Models of Planetary Nebulae based on Deprojection

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Density distributions of four planetary nebulae have been calculated in cylindrical coordinates (r,z,φ) using the iterative deprojection algorithm by Bremer (1995). Narrowband filter CCD images of NGC 2346, NGC 6563, NGC 6826 and NGC 7009 in the Hα line (6562.8 Å) were corrected for cosmic ray hits, background/foreground stars were removed, and the position angles PA of their symmetry axes were determined with a maximum correlation criterion. For NGC 6563, the axis was shifted manually to the south-east to put it on the central ridge (the PA was conserved). For deprojections in cylindrical coordinates, an inclination angle i (angle between the object axis and the line of sight) must be specified. Literature values based on optical spectra were available for NGC 2346 (Walsh 1983) and NGC 7009 (Preston and Willson 1990), for NGC 6563 and NGC 6826 lower limits were derived from deprojections.

Name	Type	P.A. (N over E)	i
NGC 2346	Middle B.	$-13°$	70°
NGC 6563	Late E.	$+66°$	75°
NGC 6826	Early E.	$-54°$	65°
NGC 2346	Middle E.	$+71°$	90°

The solutions become ambiguous for $i < 90°$, conserving most morphological features down to $i = 60°$ (Bremer 1995). Their unique part can be isolated in Fourier space, which leaves for ideal axial symmetry a cone of ignorance with a half opening angle $90° - i$ where information is lost (see Rybicki (1986), Palmer 1994), Gerhard and Binney (1996)).

Numerical deprojection experiments are presented indicating that under favorable conditions, one can reduce the cone of ignorance for distributions deviating from ideal axial symmetry. To test this on real morphologies, experimental cones were calculated for the objects above by varying i by 3°. The results are very close to the $90° - i$ limits. This shows that even when taking into account deviations from axial symmetry, the cone of ignorance in Fourier space is not necessarily reduced.

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https://doi.org/10.1017/S0074180900130359 Published online by Cambridge University Press