Infrared observations of candidate post-AGB transition objects

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In our search for new obscured PN, candidates were selected from the IRAS PSC based on their infrared colors that are typical for PN. These PN candidates were observed in the radio. On average 20 % of the objects were detected (Van de Steene & Pottasch: 1993, A&A 274, 895; 1995, A&A 299, 238). Optical spectroscopy showed that the PN candidates detected in the radio have emission line spectra typical of PN (Van de Steene et al. 1996a A&AS 118, 243; 1996b A&AS in press).

The following question remained: What is the evolutionary status of the IRAS sources with colors typical of PN which had no detectable ionization in the radio ($S_{6\mathrm{cm}} < 3$ mJy) in 1991 ?

To be absolutely certain about the correct identification of the counterpart and to obtain improved positions, we imaged 20 IRAS sources at 10 μm with TIMMI on the 3.6 m at ESO in 1995. The morphology of the resolved objects is similar to young PN.

Having obtained the improved positions, we searched for the presence of ionization by observing the Brγ line with IRSPEC on the NTT at ESO in 1995. We detected Brγ in absorption in 7 of the 20 objects. The absorption lines are very narrow in 5 objects, indicative of a low surface gravity. We consider these objects candidate post-AGB stars. Two objects show an extremely broad absorption profile, one of which also showed unresolved Brγ in emission. In seven objects no clear Brγ absorption or emission was visible. The nature of these objects having a flat spectrum is not completely clear. They might be cool post-AGB stars. Six objects show Brγ in emission. They all have a strong underlying continuum, unlike normal PN. Assuming the 6 cm radio flux to be optically thin and neglecting extinction, we calculated their expected radio flux to be considerably larger than 3 mJy. This could indicate that the radio flux has increased since 1991. Alternatively, it could be that the objects were not detected in the radio because they were optically thick at 6 cm. This would imply that they are very high density nebulae ($\log(n/\mathrm{cm}^{-3}) > 4.5$ cm^{-3}), which possibly originated from massive central stars, in agreement with them being in the galactic plane. We applied for observing time with the Australian Compact Array to investigate whether there has been an increase in ionization on a relatively short timescale.

Many questions regarding the evolutionary status of these objects remain and further observations are needed to clarify them. Nevertheless, these results raise hopes that with this sample we will be able to shed some light on the elusive evolutionary phase between AGB and PN.