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Where the Ices Melt: Snow Lines of CH_3OH and NH_3 in Orion KL - Insights from ALMA Band 1 Mapping

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Orion KL is a chemically rich high-mass star-forming region, characterized by strong molecular line emission and complex thermal structures. Using ALMA Band 1 data, we present rotational temperature (T_{rot}) and column density (N_{tot}) maps of CH₃OH and NH₃, two key tracers of dense gas and warm chemistry. CH₃OH, often considered a cornerstone molecule in the formation pathways of complex organic molecules (COMs), traces regions of active desorption and grain-surface chemistry, while NH₃ serves as a robust gas thermometer. In the central Orion KL region encompassing the Hot Core, Source I, and surrounding gas, we find consistent T_{rot} patterns between the two species, suggesting co-evolution or shared thermal excitation. The N_{tot} distributions further reveal abundance variations across the inferred snow lines (~100 K for CH₃OH and ~90 K for NH₃), offering new insights into the thermal-chemical structure and desorption processes shaping this prototypical high-mass star-forming environment.

Section

Star Formation

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