IMAGING OF MAGELLANIC CLOUD PLANETARY NEBULAE WITH THE HUBBLE SPACE TELESCOPE

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We have obtained Hubble Space Telescope (HST) Planetary Camera (PC) images of a number of Magellanic Cloud planetary nebulae. The objects, except for SMP 83 were observed as part of the Cycle I GO program. The observations were made in the [O III] λ5007Å line. The object SMP 83, was observed as part of the GTO program, and in this case observations were also made in the Hα line using the F650N filter. In order to characterise the point spread function, a star was placed at the same point on the chip as the PN. This allowed us to determine the diameters of barely resolved PN in an accurate manner, by convolving the PSF with a function until it matched the appearance of the PN image. The results are given in Table 1.

Table 1: Dimensions and Dynamical Ages of the LMC PN inferred from HST Images.

Object	Size (arc sec.)	Radius (cm)	Dynamical Age (yr)
SMP 02	0.25x0.25	9.32e+16	2980
SMP 08	0.06x0.07	2.43e+16	310
SMP 20	0.21x0.43	1.61e+17	1969
SMP 35	0.64x0.86	2.80e+17	2150
SMP 47	0.13x0.21	7.84e+16	320
SMP 72	1.72x2.02	6.97e+17	-
SMP 76	0.13x0.13	5.24e+16	570
SMP 83	0.70x1.46	4.04e+17	1544
SMP 85	0.07x0.07	2.60e+16	1070
SMP 87	0.79x0.82	3.02e+17	2560
SMP 96	0.17x0.52	1.94e+17	1007

All the low excitation PN (E.C < 4) are compact objects, barely resolved with HST. These have [O III] diameters which are much smaller than was expected on the basis of photoionisation models, even when the fact that the O^{++} zone occupies only a fraction of the ionised volume has been taken into account. This result can therefore be taken to mean that the O^{++} zone is denser than the model.A second result is that the dynamical ages of these PN, as shown in Table 1, are much shorter than the evolutionary timescale of the central stars. This situation can only be maintained if there exists a dense, slowly expanding core of un-ionised gas in these PN, perhaps associated with shell ejection in the last helium flash. This gas would have to have an expansion velocity of only ~1-3 $km.s^{-1}$ in order to have remained compact to the present day.

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