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Dust emission from the Cassiopeia A supernova remnant

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We model the thermal emission from a distribution of dust grains heated by particle collisions and the ambient supernova remnant radiation field, under conditions representative of the knots observed in Cassiopeia A (Cas A). In order to reproduce the observed Cas A dust spectral energy distribution reported by de Looze et al. (2017), we require dust emission from both the pre- and post-shock regions. We find that the shocked dust is heated mainly by collisions with electrons, while the unshocked dust is heated by the synchrotron radiation field. The grain size distribution is required to extend to smaller radii in the shocked region, indicative of the destuction of dust grains by the reverse shock. The model SEDs are only weakly dependent on the maximum grain radii, leading to a range of possible dust masses between 0.4 and 1.2 solar masses (assuming $MgSiO_3$ grains), the majority of which is located in the preshock region.

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