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Hydrogen Radio Recombination Line Masers observed with ALMA: Imaging of Warped Disks and Photo-evapo

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Contributed talk

Abstract:

Hydrogen radio recombination lines (or RRLs) are excellent probes of the kinematics and physical conditions of the ionised gas in the ISM. The lines at sub-/millimeter wavelengths are particularly especial since they may present maser amplification. This is a rare effect that has been observed only toward a handful of objects. However, in the cases where maser RRLs have been found (as e.g. in the emission line star MWC349A or in the planetary nebula MWC922), their large amplification has allowed to study with exquisite detail the kinematics and physical structure of the innermost ionised regions close to the central stars.

Massive stars are also known to strongly ionise their surroundings forming ultracompact (UC) HII regions. Recently, we have carried out very high-angular resolution images of the emission of the H21alpha RRL toward the UC HII region MonR2-IRS2, using the Band 9 of ALMA. Our images, obtained at an unprecedented angular resolution of 50 au (~60 mas at a distance of 830 pc), resolve for the first time the ionised gas around the central massive protostar into a high-velocity wind and an ionised disk. The high-velocity wind is found to be launched from the disk at a radius of 12 au from the central protostar, as if it were photo-evaporating and favouring the disk wind formation scenario for the wind. For the ionised disk, clear deviations are observed for the peak emission of the H21alpha line above and below the disk mid-plane, characteristic of a warped disk. This disk warped morphology could be due either to a companion that remains undetected, or to strong accretion processes onto the central protostar.

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Session Classification: Circumstellar Disks