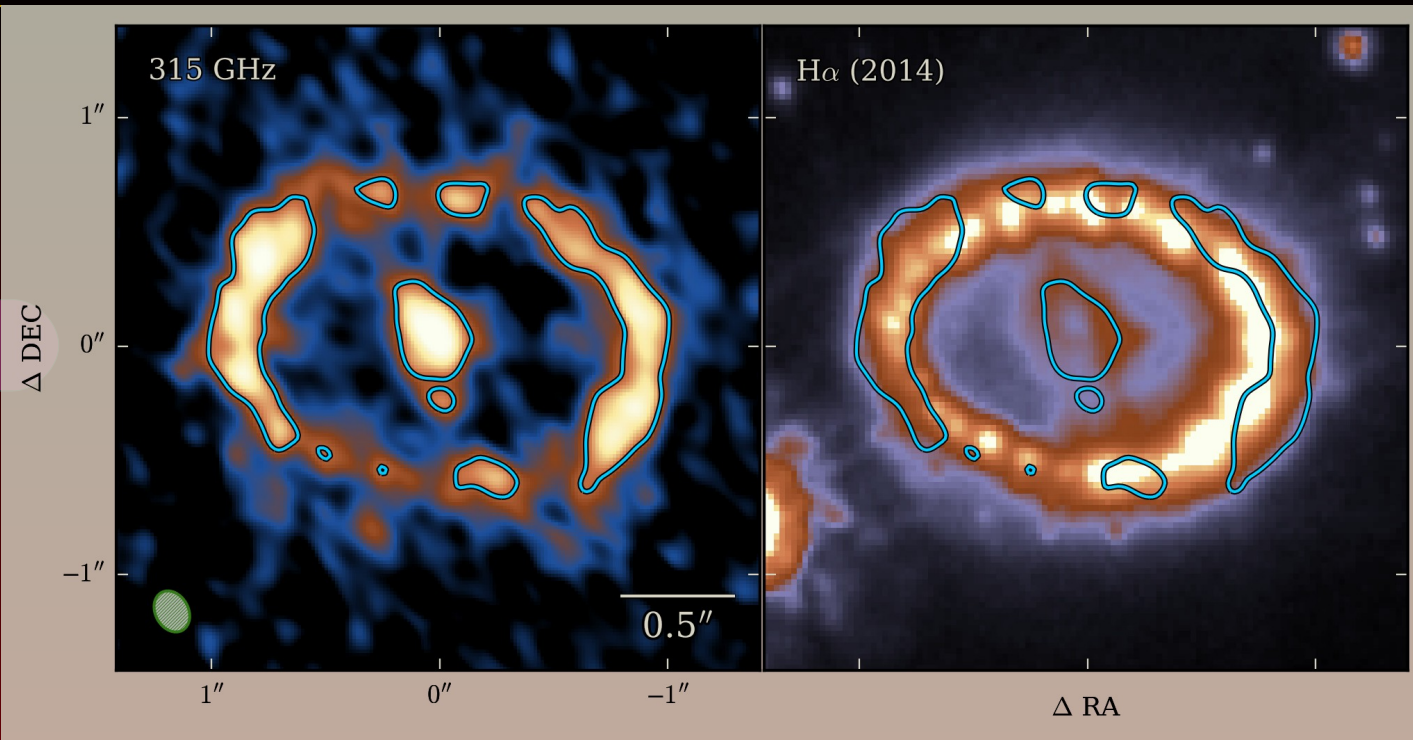


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COSMIC DUST
HIGH-RESOLUTION OBSERVATIONS OF DUST IN SN1987A
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ABSTRACT
 SN 1987A, being relatively young and as the brightest supernova observed in over 400 years, is a unique and exciting laboratory for studying supernova dust production. Located several kiloparsecs from the Large Magellanic Cloud, SN 1987A is best for every large single-dish telescope to resolve the structure of the sub-mm emission on the scale of the ejecta, where the dust is produced. Recent ALMA observations have allowed us to peer into the inner ejecta with unprecedented resolution down to physical scales of 4000 AU. Comparison of this location and morphology with other multi-wavelength emission presents an interesting picture of the early dust phase of the ejecta. The distributions of the dust continuum and molecular line emission are all variable complex, having implications for the physical properties of the system.

MOTIVATION
 Dust is a crucial component of the ISM and effectively represents much of the neutral content of a galaxy and indeed its spin distribution. Supernovae are considered to be important sources of dust (e.g., Draine 1999). SN 1987A, due to its youth and proximity at 51.4 kpc (Phillips 1990), is an excellent laboratory for studying the relation between SNR and dust.

OBSERVATIONS
 ALMA Cycle 0 observations (Indebetouw et al. 2014) directly imaged a large mass of dust located within the central region with mostly spherical distribution. This observation agreed with Bonded estimates of 0.04 M_⊙ of dust in the ejecta at 700 K (Matsumi et al. 2015). However, the location shifted during these observations and we find a ring of dust around the star in the ejecta at 1000 K. With our new 2015 observations, we can finally study the peak dust in the wake of the clumpy dust distribution. This work is intended as a first look at the evolution of the ring and ejecta.

ANALYSIS
 The spatial structure of SN 1987A clearly shows a flattened ring of circumstellar material (scale height in the mid-IR) in the black images of processing dust away by the host stars) and an inner ejecta component (the faintest emission of the star's inner disk core). The ejecta emission has a complex structure, suggesting it may be an old-fashioned hybrid in the HBT sense.

DISCUSSION
 The dust emission from the ejecta lies within 100 mas, and the peak of the continuum line is more or less coincident with the H α line.

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