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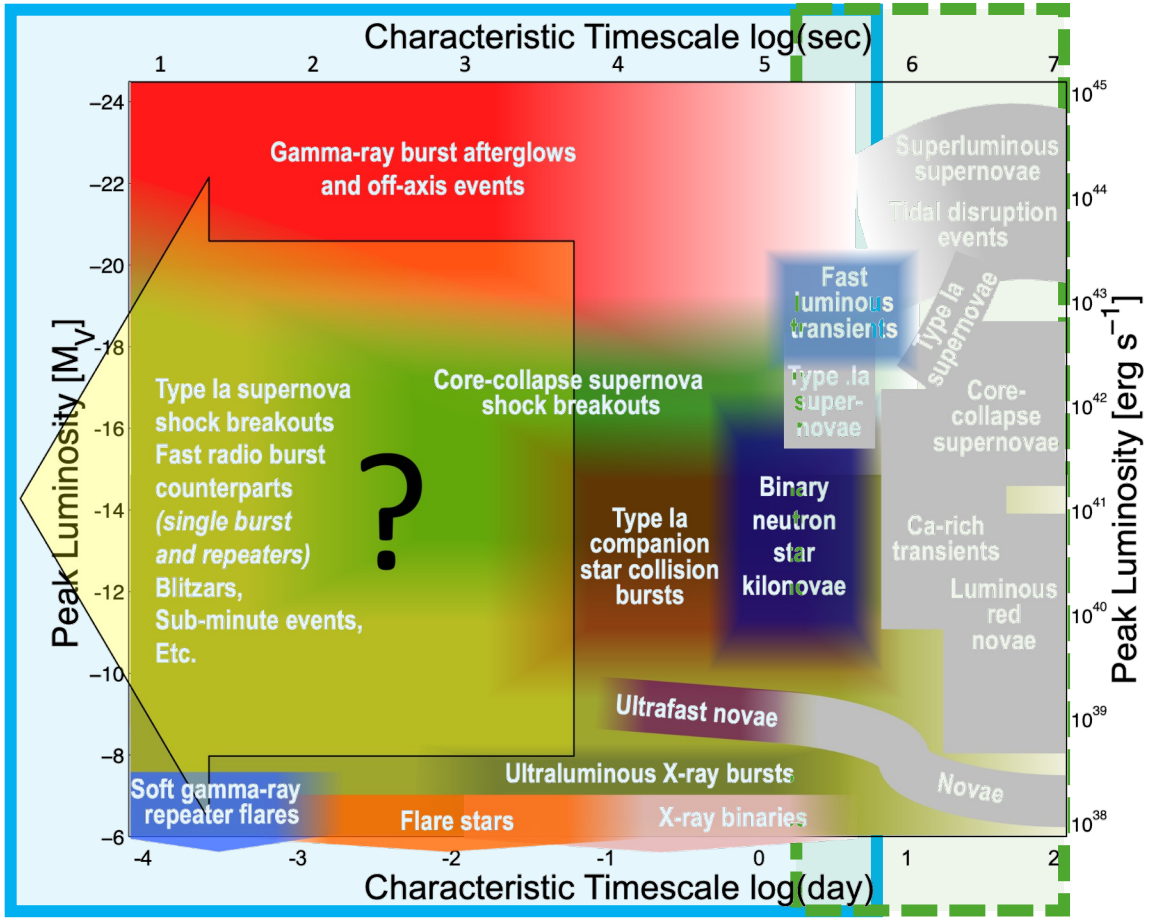
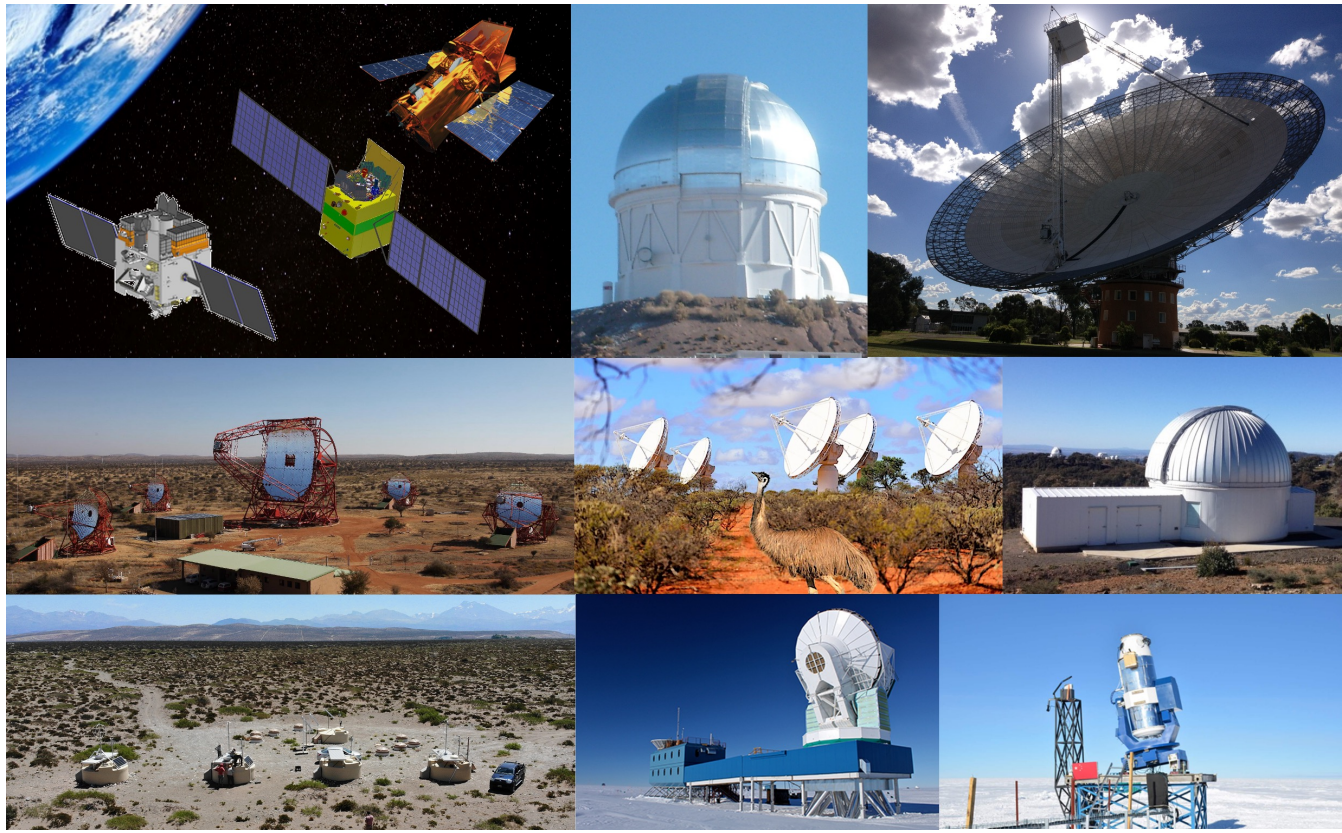
Deeper, wider, faster program

Coordinated simultaneous deep, wide-field, fast-cadenced multiwavelength/messenger fast transient search & follow up

Fast transients (millisecond-to-hours duration) occurs at all wavelengths. Examples at optical wavelengths shown below.



Fast-cadenced observations on the same fields at the same time. 1-2 telescopes each wavelength regime + particles. Real-time data processing and transient IDs.



Telescopes wide-field coordinated simultaneously include - *high-energy particles:* Pierre Auger Observatory, HAWC; *gamma-ray:* H.E.S.S., Swift; *X-ray:*, HXMT, Astrosat; *UV:* Astrosat; *optical:* CTIO DECam, Subaru HSC, KMTNet, AST3-2; *mm/sub-mm:* *South Pole Telescope;* *radio:* Parkes, ASKAP, MeerKAT, MWA; (also *GW*: LIGO/Virgo/KAGRA when online).

DWF fast transients
Millisecond, seconds and minute cadence
Multi-wavelength and particle observations

Conventional transients
Day (or days) cadence
Typically one wavelength

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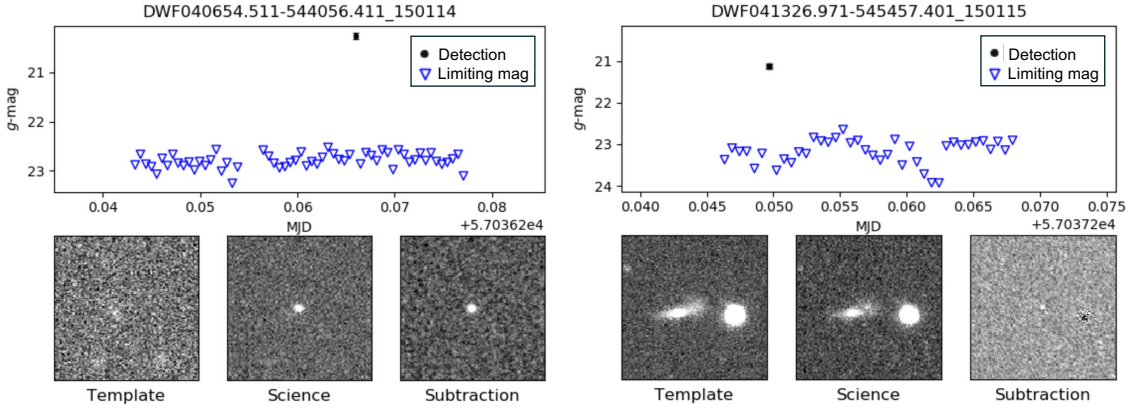
Example optical fast transients and potential new classes of events (Rare Gems) mined from the DWF data

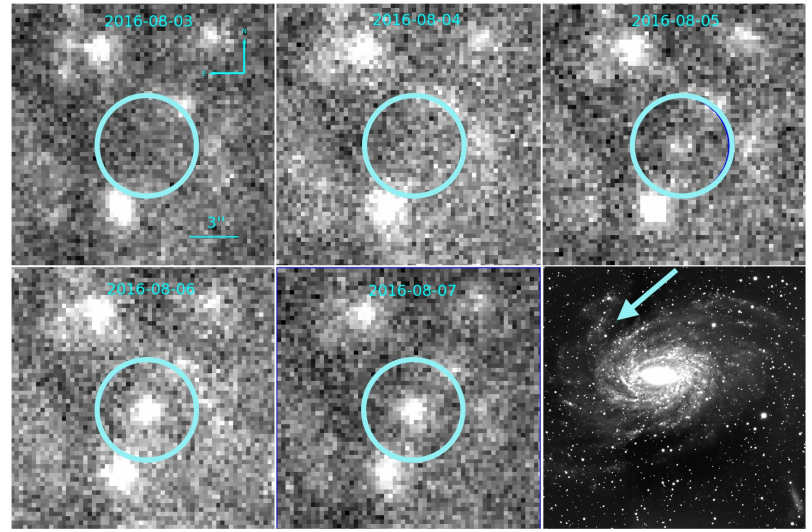


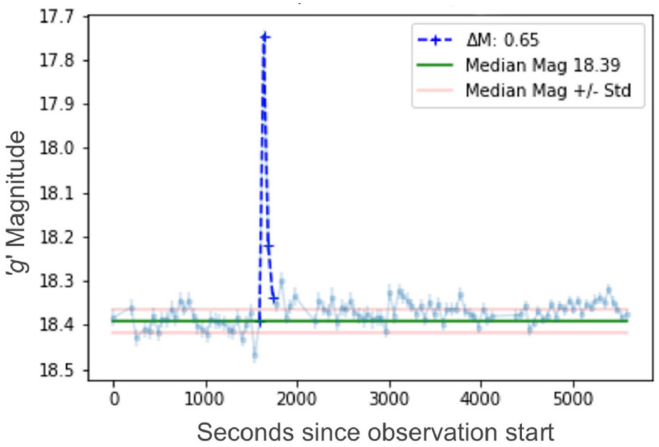
Two of the **sub-minute optical bursts** detected in the DWF dataset from machine-learning and human inspection *(Goode et al. 2024)*.

Multi-wavelength coverage of single-burst **fast radio bursts** sets limits *(Zhang et al. 2024)*.

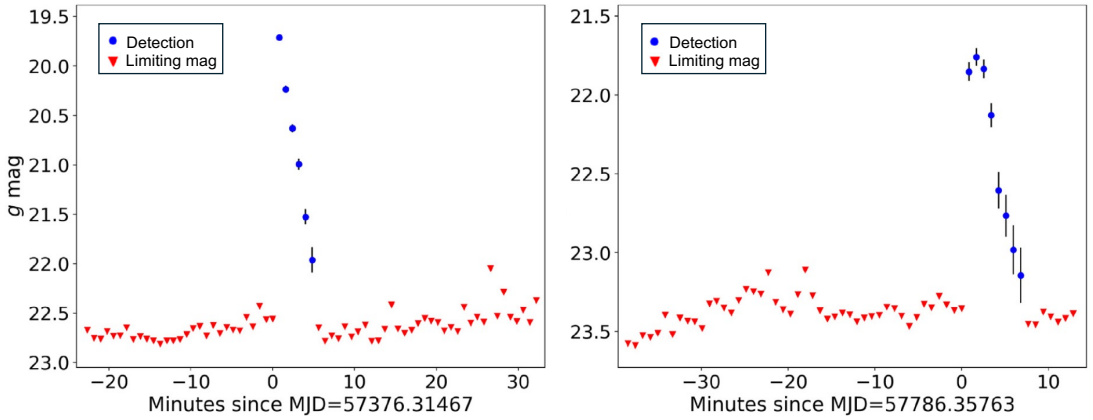
Multiple years detecting **extragalactic novae** is placing new rate constraints.

DWF catalogs the **faint transient and variable sky** *(m ~ 23, minute cadence, m ~ 26, nightly cadence)* that will help Rubin.

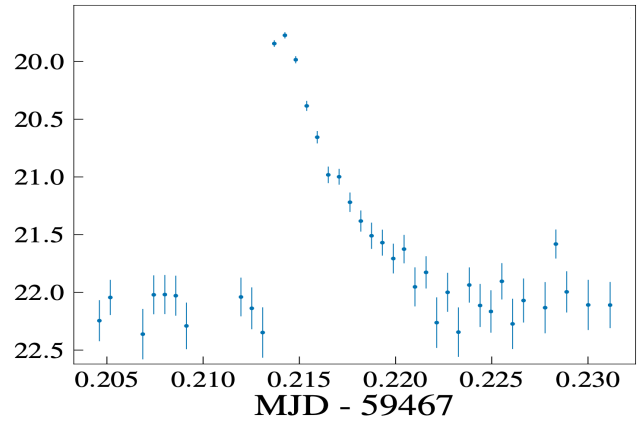




Flare stars discovered with bursts as short as ~3 minutes *(Webb et al. 2021)*



Example **fast extragalactic transient candidates**. DWF probes a faster-cadenced deeper regime than others *(Andreoni et al. 2020)*



GRB orphan afterglow candidate from a deep DWF search *(Freeburn et al. 2024)*