Abstract. We have analyzed the behaviour of various parameters of PNe in the Magellanic Clouds (MCs) and the Galaxy as a function of their morphology. The luminosity function of different morphological types has been built, finding that elliptical and round PNe dominate the bright cutoff both in the MCs and in the Galaxy. The dependence of the [OIII] absolute magnitude on chemical abundances has been investigated.

1. The samples

The MCs sample (51 objects) has been selected choosing PNe whose morphology was studied with the HST by Stanghellini et al. (1999, 2002a) and Shaw et al. (2001). Their chemical abundances and relative fluxes have been obtained from the work of Leisy & Dennefeld (2003), and the absolute fluxes from Jacoby et al. (1990).

We have analyzed two Galactic samples as well. We have obtained their morphological classification from Corradi & Schwarz (1995) and Stanghellini et al. (2002b). The first sample is composed by PNe whose data are available in the ESO-Strasbourg Catalogue (Acker et al. 1992), while the second one consists of objects in common between PNe whose chemical abundances have been re-determined by Perinotto et al. (2003) and PNe whose distances have been recently obtained by Phillips (2002). We consider the distances of the second sample to be more uniform and accurate.

2. The Planetary Nebulae Luminosity Function

We have investigated the dependence of the PNe luminosity function on their morphology in order to study which kind of PN has the highest probability to be observed in a far galaxy where only the brightest part of the luminosity function
can be detected. In Fig. 1 and Fig. 2 we present the [O iii] 5007Å luminosity function of the MCs and Galactic PNe respectively, built distinguishing among different morphological types. From these figures, we have noted that the PNLF bright cutoff is dominated by elliptical and round PNe both in the the MCs and in the Milky Way. Elliptical PNe with bipolar cores (a class defined by Stanghellini et al. 1999, but for which it is not clear whether they really constitute an independent physical class of PNe) appear to have the same maximum [O iii] luminosity as normal ellipticals and rounds. We have noted that in the Galaxy and in the MCs, bipolar PNe are generally less bright (in the [O iii] 5007Å line) than other morphological types. This behaviour can be interpreted considering that bipolar PNe are generally associated with more massive progenitors (cf. Corradi & Schwarz 1995). In fact, according to stellar evolution models, after ejection of the envelope at the tip of AGB the stellar core evolves to higher temperatures and subsequently turns down in the H-R diagram moving more slowly toward the white dwarf area. Higher core masses, which come from higher initial stellar masses, have larger initial luminosities and reach greater temperatures, but also have faster evolutions. Consequently they are expected to be found on average at higher temperatures but not at higher luminosities than lower mass objects (cf. Méndez et al. 1993).

3. Chemical Abundances

The determination of chemical abundances in a far galaxy from the information contained in spectra of PNe are generally obtained observing the brightest
objects. We have examined the chemical abundances of PNe with different morphological types vs mag \([\text{O } \text{iii}]\) in LMC (the sample of SMC PNe was too limited) and in the Galaxy to test for possible biases in measuring abundances from the brightest PNe (see Fig. 3a-b). In fact, as said in the previous section, the brightest PNe usually belong to elliptical or round (with or without internal bipolar structures) morphological classes. Note also that, in any classes of PNe, the chemical abundances of the element which were not altered during their evolution, i.e. Ne, Ar, S, represent the chemistry of the interstellar medium of the host galaxy at various times. In Fig. 3a-b we looked at the chemical behaviour of O and N in the LMC and in the Galaxy. In the LMC PNe we notice that the behaviour of these chemical abundances vs \([\text{O } \text{iii}]\) luminosity is quite similar for elliptical and round PNe with and without bipolar core (triangles and empty squares). The bipolar morphological class (filled squares) is represented almost by type I PNe (cf. Perinotto & Corradi 1998), which are overabundant in nitrogen and helium with respect to ellipticals. An increasing trend of the S, Ar, Ne, and O vs \([\text{O } \text{iii}]\) magnitude is seen (see Fig.3a for O) in the bipolar sample. This might be due to the shorter life of the younger and more massive progenitors which reach quickly lower luminosities and come from a more enriched interstellar medium.

In the sample of Galactic PNe (with chemical abundances from Perinotto et al. 2003 and distances from Phillips 2002, Fig. 3b for O and N) we also note that bipolar PNe are on average overabundant in N and He. For the considered sample of Galactic PNe, no evident trend of chemical abundance vs \([\text{O } \text{iii}]\) luminosity is seen. Here, however, the uncertainties on distances which affect the \([\text{O } \text{iii}]\) luminosity are larger than those in the LMC sample. In addition, Galactic gradients of the chemical abundances spread the data over a large range.
In both cases, LMC and Galaxy, we conclude that the chemical abundances derived from the brightest PNe are representative of the total PNe population. In fact, no strong changes of chemical abundances with [O III] luminosity are seen, except for the well-known overabundance of N and He in bipolar PNe.

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