

The origin of complex organic molecules in prestellar cores.

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Complex organic molecules (COMs) have been detected in a variety of environments, including cold prestellar cores. Given the low temperature of these objects, these last detections challenge existing models. We report here new observations towards the prestellar core L1544, based on an unbiased spectral survey of the 3mm band at the IRAM-30m telescope, as part of the Large Program ASAI. The observations allow us to provide the full census of the oxygen bearing COMs in this source and to derive their abundance. The non-LTE analysis of the methanol lines shows that they are likely emitted at the border of the core, in the same region layer where H₂O was detected by the *Herschel* space mission

We discuss the origin of this emission and propose that a non-thermal desorption mechanism is also responsible for the observed emission of methanol and COMs. We find that the desorbed oxygen and a tiny amount of desorbed methanol and ethane are enough to reproduce the abundances of COMs measured in L1544.

These new findings open the possibility that COMs in prestellar cores originate in a similar outer layer rather than in the dense inner cores, as previously assumed, and that their formation is driven by the non-thermally desorbed species.