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Visibility Plane Forward Modeling of Young Massive Clusters within the Nuclear Ring of NGC 3351

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Using high-resolution ALMA millimeter observations, we investigate the formation of massive star clusters within the nuclear ring in NGC 3351, a nearby Milky Way analog galaxy. The dense, high-pressure conditions within nuclear rings are among the most extreme star-forming settings in the local universe, providing the ideal conditions for massive cluster formation. Nevertheless, the mechanisms driving massive cluster formation and the impact of environmental conditions remain poorly understood. They are distinct from lower-mass clusters in that they form quickly and convert gas to stars efficiently, doing so before the significant onset of stellar feedback from newly formed stars. To study the full conditions of massive cluster formation, we must observe their short, infant stages when they are actively star-forming and newborn stars remain deeply embedded in gas and dust. This phase is best traced by (sub-)millimeter observations. We perform our analysis directly in the raw visibility plane using the GALARIO package to convert forward models of the region into model visibilities sampled at the same baselines as our observations. This approach avoids image-plane-based reconstruction methods that produce artifacts and correlated noise, and it preserves the full data resolution, allowing us to better constrain the intrinsic radial profiles of the young massive clusters and the physics of their star formation. Furthermore, we can derive higher-fidelity estimates and uncertainties of the shared morphology of the ring and clusters, contributing to our understanding of how gas accretion onto the nuclear ring drives massive cluster formation along its structure.

Did you give a contributed talk at CASCA 2026?

No

If you are selected for a poster, would you be interested in giving a short flash talk on your work?

Yes

What is your career level?

MSc

Which keyword describes the area of focus of this talk?

Galaxies

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