Time-domain astrophysics

Introduction: Douglas Scott
Example (protostars): Doug Johnstone
Lessons from ACT: Cody Duell
Science programme: Greg Sivakoff

Astro2020 Science White Paper No. 331

Tracking the time-variable Millimeter-wave sky with CMB experiments

Thematic Areas:
☑ Planetary Systems ☐ Star and Planet Formation
☑ Formation and Evolution of Compact Objects ☐ Cosmology and Fundamental Physics
☑ Stars and Stellar Evolution ☐ Resolved Stellar Populations and their Environments
☑ Galaxy Evolution ☑ Multi-Messenger Astronomy and Astrophysics

Principal Author:
Name: Gilbert Holder
Institution: University of Illinois at Urbana-Champaign
Email: gholder@illinois.edu
Phone: 217-300-4612

Co-authors: Edo Berger (Harvard University); Lindsey Bleem (Argonne National Laboratory); Thomas M. Crawford (University of Chicago); Douglas Scott (University of British Columbia); Nathan Whitehorn (University of California - Los Angeles)

Abstract: Cosmic microwave background experiments are making wide-area, sensitive, high-cadence maps of the sky at millimeter-wavelengths. The sensitivity of these maps (several mJy in a daily map) is now at the point where it is expected that a wide variety of moving (solar system objects), time-variable (stars, active galactic nuclei), or transient sources (novae, tidal disruption events, gamma-ray bursts, nearby supernovae, gravitational wave events) can be detected. Future experiments, like CMB-S4, will be making such maps of ∼half of the sky with roughly daily cadence.

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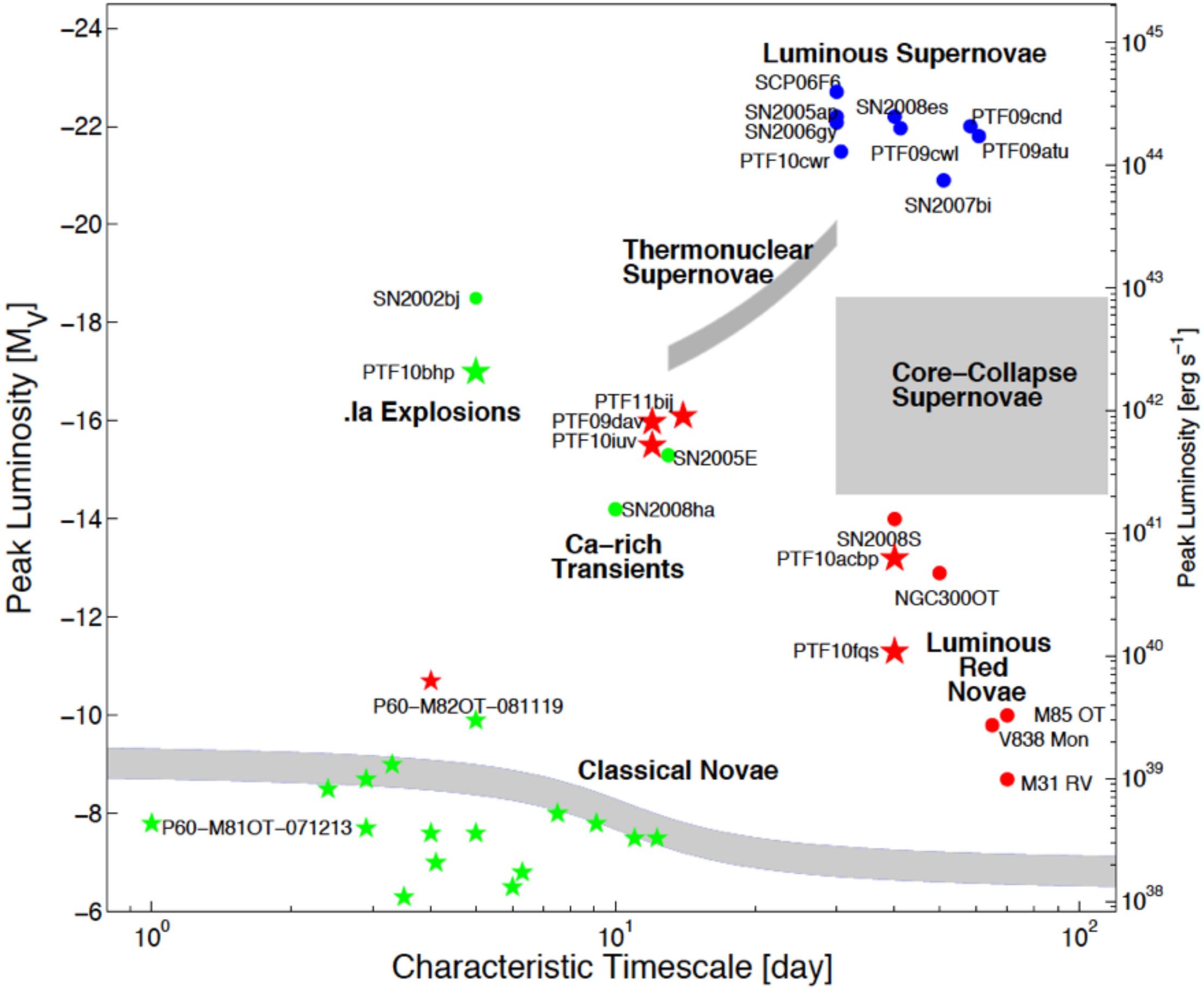
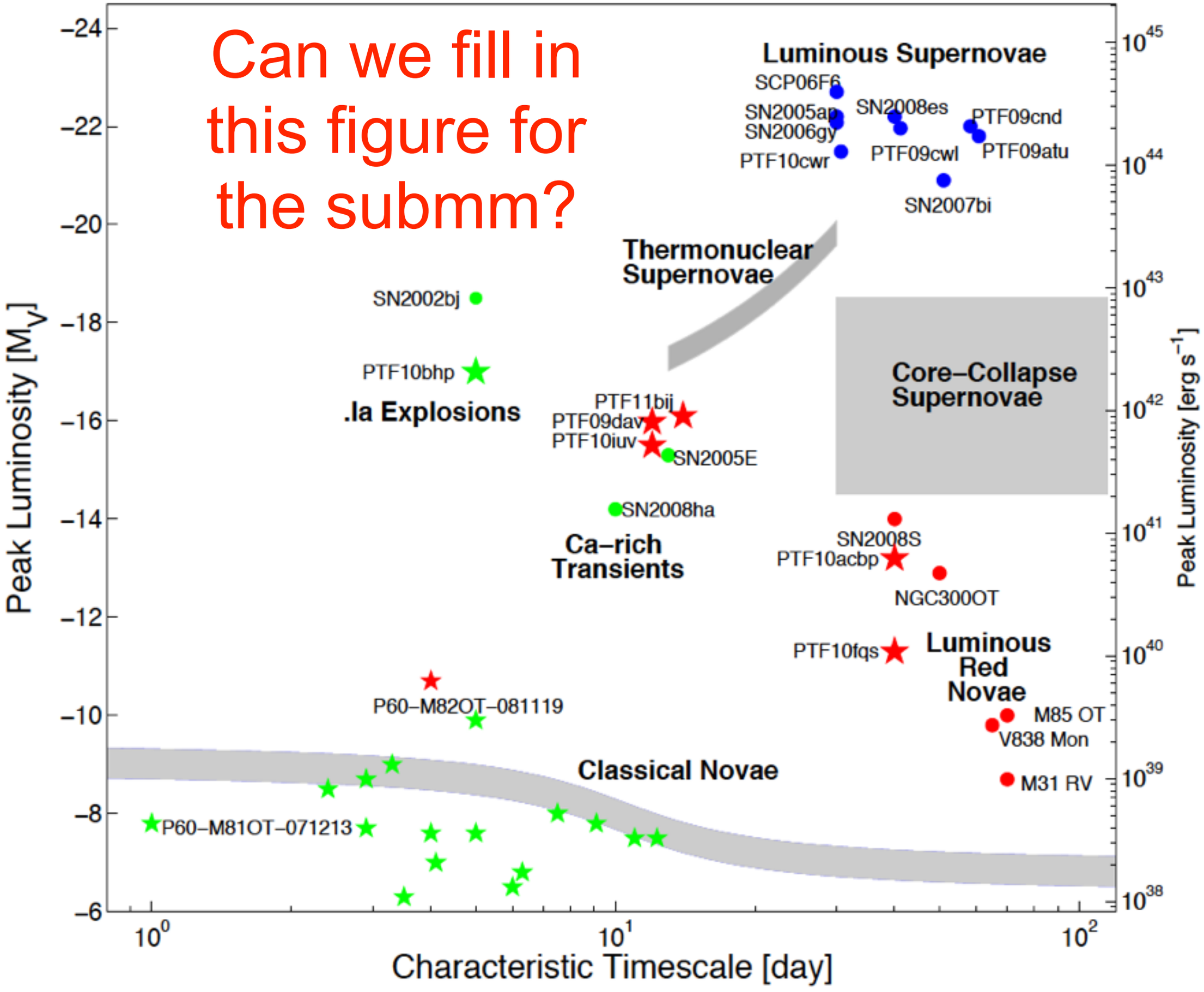
- Solar system (moving) objects
- Stars and protostars
- Novae, tidal-disruption events
- AGN (and other jets)
- GRBs, supernovae
- FRBs?
- GW events + neutrinos
- The unexpected

Kulkarni (2012) – phase space for optical transients

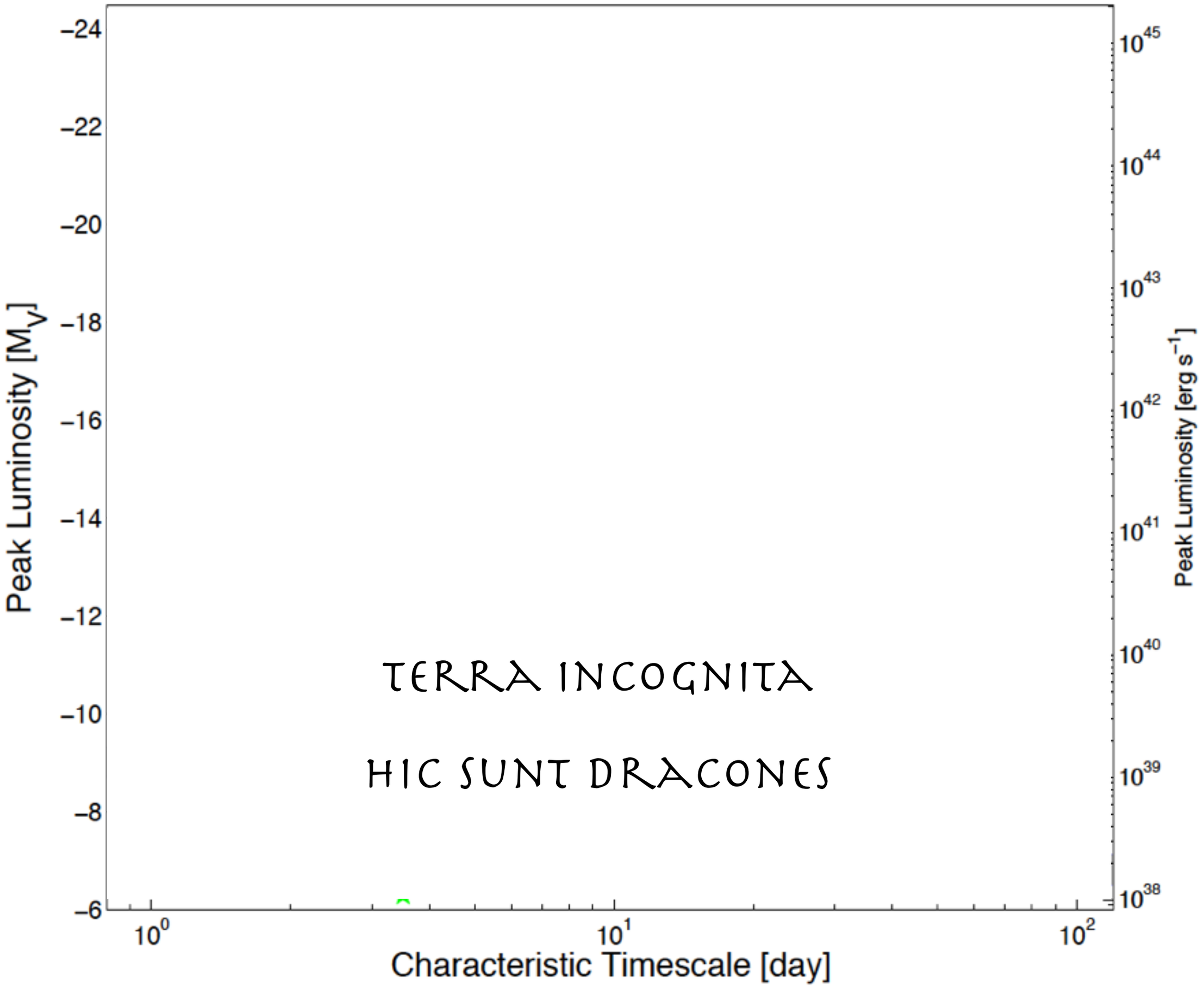


Kulkarni (2012) – phase space for optical transients

Can we fill in this figure for the submm?



CCAT (2022) – phase space for submm transients



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- Follow-up capability (CCAT niche)?