

## ALMA REVEALS THE EXTENDED ENVELOPE OF THE HYPERGIANT STAR VY CMa

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VY CMa is one of the best examples to study the stellar evolution of massive stars. Such stars are characterized by complex envelope dynamics resulting from highly directional ejecta of molecular gas and dust. Previous studies of VY CMa using HST show two SE arcs (Arc I, Arc II), an NW arc, SW clumps, and multiple knots. Using ALMA at Band 6 with 1 and 0.25-arcsecond resolution, combined with previous single-dish observations, VY CMa has been imaged in various molecules at 1 mm. From the combined data sets, all the flux from the molecular envelope has been recovered, resulting in the first complete image of the ejecta on a 15-arcsecond scale. In addition to the well-known features such as Arcs 1 and 2, new, more extended structures have been found in CO and HCN, reaching as far as 8 arcseconds from the star, including a NE plume and an E arc. Additionally, images of  $^{13}\text{CO}$  and  $\text{H}^{13}\text{CN}$  have been created to compare isotopic ratio variations of known features. These data will complement previous studies conducted on smaller spatial scales star and provide a more complete picture of the mass loss history of VY CMa.