OBSERVATIONS OF VARIABILITY OF H_2O MASER SOURCES ASSOCIATED WITH STAR FORMATION REGIONS

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An outstanding feature of the water maser emission from star formation regions is the strong time variability, which was recognised soon after the discovery of interstellar H_2O masers. It is likely that the observed considerable variations of the H_2O line profiles as well as of the flux density reflect the disturbancies in the protostellar nebule probably associated with the outflow from the newly formed stars.

The conventional viewpoint is that H_2O masers represent unstayable systems of infiniteley moving clouds assosiated with very young stars that are losing their mass. Our observations of H_2O sources during several years confirm the point: the majority of the observed H_2O masers associated with star formation regions by all their features (broad unstayable spectra, variable intensity, frequently changing flashy character) can be identified as objects of that type. Yet the recent years made it more obvious that some H_2O sources evidently do not match the conventional model of the maser sources.

The observations of H_2O maser sources were carried out from November 1979 till 1990 using the 22-meter fully steerable, parabolic reflector (RT-22) at the Pushchino Radio-Astronomical Station of the Lebedev Physical Institute. The receiver was equiped with a maser amplifier at its input and a 96-channel filter bank spectrum analyser. The

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resolution in radial velocity was 101 m/sec. We carried out for a decade monitoring observations of 20 different types of sources associated with star formation regions, with a mean sample interval of 1-2 months. The examples of "classical" and "peculiar" H_2O masers are presented.

During the period from 1980 to 1990 several bursts of maser emission quite different in character were detected for W75N.

In the H_2O spectra of Cep.A one could distinguish at different epochs 5 groups of emission features at different radial velocities. Neither clear correlation betweeen the feature intensities in different groups, nor any periodicity in their appearence were detected. Very narrow emission picks are sometimes observed in the spectrum. The analysis shows that these picks could be produced by dense condensations immersed in a less dense turbulent medium.

In the H_2O spectrum of S269 two single (nonblended) slowly and monotonously changing in intensity emission features have been constantly observed during the last 10 years. The radial velocity of them keeped constant during the whole period of observations.

The extreme variability of the H_2O emission intensity has been considered to be one of the fundamental features of H_2O sources. So particularly interesting were the cases of surprising constancy of some emission features of the H_2O spectrum (S269, W44C). In these cases we obviously deal with stayable circumstellar structures.

The spectra of some masers have a triple line profile. We regularly observe several sources of such type, e.g. S140, S255. As it was first shown by Elmegreen and Morris (1979) some H_2O sources could rather be associated with stable circumstellar formations (disks). Our observations indicate that spectra from several sources are with a high probability associated with such structures. The stayable triplet structure is particularly typical for such formations.

Some groups of radioastronomers, basing on observations of H_2O masers in star formation regions, concluded that there is a common dependence of the width of the bright lines on their intensity: $\Delta\nu \sim F^{-0.5}$ We would like to confirm the universal character of this depen-

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dence: besides the masers in regions of star formation we have found the similar dependence for circumstellar masers of old stars. For instance for the semiregular variable RT Vir it was: $\Delta\nu^{-2} \sim \ln F$ (Berulis et al. 1987). We feel that the mentioned universal dependence still waits for its explanation, though several attempts to explain it already existe. However, in some cases the dependence is more complicated.

Thus, our observations show a multitude of H_2O maser types. It is clear now that H_2O masers in regions of star formation are connected not only with the infinitely moving clumps of strong stellar wind, but also with stable circumstellar structures, most probably - with disc-like structures.

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