THEORETICAL LIGHT CURVES FOR TYPE IA SUPERNOVAE AND DETERMINATION OF THE HUBBLE CONSTANT

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The large luminosity ($M_V \approx -19 \sim -20$) and the homogeneity in light curves and spectra of Type Ia supernovae(SNe Ia) have led to their use as distance indicators ultimately to determine the Hubble constant (H_0). However, an increasing number of the observed samples from intermediate- and high-z ($z \sim 0.1 - 1$) SN Ia survey projects(Hamuy et al. 1996, Perlmutter et al. 1997) have shown that there is a significant dispersion in the maximum brightness (~ 0.4 mag) and the *brighter-slower* correlation between the brightness and the postmaximum decline rate, which was first pointed out by Phillips(1993). By taking the correlation into account, Hamuy et al.(1996) gave an estimate of H_0 within the error bars half as much as previous ones.

To clarify the possible reason of this new observational fact, we calculated monochromatic light curves for a variety of explosion models of SNe Ia with a time-dependent, multi-frequency, and multi-angle radiative transfer code. The models applied here include a standard deflagration model W7 and a series of delayed detonation models with a parameterized transition density from deflagration to detonation. We find that amongst the Chandrasekhar mass white dwarf models the difference in the ^{56}Ni mass in delayed detonation models may reproduce the observed correlation due to the difference in thermal structure of the ejecta and the temperature dependence of opacities. As a result of light curve fit for some of the above samples of SNe Ia, we found the value of the Hubble constant to be $H_0 = 66 \pm 12$ km sec^{-1} Mpc^{-1} (Iwamoto 1997, Iwamoto et al. 1998)

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