

## FURTHER OBSERVATIONS OF THE H<sub>2</sub>O EMISSION FROM NGC 4945

J.R.D. Lépine and P. Marques dos Santos  
Centro de Radioastronomia do Observatório Nacional  
Rua Pará 277 - 01243 - São Paulo, Brasil

We wish to report briefly here the results of new observations of the H<sub>2</sub>O maser emission from the galaxy NGC 4945 made in 1979 July with the Itapetinga radio telescope. The H<sub>2</sub>O emission that we detected in 1978 September, shown in fig. 1, represented an intrinsic intensity about ten times that of W 49, the strongest source in our Galaxy, and raised the question of its nature (Marques dos Santos and Lépine, 1979). The main purpose of the new observations was to obtain a more accurate position for the source and to look for variability.

NGC 4945 is a barred spiral galaxy seen almost edge-on, with the major axis at about 45° position angle and dimensions about 17' x 3'. We obtained in 1979 July a series of spectra, displacing the 4' beam by steps of 2' along the major axis. The spectra are presented in fig. 2. The spectrum corresponding to zero displacement in fig. 2 should be compared with the spectrum of the first detection in 1978 September (fig. 1), since both were obtained in the direction of the nucleus. In the new spectrum we have not removed the continuum, which is attributed to the radio source located at the nucleus (Mathewson and Rome, 1963). Although the noise level is greater in the present observations, the narrow peak at 674 km s<sup>-1</sup> has obviously disappeared, while the features at 700 km s<sup>-1</sup> and 714 km s<sup>-1</sup> seem to be still present at about the same intensity. This result cannot be considered as evidence that the narrow feature originated from a different source, since similar strong variability of one peak relative to others has also been observed in galactic sources, e.g. W 49 (Gammon, 1976).

The spectrum obtained at 2' S-W of the nucleus (-2') also shows some indication of emission features, while nothing can be seen at 4' S-W and 2' N-E of the nucleus. The positive average flux that we obtained at -2' is likely to be due to emission features, and not to be instrumental, since with our beam-switching technique only marginal zero-level offsets are expected. There is, then, a suggestion from the data that the source may be displaced from the nucleus (0') towards the south-west (-2'). If so, it may be coincident with a bright patch, probably a spiral arm, that is easily seen on the plates in this

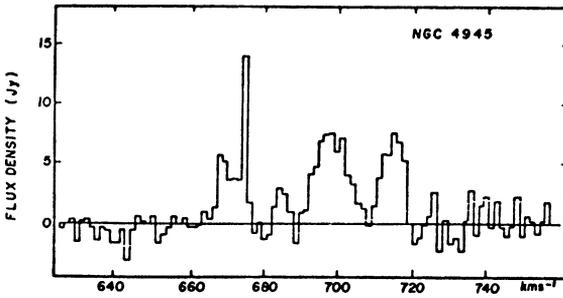


Fig. 1 -  $6_{16}-5_{23}$   $H_2O$  spectrum of NGC 4945 obtained in 1978 September, already published in ref. 1. Velocity is with respect to L.S.R.

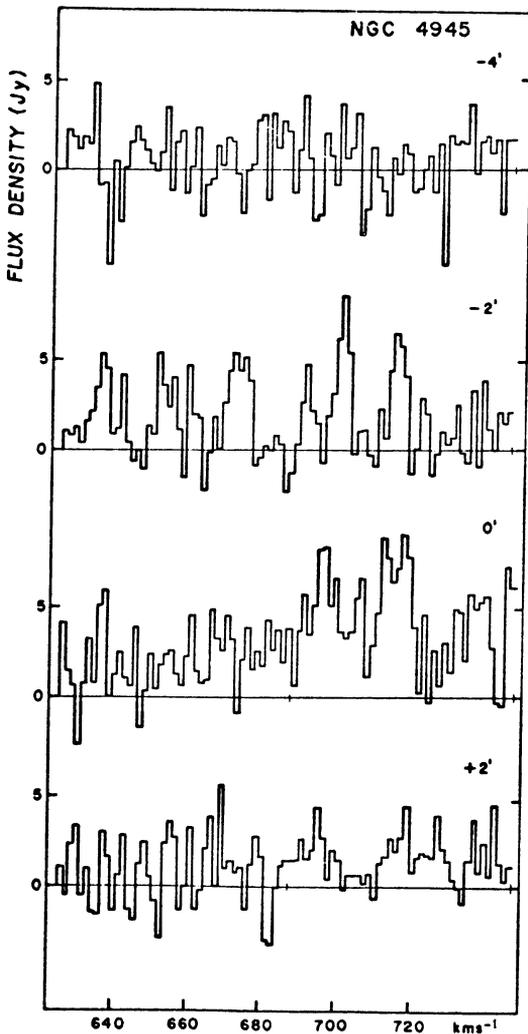


Fig. 2 -  $6_{16}-5_{23}$   $H_2O$  spectra of NGC 4945 obtained in 1979 July. Displacements with respect to the nucleus, along the major axis, are indicated; negative values correspond to the south-west. Velocities are with respect to L.S.R.

region, and is also prominent on the isophote maps by Sérsic (1968). It seems possible that the very strong H<sub>2</sub>O emission features that we have detected in NGC 4945 are associated with giant HII regions which are typical of Sc galaxies. It should be noted, however, that it is somewhat surprising to find a maximum of emission around 700 km s<sup>-1</sup> to the south-west of the nucleus. Such velocities do not fit the rotational motion that can be inferred from HI observations (Whiteoak and Gardner, 1977).

Further observations are planned, and a more detailed account of our investigations, including negative results for other galaxies, will be published later in *Astronomy and Astrophysics*.

#### REFERENCES

- Marques dos Santos, P., and Lépine, J.R.D.: 1979, *Nature* 278, 34.  
 Mathewson, D.S., and Rome, J.M.: 1963, *Observatory* 83, 21.  
 Gammon, R.H.: 1976, *Astron. and Astrophys.* 50, 71.  
 Sérsic, L.: 1968, *Catálogo de Galaxias Australes*, Univ. de Cordoba.  
 Whiteoak, J.B., and Gardner, F.F.: 1977, *Aust. J. Phys.* 30, 187.

#### DISCUSSION FOLLOWING LÉPINE

*Gillespie:* Have you observed any sources in the Magellanic Clouds?

*Lépine:* Scalise has searched for H<sub>2</sub>O emission in the Magellanic Clouds. I think he can give you more information.

*Scalise:* We searched for water masers in more than 40 positions in the Large Magellanic Cloud, covering the velocity range from 200 to 330 km s<sup>-1</sup>. Special attention was given to 30Dor (Tarantula Nebula) and Henize's N159, particularly this latter source where OH, H<sub>2</sub>CO and CO have been detected. No emission above 0.2 K antenna temperature has been detected so far. Several HII regions in the Small Magellanic Cloud were searched, again with negative results. We intend to continue searching for water masers in the Magellanic Clouds.

*Gillespie:* It does not surprise me that you see nothing in the Small Magellanic Cloud since I have failed to detect CO there, but it does surprise me that you found nothing in N159 where other molecules have been found.

*Dickinson:* Could you tell us the distance to NGC 4945?

*Lépine:* NGC 4945 is a member of the Centaurus group, estimated to be at 4 Mpc.