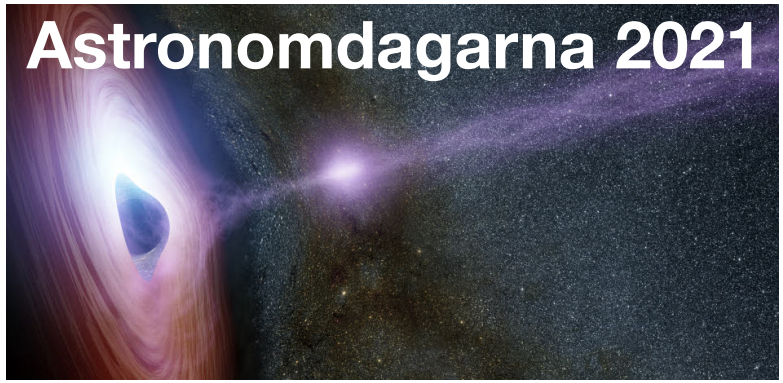

SN 2018bsz: significant dust formation in a nearby superluminous supernova

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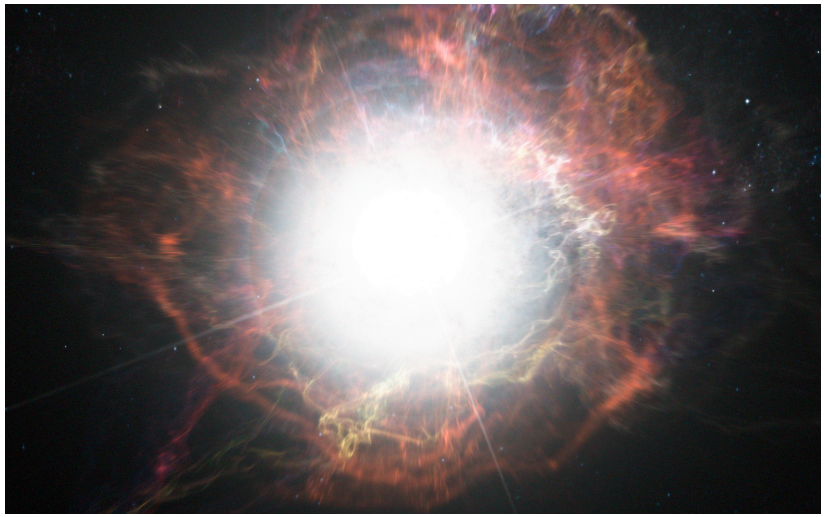
Are core-collapse supernovae the main source for cosmic dust?

- Observations of the most distant quasars ($z > 6$) show evidence for large masses of dust in galaxies in the early Universe.
  e.g. Bertoldi+03; Dwek+07

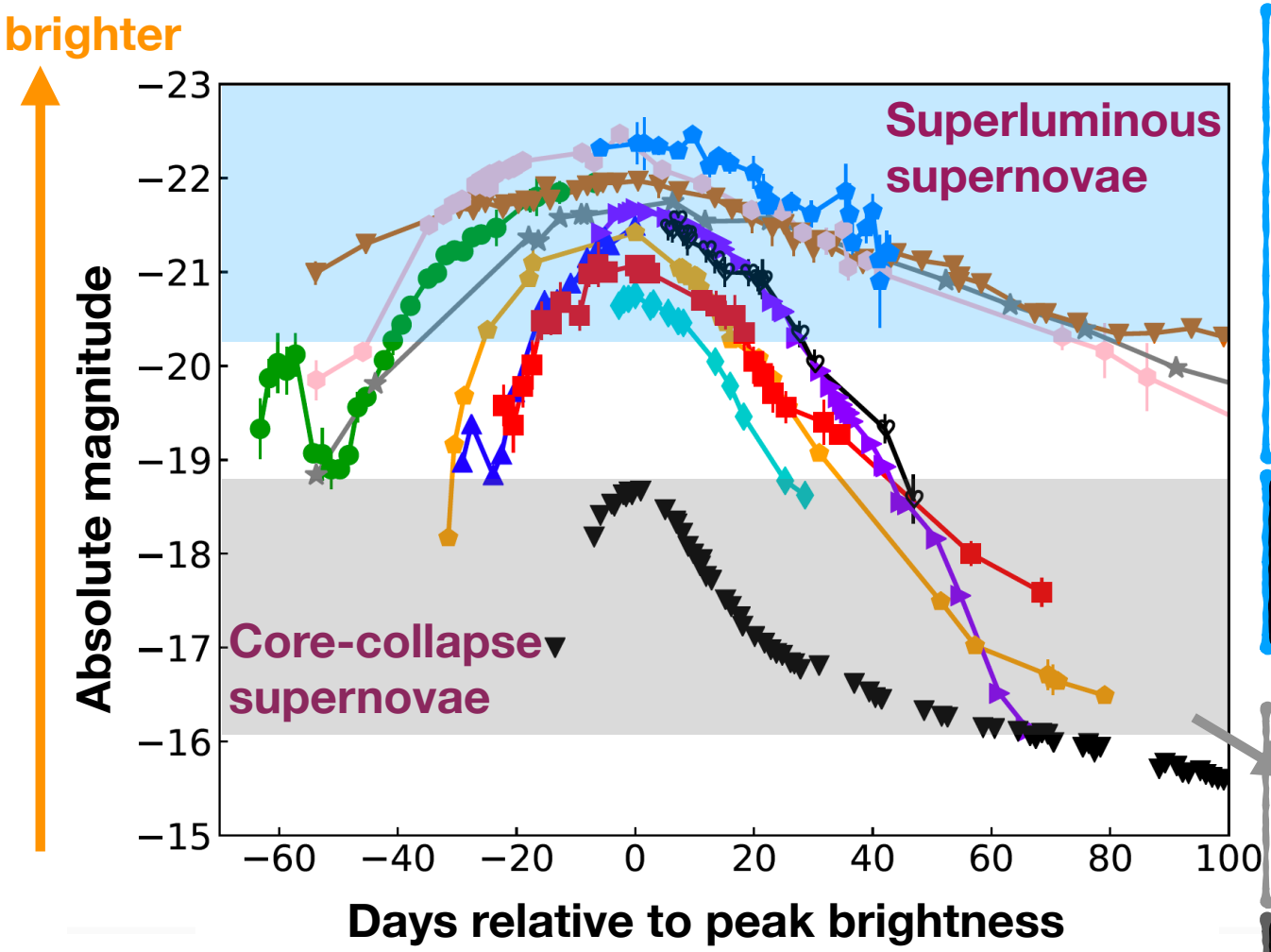
- SNe being important dust producers in the high-z Universe.
  e.g. Hirashita & Ferrara 02; Morgan & Edmunds 03; Maiolino+04; Bianchi & Schneider 07; Gall+11; Calura+14



Credit: ESO/M. Kornmesser

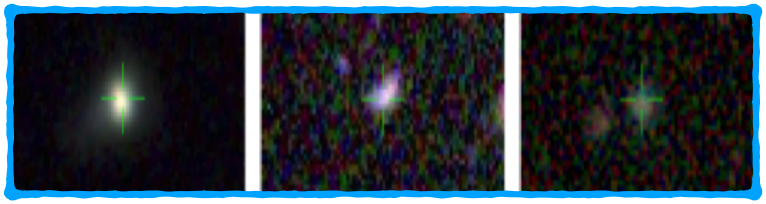
- It is still a challenge to account for the large amount of dust in high-z galaxies.
  e.g. Todini & Ferrara 01; Clayton+01; Dwek & Cherchne 11
  - The asymptotic giant branch (AGB) stars may be an important contributor to dust formation by z ~ 6 - 7.
    Valiante+09, 11
  - Additional dust production mechanisms are required.
    e.g. Matsuura et al. 2009

Superluminous supernovae: massive & low metallicity



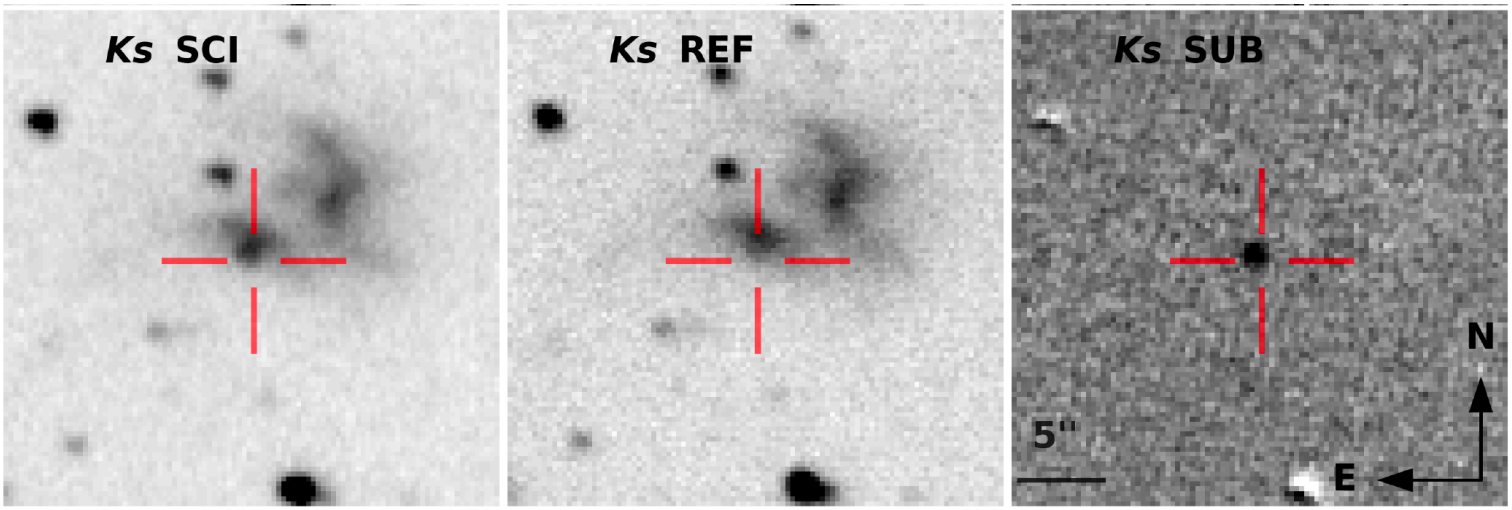
Chen et al. 2017b, A&A, 602, 22

- 10-100 times brighter than normal supernovae.
- Predominantly occur in dwarf galaxies with low stellar mass and low metallicity.
  Neill+11; Chen+13; Lunnan+15; Leloudas+15; Angus+16; Perley+16; Chen+17a; Schulze+18.



- Death of massive stars
- Normally found in bright spiral galaxies

SN 2018bsz

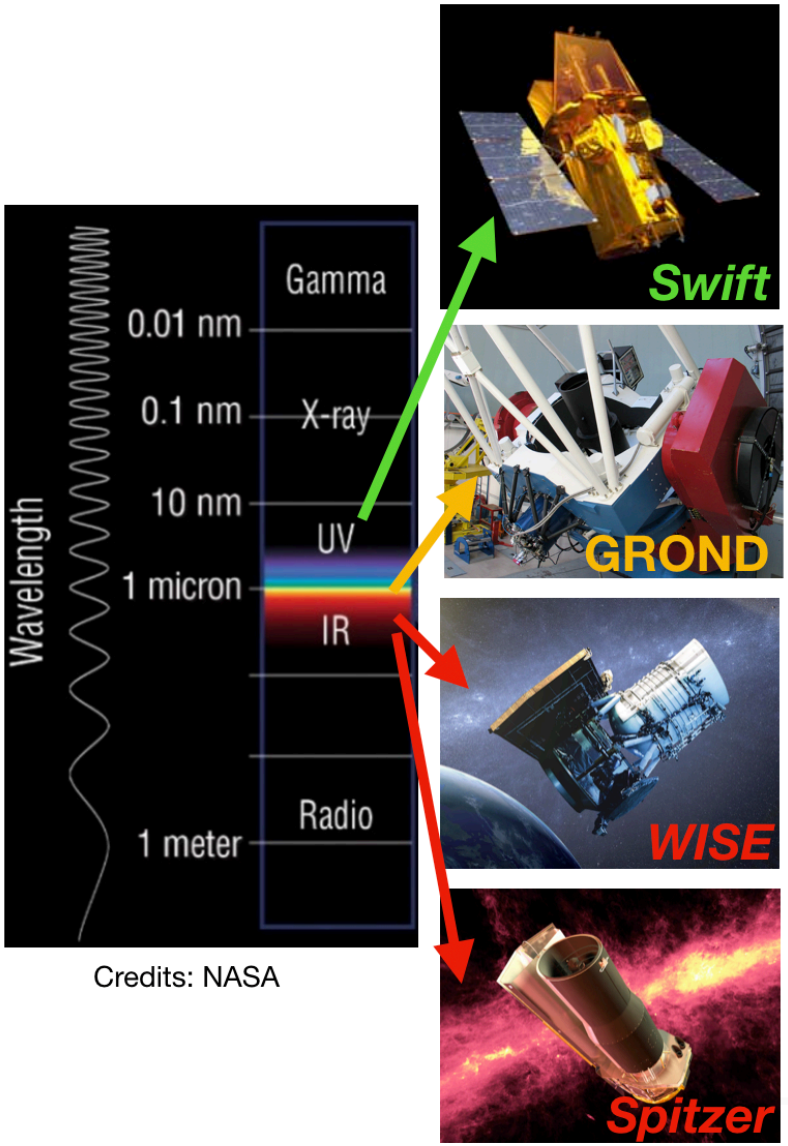


Chen et al. 2021, arXiv:2109.07942

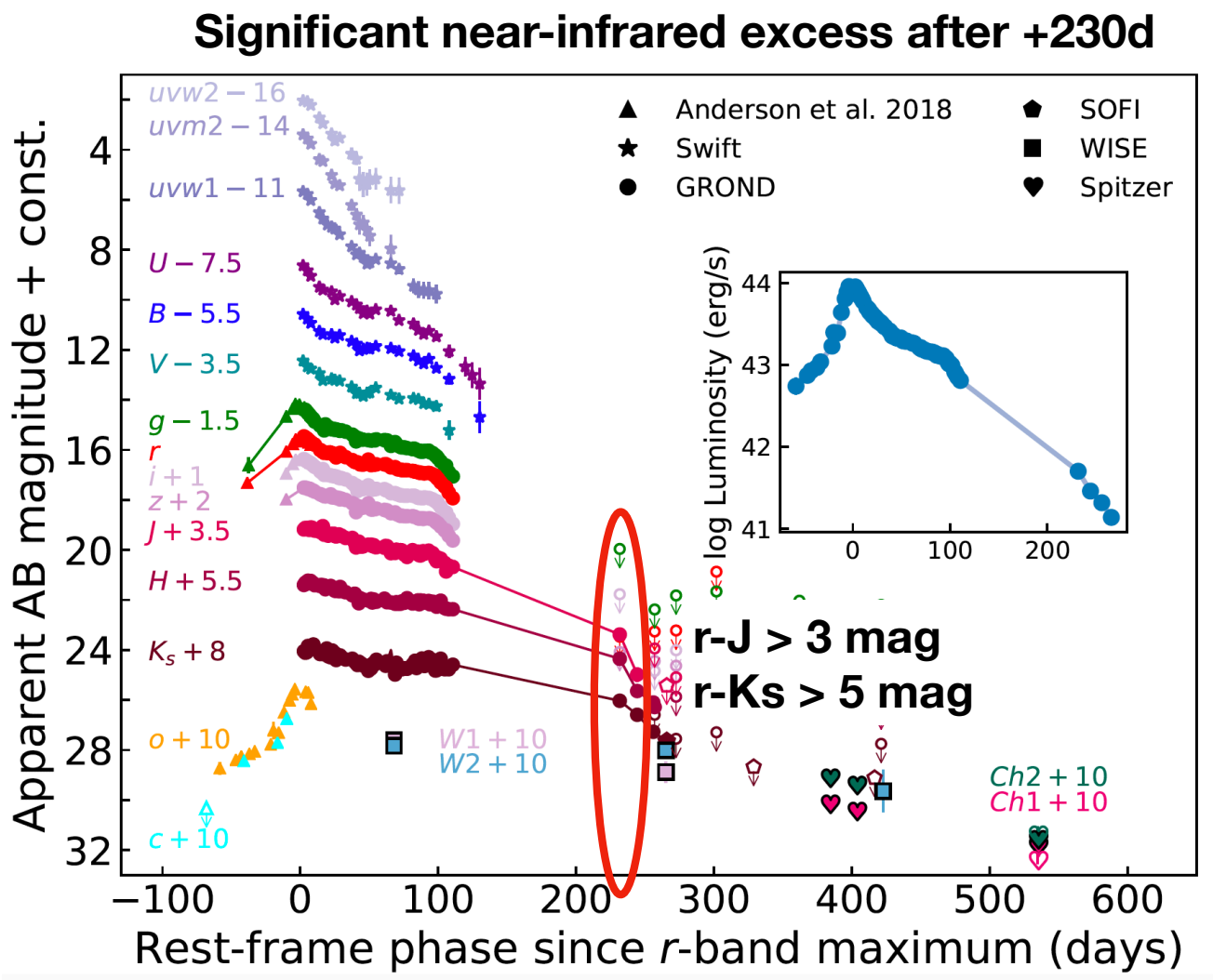
- Hydrogen-poor (Type I) superluminous supernova with strong CII features.
  Anderson+18

- One of the most nearby superluminous supernovae at z = 0.0267 (111 Mpc).

Multi-band observations

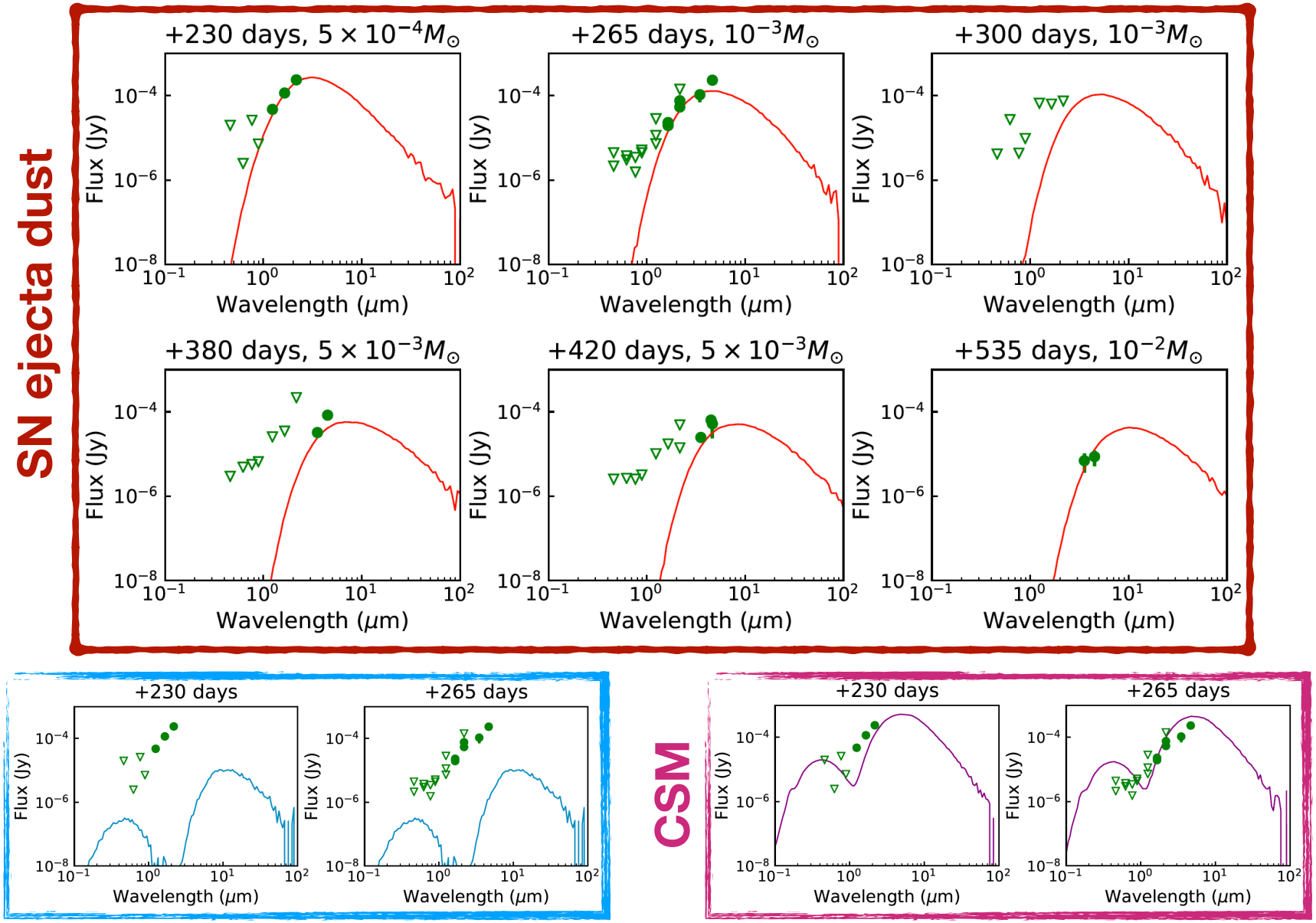


Credits: NASA

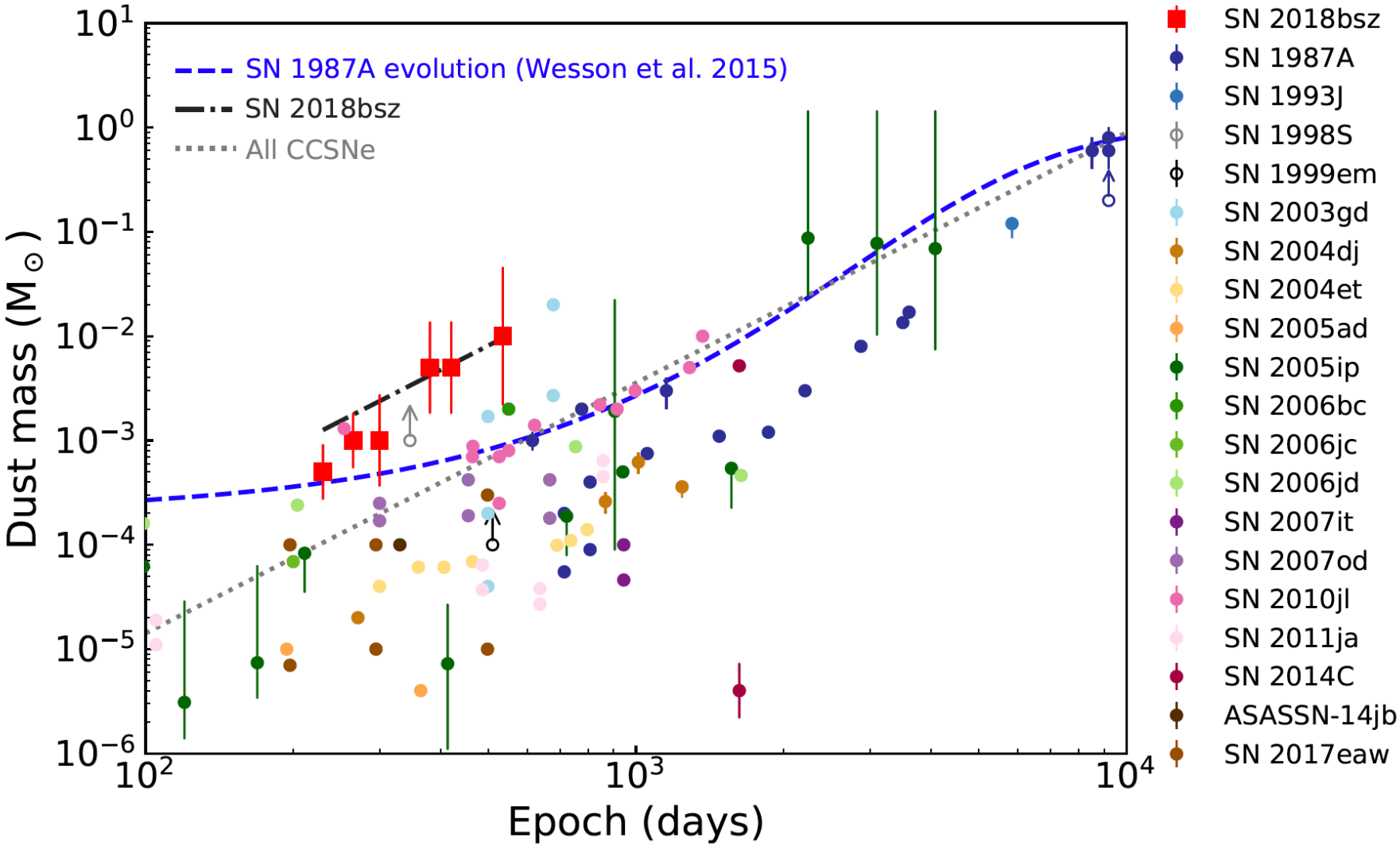


Chen et al. 2021, arXiv:2109.07942

Dust modelling results



SN 2018bsz produces 10 times more dust than core-collapse supernovae



Chen et al. 2021, arXiv:2109.07942

Dust contribution from superluminous supernovae

- We suggest that superluminous supernovae may be a significant contributor to dust formation in the early Universe.
  - One SLSN-I for 3500(+2800-720) CCSNe at local Universe.
    Frohmaier+21 in PTF sample
  - If SLSNe are produced by more massive stars than CCSNe and if the initial mass function at high redshift is top heavy then is could be a very optimistic scenario where SLSNe make up ~10% of very high-*z* SNe.
- Our observations thus open a new area that is of long-term legacy value and dust formation in superluminous supernovae may become a prime scientific goal for the *James Webb Space Telescope*.

Thank you for your attention!

If you are interested, for more details see:
Chen et al. 2021, arXiv:2109.07942

SN 2018bsz: significant dust formation in a nearby superluminous supernova

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