A23c Unravelling the dynamics of the unsual SMC nebula: N66

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We report on the discovery of an expanding loop of filamentary molecular debris associated with the enigmatically powerful star forming region in the Small Magellanic Cloud (SMC); N66. The NGC346 cluster associated with N66 hosts upwards of 33 O-Type stars, and harbours 6% of all *current era starformation in the entire SMC*. It is plausibly responsible for depositing the observed mechanical energy within the nebula, but the actual formation for the spectacular and anomolous NGC346 cluster is unknown, and this work reports on the first stages of research into understanding the formation of NGC346.

Under the simplest approximation, without considering momentum transfer, turbulence or stellar radiation, the timescale for the formation of the loop is 2-5Myr, roughly consistent with the age of the stars comprising NGC346. We determine the geometry and morphology of the expanding loop is consistent with the scenario that NGC346 and nearby sub-clusters formed suddenly and rapidly, well within a crossing time of the ∼100 pc-wide N66 nebula, and is consistent with the idea the stellar cluster formed as the result of a filament-filament collision. A three-dimensional (PPV) analysis of the ratios of the CO(1-0) and CO(2-1) emission lines shows both transitions are close to completely thermalised; a radiative transfer analysis is difficult, but nonetheless suggests a slight enhancement of temperature/density towards the interiors of the fragments.

The simplest interpretation in this case is that NGC346 is responsible for the exciting the higher transition through a combination of radiatively heating, and via a compressive shock passing through the ISM.