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SMA 200-300 GHz Survey for Dust Properties in the Class II Disks in the Ophiuchus Molecular Cloud

We present a SMA survey of 18 Class II sources in Ophiuchus Molecular Cloud, extending previous spectral index studies from the Taurus-Auriga region. Our observations made 8 independent samples of flux densities over the 200–300 GHz frequency range. By measuring flux densities across multiple frequency bands, we derive $\alpha_{200-300\mathrm{GHz}}$ to investigate dust optical depth and grain growth properties. Recent studies suggest that most Taurus disks exhibit $\alpha \approx 2.0$, indicating that their millimeter emission is dominated by optically thick (τ
$gtrsim5$) dust thermal radiation. If this trend holds in Ophiuchus, it implies that some previous works that were based on the optically thin assumption thus might have underestimated optical depths by at least one order of magnitude. Assuming DSHARP dust opacities, this corresponds to underestimates of dust masses by a similar factor. Intriguingly, our primarily results revealed that the spectral indices of Ophiuchus disks fall within a similar range to those in Taurus, supporting the hypothesis that dust evolution is regulated by optical depth effects rather than grain size variations alone. Population synthesis modeling will be performed to constrain maximum grain sizes (a_{max}) and dust temperatures (T_{dust}), with initial estimates suggesting that dust growth beyond the water snowline remains limited by the bouncing/fragmentation barriers. The corresponding results of this study will place new constraints on dust evolution models, maximum grain sizes, and the role of optical depth in disk structure, contributing to a broader understanding of planet formation across different star-forming environments.
The work is still on progress.

Section

Star Formation

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