Revista Mexicana de Astronomía y Astrofísica, **47**, 31–48 (2011)

MID-INFRARED OBSERVATIONS OF PLANETARY NEBULAE DETECTED IN THE GLIMPSE 3D SURVEY

J. A. Quino-Mendoza, J. P. Phillips, and G. Ramos-Larios

Instituto de Astronomía y Meteorología, Universidad de Guadalajara, Mexico

Received 2010 September 23; accepted 2010 December 13

RESUMEN

Presentamos mapas, perfiles y fotometría de 24 nebulosas planetarias (NPs) detectadas en el estudio del plano galáctico en el infrarrojo medio (MIR) de GLIMPSE 3D. Las NPs muestran muchas de las propiedades observadas en estudios previos de estas fuentes, incluyendo la evidencia de emisión a mayores longitudes de onda afuera de las zonas ionizadas, una consecuencia probable de la emisión de hidrocarburos aromáticos policíclicos (PAHs) dentro de las regiones de fotodisociación (PDRs). Notamos también variaciones en los cocientes de flujo 5.8 μm/4.5 μm y 8.0 μm/4.5 μm con respecto a la distancia del núcleo; presentamos evidencia de un aumento en la emisión MIR en los halos de las fuentes y encontramos evidencia de variaciones en color respecto de la evolución nebular.

ABSTRACT

We present mapping, profiles and photometry for 24 planetary nebulae (PNe) detected in the GLIMPSE 3D mid-infrared (MIR) survey of the Galactic plane. The PNe show many of the properties observed in previous studies of these sources, including evidence for longer wave emission from outside of the ionised zones, a likely consequence of emission from polycyclic aromatic hydrocarbons (PAHs) within the nebular photo-dissociation regimes (PDRs). We also note variations in 5.8 μm/4.5 μm and 8.0 μm/4.5 μm flux ratios with distance from the nuclei; present evidence for enhanced MIR emission in the halos of the sources; and note evidence for variations in colour with nebular evolution.

Key Words: infrared: ISM — ISM: jets and outflows — planetary nebulae: general

1. INTRODUCTION

The late evolution of moderate mass stars is known to lead to appreciable loss of mass, and to the formation of planetary nebular shells. Whilst these envelopes are mostly neutral during the earliest phases of expansion, subsequent evolution of the central star leads to increased HII/HI mass ratios.

Much of the prior investigation of these sources in the radio and visible has concentrated on defining the physical properties and kinematics of the ionised shells. More recent observations in the infrared, however, have also extended our understanding of the neutral and dust emission regimes. Early bolometric observations, for instance, resulted in the detection of emission excesses attributable to hot and warm dust (see e.g., Barlow (1983) for a listing of earlier ground-based photometry). Subsequent advances in technology, and in the sensitivity of detector systems, have also enabled spectroscopy and mapping using ground- and space-based observatories. These include low resolution photometry and mapping undertaken with the *Infrared Astronomical Satellite* (*IRAS*, e.g., Leene, Zhang, & Pottasch 1987), and spectroscopy of a broad range of sources using the *Infrared Space Observatory* (*ISO*; e.g., Liu et al. 2001; Szczerba, Górny, & Tylenda 1998; Beintema 1997).

Perhaps the greatest advance to have occurred in recent years has been through near-to-far infrared observations with the *Spitzer Space Telescope* (*Spitzer*; Werner et al. 2004), however, which has enabled spectroscopy and mapping at high spatial and spectral resolutions. Individually pointed observations have been reported by Hora et al. (2004), Guiles et al. (2007), Su et al. (2007), Ueta (2006), Phillips & Ramos-Larios (2010), and Ramos-Larios,