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51.05
Synoptic Observations of the He I λ5876 Line in Active Solar-Type Stars
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The results of a synoptic program of high resolution spectrophotometric observations of the He I triplet line at 5876A in selected solar-type stars are reported. These observations were obtained with the NSO McMath/Potsdam system with the echelle grating. Previous work by Danski and Lambert (1985; Astron. Astrophys., 148, 293) reported the detection of rotational modulation of this feature in three solar-type stars. These results are extended by this investigation with improved time resolution for a small sample of active chromosphere, solar-type stars. In addition, the possibility of using the He I D3 absorption line as a diagnostic of active region areas overages is discussed.

51.06
The Relation Between Chromospheric Emission and Age for Solar-Type Stars
D.R. Soderblom, D.R.H. Johnson, D.K. Duncan (STScI)
We have examined Ca I H and K emission in stars of known age: slightly evolved F stars, and solar-type secondaries in binaries with evolved primaries. This was done to better define the chromospheric emission vs. age relation at ages between that of the Hyades and the Sun, and to investigate the reality of the Vaughan-Preston "gap."
There is clearly a correlation between HK emission and age, but, due to uncertainty in the ages of these stars, the results are ambiguous in that they are consistent with either a Skumanich-like power law or a curve corresponding to a constant star formation rate. Despite the difficulty, stars in clusters must be observed to better define the chromospheric emission-age relation, but the effort will produce interesting results for either the evolution or stellar chromospheres or the recent star formation rate.

51.07
Long-Term Variability Characteristics of Lower Main-Sequence Hyades Stars
R. R. Redick (AFO/Sacramento Peak), G. W. Lockwood, D. T. Thompson, and B. A. Skiff (Lowell Observatory)
High-precision D, y differential photometric observations of twelve Hyades stars ranging in spectral type between F5V and K0V have been obtained at Lowell Observatory over the past five years. The observations have a night-to-night precision of about 0.003 mag, and the mean standard error of the seasonal averages is of order 0.001 mag. Thus, variability can be detected at a level of about 1% during a single season, and about 0.3% from one season to another. Three program stars earlier than spectral type F7V are not detectably variable, but the nine later-type stars all persistently show significant seasonal variability, with a peak-to-peak amplitude of up to 5%. Several of these stars also show interseasonal variations of as much as 3%. Rotational modulation has been detected for all nine of these stars during one or more seasons.

51.08
Exploration of the CO Fundamental Bands in Late Type Stars
G. Wiedemann (NASA/GSFC), T. Ayres (CASA), D. Jennings (NASA/GSFC), and S. Saar (JILA)
In the sun and the giant Arcturus have revealed thermal structure strongly deviating from those derived from ultraviolet measurements.
We have used a newly developed post-dispersion detection system in connection with the 4 m TTS on Kitt Peak to observe the ω1 CO bands at 2142 cm−1 at 0.03 cm−1 spectral resolution in 13 late type stars. The observations are in good agreement with model calculations for thermally bifurcated atmospheres (T. Ayres, Ap. J., 244, 1981), in particular with the thermally bifurcated, hemispherical CO-enhanced depression of the surface temperatures in stars earlier than spectral type F5 (D. Muchmore and F. Ulschneider, Astron. Astrophys. 142, 1985).
Isotopic lines of 13C, 17O, and 18O are observed and will be used in models for convection and mixing processes in a range of late type stars.

51.09
Formation of Emission Lines in the Outer Atmosphere of Arcturus (Alpha Herculis II)
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We solve the coupled radiative transfer and statistical equilibrium equations for H, C II, O, Mg I-II, Al I-II, Si I-III, and S to calculate emission line profiles for comparison with IU E observations. The calculations are based on the hydrostatic model chromosphere of Ayres and Linksy, extended outward with a constant temperature of 10,000 K to a column mass of 1-10 g/cm2. (Optical depth unity at the center of the H Lyman-a line occurs near 1-2 g/cm2.) The effects of partial frequency redistribution are included in the formation of H Lyman-a, Lyman-β, Mg I 2853, Mg II h,k, and C I 1657 (which is treated as a blend of 6 components). We include Lyman-a and Lyman-β fluorescence in calculating the excitation of S and O, respectively. Our ionization-equilibrium calculations include low-temperature dielectric recombination and the effects of ultraviolet line opacity on the photoionization rates. We display the following computed flux profiles: H Lyman-a (and Lyman-β); C I 1657, 1993; C II 1335; C III 2324; C IV 1908; O I 1302, 1641; Mg I 2853; Mg II h,k; Al I 1730; Al II 2696; Si II 1808, 1816; Si III 1892; Si II 1296, 1820, 1900. These computed profiles are compared with available IU E observations in order to determine from the various discrepancies how the assumed atmospheric model can be improved.

51.10
Short-Term Variability in Alpha Orionis
A. K. Dupree, S. L. Ballunas (Harvard-Smithsonian Center for Astrophysics), E. F. Guinan ( Villanova University), L. Hartmann (Harvard-Smithsonian Center for Astrophysics), and G. S. Sonneborn (Goddard Space Flight Center/CSC)
A periodicity of approximately 1.1 years has been discovered in spectroscopic and photometric observations of Alpha Ori (M2) during 1984-1988. The observational material includes photoelectric photometry in the blue (λ4500) obtained at Villanova Observatory, relative strengths of Ca II H and K emission cores measured nightly at the Mt. Wilson Observatory, and ultraviolet continuum (λ3000) and emission line profiles obtained with IUE approximately twice per month. A period analysis shows the 1.1 yr period to be significant in the optical and ultraviolet continua, and in the ratio of the Mg II (λ2796/λ2802) line emission cores. Other ultraviolet chromospheric emission lines do not appear to participate in this variability to within the accuracy of measurement of the IUE.
The ratio of the Mg II components (λ2796/λ2802) correlates well with the variation of the optical (b-band) and ultraviolet