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TITLE: Cosmic Fire Hydrants: The nature of 11 high-velocity water masers in our Galaxy

ABSTRACT BODY:

Abstract Body: Water masers act as excellent cosmic markers for the motion of dynamic astronomical regions such as young massive circumstellar disks and outflows from evolved stars. Studying fast water masers gives us a very rare insight into two very significant stages of stellar evolution.

In high-mass star forming regions, water masers are formed in the walls of conical outflows, in collimated jets and in some cases under the influence of a circumstellar disk wind. High-resolution studies of these masers therefore enable us to probe the accretion mechanism for massive star formation. Water masers in post-Asymptotic Giant Branch (AGB) stars probe the very brief phase of aspherical mass-loss before the outer layers of the circumstellar envelope are ionised and the star becomes a Planetary Nebula. The process of aspherical Planetary Nebula formation is still the subject of considerable debate, with the binary hypothesis and magnetic collimation of fast winds being the leading explanations at present.

We selected the eleven water maser sites from the H₂O Southern Galactic Plane Survey that have differential radial velocities greater than 200 km/s. The water maser sites were subsequently re-observed at higher angular resolution to localise the maser positions with respect to other astronomical emission in the vicinity and where possible, to probe the internal velocity gradients. We conducted a multi-wavelength study of these sites of water masers to determine the stage of stellar evolution, their physical size and a number of other attributes. We present several significant new results and open questions that demand further investigation.

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