ABSTRACTS

07.03 Local Stability of Thick Accretion Disks, P.J. WIITA, U. Penn., M.A. ABRAMONIC, Oxford U., M. LIVIO, Technion, T. PIRAN, Hebrew U. A general approach for analyzing local (short-wavelength) perturbations to rotating, non-self-gravitating bodies is presented. We specialize to the case of thick accretion disks, which may be usefull models for quasars, by assuming negligible viscosity. A fifth order dispersion relation is found, and the dominant terms are considered in detail for the situation where the perturbations are parallel to the non-azimuthal flow, and are taken to be axisymmetric. We find several sets of stability criteria that depend on the local velocity and the wavelength of the perturbation, and show that oscillations similar to g- and p-modes exist in thick disks. The most important stability criteria are closely related to the Holland condition.

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08.01 Magnetic Fields on Late-Type Stars, GROFFREY W. MARCY, Mount Wilson and Las Campanas Observatories.

A search for magnetic fields on G and K dwarfs, subgiants, and giants has been carried out by looking for broadening in absorption-line profiles which are sensitive to the Zeeman effect. About half of the 30 observed dwarfs exhibited such excess broadening, but, at the time of this writing, none of the five evolved stars (including the active subgiants, 24 DMS and And) showed convincing evidence of Zeeman broadening. For the dwarfs, measures of the average magnetic-field strength and of the fraction of the photosphere covered by fields may be determined by deconvolving the broadened line profiles into Zeeman triplets. The resulting magnetic-field measurements correlate with Ca II H and K emission, soft X-ray flux, and stellar rotation rate. The observed dependencies are consistent with those predicted by Unscheider and Stein (Ast. and Astrophys., 1982, 106, 9) for slow-mode slow-wave heating of chromospheres, and Alfvén-wave heating of coronae. The observed magnetic fluxes are related to basic stellar parameters by: \( \Phi \propto T \gamma^{2.8} \nu \), \( \nu \) for dwarfs of spectral-type G5 to K5. This relationship, similar to that found for Ca II H and K emission, provides a test for dynamo models.

08.02 Coordinated Ultraviolet, Microwave, and Optical Observations of Flares on VZ CMi and AD Leo, J. L. Linsky, F. Bernmann, A. Brown, JILA, Univ. of Colo. and NBS, D. E. Gary, CIT, M. Rodono, V. Pazzani, Catania Astrophys. Obs., A. D. Andrews, C. J. Butler, P. B. Young, Armagh Obs. — We report on coordinated observations of flares on two Dm flare stars using the International Ultraviolet Explorer, the Very Large Array, and optical photometry. A low dispersion short wavelength spectrum (image SIM 1977) of VZ CMi obtained on 3 February 1983 0605-0615 UT shows bright emission lines and continuum indicative of a flare within this time interval. The peak optical enhancement was 4 magnitudes in the U band, and the VLA observed a 5 mJy flare at 6 cm in the time interval 0615-0618 UT. Subsequently, IUE detected the onset of a flare on AD Leo in the long wavelength spectral region at 0354 - 0358 UT on 5 February 1983. The VLA detected the same flare beginning at 0353-0357 UT with the peak flux of 7-8 mJy at 6 cm in the time interval 0358-0408 UT. We will present the data on these two flares and other probable flares on AD Leo. Of particular interest is the time of flare onset, peak flux, and duration as seen in these different spectral bands for which the observed flux originates in very different atmospheric regions and at very different temperatures. We will discuss the probable mechanisms by which the optical, ultraviolet, and microwave radiation is formed, and discuss the implications of the timing data.

Energy Sources in T Tauri Stars, N. Calvet, and J. Alibaral, CIDA, Venezuela. For values of effective temperature and gravity appropriate to T Tauri stars, we have calculated the flux of energy carried into the atmosphere by magnetohydrodynamic waves originating in the turbulent convection zone. We have estimated the energy loss from the outer atmosphere, above the photosphere, for a number of T Tauri stars. We have included in the estimation of the energy loss radiation in the ultraviolet, optical, and infrared emission lines, the ultraviolet continuum excess flux and the flux in X-rays, as well as the wind kinetic energy. Within the uncertainties of the theoretical calculations for the wave flux and of the estimates for the energy loss, the comparison of both tentative suggests that MHD waves from the convection zone can account for the energy output from the outer atmospheres of T Tauri stars, if the surfaces have a large coverage of magnetic fields. If instead MHD wave fluxes represent a major energy source in T Tauri stars, then the observed decrease of emission line fluxes with luminosity could be understood in terms of the decrease of wave flux with increasing gravity as the star evolves. In addition to the basic energy input from the convection zone, surface transient phenomena as flares are likely to be important for the most active T Tauri stars.

08.04 Numerical Simulations of Global Stellar Convection, G. A. Glatzmaier, LANL. We describe nonlinear, three-dimensional, time-dependent solutions of the anelastic magnetohydrodynamic equations for a stratified, rotating, spherical, fluid shell. Solar values have been taken for the mass, luminosity, rotation rate, and the profiles of density, temperature, and opacity for a shell representing 40% of the Solar radius and spanning seven pressure scale-heights. The upper half is superadiabatic while the lower half is subadiabatic. Differential rotation is induced by the interaction of convection and rotation. Our solutions have a surface equatorial acceleration like that observed on the Sun with a meridional circulation of about 5 m/s. In general, we find angular velocity increasing with radius. The surface temperature profile is also well within Solar observational limits with the equator-pole temperature difference five orders of magnitude.

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