ANOMALOUS OH EMISSION IN GALACTIC STAR FORMING REGIONS: A CLUE TO THE MEGAMASER PHENOMENON?

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We report the detection of spatially extended, anomalous OH emission in galactic star forming regions. This OH emission is similar, although much weaker, than that produced by extragalactic megamasers. This new type of galactic emission may provide clues to elucidate the nature of the extragalactic OH megamaser phenomenon observed in luminous infrared galaxies.

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THE DISTANCE TO THE SERPENS CLOUD AGAIN

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We present new near infrared data of reflection nebulosity stars (R-stars) associated with the Serpens dark cloud, and of probable member stars to the region with Hα presumably in emission. In an attempt to detect the star that is responsible for the small diffuse red nebulosity seen on the red POSS print in the vicinity of star 17 of Chavarría–K. *et al.* .(1988, *Astr. and Ap.*, **197**, 151), positions and photometry of 10 infrared sources are also given. If the red nebulosity is an H II region, its exciting star was not detected by us.

The new IR photometry of R-stars, and a reinspection of spectrograms of stars VV Ser, HD 170739, HD 170784, BD+1°3696 and BD–0°3513 allow us to redetermine the distance to the Serpens Cloud, found equal to d = 296 ± 34 pc (7 stars), and the extinction law to the region, in particular the total to selective extinction ratio R = 3.4 ± 0.2. The distance estimate is in better agreement to that by Chavarría–K. *et al.* (1988) of d = 250, than the estimate by Zhang *et al.* (1988, *Astr. and Ap.*, **199**, 170) of d = 750 pc. Note that star 15 (BD–0°3513) of Chavarría–K. is the reflection nebulosity detected with IRAS Zhang *et al.* (1988) at the south-east of their Figure 1.

Finally, from the infrared color-color $(H - K, K - L)$ diagram we conclude that only three stars have warm circumstellar envelopes, namely IRS 1 and 2, and star 17. Note that this last star fulfills all requirements of Herbig emission line stars. A more detailed note reporting our results will be published elsewhere.

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WINDS OF T TAURI STARS

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We present calculations of spherically symmetric models for the winds of T Tauri stars with the aim of determining the temperature structure, the mass loss rate, and the velocity fields (expansion plus turbulent) most appropriate for describing the extended expanding region of these stars. We calculate fluxes for the hydrogen lines and continua, for the resonance lines of Ca II and Mg II, and for the D line of Na I. The photosphere of the star is taken to be described by T_{eff} = 4000 K, M = 1 $M_{\odot}$, and R = 3 $R_{\odot}$. Expansion and turbulent velocity fields are similar to those in Hartmann, Edwards and Avrett (1982). Turbulent velocities are assumed to be isotropic. The temperature profile of the expanding region and the mass loss rate are taken as free parameters. We find: (1) The Hα emission flux in TTS originates in a region of T $\geq$ 8000 K which extends at least to 2.5 to 3 R_*. Envelopes with temperature lower than this limit will have Hα in absorption. (2) Comparison of observed Balmer decrements with model results suggest that stars with large Balmer decrements and stars in which only Hα is in emission, have envelopes with T $\approx$ 8000 K and $\dot{M} \leq 3 \times 10^{-9}$ $M_{\odot}$ yr^{-1}. The precise value of the Balmer decrement depends on the details of the temperature structure in the upper chromosphere (where most of Hβ forms) and in the envelope (where Hα forms). (3) Spherically symmetric models produce excessive flux in Mg II k as compared to observations. The hypothesis of sphericity of the wind may be responsible for the discrepancy. (4) The resonance lines of Ca II are formed primarily in the chromosphere. (5) The Balmer jump is generally in emission except for models with the lowest temperatures and mass loss rates. (6) Mass loss rates approaching 10^{-7} $M_\odot$ yr^{-1} are required to produce blueshifted Na I absorption, in agreement with Natta *et al.* (1989). (7) Na I in emisssion can be produced in hot chromospheres (T $\approx$ 7000 K) or in hot (T $\approx$ 10000 K), high mass loss rates $\dot{M} \approx 10^{-7}$ $M_\odot$ yr^{-1} envelopes.

[O I] IN THE ENVELOPES OF T TAURI STARS

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We determine the range of physical parameters of the envelope of T Tauri stars that would produce fluxes similar to the observed fluxes of the [O I] forbidden lines. We assume that the envelope is spherically symmetric, isothermal, with constant velocity, and that it connects smoothly to an inner region similar to the MHD wind models of Hartmann, Calvet, Avrett, and Loeser, (1989, *Ap. J.*, submitted). The photosphere of the star is described by T_{eff} = 4 500 K, M = 1 $M_\odot$, and R = 3 $R_\odot$. Mass loss rates and gas temperatures are free parameters. Hydrogen ionization is supposed to occur from n = 2, as in Hartmann, and Avrett, (1984, *Ap. J.*, **284**, 238), and Natta, Giovanardi, and Palla (1988, *Ap. J.*, **332**, 921. The Lyman α line is taken to be optically thick. The radiation field for the n = 2 level is characterized by the temperature of the radius where the Balmer continuum becomes optically thick. Radiative ionization and charge exchange reactions with hydrogen are included in calculating the ionization of oxygen. We find that, for the range of temperatures considered, forbidden line fluxes are good indicators of the mass loss rate. We also find that the ratio F(5557)/(F(6300) + F(6363)) is a good indicator of the temperature of the envelope. Comparison of observed fluxes with theoretical predictions indicates that stars with [O I] significantly in emission have mass loss rates of the order of 10^{-7} $M_\odot$ yr^{-1} and envelope temperatures between 6 000 and 10 000 K.

A KINEMATIC AND COMPOSITIONAL ANALYSIS OF THE WIND–BLOWN SHELL NGC 6888

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We present a quantitative model describing the morphology and physical processes taking place in NGC 6888, a 'wind blown 'type (Chu 1981, *Ap. J.*, **249**, 195), large (18.0' × 11.9' = 7.6 × 5.0 pc), high surface brightness and close (1.4 kpc) shell nebula around the WN6 star HD 192163 (M_V = −4.4).

CCD imagery of NGC 6888 using the Palomar 1.5–m telescope and focal reduction system (equivalent f/1.66, 1.19"/pixel, 16' square field) in the most prominent emission lines Hα, Hβ, [N II], [O III] and [S II] were obtained on August 1986, July 1987 and July 1988. This high resolution imagery (after reduction and calibration), revealed the presence of at least three distinctly different physical phenomena occurring in this object: 1) strong [O III] filaments bounding the perimeter of the nebula indicative of shocks expanding into the surrounding ISM; 2) N, H and possibly He enriched (likely stellar ejected) material in the NE, W and SW lobes; and 3) relatively normal composition material in the NW and SE directions from the WN star within the [O III] filament bounded areas.

The spatial variations in temperatures, densities, composition and ionization in NGC 6888 thus revealed by the imagery were further probed using deep spectrophotometry of the brightest knots and filaments in July and September 1988, using the KPNO No. 2 0.9-m telescope + the IRS (intensified reticon scanner).

These results collectively indicate a scenario that is a combination of several physical processes. The nebula is thought to be composed of swept up interstellar material that forms a thin skin around a thick, hot shell of stellar wind gas. The observed shell is bounded on the outside by an ionization shock. The nebula is apparently N and He enriched (suggesting a stellar origin). The spectrophotometry indicates [O III] temperatures of ~ 40000°K along the shocked filaments, and [N II] temperatures of about 9000 °K in the N and H rich knots.