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Light-curve and spectral properties of ultra-stripped core-collapse supernovae

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Abstract. We discuss light-curve and spectral properties of ultra-stripped core-collapse supernovae. Ultra-stripped supernovae are supernovae with ejecta masses of only $\sim 0.1 M_\odot$ whose progenitors lose their envelopes due to binary interactions with their compact companion stars. We follow the evolution of an ultra-stripped supernova progenitor until core collapse and perform explosive nucleosynthesis calculations. We then synthesize light curves and spectra of ultra-stripped supernovae based on the nucleosynthesis results. We show that ultra-stripped supernovae synthesize $\sim 0.01 M_\odot$ of the radioactive ^{56}Ni, and their typical peak luminosity is around 10^{42} erg s^{-1} or -16 mag. Their typical rise time is $5-10$ days. By comparing synthesized and observed spectra, we find that SN 2005ek and some of so-called calcium-rich gap transients like PTF10iuv may be related to ultra-stripped supernovae.

Keywords. supernovae: general, gravitational waves

Ultra-stripped supernovae (SNe) are SNe with ejecta masses of only $\sim 0.1\ M_\odot$. When a SN progenitor has a compact companion, this kind of SNe with extreme stripping can occur (e.g., Tauris *et al.* 2013). We show light-curve and spectral properties of ultra-stripped SNe in Fig. 1. See Moriya *et al.* (2016) for more details.

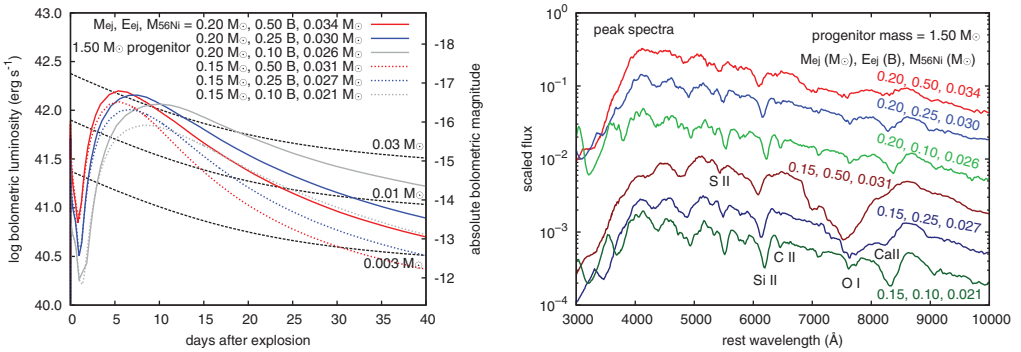

Figure 1. Light-curve (left) and spectral (right) properties of ultra-stripped SNe.

References

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