EXPANSION VELOCITIES OF [NII] and [OIII] FROM COMPACT PLANETARY NEBULAE

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We observed the expansion velocities, Vexp[NII] and Vexp[OIII] of angularly small planetary nebulae(PNe) and examined the relations between expansion velocities and distance free parameters like relative emission line intensities of HeIIλ4686, [OIII]λ5007, and [NII]λ6583. The expansion velocities of PNe are usually obtained from the emission lines of [OIII]λ5007. But these quantities obtained from [NII]λ6583 are more suitable to investigate the evolution of PNe because O^{++} region is confined within inner part for lower and intermediate excitation PNe.

The observations were made with the one-dimensional intensified Reticon system at the Coude spectrograph of the 188-cm telescope at the Okayama Astrophysical Observatory. The dispersion was 5.3-A/mm (0.13-A/pixel). Observed line profiles are fitted by Multiple Gaussians. The expansion velocity was determined from FWHM velocity or from the velocity difference between the peaks of the Gaussians. In addition to our own samples of 18 PNe, other samples of PNe have been selected from Sabbadin et al (1984) and Ortolani and Sabbadin (1985), and analyzed on the basis of their Vexp[NII] and Vexp[OIII]. The line intensities and chemical abundances were refered from several literature.

The relations between expansion velocities and distance free parameters (line intensities, chemical abundances, and the difference of expansion velocities, Vexp[NII]-Vexp[OIII]) were examined with the samples of 40 PNe. Our conclusions are as follows.

(1) Expansion velocities obtained from O^{++} are systematically smaller than those from N^{+} even in apparently compact PNe.

(2) The expansion is certainly accelerated from the center of PN even among our samples.

(3) Expansion velocities do not depend upon chemical abundances.

(4) We can show several relations between expansion velocities and line intensities which have to be explained with the expansion model of PNe. For example, the relations between Vexp[OIII] and I([NII]λ6583)/I(Hα): Vexp[NII] and I([OIII]λ5007)/I(Hβ) with the parametar of I(HeIIλ4686)/I(Hβ) seem to be the most promising ones to establish expansions of PNe.

S. Torres-Peimbert (ed.), Planetary Nebulae, 190.