



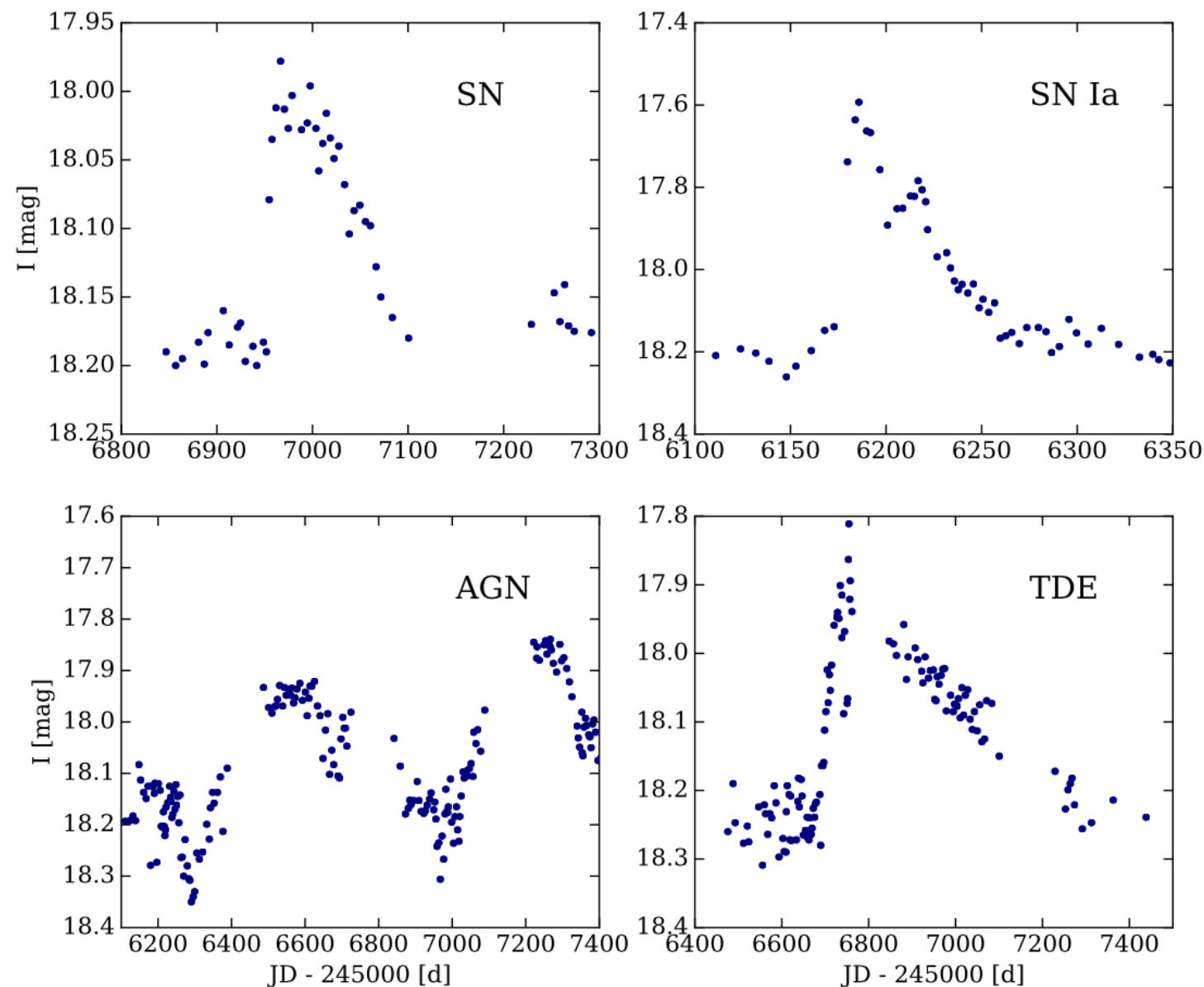
OGLE

Nuclear Transients in OGLE and Gaia

Aleksandra Hamanowicz

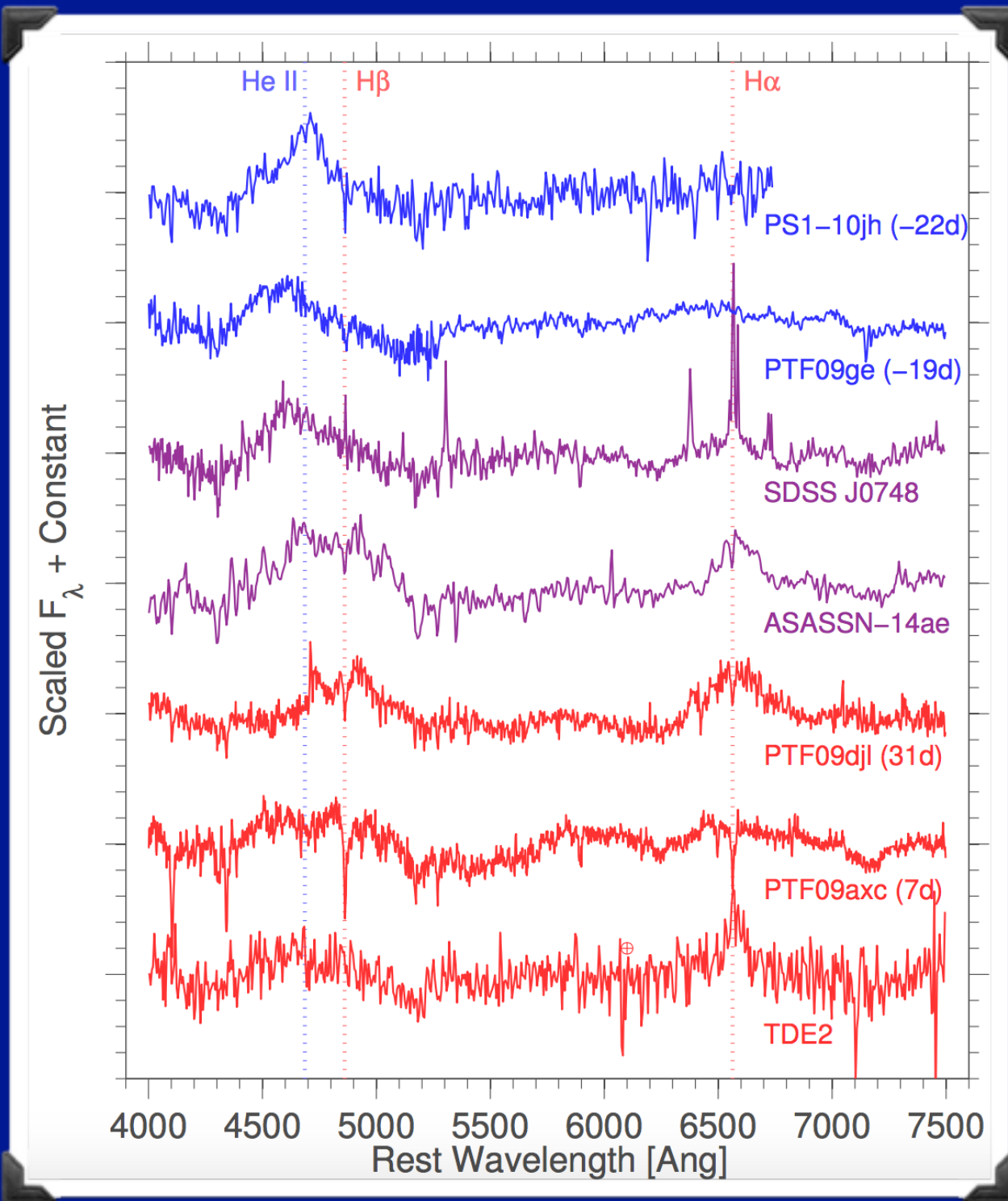
European Southern Observatory
Astronomical Observatory University of Warsaw, Poland

Nuclear transients



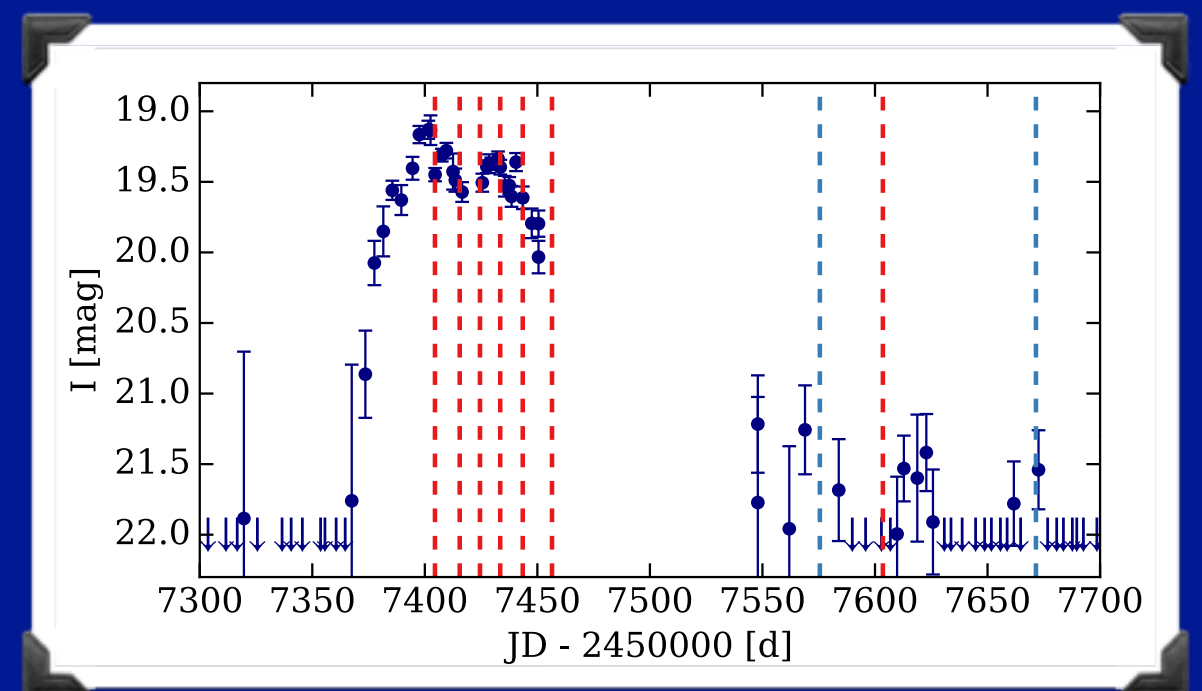
- ▶ Core-collapse SN: rather faint, apart from SN IIn (~ -19 mag)
- ▶ Supernovae Ia: bright $M = -19.5$ mag
- ▶ AGN activity: irregular variability or flares above 1 mag (CL-AGN)
- ▶ Tidal Disruption Events

Tidal Disruption Events



Arcavi et al. 2014

- ▶ photometric lightcurve following $t^{-5/3}$ decline
- ▶ broad HeII line in the spectrum
- ▶ blue, featureless early spectrum, corresponding to black-body $T > 10,000\text{K}$



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OGLE and Gaia hunt for TDEs

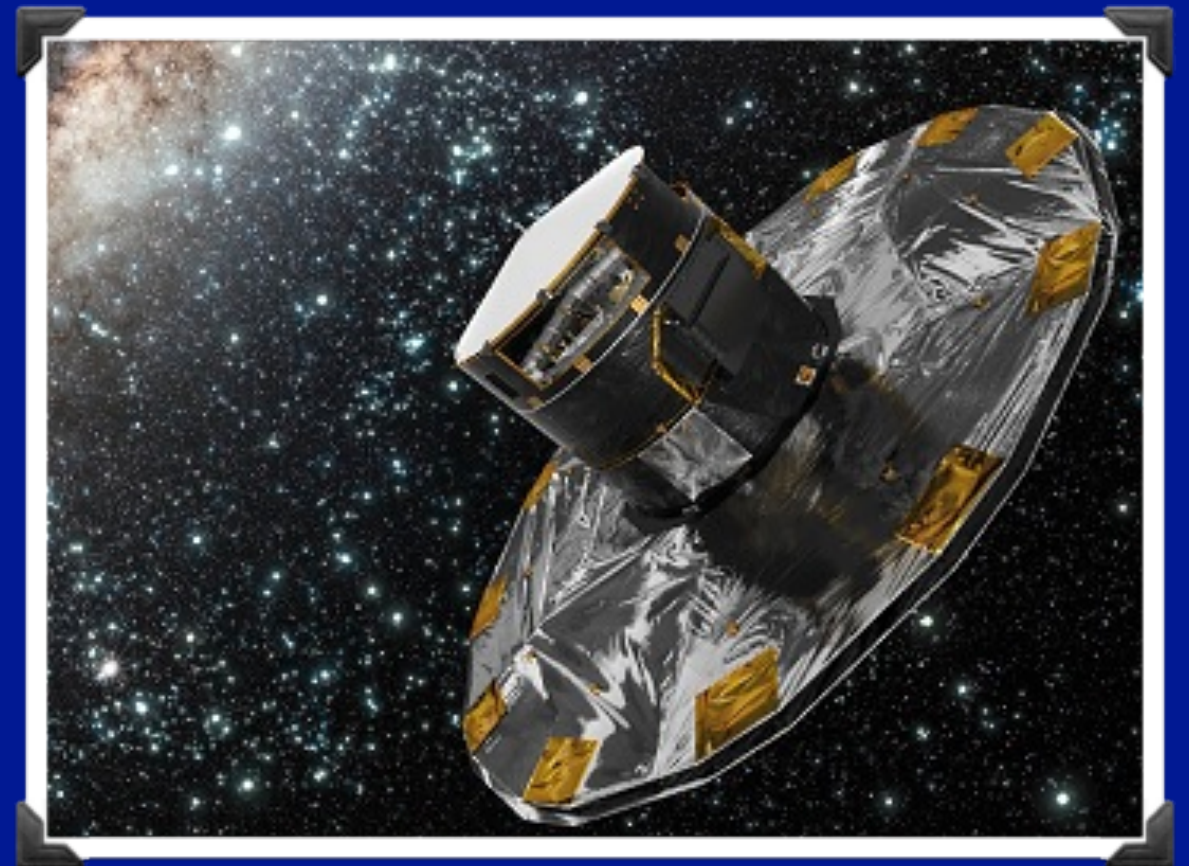


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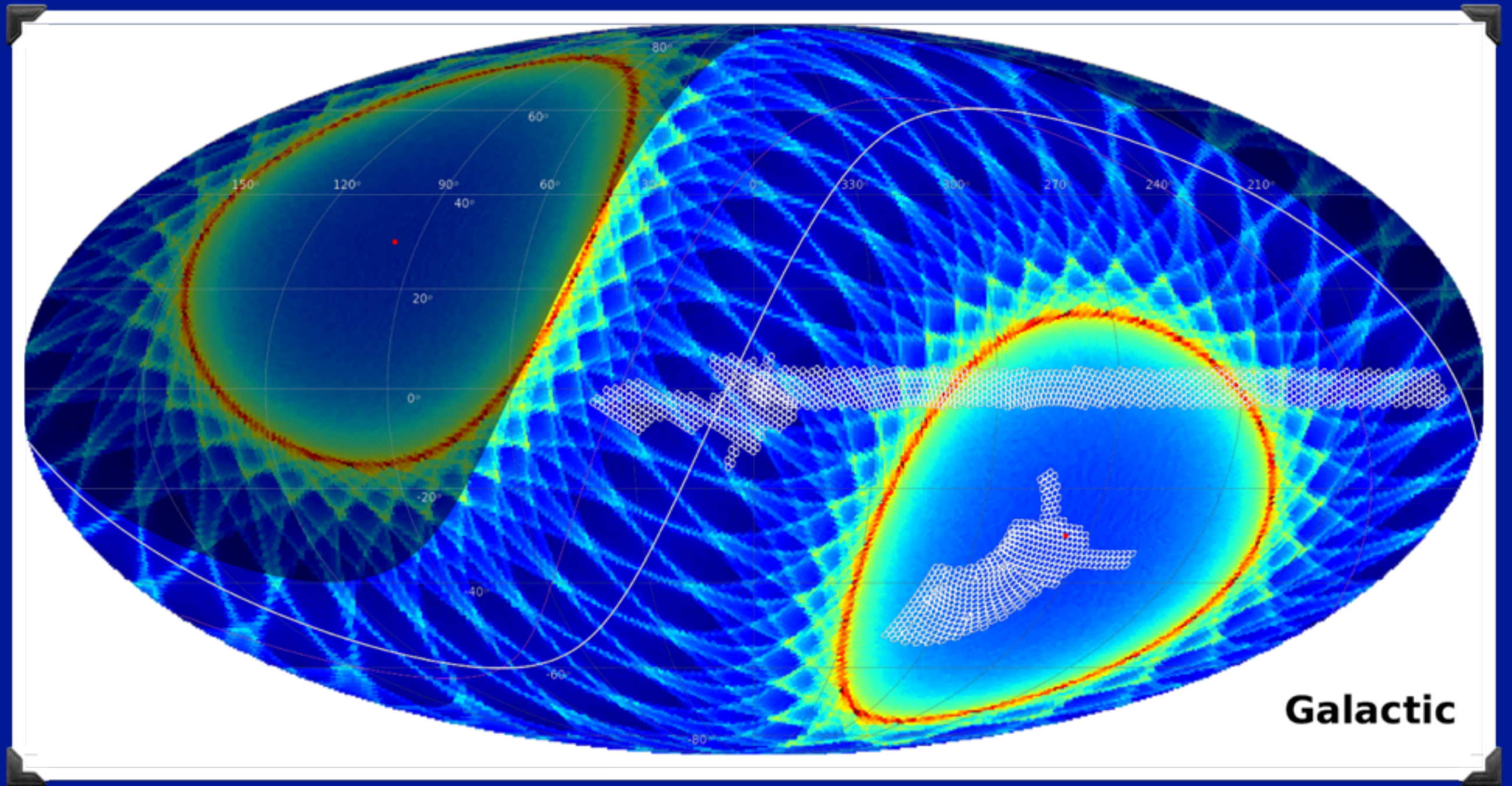
- ▶ Disc, bulge and Magellanic Clouds region (MC)
- ▶ Precise photometry up to $I = 22$ mag
- ▶ 2-3 days cadence (MC)

Gaia

- ▶ All-sky coverage
- ▶ Photometry reaching $V = 20$ mag
- ▶ every month 2 observations with 106 min gap



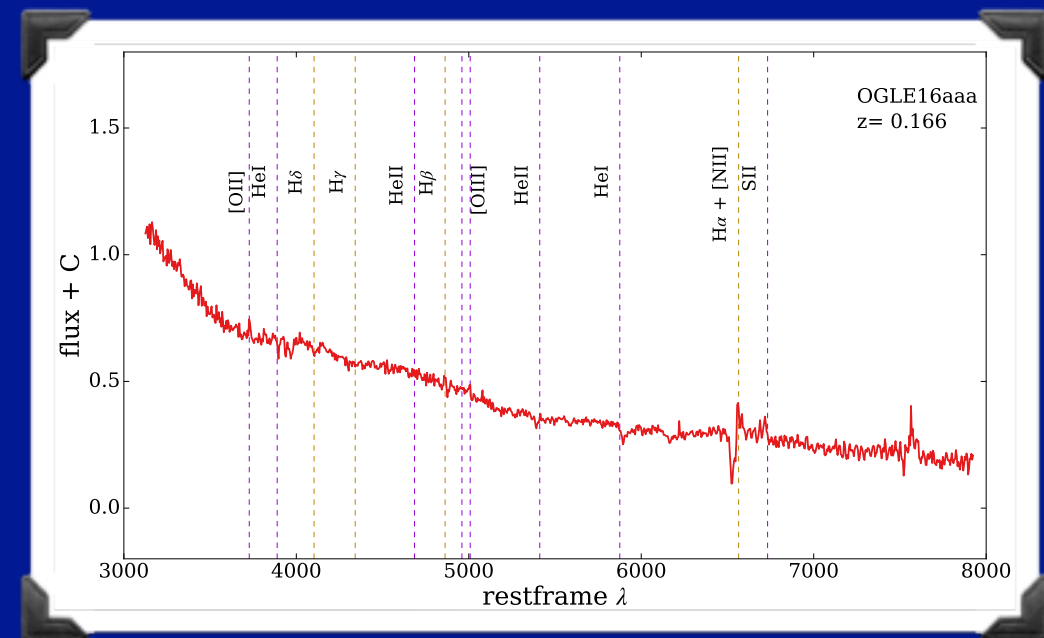
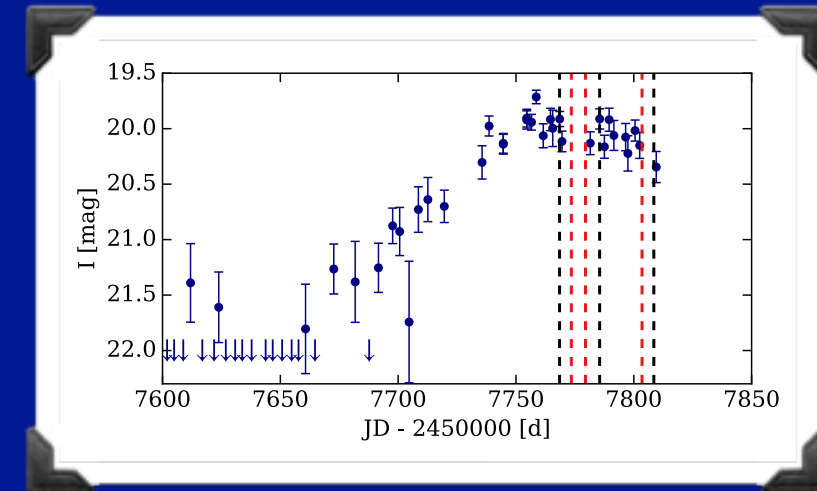
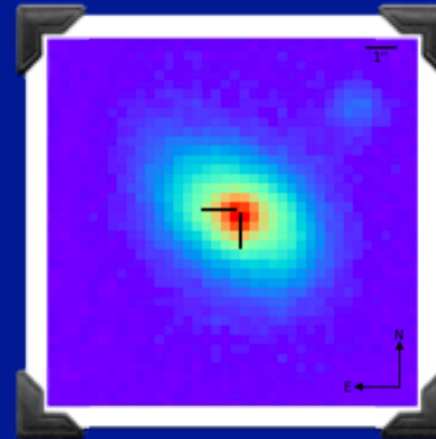
OGLE and Gaia sky



credits: J. Skowron, N. Blagorodnova

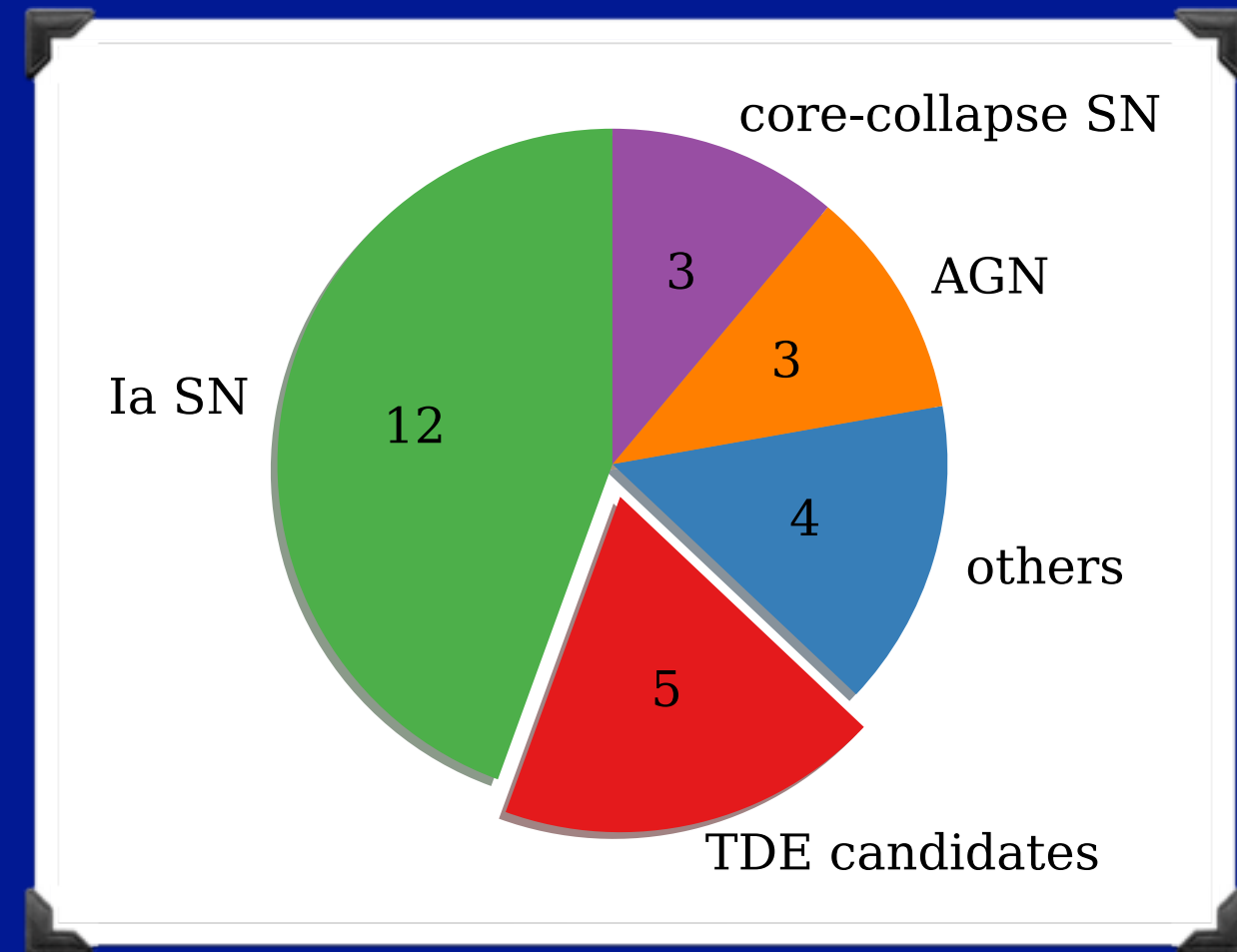
The Survey

- ▶ Photometric detection: transit position and photometric lightcurve
- ▶ Spectroscopic classification: blue continuum and emission lines especially broad HeII
SALT, VLT - south
NOT - north
- ▶ UV: Swift follow-up triggers (K. Sokolovski)



OGLE & Gaia real-time search

- ▶ OGLE & Gaia nuclears found in real-time
- ▶ spectroscopic classification
- ▶ almost no core-collapse SN (to weak?)

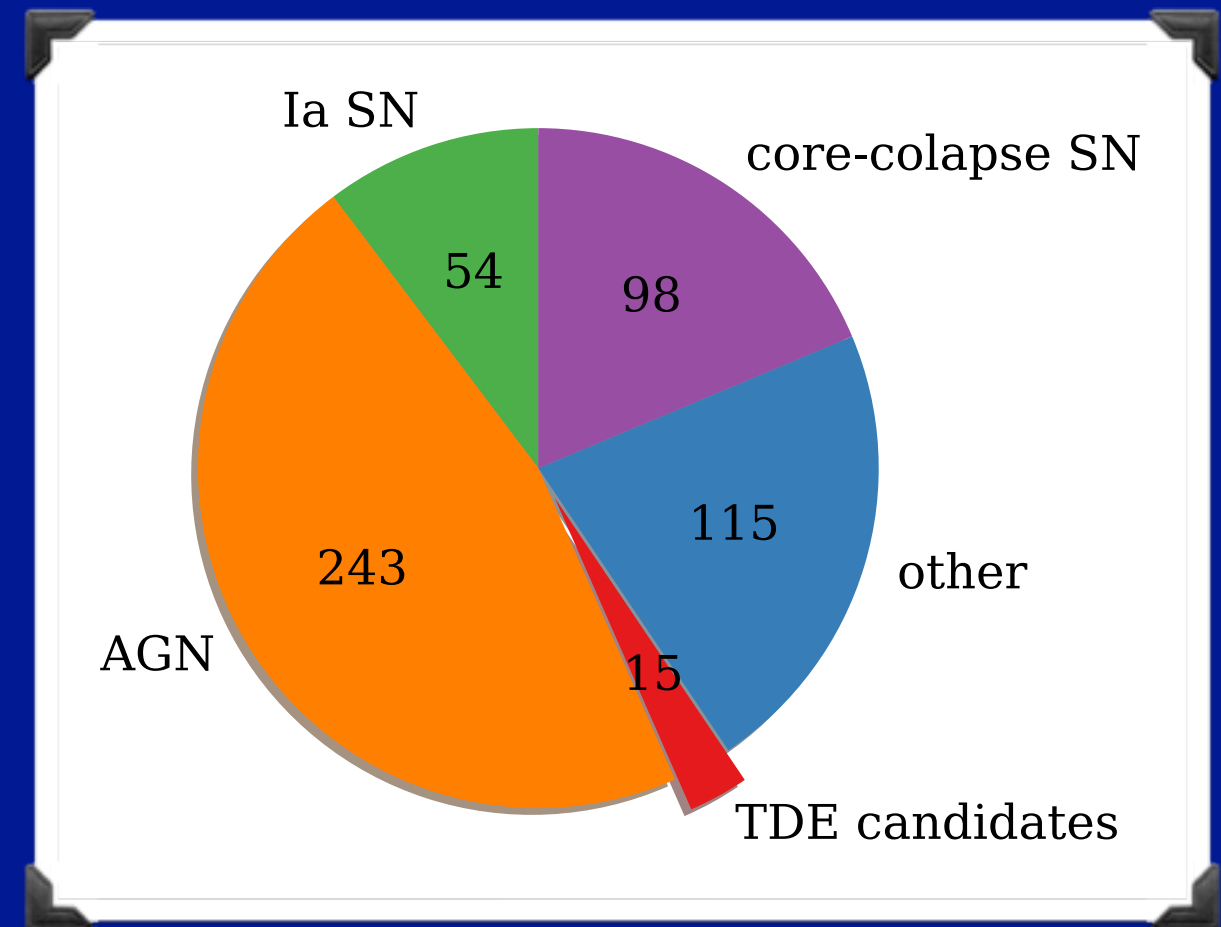


$$N_{\text{Ia}}/N_{\text{cc}} = 4$$

Confirmed TDE = 0

OGLE archival search

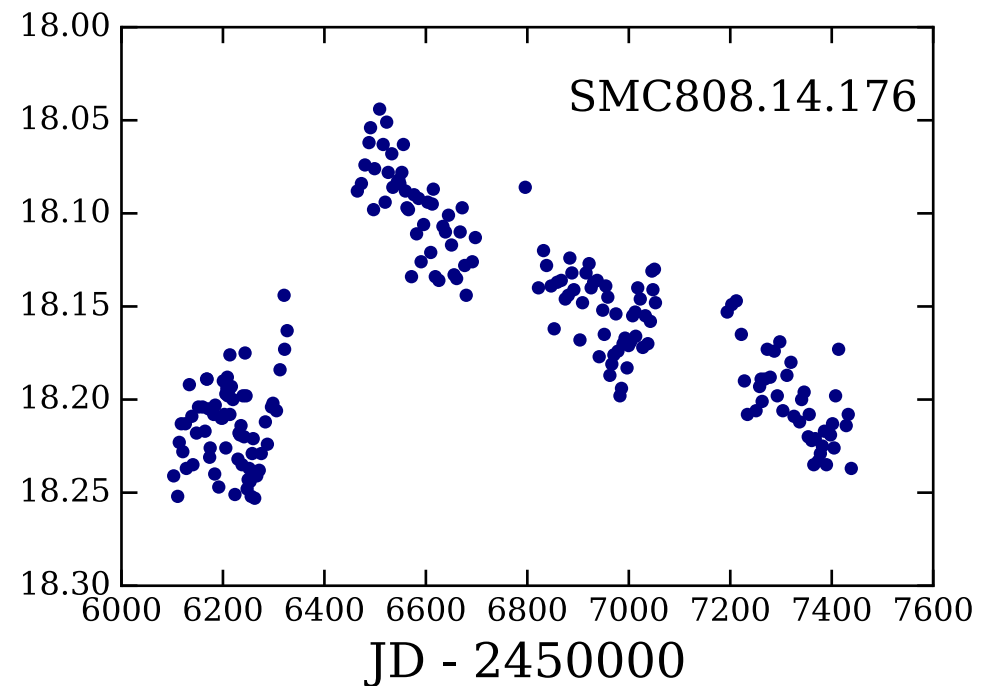
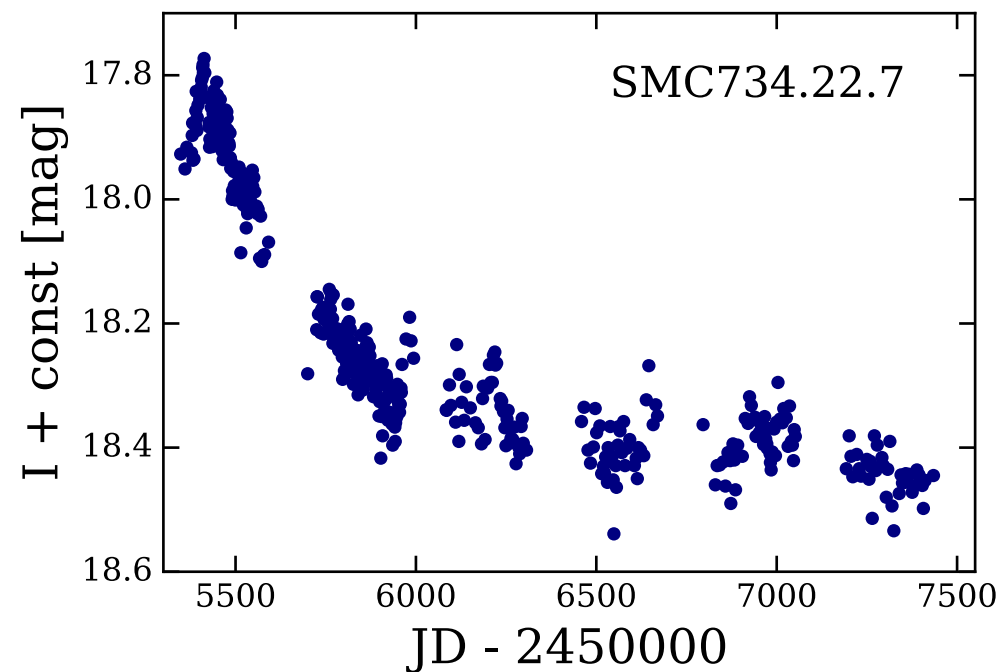
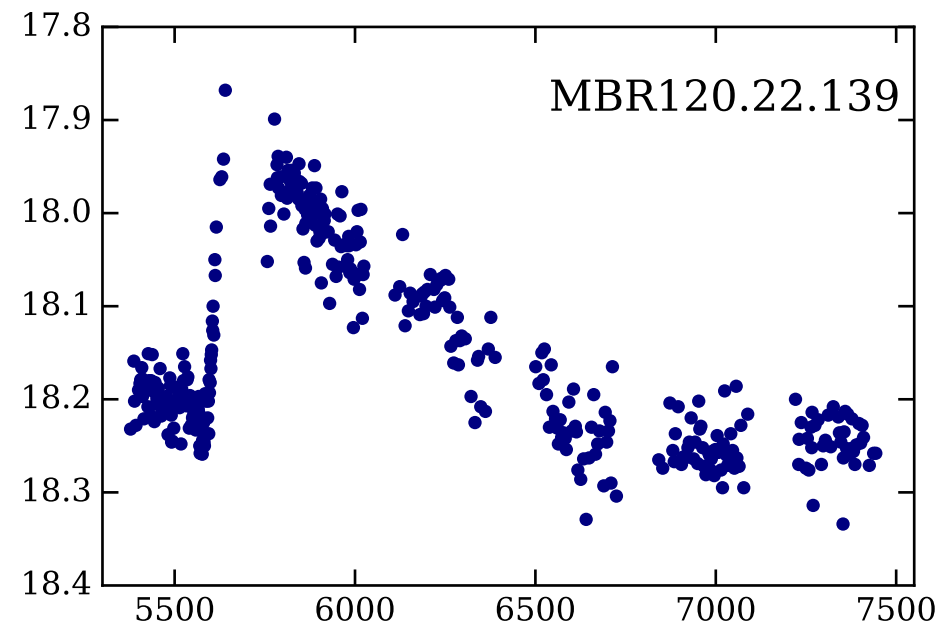
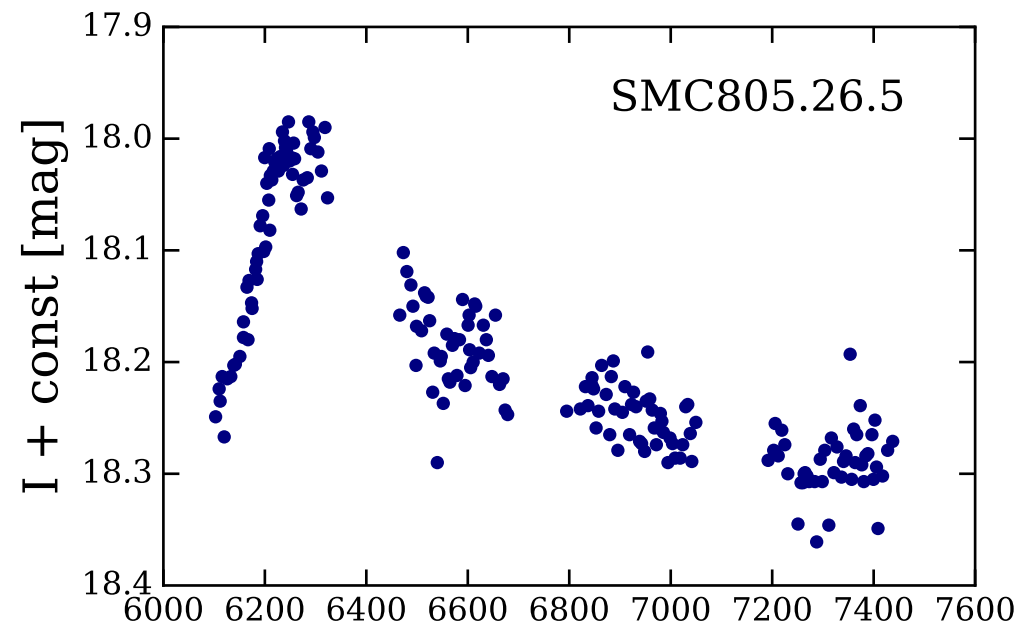
- ▶ forced photometry at centres of OGLE-IV galaxies
- ▶ transients classified manually, based on their light-curves
- ▶ all SN types (including core-collapse)



$$N_{\text{Ia}}/N_{\text{cc}} = 0.55$$

Confirmed TDE = 1

Long nuclear transients



Conclusions

- ▶ Weak core-collapse supernovae are difficult to detect in the bright nuclei of its host galaxy
- ▶ SN type Ia are bright enough to be detected on larger distances and in the nuclei - they are dominating the sample
- ▶ Photometric alert is not enough to classify the event, need for multiwavelength follow-up during and after the event to understand the host
- ▶ TDE hard to find, possible other phenomena occurring in the centres of galaxies
- ▶ Hunt continues...