

Positive feedback, quenching and sequential super star cluster (SSC) formation in NGC 4945.

Bellocchi, E.¹, Martín-Pintado, J.¹, Rico-Villas, F.¹, Martín, S.^{2,3} and Jiménez-Sierra, I.¹

¹ Centro de Astrobiología, (CSIC-INTA), Astrophysics Department, Madrid, Spain

² European Southern Observatory, Alonso de Córdova, 3107, Vitacura, Santiago, 763-0355, Chile

³ Joint ALMA Observatory, Alonso de Córdova, 3107, Vitacura, Santiago, 763-0355, Chile

Abstract

We have used ALMA imaging (resolutions 0.1''-0.4'') of ground and vibrationally excited lines of HCN and HC₃N toward the nucleus of NGC 4945 to trace the protostellar phase in Super Star Clusters (proto-SSC). Out of the 14 identified SSCs, we find that 8 are in the proto-SSC phase showing vibrational HCN emission with 5 of them also showing vibrational HC₃N emission. We estimate proto-SSC ages of 5-9.7×10⁴ yr. The more evolved ones, with only HCN emission, are close to reach the Zero Age Main Sequence (ZAMS; ages ≥10⁵ yr). The excitation of the parental cloud seems to be related to the SSC evolutionary stage, with high (~65 K) and low (~25 K) rotational temperatures for the youngest proto and ZAMS SSCs, respectively. Heating by the HII regions in the SSC ZAMS phase seems to be rather local. The youngest proto-SSCs are located at the edges of the molecular outflow, indicating SSC formation by positive feedback in the shocked regions. The proto-SSCs in NGC 4945 seem to be more evolved than in the starburst galaxy NGC 253. We propose that sequential SSC formation can explain the spatial distribution and different ages of the SSCs in both galaxies.

My poster is available at <https://zenodo.org/record/7015155#.Y4H9DSHMLYI>