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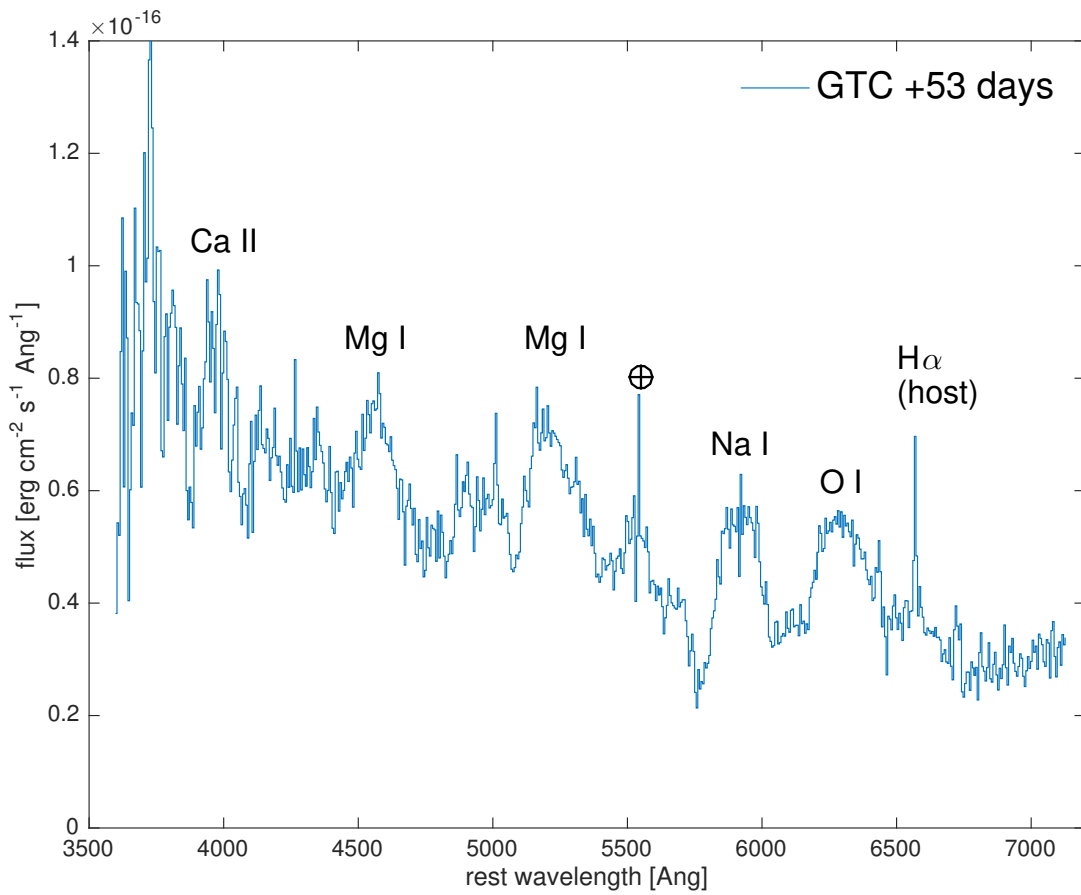
**Supplementary information**

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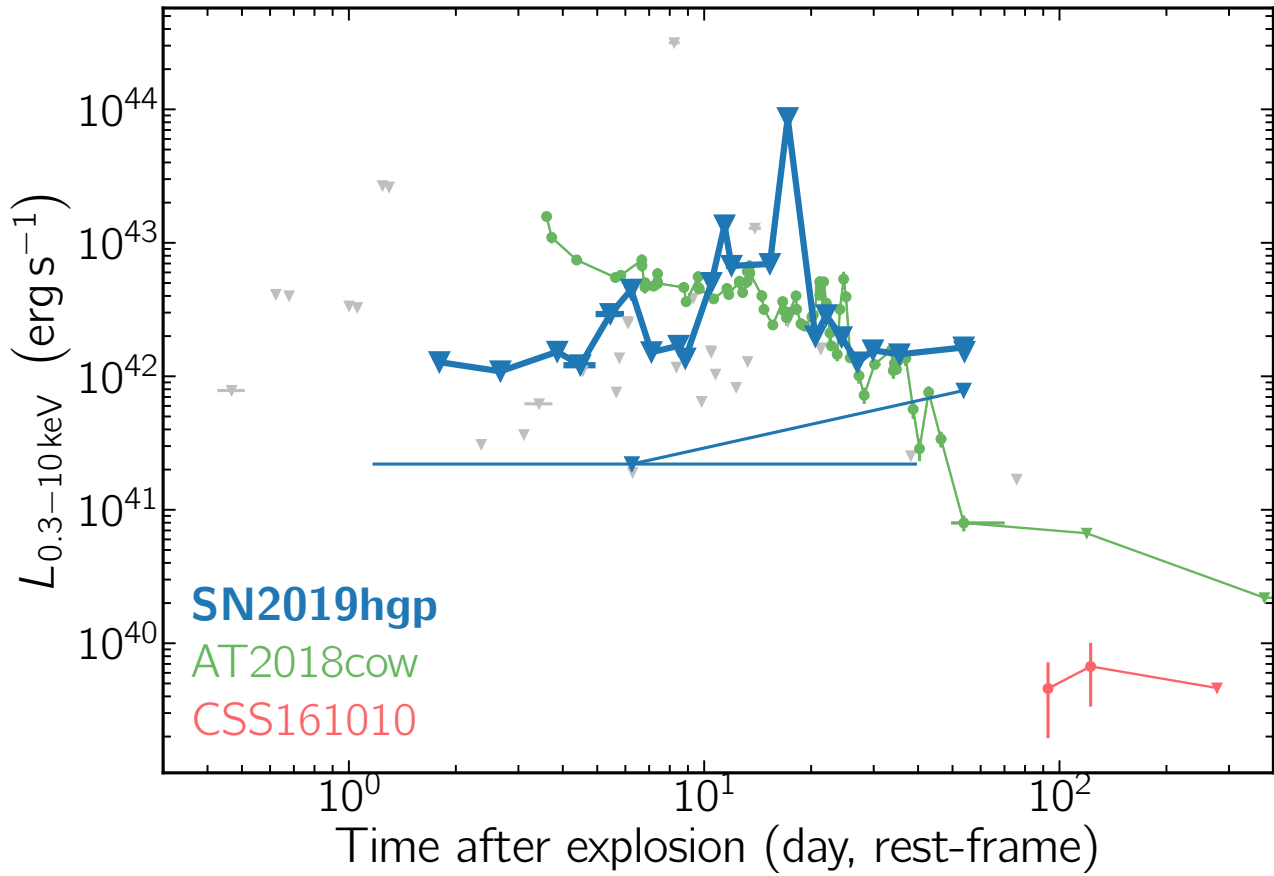
**A WC/WO star exploding within an  
expanding carbon–oxygen–neon nebula**

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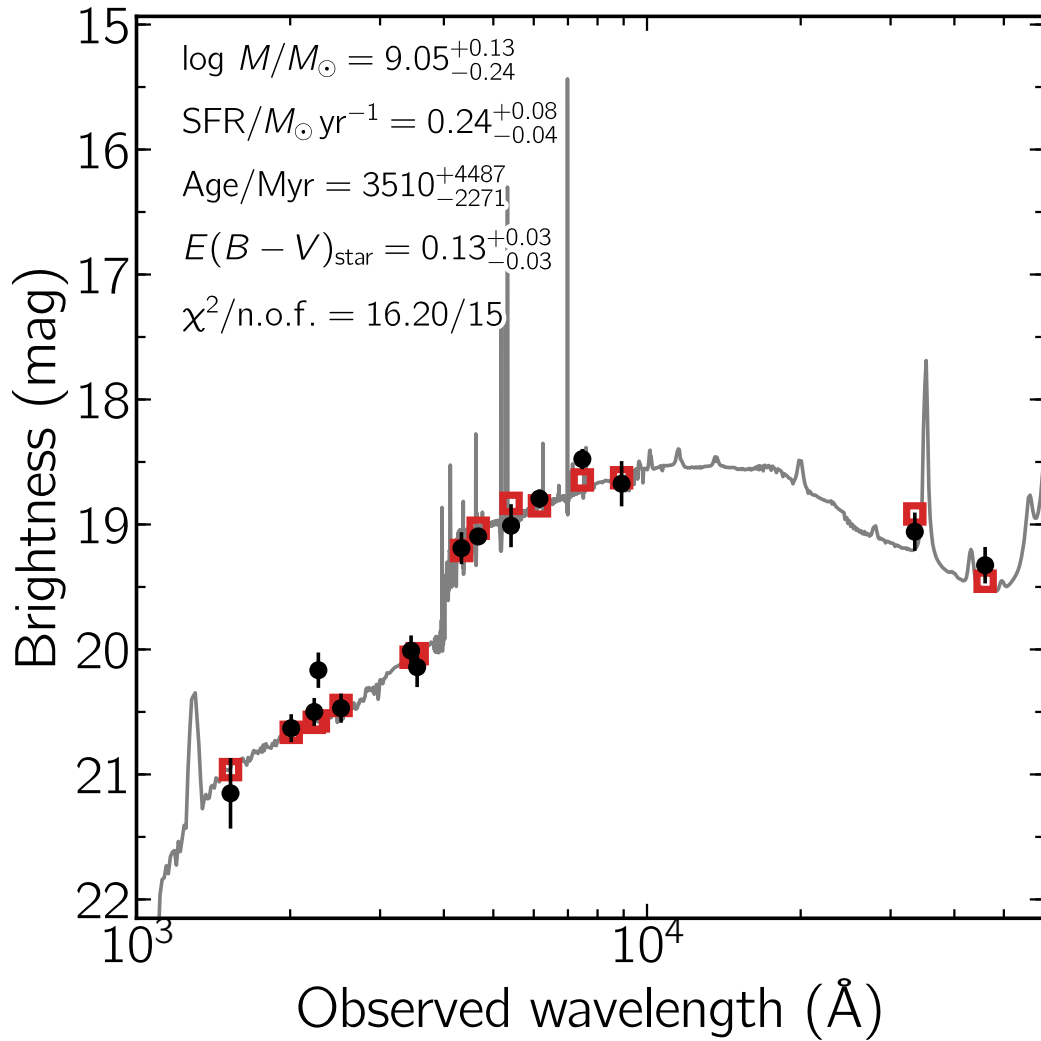
In the format provided by the  
authors and unedited



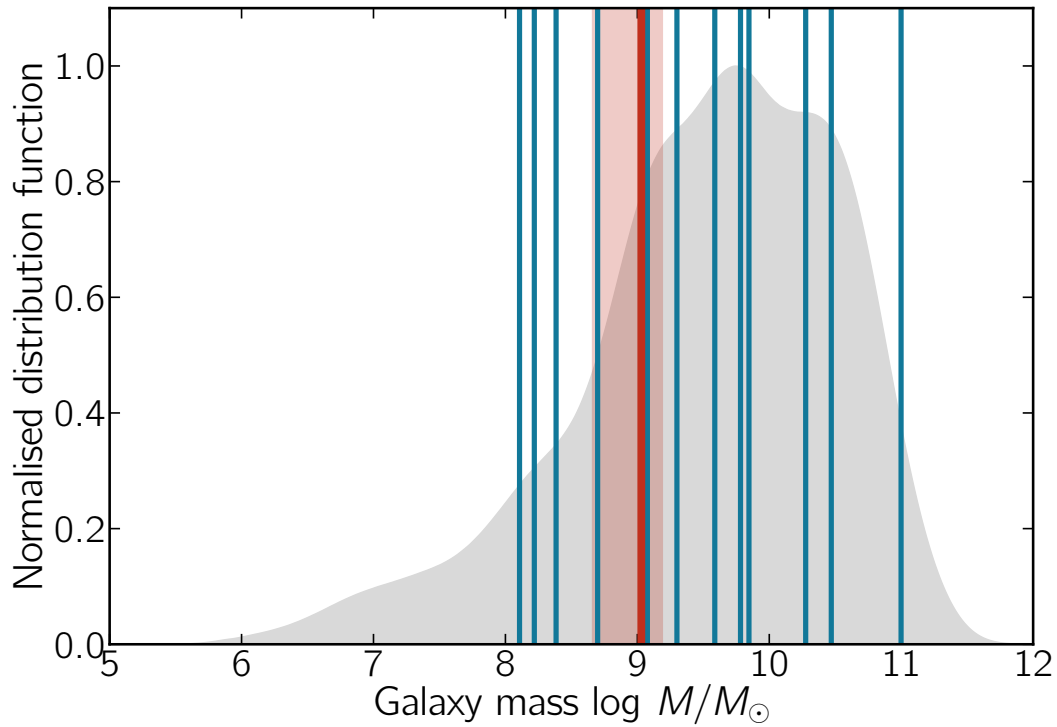
**Supplementary Figure 1** A nebular spectrum of SN 2019hgp obtained 52.8d after explosion. Common emission features are marked. Weak absorption from Na I D and Mg I]  $\lambda_{4571\text{\AA}}$  may suggest that the spectrum is not fully nebular at this time.



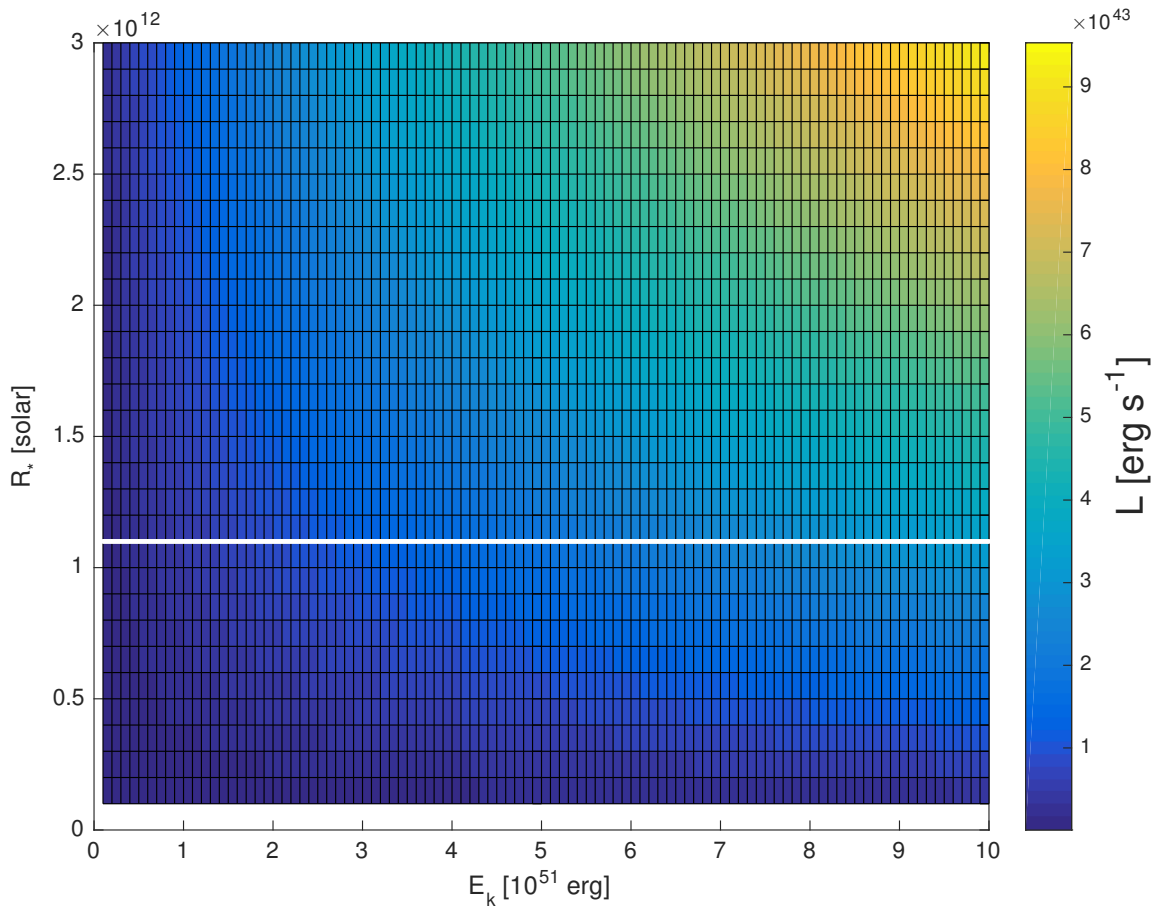
**Supplementary Figure 2** Comparison of the X-ray luminosity of RETs. Only two events (AT2018cow and CSS161010; filled circles) are detected. Upper limits (grey triangles - sample; blue triangles - SN 2019hgp) indicate we should have detected SN 2019hgp in X-ray if it had a similar X-ray luminosity to that of AT2018cow, but not if it was similar to CSS161010. For SN 2019hgp, we present orbit stack (connected with a heavy line) as well as dynamically binned limits (thinner line). This comparison motivates more sensitive studies of SNe Ibn and Icn, extending to beyond 100 days. Standard  $1\sigma$  error bars marked.



**Supplementary Figure 3** Spectral energy distribution (SED) of the host galaxy of SN 2019hgp from 1000 to 60,000Å (black data points). The solid line displays the best-fitting SED model. The red squares represent the model-predicted magnitudes. The fitting parameters are shown in the upper-left corner. The abbreviation "n.o.f." stands for numbers of filters. Standard  $1\sigma$  error bars marked.



**Supplementary Figure 4** The host-galaxy mass of SN 2019hgp (red line, uncertainty marked with transparent rectangle) and Type II SNe with flash features (blue lines) from the PTF survey in the context of host galaxies of all Type II SNe from the PTF survey (grey distribution). SNe with flash features span a wide range of galaxies from  $10^8 M_{\odot}$  to  $10^{11} M_{\odot}$ . The host of SN 2019hgp does not stand out among the hosts of flash objects.



**Supplementary Figure 5** The peak bolometric luminosity of the shock-cooling emission (color-coded) from explosions with varying progenitor radii and explosion energies, calculated using theoretical formulae<sup>16</sup>. The peak luminosity we measure ( $L = 3.44 \times 10^{43} \text{ erg s}^{-1}$ ; always above white horizontal line) requires supergiant progenitors with  $R_* > 10^{12} \text{ cm}$ .

Supplementary Table 1. SN 2019hgp Photometry

MJD (days)	Rest-frame Phase (days)	AB MAG	Instrument	Filter
58638.23	-2.69	> 20.81	P48	r
58638.26	-2.67	> 20.78	P48	r

Note. — Full table is available as a separate, machine-readable file. A portion is shown here for clarity. No extinction correction has been applied. The GTC photometry is not host-subtracted.

Supplementary Table 2. SN 2019hgp Spectroscopy

Observation date (UTC)	Phase (days)	Facility	Exp. time (s)	Grism/Grating	Slit (arcsec)	Range (Å)
2019 Jun 08 03:18:05	1.0	P60/SEDM	2250		IFU	3776–9200
2019 Jun 08 12:51:13	1.4	Gemini N./GMOS	2 × 900	B600+G5307	1	3630–6850
2019 Jun 08 12:51:13 (host)	1.4	Gemini N./GMOS	2 × 900	B600+G5307	1.0	3630–6850
2019 Jun 08 22:03:49	1.8	LT/SPRAT	1200		1.8	4020–7960
2019 Jun 08 22:12:38	1.8	P60/SEDM	2250		IFU	3776–9200
2019 Jun 09 02:14:49	2.0	LT/SPRAT	1400		1.8	4020–7960
2019 Jun 09 04:00:39	2.1	P60/SEDM	2250		IFU	3776–9200
2019 Jun 09 22:26:20	2.8	LT/SPRAT	1600		1.8	4020–7960
2019 Jun 10 07:26:06	3.2	Gemini N./GMOS	2 × 900	B600+G5307	1	3630–6850
2019 Jun 10 21:55:03	3.8	LT/SPRAT	600		1.8	4020–7960
2019 Jun 10 22:05:12	3.8	LT/SPRAT	600		1.8	4020–7960
2019 Jun 11 22:47:15	4.8	P60/SEDM	2250		IFU	3776–9200
2019 Jun 11 23:33:50	4.9	NOT/ALFOSC	2700	Grism_#4	1	3600–9700
2019 Jun 12 08:03:00	5.2	HET/LRS2	1800	blue arm	IFU	3640–6950
2019 Jun 12 22:02:47	5.8	WHT/ACAM	900	V400	1	3750–9200
2019 Jun 12 23:45:21	5.9	P60/SEDM	2250		IFU	3776–9200
2019 Jun 14		Lick 3-m/KAST				3200 9150
2019 Jun 14 01:57:52	6.9	P60/SEDM	2250		IFU	3776–9200
2019 Jun 15 00:39:02	7.9	P60/SEDM	2250		IFU	3776–9200



Supplementary Table 2 (cont'd)

Observation date (UTC)	Phase (days)	Facility	Exp. time (s)	Grism/Grating	Slit (arcsec)	Range (Å)
2019 Jun 15 07:13:00	8.2	HET/LRS2	2000	blue arm	IFU	3640–6950
2019 Jun 15 22:02:17	8.9	LT/SPRAT	1800		1.8	4020-7960
2019 Jun 16 21:53:05	9.8	P60/SEDM	2250		IFU	3776-9200
2019 Jun 16 22:08:36	9.8	LT/SPRAT	2400		1.8	4020-7960
2019 Jun 17 06:58:00	10.2	HET/LRS2	1800	blue arm	IFU	3640-6950
2019 Jun 17 21:44:01	10.8	NOT/ALFOSC	2400	Grism_#4	1	3600-9700
2019 Jun 19 02:31:11	12.0	P60/SEDM	2250		IFU	3776-9200
2019 Jun 19 22:45:24	12.8	LT/SPRAT	1200		1.8	4020-7960
2019 Jun 19 23:05:33	12.9	LT/SPRAT	1200		1.8	4020-7960
2019 Jun 22 07:49:13	15.2	LDT/Deveny/LMI	2 × 450	300/4000	1.5	3550-7970
2019 Jun 26 09:05:37	19.3	P200/DBSP	1200	600/4000 & 316/7150	1.5	3600-10500
2019 Jun 30 09:50:46	23.3	Keck1/LRIS	1800		1	3120-10230
2019 Jul 01 07:43:10	24.2	P200/DBSP	1500	600/4000 & 316/7150	1.5	3400-10000
2019 Jul 04 10:49:25	27.4	Keck1/LRIS	850	400/3400, 400/8500	1	3100-10300
2019 Jul 29 21:19:22	52.8	GTC/OSIRIS	3x1400	R1000B & R1000R	0.8	3630-10200
2019 Jul 30 04:21:00	53.1	HET/LRS2	1800	red & blue arm	IFU	4010-9950

Note. — The phase is calculated with respect to the estimated explosion date on June 7.1 2019 and is here given in the observer frame.

Supplementary Table 3. Photometry of the host galaxy of SN 2019hgp

Survey/ Telescope	Instrument	Filter	Brightness (mag)
<i>GALEX</i>		<i>FUV</i>	$21.31 \pm 0.26$
<i>Swift</i>	UVOT	<i>uvw2</i>	$20.80 \pm 0.05$
<i>GALEX</i>		<i>NUV</i>	$20.34 \pm 0.10$
<i>Swift</i>	UVOT	<i>uvm2</i>	$20.67 \pm 0.05$
<i>Swift</i>	UVOT	<i>uvw1</i>	$20.60 \pm 0.06$
<i>Swift</i>	UVOT	<i>u</i>	$20.11 \pm 0.07$
SDSS		<i>u'</i>	$20.23 \pm 0.15$
<i>Swift</i>	UVOT	<i>b</i>	$19.26 \pm 0.08$
SDSS		<i>g'</i>	$19.17 \pm 0.03$
<i>Swift</i>	UVOT	<i>v</i>	$19.07 \pm 0.14$
SDSS		<i>r'</i>	$18.85 \pm 0.05$
SDSS		<i>i'</i>	$18.52 \pm 0.06$
SDSS		<i>z'</i>	$18.70 \pm 0.17$
<i>WISE</i>		<i>W1</i>	$19.06 \pm 0.12$
<i>WISE</i>		<i>W2</i>	$19.33 \pm 0.11$

Note. — All magnitudes are reported in the AB system and not corrected for reddening.