

A New Population of Planetary Nebula Discovered in the Large Magellanic Cloud

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Abstract.

We report discovery of ~ 600 planetary nebula (PN) in the central 25 sq. degree region of the Large Magellanic Cloud (LMC). Candidates were found on a multi-exposure $H\alpha$ and short red (SR) combined UK Schmidt Telescope (UKST) map. Confirmatory 2dF fibre spectroscopy on the Anglo-Australian Telescope (AAT) has almost tripled PN in the LMC central bar region. This new population will have important implications for the PN luminosity function and will provide improved kinematics, refined abundance gradients and a better picture of chemical evolution.

Keywords: Large Magellanic Cloud, Planetary Nebula, H-alpha survey

INTRODUCTION

Problems of distance determination affecting the PN luminosity function and physical properties can be overcome by studying PN in the LMC where, by approximation, all PN are at 51kpc. Several studies have surveyed for LMC PN but confirmed numbers remain modest (~ 300) compared to the several thousand that might be expected (Jacoby 1980).

THE AAO/UKST $H\alpha$ MAP OF THE LMC

Sets of 12 well-matched 2-hour, high resolution UKST $H\alpha$ exposures and 6 equivalent 15-min SR exposures of the LMC were digitally stacked by the SuperCOSMOS facility at the Royal Observatory, Edinburgh, creating 10 micron (0.67 arcsec) pixel data which goes 1.35 and 1 magnitudes deeper than individual exposures giving R_{equiv} 22 for $H\alpha$ and 21.5 for SR. The stacked data sets were registered onto the same pixel grid followed by accurate assignment of a world co-ordinate system creating the most uniform narrow-band map of the LMC ever made.

PN CANDIDATE SELECTION METHOD

Candidate emission sources were found via an adaptation of a technique within the ATNF KARMA package (Gooch 1996). Careful software parameter selection allowed the matched $H\alpha$ and SR images to be perfectly balanced allowing only peculiarities of either pass-band to be observed. This revealed over 2000 emission sources. The techniques' veracity has been powerfully

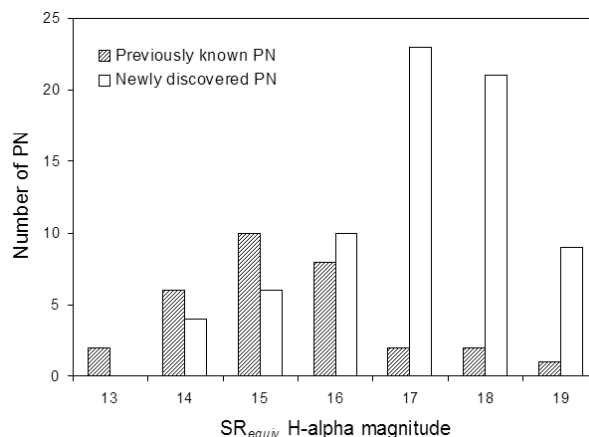


FIGURE 1. Previously known vs. newly confirmed PN by magnitude in the preliminary 3.25° square region. An overall increase in number and depth by 3 magnitudes is evident.

demonstrated: firstly by initial results from a small 3.25° square area (Figure 1; Reid & Parker, 2005), then by the independent re-identification of all previously known PN in the studied region and thirdly by our complete AAT 2dF survey which confirmed ~ 400 new PN, ~ 200 probable PN and a large number of other emission line sources.

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