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Survey of dust emission in Galactic supernova remnants

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There is still on-going debate as to how much dust has been formed and destroyed by supernovae and supernova remnants. A systematic search for dust in supernova remnants is an effective way to resolve this issue. We search for far-infrared counterparts of 62 known supernova remnants in the Galactic plane ($|l| < 60^\circ$) at 70, 160, 250, 350, and 500 μm using the Herschel Infrared Galactic Plane Survey (Hi-GAL). We detect FIR dust emission from 24 of our sample, with some evidence of ejecta dust heated by pulsar wind nebulae. Detailed analysis of near-infrared to radio emission from three pulsar wind nebulae suggests that there is a significant mass of ejecta dust within the supernova remnants. We use point process mapping to further analyse the dust mass distribution across the three sources at various temperatures and values of dust emissivity. This indicates the presence of between 0.29 and 0.64 solar masses of dust within each supernova remnant which is warmer than that of the ISM, at temperatures of 20 - 45 K. We expect that pulsar wind nebulae can heat SNR dust, increasing the temperature above that of the surrounding interstellar medium. We also find marginal evidence for one SNR that there may be a variation in the dust emissivity between the SNR material compared to that of the ISM, suggesting that there is a different dust composition within the SNR.

Consider for a poster?

Yes

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