SNLS: The Supernova Type Ia Rate at z = 0.47

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We present a preliminary measurement of the distant Type Ia supernova rate derived from the Canada – France – Hawaii Telescope Supernova Legacy Survey (SNLS). By observing four one-square degree fields with a high temporal frequency ($\langle \Delta t \rangle \sim 4$ observer-frame days) over large fractions of a year (~ 6 months each field, with breaks during full moon) and using 8 meter-class telescopes for spectroscopic followup, the survey not only provides the dense time sampling needed to achieve a high completeness, but also enjoys the benefit of high quality spectroscopy to verify the Type Ia candidates and hence reduce contamination from non-Type Ia events. The goal of the survey is to measure $\sim$ 700 Type Ia SNe out to $z \sim 1$ over a period of 5 years. We use the first two years of survey data to begin characterizing the Type Ia sample and explore a methodology for calculating rates from the survey. We use individual SNLS survey epoch properties to observe Monte Carlo simulations of 10^6 Type Ia supernovae in the redshift range $0.2 < z < 0.6$, and thus derive our survey efficiency. We combine this efficiency with a carefully selected control sample of spectroscopically confirmed SNLS Type Ia SNe to derive a volumetric rate. When comparing our volumetric rate with other ground-based surveys that also use spectroscopic candidate verification, we find no evidence for significant systematic underestimation of the SN Ia rates near $z = 0.5$. When comparing published SN Ia rates spanning the redshift range $0.0 < z < 1.6$ to models of SN Ia production, we find that neither pure delay-time models nor two component models can accommodate all the observed data.

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