INFRARED DETECTION OF SUPERNOVA REMNANTS IN THE NUCLEUS OF NGC 253 ?

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1. Results and Discussion

The high rate of gas consumption and evidence for massive stars in NGC 253, implies a prodigious star formation and supernovae rate. However there is no optical confirmation of these supernovae, presumably due to the enormous dust obscuration present. Radio observations (Antonucci and Ulvestad 1988) reveal compact radio sources i.e. young supernova remnants (SNRs).

Using a new PtSi 256 × 256 pixel near–IR array with $0.05''$/pix we obtained, at CTIO, an H image of the nuclear region which penetrates the dust. Our image (see Forbes, Ward and DePoy 1991 for details) reveals several regions of enhanced emission (hotspots) as well as the central nucleus. Assuming the H nucleus lies at the 6cm nucleus, we find very good spatial agreement between the hotspots and strong compact 6cm sources i.e. SNRs.

We spectulate that the hotspots are reradiation from dust associated with an expanding SNR shell. The IR colours of hotspot A are consistent with the observations of known type II SN some years after the explosion (Dwek 1983).

2. Conclusions and Future Work

With the available data we have not been able to positively identify the nature of the IR hotspots in NGC 253, although we consider SNRs to be the most plausible. The other possible sources – giant HII regions or clusters of RSGs – may be indirectly related to SNRs as the site of such events. One method of clarifying the nature of the hotspots is with high spatial resolution spectroscopic imaging. For example, strong CO absorption lines will indicate the presence of supergiants; whereas strong [FeII] ($1.26\mu m$ and $1.64\mu m$) and weak Brγ ($2.17\mu m$) will confirm that a SNR, and not an HII region, is the dominant source of the IR emission. Imaging in [FeII] may prove to be an excellent technique for revealing the remnants of massive stars, in the same way that Hα imaging reveals the birth of young stars. In the more distant future imaging in Co II at $10.52\mu m$ could be used to identify type II SN. The production of ^{56}Co is directly related to the initial stellar mass. Eventaully when a number of SN are observed in this line a mean IMF for starburst galaxies could be derived (van Buren and Norman 1989).

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