

EVOLUTION OF MAGELLANIC CLOUD PLANETARY NEBULAE

Stephen J. Meatheringham, Michael A. Dopita, and Peter R. Wood
Mount Stromlo and Siding Spring Observatories,
Australian National University
B. Louise Webster
School of Physics, University of New South Wales
David H. Morgan
Royal Observatory, Edinburgh
Holland C. Ford
Space Telescope Science Institute

ABSTRACT. New evolutionary correlations have been discovered to apply to the population of Planetary Nebulae (PN) in the Magellanic Clouds. Firstly, the age of the nebular shell is found to follow a relationship $\tau = 890[(M_{neb}/M_{\odot})(V_{exp}/\text{km s}^{-1})]^{0.6}$ yr, which is shown to be consistent with a model in which the total energy of the ionised and swept up gas drives the expansion down the density gradient in the precursor AGB wind. Secondly, a tight correlation is found between the expansion velocity and a combination of the Excitation Class and the H β flux. This appears to be determined by the mass of the planetary nebula nuclear star. These correlations provide strong observational support for the idea that the PN shells are ejected at low velocity during the Asymptotic Giant Branch phase of evolution, and that they are continually accelerated during their nebular lifetimes.