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Planet-forming regions of disks in the JWST era

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Despite the tremendous number of exoplanets detected, planet-forming scenarios are not yet able to fully explain the large diversity of planets. They form in protoplanetary disks, by accreting gas and dust in their surroundings. It is thus necessary to study the composition of disks, especially the Carbon-to-Oxygen ratio (C/O), to better constrain planet formation. In this context, the James Webb Space Telescope opens an unprecedented observation window on the inner disks (<10-50 au), where planets are forming. Amongst molecular features in the observed spectra, water and acetylene (C2H2) are widely detected.
The aim of this work is to study the extent to which H2O and C2H2 emission are good tracers of the C/O ratio of the gas in the inner disk, using the 2D thermochemical model DALI (Dust And Lines). After significant improvements in the model, especially a refined Carbon chemistry, first results show that the line flux ratio C2H2/H2O is highly sensitive to the C/O ratio, making it a promising tracer.

Astrophysics Field

Protoplanetary disk, chemistry, Interstellar Medium

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