
Planetary Nebulae genesis: emerging HII regions in post-AGB stars

Carmen Sanchez Contreras^{*1}, Alejandro Baéz-Rubio², Javier Alcolea³, Valentin Bujarrabal³, and Jesus Martin-Pintado¹

¹Centro de Astrobiología (CAB, INTA-CSIC) – Spain

²Instituto de Astronomía, UNAM – Mexico

³Observatorio Astronómico Nacional (OAN) – Spain

Abstract

We report the results from a pilot search for radio recombination line (RRL) emission at millimeter wavelengths in a small sample of pre-Planetary Nebulae (pPNe) and young PNe (yPNe) with emerging central ionized regions. These lines are excellent probes of the dense inner ($< \sim 150$ au) and heavily obscured regions of these objects, where the yet unknown agents for PN-shaping operate. We present the observations and the main results derived from non-LTE line and continuum radiative transfer models of the mm-RRL and continuum emission, which has allowed us to constrain the structure, kinematics, and physical conditions (electron temperature and density) of the ionized cores of our sample. One fundamental outcome from our analysis is the estimate of the mass-loss rates of the young (> 15 - 30 yr old) post-AGB ejections in our sample. We deduce mass-loss rates of pAGB $\approx 10^{-6}$ - 10^{-7} Msun/yr, which are significantly higher than the values adopted by stellar evolution models currently in use and that would result in a transition from the Asymptotic Giant Branch to the PN phase faster than hitherto assumed.

Keywords: AGB and post, AGB, circumstellar matter: winds, outflows, mass, loss, HII regions, radio recombination lines

*Speaker