

HIGH-RESOLUTION RADIAL VELOCITY AND $H\alpha$ STUDY OF PROTO-PLANETARY NEBULAE

B.J. HRIVNAK

Dept. of Physics and Astronomy, Valparaiso University, Valparaiso, IN 46383 USA
and

A.W. WOODSWORTH

Dominion Astrophysical Observatory, 5071 W. Saanich Rd., Victoria, BC V8X 4M6
CANADA

We are engaged in a program to monitor radial velocity variability in proto-planetary nebulae (PPN). Observations are being made with the radial velocity spectrometer at the DAO, with a precision of $\pm 0.5 \text{ km s}^{-1}$. Radial velocity variability can arise from binary motion and/or pulsation in these post-AGB stars. The demonstration of a binary nature for some of these objects can have important implications for the understanding of their physical properties, and for the shaping of their circumstellar shells.

We have found the following results to date:

1. all 9 PPN studied show radial velocity variability with peak-to-peak amplitudes ranging from 5 to 13 km s^{-1} ;
2. 4 objects clearly display periodic radial velocity variations, 67134+1005, 18095+2704, 22223 + 4327, 22272 + 5435, with preliminary periods ranging from 95 to 340 days.

These observations are continuing.

We have also made high resolution (0.1–0.2 Å) spectroscopic studies to investigate $H\alpha$ emission in these same objects. It can be produced by shock waves which drive mass loss, or by other activity in the atmospheres: The PPN all display spectra of F and G supergiants. They have each each been observed between 1 and 7 times, with the following results to date:

1. $H\alpha$ emission is common in the F stars, as it is seen in 3 of 5;
2. in the G stars 1 in 4 shows emission above the continuum;
3. P Cygni, reverse P Cygni and shell profiles are seen;
4. $H\alpha$ emission varies in strength in the objects.