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4.03 On the Reality of a Boundary in the H-R Diagram between Late-Type Stars With and Without High Temperature Outer Atmospheres. T. SIMON,*J. L. LINSKY* and R.K. KEAN.  JILA, U. of Colo. & NBS. — We test the hypothesis of Linsky and Huizt that a boundary exists in the H-R Diagram separating yellow giants (V-K < 0.80, which typically show evidence of 10^5 K plasma, from red giants and supergiants (V-K > 0.80), which typically show little or no evidence of any plasma hotter than 10^5 K. We discuss the JR 1150-2000 A low resolution spectra of 39 late-type stars of luminosity class V-IV. One test involves deeply exposed spectra of 14 stars chosen to constitute a "reverse bias" sample; that is, stars to the left (larger Teff) of the proposed boundary were chosen to likely have the smallest amounts of 10^5 K plasma, whereas stars to the right were selected to likely have the largest amounts of 10^5 K plasma. Despite this reverse bias, we observe C IV emission in four of the six stars to the left, and except for 56 Peg, which is a spectroscopic binary, we detect no C IV emission in the stars to the right. Using the entire sample, we find that only all the yellow-giant and supergiant stars show C IV emission, but there is a range of nearly two orders of magnitude in F_c / A_{bol}. Except for two spectroscopic binaries and one hybrid star, none of the 18 red giants show prominent C IV emission, and upper limits on F_c / A_{bol} are in many cases an order of magnitude smaller than the weakest detection among the 21 stars to the left. We therefore conclude that the Linsky-Huizt transition boundary is a real phenomenon in the sense that single stars to the right of the boundary, with the exception of hybrid stars, contain significantly less 10^5 K plasma than typical single stars to the left of the boundary.

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4.04 Analysis of the Balmer Lines in Z C Ma: Evidence for a Decelerating Stellar Wind. S.A. DRABER and R.K. ULRICH, U.C.L.A. — As part of a general survey of emission lines in pre-main sequence stars (Ulrich and Knapp, in preparation), 5 spectral scans of the Herbig Be-star Z Canis Majoris have been obtained covering the wavelength regions around H_a and H_b. Selected lines show pronounced P Cygni features, indicating outflow of material. On scans the Ha line profile showed a steep, almost vertical decline from the emission peak to the absorption trough. This can be most naturally interpreted as being due to a decelerating outflow of gas with a peak velocity near the photosphere of ~1000 km/sec. An all the sharp drop is due to the underlyi 'photopheric' absorption line has been examined using a Sobolev escape probability technique applied to a two-level atom. One added complication for any theoretical model is that one of the other Ba observations of this star there is a ledge in the profile between the emission peak and the absorption about the flux level of the continuum and about 500 km/sec wide in velocity space, rather than a steep drop. An absolute mass loss rate for Z C Ma can be derived using a multi-level atom method to attempt to fit the observed profiles, provided the basic stellar parameters are known. However, there is considerable uncertainty in the distance to this star: Herbig (1960, Ap. J. Suppl. 4, 337) has estimated 300 pc, while Herbst, Babcock, and Warner (1978, Ap. J., 223, 471) found it to be 1150 pc. The luminosity implied by the larger distance estimate would make Z C Ma one of the most luminous pre-main sequence stars known, with L = 10^4 L_\odot. A comparison is made between this star and the peculiar variable P Cygni, to which it shows some similarity. This work is supported in part by NSF grant AST 80-19745.

4.05 Observations of a Low Velocity Stellar Wind in the Be Star η Cen. R.S. Pohlman, Princeton U. Obs. — Copernicus far ultraviolet (1310-1420) observations of the Be star η Cen from 1975 through 1980 are discussed. Low resolution (2.2A) observations reveal a spectrum very similar to the normal 85158 star η Sco except for the lines of SIII and FeIII. These lines are significantly stronger in η Cen. High resolution (0.05A) observations of the SIII and FeIII lines show them to be asymmetrical. Analysis of these lines shows that they are not complex shell lines but rather are lines formed in a strong, low terminal velocity stellar wind. Reasonable fits to the observed line profiles except at line center can be obtained using the theoretical profiles of Castor and Lamers (Ap. J. Supp. 1979, 39, 481). This analysis yields a mass loss rate of > 10^{-9} M_\odot yr^{-1} and a terminal velocity of ~150 km s^{-1}. No emission component is seen. Variations observed in the wind strength and/or structure during the observing period are caused. No significant variation in the terminal velocity was observed. Models for the mass outflow in η Cen are discussed and the occurrence of similar winds in other Be stars is explored. This work is supported by NASA Contract NAS5-23576.

4.06 J.R. Echelle Mode Observations Contrasting Coronal and Non-Coronal Late Type Giant and Supergiant Stars. A. Blackman, Queen Mary College, London, U.K. Linsky, J. L., JILA, U. of Colo. & NBS, C. Jordan, O. Enqvist, Olo U. — We report on a series of high resolution, far ultraviolet observations of late type stars obtained during 1981 with the IUE satellite. Two stars, beta Dra (Q2 111) and beta cyt (Q1 11), both exhibit soft X-rays and high temperature far UV emission lines indicative of solar-like coronae and transition regions, while a third (Q1 11) exhibits very strong corona and transition region lines. These stars represent the most luminous and the coolest stars, respectively, for which there is evidence for both coronae and transition regions. In contrast, Alpha Ori (Q2 11b) which lacks any evidence for material hotter than about 20,000 K, shows bright emission lines of Fe II and II II in its 930 minute exposure. A faint 'continuum' also was detected, possibly due to numerous faint atomic or molecular emissions. Lines of Fe II UV121 and UV191 were also found, indicating the presence of moderate high energy electrons (11 eV) for such a cool atmosphere. Finally, an 1040 minute exposure of the Na II binary 56 Peg was obtained. The breadth of the emission lines is comparable to that found in beta Dra, raising the interesting question about the influence of the white dwarf on the red giant. These data will be discussed in terms of the emission measures, line profiles and energy balance which can be deduced theret.

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4.07 A Metallicity Calibration of Absorption-Line Strengths in K Giant Stars. S.M. Faber, E.D. Frebel, Lick Obs., BAA, UC Santa Cruz, D. Buscombe, MRCO. — We have compared absorption-line strengths in 110 K giant stars with published values of [Fe/H]. Spectral features were measured on moderate-dispersion I1S spectra, including two iron-peak blends and TiO in addition to the usual strong features CN, CH, MgH, MgH, and NaD. Trends with effective temperature have been allowed for and removed.

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