Contribution ID: **21** Type: **Contributed talk**

# Core Formation in Molecular Clouds: Evidence Favoring Turbulent Over Gravitational Fragmentation

*Tuesday 6 May 2025 17:40 (20 minutes)*

Stars form within dense cores embedded in turbulent molecular clouds. In this study, we investigate the cloud fragmentation process in Galactic molecular clouds with various star formation acttivity. Using astrodendro, we identified over $10^4$ dense cores across both nearby molecular clouds and high-mass star-forming clumps. Our central hypothesis is that core mass and separation provide key insights into cloud fragmentation mechanisms.

Our analysis reveals that in nearby clouds, core masses and separations are significantly smaller than those predicted by gravitational fragmentation but agree well with the expectations of turbulent fragmentation. In contrast, in high-mass SF clumps, cores formed via turbulent fragmentation tend to be gravitationally unstable, suggesting that self-gravity plays an increasingly dominant role in higher-density environments.

These findings indicate that turbulent fragmentation is the primary mechanism driving core formation across diverse cloud conditions, with gravitational effects becoming more significant as density increases.

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**Session Classification:** Session 1b