linear polarization from the 70 OH/H_2O associations mapped at the VLA in order to compare their polarization directions with the maser and H II morphology. This data is currently being analyzed.

HUGHES: A much higher resolution map of Cep A, at 0.3", shows that the H_2O masers are situated all at the edge of the H II region, while the OH masers are well outside. We attribute this to a stage in the development of the H II region as summarized in the Abstract of the paper by Hughes. The presence and position of H_2O and OH masers is then a property of the age of the H II region and of the spectral type of the exciting star.

COHEN: I agree that the age of the region is very important in this respect.

REID: You claim that OH masers are observed at the limbs of shock-expanding shells. This is not in agreement, *statistically*, with the results of Garay, Reid, and Moran (1985) which show that masers preferentially lie toward the center of the H II emission.

COHEN: It is important to have accurate radio positions and high angular resolution. In one case that we have looked at, OH 45.1, the OH masers clearly lie around the edge of an H II shell seen in a high resolution VLA map by Turner and Matthews (1984), whereas they appear on the *face* of the H II region in the lower resolution map by Garay *et al.* I think the question needs to be looked at more carefully.

MODELS OF SHOCK ACTIVITY IN THE BN-KL REGION OF ORION

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The observed H_2, CO, OI(63 μm), SiII(34.8 μm) and H51α emission line intensities in the BN-KL region of Orion are modeled as arising from two types of shock waves. The molecular emission arises from non-dissociative shocks with low peak postshock temperatures (< 3000 K), traveling at speeds of $v_s \sim 40$ km/s into ambient gas of density $n_0 \sim 10^{5-6}$ cm^{-3} and transverse magnetic field $B_0 \sim 0.5$ milligauss. The OI(63 μm), SiII(34.8 μm) and H51α emission arises in the cooling regions behind faster (~ 80 km/s) dissociative shocks with high peak postshock temperatures ($\sim 10^5$ K) and with preshock densities $n_0 > 3\times10^4$ cm^{-3}.

A simple global model is proposed to explain the source of these two characteristics shock waves. A wind from IRc2, characterized by a speed $v_w \sim 120$ km/s and $\dot{M} \sim 5\times10^{-3}$ $M_\odot$/yr, drives clouds at velocity $v_s \sim$ 40 km/s into ambient molecular gas in KL. The wind striking the cloud

(or shell) creates the dissociative "wind shock" which emits the atomic lines. The cloud sweeping up the ambient molecular gas creates the "molecular shock".

The mass loss rate of IRc2 is determined independently from considerations of the momentum in the shocked material as well as from comparisons of the observed OI(63 μm), SiII(34.8 μm), and H51α intensities to shock models.

High speed H_2O masers may be activated in the postshock gas created when dense "bullets" ejected from the region of protostellar activity transit the compressed gas between wind shock and molecular shock.

TORRES-PEIMBERT: The proposed mass loss of 7×10^{-3} $M_\odot$/yr requires a short lifetime for maser activity. Is this short time consistent with observations?

HOLLENBACH: The high speed H_2O masers in BN-KL are expanding at 100 km s^{-1} from a point about 0.1 pc distant, implying a timescale of 10^3 yrs. The shock model, which has a shell expanding at 40 km s^{-1} at the same distance, implies a similar timescale. Thus, 3-7 $M_\odot$ have been lost in the evolution of the protostar, which is not unreasonable. I agree that other maser regions, and the statistics of galactic H_2O maser activity, imply longer lifetimes for maser activity *in general*.

RODRIGUEZ: How do you distinguish the H51α emission of the shock from that coming from the Orion optical nebula?

HOLLENBACH: I refer you to Hasegawa and Akabane(Astrophys. J. 1984), but two main points are that: (i) the morphology of the contours strongly suggest a shock contribution to the H II region emission, and (ii) this contribution has a lower effective recombination temperature (∿3500 K) than the H II region component, an effect predicted for shock recombination zones.

TE. HASEGAWA: The H51α emission associated with the shocked gas superposed on the stronger foreground emission from the H II region is identified based on the following observed characteristics: (1) The positional coincidence with the H_2 emission from the shocked gas, (2) the velocity coverage larger than that of the H II region in the neighborhood, (3) the kinematical structure (except the velocity extent) consistent with that of the H_2 emission, and (4) the electron temperature deduced to be significantly lower than that in the H II region (∿ 3×10^3 K vs. 8×10^3 K; Hasegawa and Akabane 1984: Astrophys. J. Letters. 287, L91).