intermediate-resolution ($\lambda/\Delta \lambda \approx 50$) spectroscopy with the Aerospace Corp. Infrared Spectrograph. The higher resolution data confirmed the analogy of the silicate features in $\beta$ Pic (Kracke et al. 1993, ApJ, in press) and $\gamma$ Oph (Russell et al. 1993, in prep.) to similar features in Solar System comet spectra.

Among the Vega-type stars we recently observed, $\beta$ UMa, $\zeta$ Lep, $\alpha$ Hex, and $\gamma$ Oph exhibit significant dust emission at 10 $\mu$m ($\geq 0.15$ Jy). We expect to resolve whether silicate emission is present with the higher spectral resolution available with the Aerospace Spectrograph.

We have compared the spectrum of $\beta$ Pic with those in the data compilation of the IRAS Low Resolution Spectrograph. Of the 3,423 sources, 8 exhibit 10 $\mu$m silicate emission features that match $\beta$ Pic's reasonably well. Many of these sources do not have known associations; these that do are typically low-mass giant branch Miras or massive supergiants. We are investigating at least 5 possible associations with early-type main-sequence stars.

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32.02

Photoevaporating Stellar Envelopes Observed with Rayleigh Beacon Adaptive Optics


We present Hα and Hβ images of a ~1' diameter field centered on $\theta^2$ Orionis made with a unique adaptive optics system that uses either starlight or Rayleigh-backscattered laser light to correct for atmospheric wavefront distortion. Approximately one half of the stars in this region are positionally associated with knots of ionized gas, which are interpreted as photoevaporating envelopes of low mass stars. The acronyms PIGs, EIDERs, or ProPlyDs all refer to these same knots. The Hα fluxes of the PIGs are proportional to their 2-cm radio continuum flux densities, and for nearly all the ionized knots, the 2-cm brightness temperatures are consistent with $\theta^2$ Ori as the primary source of ionization. The thermal pressure in the ionized knots is much greater than the ram pressure of the wind from an $\theta^2$-type star, so the comet-like morphology of the nebulouslobes cannot be caused by a hydrodynamical interaction such as a bow-shock. Instead, it is the result of an equilibrium between photoionization, recombination, and shadowing.

The positions of the stars associated with the PIGs in the observational HR diagram indicate they are pre-main-sequence stars with masses less than $\approx 3M_\odot$, with $\approx 1M_\odot$ being typical. Also, the ratio of the ionized component of the PIGs grow with distance from $\theta^2$ Ori, which we interpret as evidence that the mass loss rates from the PIGs are all the same, within a factor of two.

32.03

High Resolution Study of the Circumstellar Physical and Chemical Environments of Nearby Young Stellar Objects

J.P. McMullin and L.G. Mundy (University of Maryland)

We present results of a study aimed at identifying the physical and chemical processes which shape the appearance, chemistry and evolution of gas associated with and participating in the formation of young stellar objects. Six nearby young stellar objects (Orion-IRAS 05388-6024 (Orion, d~500 pc), 60BIRSAS60N (Serpens, d~310 pc), and NGC 1333 IRAS 4A and IRAS 4B (Perseus, d~350 pc)), spanning a range in luminosity from 20 to several thousand solar luminosities, have been examined in species selected to highlight the structure and chemical activity on scales of a few hundred to a few thousand AU. Using BIMA observations in combination with large beam observations, we construct a detailed portrait of the structure, excitation, and abundance patterns in each of the target sources, and explore patterns in the development of low-intermediate mass star forming regions.

32.04

The Radio Continuum from Classical T Tauri Stars

S.M. White, L.G. Mundy and A.W. Grossman (Department of Astronomy, University of Maryland)

We have carried out a survey of radio continuum emission from the classical T Tauri stars in the Taurus and Ophiuchus star-forming clouds not previously observed with the Very Large Array. The detection rate is surprisingly low. We combine our results with those of other surveys in order to analyze the correlation of radio continuum luminosity with other properties of T Tauri stars, and discuss the nature of the radio continuum and its relationship to the winds of these stars.

32.05

Numerical Simulations of Accretion Disks

R. Deinseel (University of Florida)

Two dimensional self-gravitating gaseous accretion disks are modeled using smoothed particle hydrodynamics, which allows a general solution to the hydrodynamical equations, in the sense that the disks are not forced to remain within a grid. An inner boundary condition allows for particles to naturally accret onto a central object. Such disks are representative of an early stage in the evolution of a solar system. The unstable non-axisymmetric modes are found using Fourier techniques, and the nonlinear evolution of the modes followed. These modes redistribute the angular momentum, causing the disk to evolve. However, a second mechanism for redistributing the angular momentum is present in the shear viscosity, and its relative importance is discussed.

32.06

A Non-LTE Model for the Origin of the CO First Overton Band Emission in Young Stellar Objects

P. N. Safier (UC Berkeley), S. Martin, A. Konigl (U. Chicago)

We propose that the CO first overtone emission detected in YSOs originates in a centrifugally driven disk-wind where the level population of CO is dominated by non-LTE effects. Using a revised set of collisional cross sections, we show that there is no need to invoke an LTE level population to account for the observed fluxes and line ratios. We use the disk-wind models presented by Safier (1993; ApJ, 408, 115), and compute for the four lowest $\Delta v = 2$ transitions the emergent intensities and line profiles. In contrast to previous work by other authors, the thermal structure of the emitting region is not freely specified to match the data, but is computed self-consistently once the wind's mass outflow rate, the stellar parameters ($M_*, R_*$, and $T_*$), and the wind dynamical parameters (ratio of magnetic flux to mass flux and the initial angle between the magnetic field and the disk surface) are specified. These winds are endowed with a robust...