J/MNRAS/437/656 SN PS1-11ap light curves (McCrum+, 2014)

The superluminous supernova PS1-11ap:
bridging the gap between low and high redshift.
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Rodney S.A., Chen T.-W., Howell D.A., Huber M.E., Pastorello A.,
Tonry J.L., Bresolin F., Kudritzki R.-P., Chornock R., Berger E., Smith K.,
Botticella M.T., Foley R.J., Fraser M., Milisavljevic D., Nicholl M.,
Riess A.G., Stubbs C.W., Valenti S., Wood-Vasey W.M., Wright D.,
Young D.R., Drout M., Czekala I., Burgett W.S., Chambers K.C., Draper P.,
Flewelling H., Hodapp K.W., Kaiser N., Magnier E.A., Metcalfe N.,
Price P.A., Sweeney W., Wainscoat R.J.
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=2014MNRAS.437..656M (SIMBAD/NED BibCode)

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Abstract:
We present optical photometric and spectroscopic coverage of the superluminous supernova (SLSN) PS1-11ap, discovered with the Pan-STARRS1 Medium Deep Survey at z=0.524. This intrinsically blue transient rose slowly to reach a peak magnitude of M_u=-21.4mag and bolometric luminosity of $8x10^{43}$erg/s before settling on to a relatively shallow gradient of decline. The observed decline is significantly slower than those of the SLSNe-Ic which have been the focus of much recent attention. Spectroscopic similarities with the lower redshift SN2007bi and a decline rate similar to 56Co decay time-scale initially indicated that this transient could be a candidate for a pair instability supernova (PISN) explosion. Overall the transient appears quite similar to SN2007bi and the lower redshift object PTF12dam. The extensive data set, from 30d before peak to 230d after, allows a detailed and quantitative comparison with published models of PISN explosions. We find that the PS1-11ap data do not match these model explosion parameters well, supporting the recent claim that these SNe are not pair instability explosions. We show that PS1-11ap has many features in common with the faster declining SLSNe-Ic, and the light-curve evolution can also be quantitatively explained by the magnetar spin-down model. At a redshift of z=0.524, the observer-frame optical coverage provides comprehensive rest-frame UV data and allows us to compare it with the SLSNe recently found at high redshifts between z=2 and 4. While these high-z explosions are still plausible PISN candidates, they match the photometric evolution of PS1-11ap and hence could be counterparts to this lower redshift transient.

Description:
The PS1 system is a high-etendue wide-field imaging system, designed for dedicated survey observations. The system is installed on the peak of Haleakala on the island of Maui in the Hawaiian island chain. The telescope has a 1.8m diameter primary mirror, and the gigapixel camera (GPC1) located at the f/4.4 Cassegrain focus consists of sixty 4800x4800-pixel detectors (pixel scale 0.258-arcsec) giving a field of view of 3.3° diameter.

The PS1 observations are obtained through a set of five broad-band filters, which are designated as gP1, rP1, iP1, zP1 and yP1.

The PS1 photometric system and its response are covered in detail in Tonry et al. (2012ApJ...750...99T, Cat. J/ApJ/750/99).

Objects:

RA (2000)	DE	Designation(s)
10 48 27.7	+57 09 09.2	PS1-11ap = PS1-11ap

File Summary:

FileName	Lrecl	Records	Explanations
ReadMe	80	.	This file
tablea1.dat	55	240	Observed photometry of PS1-11ap, without K-corrections.

See also:
J/ApJ/750/99 : The Pan-STARRS1 photometric system (Tonry+, 2012)

Byte-by-byte Description of file: tablea1.dat

Bytes	Format	Units	Label	Explanations
1- 10	A10	"date"	Obs.date	Observation date
12- 19	F8.2	d	MJD	Modified Julian date of observation
21- 23	F3.2	d	e_MJD	? rms uncertainty on MJD (1)
26- 31	F6.2	d	Phase	Phase (days since explosion)
33- 35	F3.2	d	e_Phase	? rms uncertainty on Phase (1)
37	A1	---	l_mag	Limit flag on mag
38- 42	F5.2	mag	mag	LT magnitude in Filter (2)
44- 47	F4.2	mag	e_mag	? rms uncertainty on mag
49- 51	A3	---	Filt	[grizy P1] Filter (3)
53- 55	A3	---	Tel	[LT PS1] Telescope

Note (1): The MJD and phase of any observations from 2011 December onwards
represent the mid-points of the co-added frames, hence the uncertainties given.
Note (2): The LT magnitudes (Filters GRIZ) have been converted to the PS1
system as discussed in Section 2.2.
Note (3): LT filters: g, r, i and z.
PS1 filters: gP1, rP1, iP1, zP1 and yP1.

History:
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(End) Patricia Vannier [CDS] 10-Mar-2015

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