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## Francesca Perrotta - H<sub>2</sub>O emission lines in a strongly lensed dusty star-forming galaxy at $z \sim 3.1$

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We report ALMA high-resolution observations of water emission lines  $p$ -H<sub>2</sub>O( $2_{02}-1_{11}$ ),  $o$ -H<sub>2</sub>O( $3_{21}-3_{12}$ ),  $p$ -H<sub>2</sub>O( $4_{22}-4_{13}$ ), in the strongly lensed galaxy HATLASJ113526.2-01460 at redshift  $z \sim 3.1$ . From the lensing-reconstructed maps of water emission and line profiles, we infer the general physical properties of the ISM in the molecular clouds where the lines arise. We analyze the relative contributions of Far Infrared pumping and collisions in water lines excitation. Our findings are also supported by the detection of the medium-level excitation of CO resulting in the line emission CO (J=8-7). Thanks to the unprecedented high resolution offered by the combination of ALMA capabilities and gravitational lensing, we discern the different phases of the ISM and locate the hot molecular clouds into a physical scale of  $\sim 500$  pc. We discuss the possibility of J1135 hosting an AGN in its accretion phase and the relation between the water emission lines and the total infrared luminosity of J113526.2, as well as the SFR as a function of water emission intensities, comparing the outcomes to local and high- $z$  galactic samples from the literature.

**Session Classification:** Galaxies and AGNs