SUPERLUMINOUS SUPERNOVAE HYDRODYNAMIC MODELS

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Recently discovered very luminous supernovae present stimulating cases to explore the extents of the available theoretical models. We use our radiation hydrodynamic code in order to simulate magnetar powered Superluminous Supernovae (SLSNe). It is assumed that the central rapidly rotating magnetar deposits all its rotational energy into the ejecta which is added to the usual power by radioactive nickel decay. The magnetar luminosity and spin-down timescale are adopted as the free parameters of the model. For the case of ASASSN-15lh, which has been claimed as the most luminous supernova ever discovered, we have found physically plausible magnetar parameters can reproduce the overall shape of the bolometric light curve (LC) provided the progenitor mass is $\approx 6M_{\odot}$. The ejecta dynamics of this event shows signs of the magnetar energy input which deviates the expansion from the usually assumed homologous behaviour. Our numerical experiments lead us to conclude that the hydrodynamical modeling is necessary in order to derive the properties of powerful magnetars driving SLSNe and to characterize their stellar progenitors.

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