archival IUE observations to search for Ly alpha emission in stars with 0.20 < B-V < 0.83. The Ly alpha line should be a more effective diagnostic than either C II (1355 A) or C IV (1549 A) for these stars, because of its greater intrinsic strength, and the reduced photospheric continuum at 1216 A. Although stellar Ly alpha emission will be attenuated by interstellar HI, models of the local interstellar medium suggest that the attenuation is less than a factor of two for most A stars within 50 pc of the Sun. We will present our algorithm for removing diffuse geocoronal and interplanetary Ly alpha from IUE spectra, which involves 2 dimensional imaging of the sky background. To date, Ly alpha emission has been definitely detected in Altair, 71 Tau (F0V, B-V = 0.26), and 7 And (F0V, B-V = 0.29). Our results confirm that in the A-stars, Ly alpha can be a more sensitive diagnostic of chromospheric activity than other UV emission lines in IUE spectra.

H-alpha Photometry of Dwarf K and M Stars

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H-alpha photometry of 125 dwarf K and M stars has been obtained with the Perkin telescope at Van Vleck Observatory. Three interference filters were used, with full widths of 15, 3, and 0.8 nm, each centered at 656.3 nm. A new temperature-controlled photometer head and super-cooled thermoelectric cold box were employed to further improve signal-to-noise over previous measurements at VVO (Herbst and Layden, 1987, AJ 94, 150). The typical star was observed on 4 to 8 nights. A subset of emission stars was observed more often in order to search for (possibly periodic) variations. Definite variations in H-alpha equivalent width were detected in several stars, including GL 896AB and 99A, and their character will be discussed. The general form of the scatter in the (H-alpha index, R-I) plane is similar to that reported by Herbst and Layden and by Stauffer and Hartmann (1986, Ap.J. Suppl., 61, 531). A few strong absorption-line stars have been discovered, one of which appears to be highly variable in its H-alpha equivalent width. It appears possible with this system to identify cases of extreme chromospheric activity in absorption line stars as well as emission stars.

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Element Abundances for HD101065 by Spectrum Synthesis

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HD101065 (Przybylski's "holmium star") remains one of the most enigmatic objects in the sky despite more than 25 years of study since its peculiar chemistry was first pointed out. Motivated by the possibility that the cobalt-to-iron ratio in this star might be as large as unity, a synthesis of the ultraviolet