ABSTRACTS

Interstellar absorption lines in the spectra of stars behind bona fide molecular clouds. With an appropriate choice of gratings, it is possible to observe simultaneously the $\lambda 8760$ band of C$_2$ and the $\lambda 9140$ band of CN ($A''\Pi, v = 1 - \Sigma'\Pi, \nu = 0$). Data with spectral resolution of 50,000 may be obtained near $\lambda = 0.9$ $\mu$m for stars with as much as 15 magnitudes of visual extinction. Observations of absorption lines of C$_2$ and CN from molecular clouds will allow accurate measurements of molecular column densities and rotational excitation temperatures, from which kinetic temperatures, gas densities, and radiation fields in molecular clouds may be estimated.

As an initial result of this program, we discuss the detection of four rotational lines of the red band of CN toward HD 29647, a 8 star which is behind the envelope of Taurus Molecular Cloud 1; the star has 4 magnitudes of visual extinction. These spectra will be shown and compared with spectra of the violet (X875) band of CN.

This research was partially supported by NSF grant AST 81-14887.

25.09
Radio Continuum from the Surroundings of V645 Cyg and M80108A
L.F. Rodríguez, E. Curiel, J. Cantó (UNA, México), J.M. Torrelles (Cfa)

Using the VLA in the D configuration at 6 cm we have detected a depression in the radio continuum near the center of V645 Cyg and M80108A. The depression is interpreted as free-free radiation arising from shock-ionized gas. The powerful winds that these stars are known to possess shock the surrounding molecular cloud and produce these ionized regions of modest emissivity. If our interpretation is correct, it is possible to obtain high-resolution data with high-sensitivity CO observations to obtain estimates of the stellar mass loss rate and wind terminal velocity.

25.10
A Transition from Chromosphere to Wind for MgII in T Tauri Stars
G. Basri, N. Calvet (UC, Berkeley), C.L. Imhoff (CSc), M.S. Giampapa (NOAO)

We have analyzed a set of simultaneous CaII and MgII observations of T Tauri stars obtained with the IUE satellite and at Lick Observatory. They show a range of variable surface CaII fluxes but the MgII fluxes appear to saturate at an upper limit of surface emission in the stars with greater than two solar masses. In the lower mass stars, the ratio of CaII to MgII is quite similar to that found in active main sequence dwarfs, although there is a jump in the levels of emission. We suggest that both diagnostics are formed mainly in the chromosphere for the lower mass stars, and that MgII becomes optically thick in the wind for the higher mass stars. Some implications for the interpretation of line profiles and model atmospheres are discussed.

25.11
Kinetic Efficiencies of Stellar Wind Bubbles
D. Van Buren (JILA)

The theoretical fraction of a stellar wind's energy converted into the kinetic energy of an expanding swept up shell is 20% in the classical theory of stellar wind bubbles. Observational estimates of this conversion factor based on the amount of ionized material in and the kinematics of wind swept shells about Wolf-Rayet stars generally yield results of 41%. If there is a substantial amount of neutral material in the shell, it will not be counted and the kinetic efficiency will be underestimated.

Presented here is a dynamical estimate which accounts for this neutral material in deducing the kinetic efficiencies of stellar wind bubbles. Bubbles classified as wind blown shells have kinetic efficiencies in line with theoretical expectations for energy conserving evolution in a homogenous medium. Ring-like nebulae have significantly lower efficiencies, probably because they have been "poisoned" by the photo-evaporation of clouds engulfed during evolution into a cloudy substrate.

25.12
Lunar Occultation Observations of M88-IR
M. Simon, D. Peterson (Bary-Stony Brook), A. Longmore (UKIRT), J. Storey (U. of New South Wales), A. Tokunaga (JETI/University of Hawaii)

3.8 $\mu$m and 10 $\mu$m wavelength lunar occultation observations of the young stellar object M88-IR were obtained at the AAAT, IRTP, and UKIRT telescopes. Analysis shows that the IR continuum arises from two components. One has an elongated and markedly asymmetric intensity distribution, of size at half intensity is about 6 milli-arc seconds, corresponding to about 9 astronomical units at 1.5 kpc assumed distance. Surrounding this small component is a larger component, approximately 50 milli-arc seconds in radius. At 3.8 $\mu$m wavelength, the small component radiates about 95% of the flux and the large component 5%. At 10 $\mu$m, the large and small components contribute about equally to the observed flux. The large component probably represents thermal emission from dust grains heated by the young star and distributed over solar system length scales. The large component probably represents the inner region of the molecular cloud heated by the central star.

25.13
Observations of Radio Recombination Lines with Principal Quantum Number 456656 toward Cas-A
W.C. Erickson (U of MD) K.R. Anantharaman (Raman Research Institute)

We report observations carried out near 25, 38, 52, and 68 MHz, using the NRAO 91-m telescope at Green Bank to investigate low frequency recombination lines in the direction of Cas-A. We detected lines in absorption at all of these frequencies. The possibility that such recombination lines can be seen in absorption at very low frequencies was first discussed by Shaver. The absorption line at 26 MHz, observed by Konvalinka and Sodin towards Cas-A, was interpreted by Blake, Crucher and Watson as the 631a recombination line due to carbon or heavier elements. This was confirmed subsequently by Konvalinka and Sodin with their detection of the 640a line at the same optical depth as the 631a line within the errors. As all high frequency observations show recombination lines of hydrogen or heavier elements only in emission, the same theoretical considerations lead naturally to the prediction that at some intermediate frequency the optical depth should go through zero and change sign. In the present observations, undertaken to investigate this phenomenon, we detected lines at velocities of approximately $-47$ and $-39$ km/s corresponding to the HII, OH, NH, and H2O absorption features that originate in the Perseus arm. The $-47$ km/s feature is in absorption at all the four frequencies but the $-39$ km/s feature may have turned over to emission between 52 and 68 MHz.