

Spectroscopic Study of the Variable Planetary Nebula IC 4997

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Abstract—Based on our spectroscopic observations of the variable planetary nebula IC 4997 in 2003–2009, we have obtained the relative fluxes in optical emission lines. The interstellar extinction $c = 0.35$ has been found from the Balmer decrement by taking into account the effect of self-absorption in hydrogen lines in dense nebular regions. The variations in the Balmer decrement point to variability of the self-absorption and circumstellar extinction. We have investigated the variations in the relative intensities of some spectral lines and their ratios with time. The drop in the ratios $F(\lambda 4363)/F(\text{H}\gamma)$ and $F(\lambda 4363)/F(\lambda 4959)$ that began back in 1990–1995 has continued, suggesting a decrease in the electron density and temperature in the central nebular region. The ratio $F(\lambda 6731)/F(\lambda 6717)$ has remained constant. It gives an estimate for the electron density in the outer regions of IC 4997, $N_e \sim 10^4 \text{ cm}^{-3}$.

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