JD21

The Megamaser – AGN Connection

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THE MEGAMASER - AGN CONNECTION

Fifteen years after the discovery of the first OH megamaser in Arp 220 and twenty years after the discovery of the first extragalactic H_2O maser sources, a first Joint Discussion on this topic has been held at the IAU General Assembly.

One of the early hopes for studying megamasers was that these sources would tell us something about galactic nuclei. The two major flavors of megamasers do exactly that. OH megamaser activity occurs in dusty galaxies that have Seyfert 2, LINER, or compact starburst characteristics and are prominent far-infrared sources. The OH maser emission originates in the nuclear regions but does not yet seem to be associated with a single compact source and some of the emission may come from a rather diffuse source. On the other hand, the H_2O megamaser emission appears to be associated with compact nuclear sources and with nuclear activity in optically selected Seyfert 2 or LINER galaxies. The OH and H_2O maser emission is strong enough in a number of sources that very high resolution VLBI observations are possible, which allows us to look inside the nuclei of these galaxies. All megamaser sources appear to have edge-on nuclear disk structures, which provides a favorable geometry for the maser emission.

The earliest suggestion of radiative FIR pumping for the OH molecules has been confirmed with recent results from ISO and megamaser candidates have been selected on the basis of their FIR colors from the IRAS data base. The success rate for finding OH megamasers among these FIR selected sources is quite high but it is still affected by the geometry of the dusty torus. On the other hand, the pumping mechanism for the H_2O masers has not yet been clearly identified. As a result the success rate for finding water vapour masers among the optically selected AGN is relatively small, which results from the thinness of the compact disk surrounding the compact nuclear sources and from the pumping conditions. The evidence from the H_2O megamasers sources clearly points at massive black holes in these galaxies.

The megamasers also provide work for the theorists. The detailed observational data of some well studied H_2O sources allows one to make over-constrained models of keplerian disks. The parameterizations of these disks may serve as test cases for our understanding of nuclear accretion disks in AGNs. Similarly the pumping mechanisms for the various masing molecules require renewed study. Although, there may be some general understanding of the processes involved in pumping these molecules, the details have to be filled in.

This Joint Discussion was successful in bringing together the observational and theoretical aspects of the Megamaser - AGN connection. JD21 was only planned as a morning session, but the extensive discussions and the many participants made sure that the session ran well into lunchtime. Another more extensive JD is planned for the next General Assembly.

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J. Andersen (ed.), Highlights of Astronomy, Volume 11B, 937.