Phillips, & Cuesta (2008), among many others. Similarly, the results of the more extended GLIMPSE and MIPSGAL surveys are reported by Phillips & Ramos-Larios (2008a), Cohen et al. (2007), Ramos-Larios & Phillips (2008), Zhang & Kwok (2009), Phillips & Marquez-Lugo (2010), Chu et al. (2009) and Mizuno et al. (2010). These show that much of the MIR emission is attributable to polycyclic aromatic hydrocarbons (PAHs) and a broad variety of ionic and molecular transitions, whilst much of the longer wave emission appears to arise from cool dust continua, as well as transitions such as [ArII] 6.985 μm, [NeVI] 7.643 μm, [ArIII] 8.991 μm, [Ne V] 24.32 μm, [OIV] 25.87 μm and so forth. The extension of PAH and dust emission components outside of the ionised shells suggests the presence of enveloping photo-dissociation regimes (PDRs), likely associated with neutral gas in the AGB mass-loss halos. Individual structures in these halos have been investigated by Phillips et al. (2009), Ramos-Larios & Phillips (2009), Phillips & Ramos-Larios (2010), and Ramos-Larios, Phillips, & Cuesta (2010).

Whilst much of the MIPSGAL survey material is available for public use, the 70 μm data is inaccessible at present, and the associated catalogues are in process of being compiled. Similarly, although the GLIMPSE I and II data are fully available, only $\sim$75% of the GLIMPSE 3D survey is accessible at present. Nevertheless, although interesting portions of the Galactic plane are still missing from the latter survey, we are in a position to analyse the properties of the PNe which have been detected so far. The coordinates of these sources are taken from Acker et al. (1992), Parker et al. (2006) and Miszalski et al. (2008), the latter two of which are referred to as the MASH I and II catalogues. These catalogues include the majority of Galactic PNe to have been identified so far, although the sampling of bulge PNe is less complete. A fuller discussion of the latter component can be found in Phillips & Ramos-Larios (2009).

We shall here concentrate upon extended nebular shells having reasonably high S/N detections. This will permit us to provide mapping, profiles and photometry for 24 PNe in the 3.6, 4.5, 5.8 and 8.0 μm photometric channels. It will become apparent that the sources have interesting characteristics in the MIR which are often at variance with what is observed in other wavelength regimes, and are attributable to the combined influence of neutral and ionised gas and dust components.

2. OBSERVATIONS

One of the major legacy programs of Spitzer was to map the inner region of the Galactic plane, a program which was undertaken using the Infrared Array Camera (IRAC; Fazio et al. 2004) in four photometric channels. The first results of this survey (denominated GLIMPSE I) covered the longitude and latitude ranges $l = 10^\circ - 65^\circ$, $295^\circ - 350^\circ$, $b = \pm 1^\circ$, and data products were delivered between April 2005 and August 2006. The second extension of this survey (GLIMPSE II) covered regions close to the Galactic centre (GC), including the longitude range $10^\circ < l < 350^\circ$, and latitudes extending up to $b = \pm 2^\circ$ – although it excluded the region about the G.C. itself (i.e. $l = \pm 1^\circ$, $b = \pm 0.75^\circ$). Products for this survey became available in May 2007. Finally, the GLIMPSE 3D survey represents a vertical extension of the GLIMPSE I & II surveys, and covers higher Galactic latitudes in selected longitude ranges. For the most part, latitudes $|b|$ are < 3 deg, but this extends to $|b| < 4.2$ deg in the centre of the Galaxy. The data have been delivered in several tranches between 2007 and the present date, and will (when fully available) cover an area of 199.6 deg^2; although data for $b > 1^\circ$, $8^\circ < l < 355^\circ$, and $5^\circ < l < 8^\circ$, $b < -1^\circ$ are still not available for general use – a region which corresponds to 25% of the final survey area. We shall be investigating the properties of planetary nebulae detected in the available 3D regime.

The IRAC employed filters having isophotal wavelengths (and bandwidths $\Delta\lambda$) of 3.550 μm ($\Delta\lambda$ = 0.75 μm), 4.493 μm ($\Delta\lambda$ = 1.9015 μm), 5.731 μm ($\Delta\lambda$ = 1.425 μm) and 7.872 μm ($\Delta\lambda$ = 2.905 μm). The normal spatial resolution for this instrument varied between $\sim$1.7 and $\sim$2 arcsec (Fazio et al. 2004), and was reasonably similar in all of the bands, although there was a stronger diffraction halo at 8 m than in the other IRAC bands. This leads to differences between the point source functions (PSFs) at $\sim$0.1 peak flux. The observations have a spatial resolution of 0.6 arcsec/pixel.

We have used these data to produce colour-coded combined images in three of the IRAC bands, where 3.6 μm results are represented as blue, 4.5 μm emission is green, and the 8.0 μm results are indicated by red. We have also undertaken contour mapping in all four of the IRAC bands, where the lowest contours correspond to $3\sigma_{\rm rms}$ background noise levels or greater, and the intrinsic flux E_n for contour n has a value

$$E_n = A10^{(n-1)C} - B, \qquad (\text{M Jy sr}^{-1}) \qquad (1)$$