

SPECTRA OF THE 2.12 μ m QUADRUPOLE LINE OF H₂ IN THE ORION MOLECULAR CLOUD

D. Nadeau, G. Neugebauer and T. R. Geballe
Hale Observatories Hale Observatories
California Institute of Technology Carnegie Institution of
Washington

New spectra of the 2.12 μ m line of H₂ in Orion have been obtained during 1979 February at the Mount Wilson 2.5m and Palomar 5m telescopes. These data provide wider spatial coverage and higher spatial resolution than the observations reported earlier by Nadeau and Geballe (1979). The complete data, displayed here in two maps, are consistent with the earlier interpretation, which is summarized below.

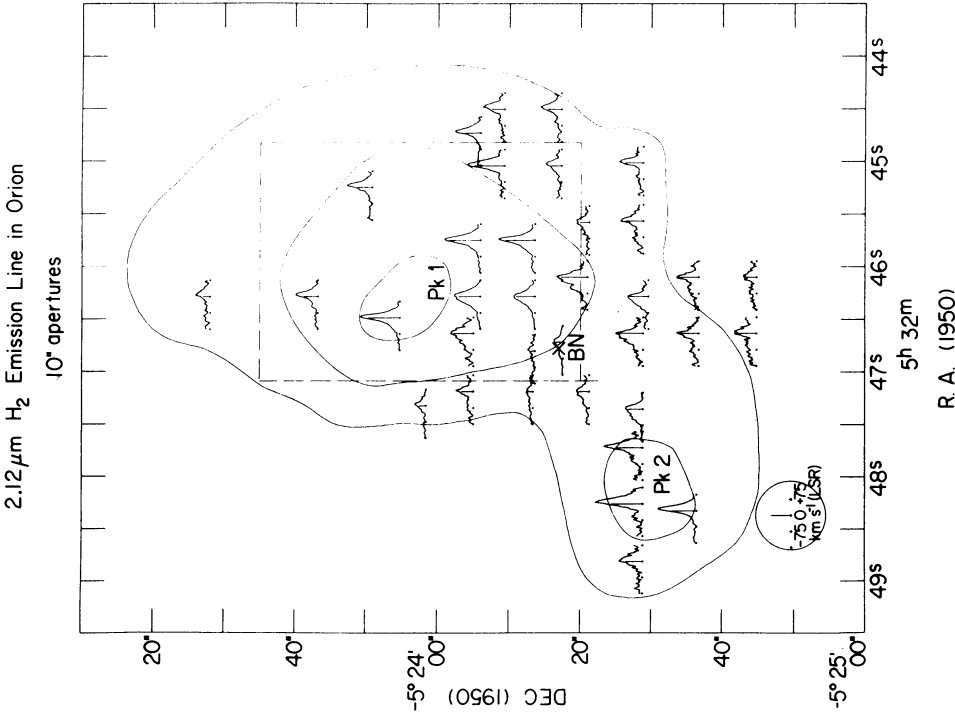
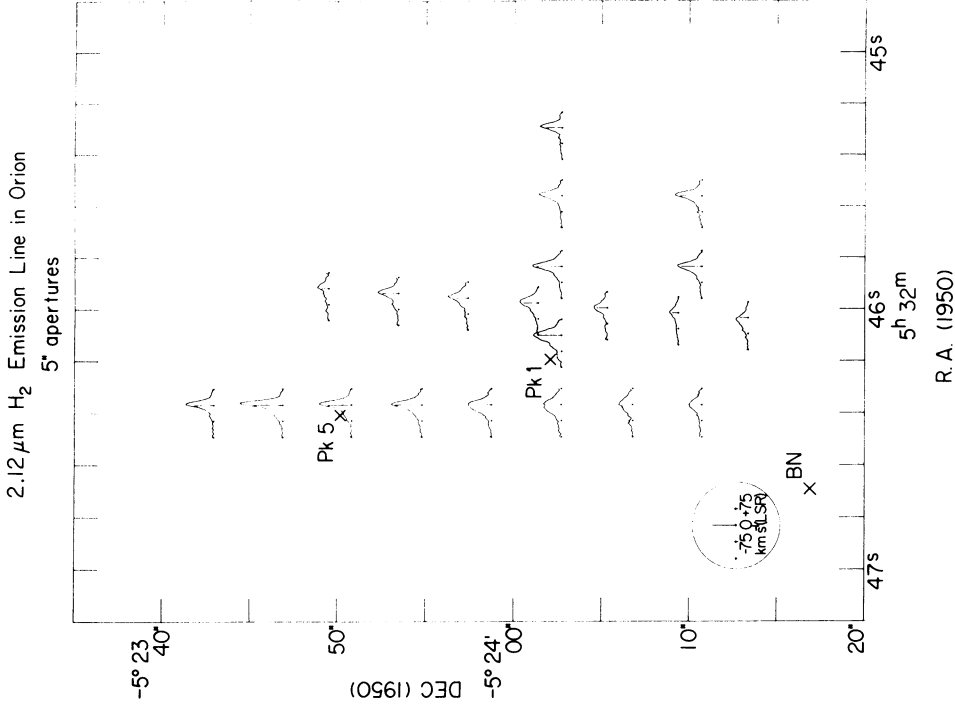
In the south-central part of the emission region the H₂ line is broad and has an extended blue wing. The new data make it clear that in all directions away from there the blue wing contracts and weakens relative to the peak, so that the line becomes narrower and more symmetric. Throughout the entire region the velocity of peak line intensity is $+9 \pm 3$ km s⁻¹ (LSR), very close to that of the extended and cooler molecular cloud.

The most plausible model of the emitting region is that H₂ has been accelerated and excited by one or more shock waves expanding about a central source. The source, which should have a velocity near $+9$ km s⁻¹ and be located in the direction from which the broad lines are seen, apparently is not identified with any known object. It is unlikely that the H₂ emission is the result of a single shock propagating at velocities less than 24 km s⁻¹, as was predicted by several authors.

From similarities in location, spatial extent, and range of velocities the infrared H₂ lines probably are a manifestation of the "plateau source" of broad radio lines in Orion. The asymmetric H₂ lines, however, contrast with the more symmetric radio lines. The difference may be explained either by an asymmetric expansion of the hottest gas in the "plateau source" or by obscuration of the rear of the expanding cloud by dust mixed with the gas.

REFERENCE

Nadeau, D., and Geballe, T. R.: 1979, *Astrophys. J.* 230, pp L169-L173.



Circles represent aperture sizes. For each spectrum coordinates correspond to position of zero velocity and zero intensity. Dashed rectangle in 10" map is area shown in 5" map.