



Contribution ID: 158

Type: **Contributed talk**

Old and new dust associated with Supernova 1995N

Tuesday 12 June 2018 12:05 (25 minutes)

The discovery of $0.4\text{--}0.7M_{\odot}$ of dust in the remnant of SN1987A 23 years after its explosion (Matsuura et al. 2011) demonstrated that supernovae can be efficient dust factories, but raised many questions. Among them, when did this dust form? Was it there at early times but previously undiagnosed by techniques for estimating dust masses, or did it form at later times? In Wesson et al. (2015) we created radiative transfer models to investigate this question, fitting the optical-far IR SED of SN1987A to calculate the dust mass at epochs from 600-9000 days after the explosion. We found that the rate of dust formation could be represented by a sigmoid curve with peak dust formation occurring many years after the explosion.

The far infrared observations necessary to constrain the emission from cold dust are lacking in most supernovae. An alternative method of estimating the dust mass exploits the blue-shifting of emission lines in the presence of dust to diagnose the dust mass (Bevan and Barlow, 2016). This has the additional advantage that only dust within the expanding remnant will affect the line profiles - pre-existing dust that is thermally echoing will not.

I will present SED and emission line profile models of SN 1995N, observed as part of a programme to determine dust masses in supernova remnants years to decades old. Van Dyk (2013) found that mid-IR observations implied the presence of $0.05\text{--}0.2M_{\odot}$ of pre-existing circumstellar dust which has been flash-heated by the supernova outburst. I confirm this with three-dimensional radiative transfer models to fit the SED. Additionally, emission line profile modelling reveals that a further $0.1\text{--}0.4M_{\odot}$ of dust has formed in the expanding supernova ejecta. This shows that pre-existing and newly formed dust can be clearly distinguished in supernova remnants, and that both may contribute significantly to the total dust mass formed by a massive star.

Consider for a poster?

Yes

Primary author: WESSON, Roger (University College London)

Presenter: WESSON, Roger (University College London)

Session Classification: Dust production by supernovae and massive stars

Track Classification: The creation and evolution of dust