OBSERVATION OF H_2O IN THE CENTRAL MOLECULAR ZONE OF THE GALACTIC CENTER

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Basis of Research: We attempt to observe infrared spectrum of H_2O in the Central Molecular Zone (CMZ) of the Galactic center (GC) toward 10 stars which were used for observations of H_3^+, Oka et al. (2019)[a]

Theoretical Spectrum: The spectrum is predicted to be in absorption in diffuse clouds at the wavenumbers reported by Mecke (1933)[b] at 3198.9 cm^{-1} corresponding to the $1_{11} \leftarrow 0$ transition of para-H_2O and at 3215.2 cm^{-1} corresponding to the $2_{12} \leftarrow 1_{01}$ transition of ortho-H_2O. This extremely simple rotational structure is due to the very rapid rotational spontaneous emission of H_2O.

Para- versus ortho-: If the chemistry in the CMZ is thermodynamic, all H_2O will be in the lowest 0_{00} para level. It is interesting to see the observed ratio of para and ortho and its variation depending on the location of stars.

[a]Oka, T. Geballe, T.R., Goto, M., Usuda, T., McCall, B.J., Indriolo, N. 2019, Astrophys. J. 883:545 (31pp)
[b]Mecke, R. 1933, Z. Phys. 81, 313-331