K05a HSC Transient Survey (III): The diversity of early-phase Type Ia supernovae

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Type Ia supernovae (SNe Ia) have been used as "standard candles" to demonstrate the accelerating expansion of the universe although the nature of their progenitor systems and how the stars explode are still obscured. As a growing number of SNe Ia found in the first few days of their explosion, some of them show abnormal brightness excess in the early phase ("early-excess SNe Ia"), which indeed have been predicted as a unique diagnostic for identifying the progenitor of SNe Ia. The recent discovery of a peculiar early-excess SN Ia, MUSSES1604D by Subaru/HSC indicates a "new" channel so-called the helium-detonation scenario to interpret the peculiar light curve behavior of early-phase SNe Ia. In this presentation, we will present the details of previously discovered early-excess SNe Ia, and discuss possible intrinsic connections among these objects. After that, we will talk about advantages and prospects of the early-phase SNe Ia study in the Subaru/HSC era.