Understanding the Variability of Optical Spectra of H2O Megamasers

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Within the centers of about 3% of galaxies, there is luminous emission at 22 GHz originating in Microwaves Amplified by Stimulated Emission of Radiation (masers) from water molecules. Some of these detections reveal megamasers, or masers with intensities that are millions of times greater than that of the first masers discovered in the star-forming spiral arms of our own galaxy. A fraction of these megamasers are found in a disk-like configuration, offering unprecedented tools for measurements of direct distances to their host galaxies and of the masses of the black holes that lurk in the centers of these systems. Previous studies have suggested a relationship between the megamaser emission and the process by which radiation is produced by the accreting of matter onto these supermassive black holes, however, the results to date remain inconclusive. We attempt here to test this hypothesis by investigating whether there is a relationship between the properties of the water maser emission and the optical variability that is expected for accreting black holes. The data is analyzed using SQL and python methods, using the largest sample of galaxies that have been surveyed in 22 GHz emission, from the Megamaser Cosmology Project.

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