

Type Ia supernovae observed in TESS data

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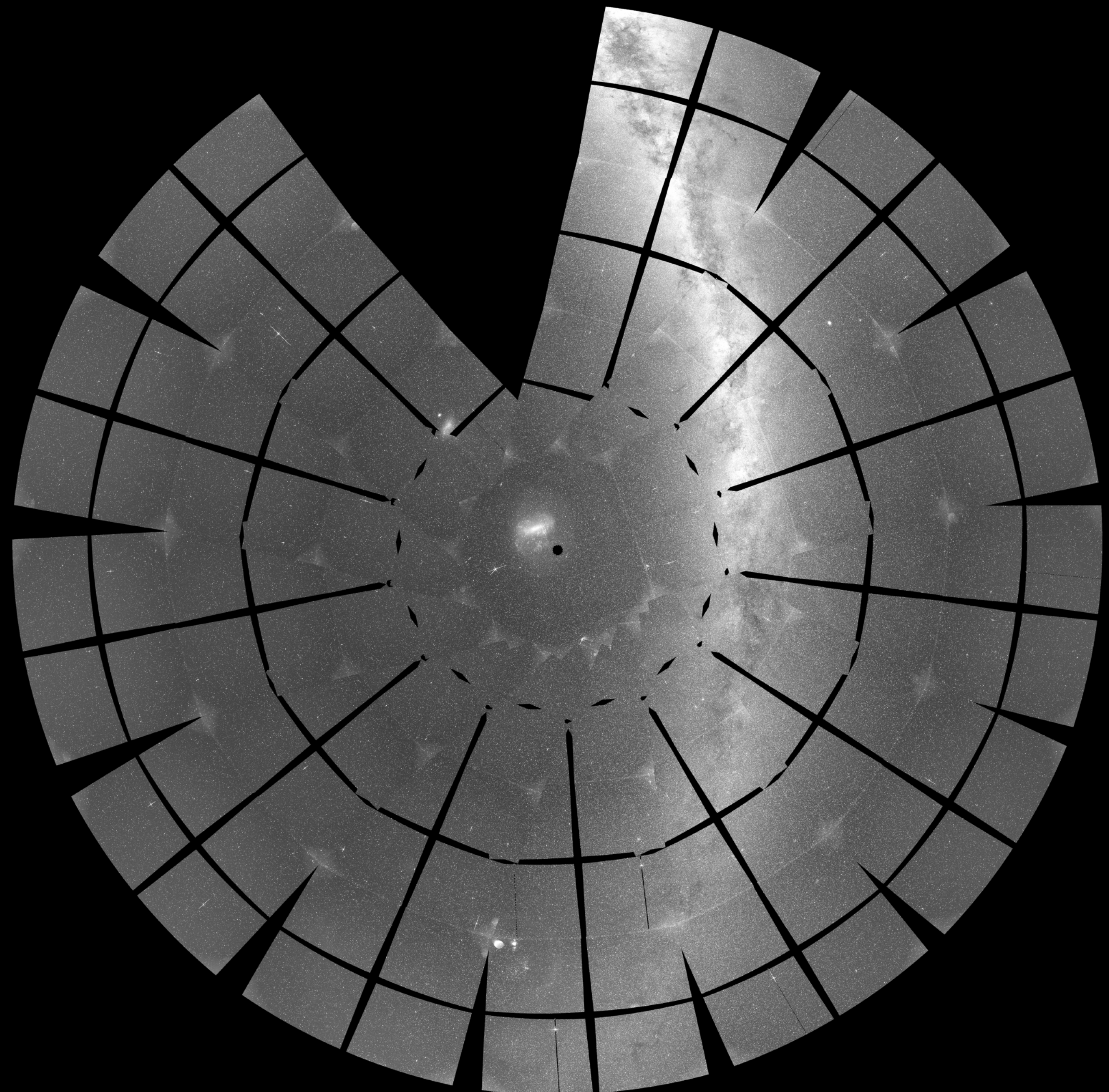
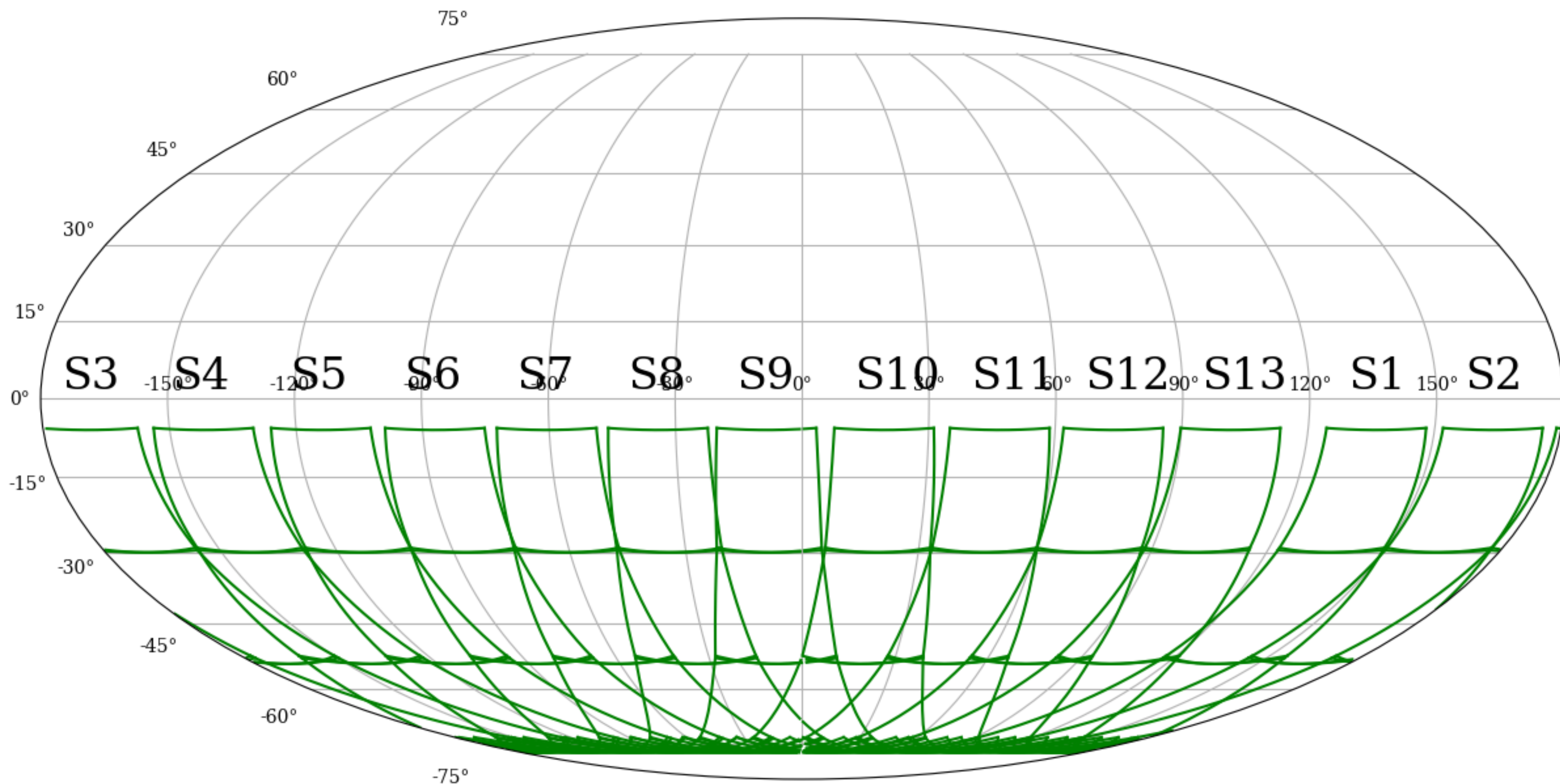


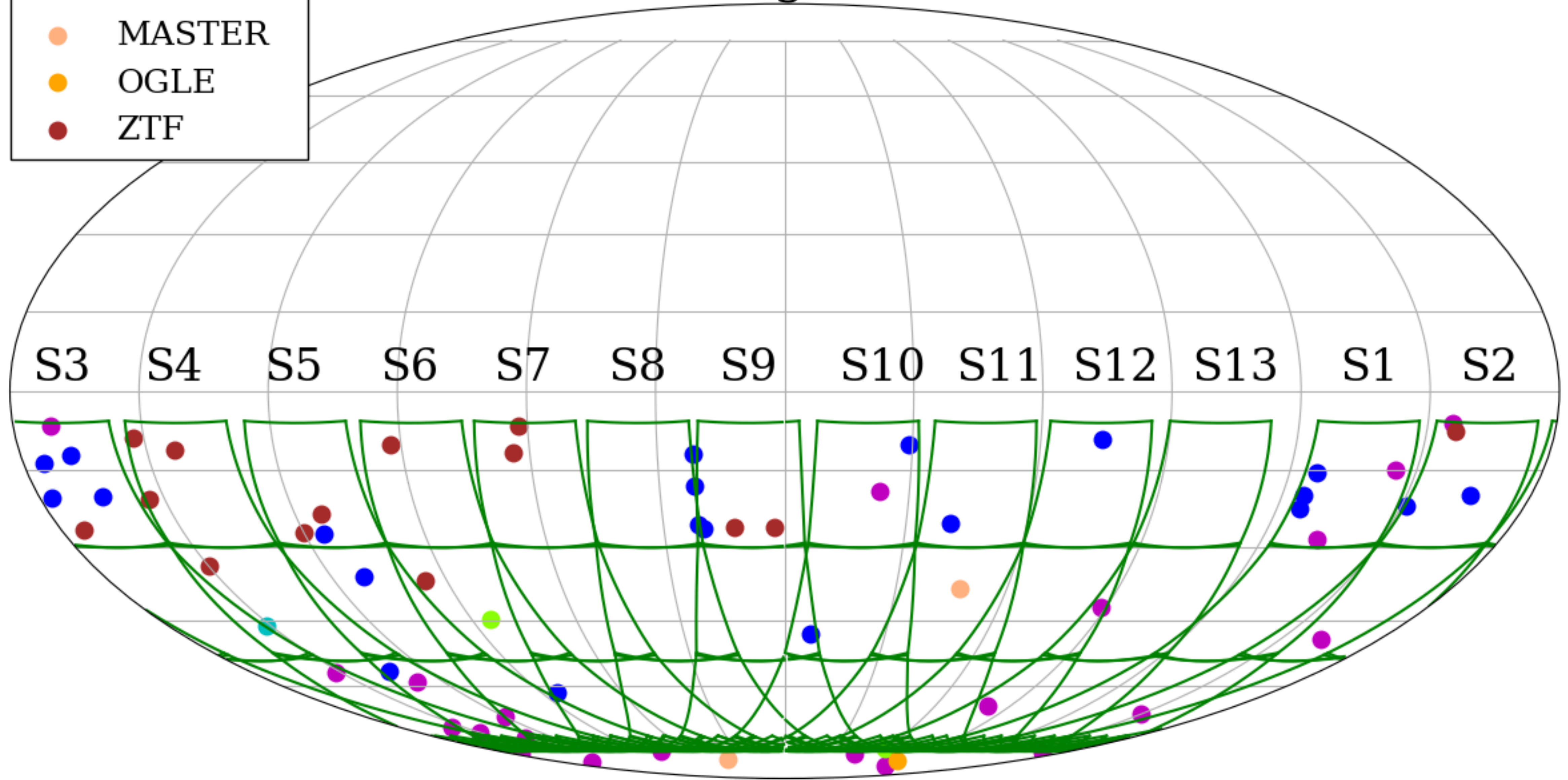
Image Credit: R. Vanderspek

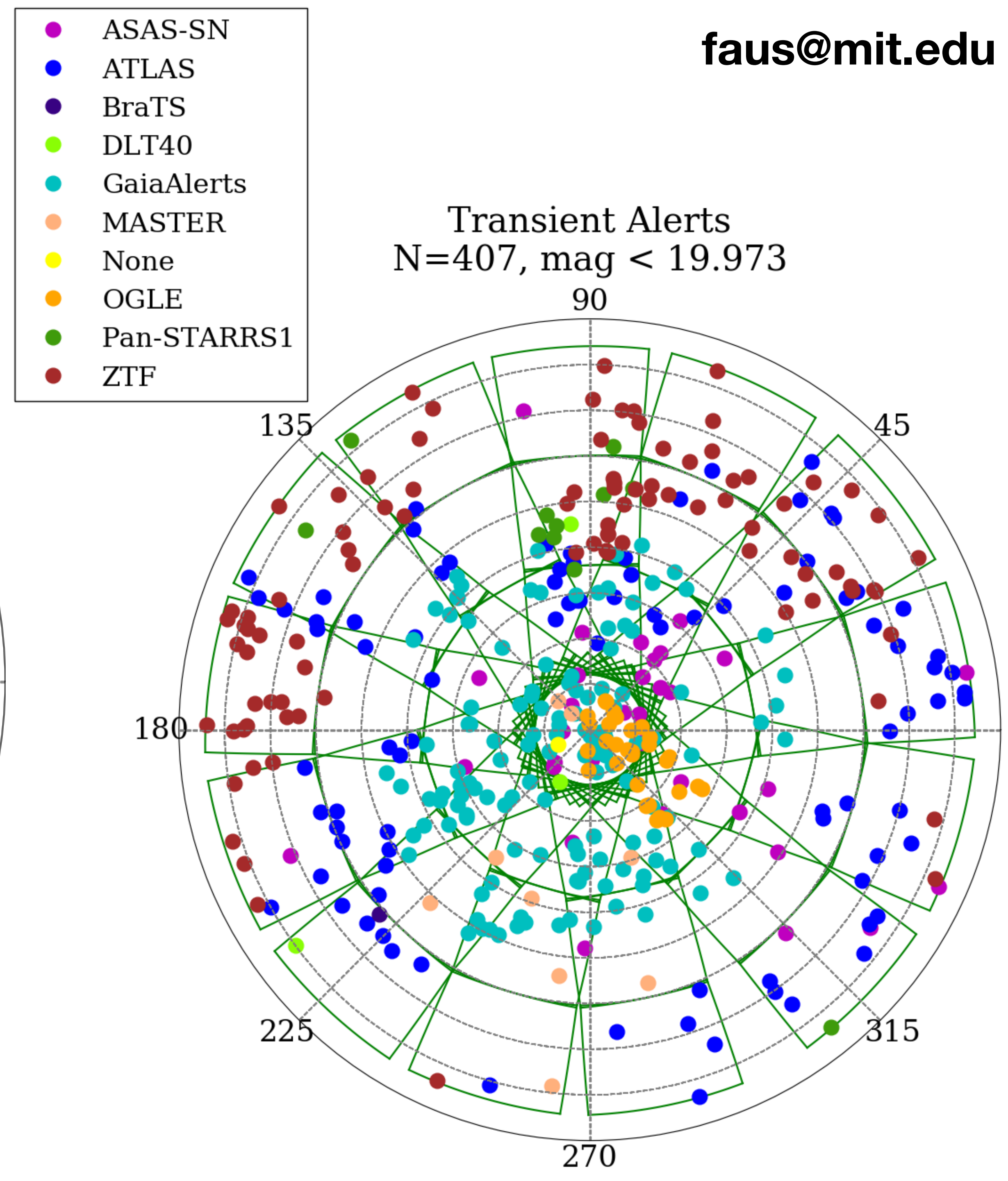
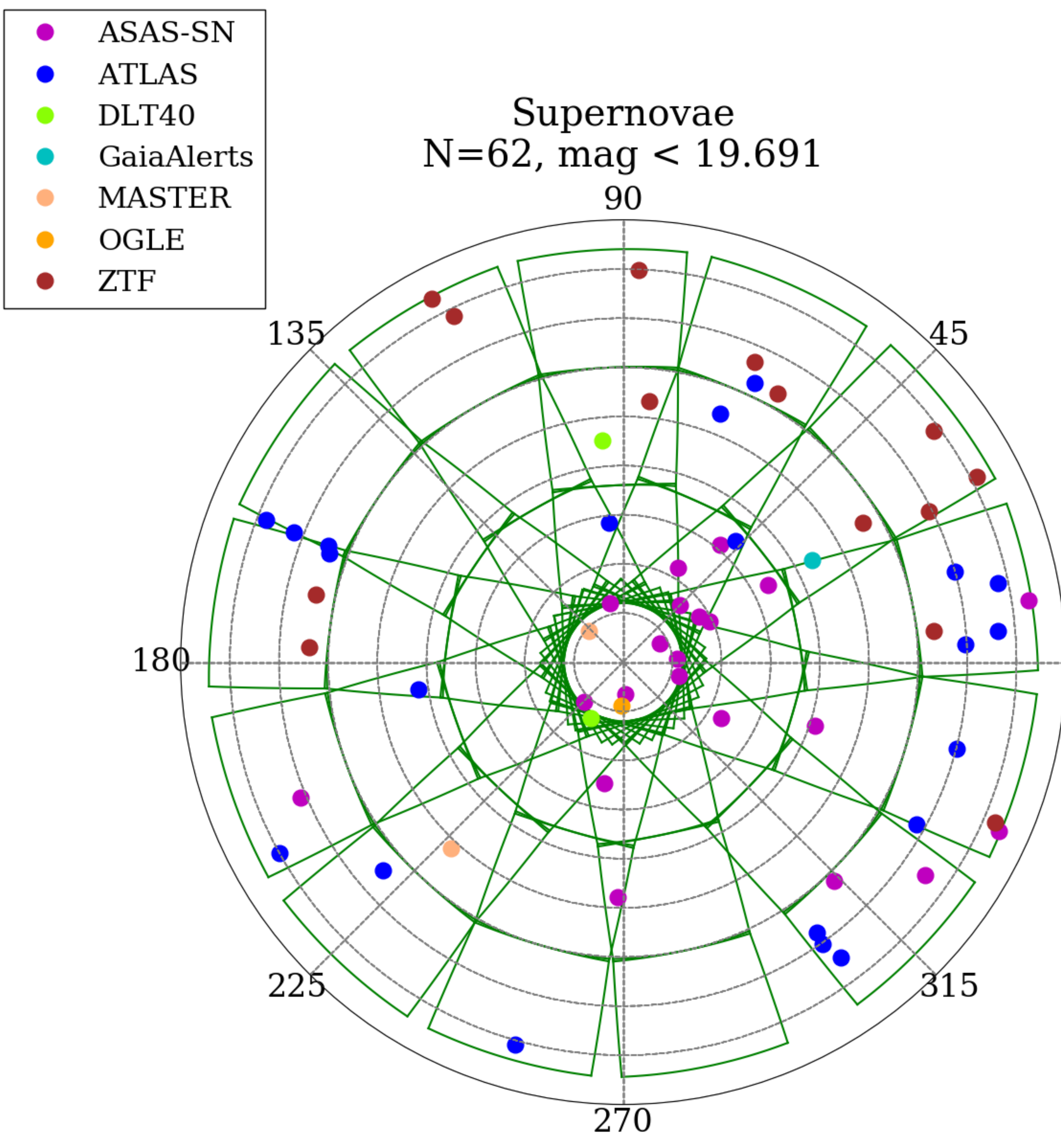


Supernovae

N=62, mag < 19.691

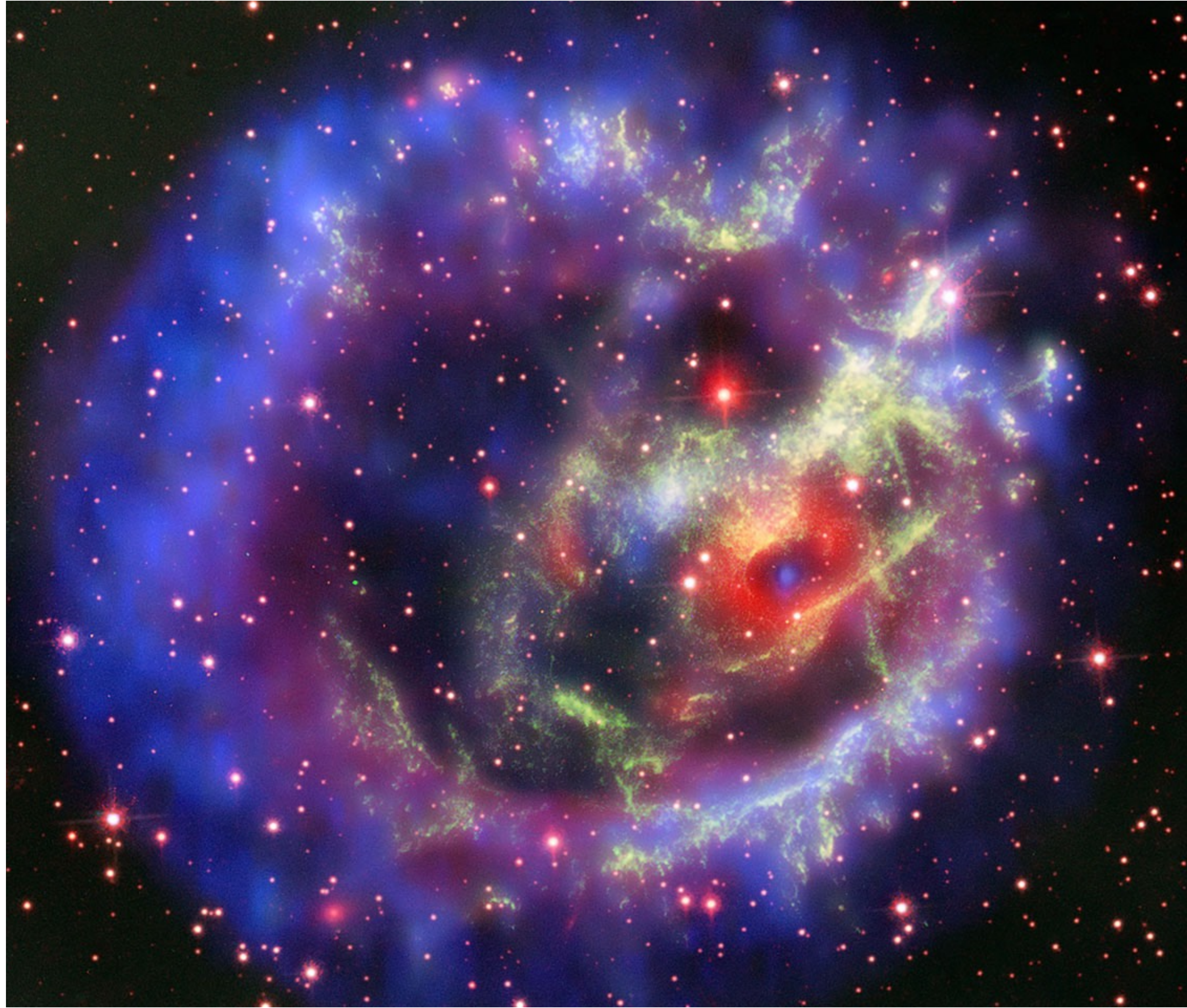
- ASAS-SN
- ATLAS
- DLT40
- GaiaAlerts
- MASTER
- OGLE
- ZTF

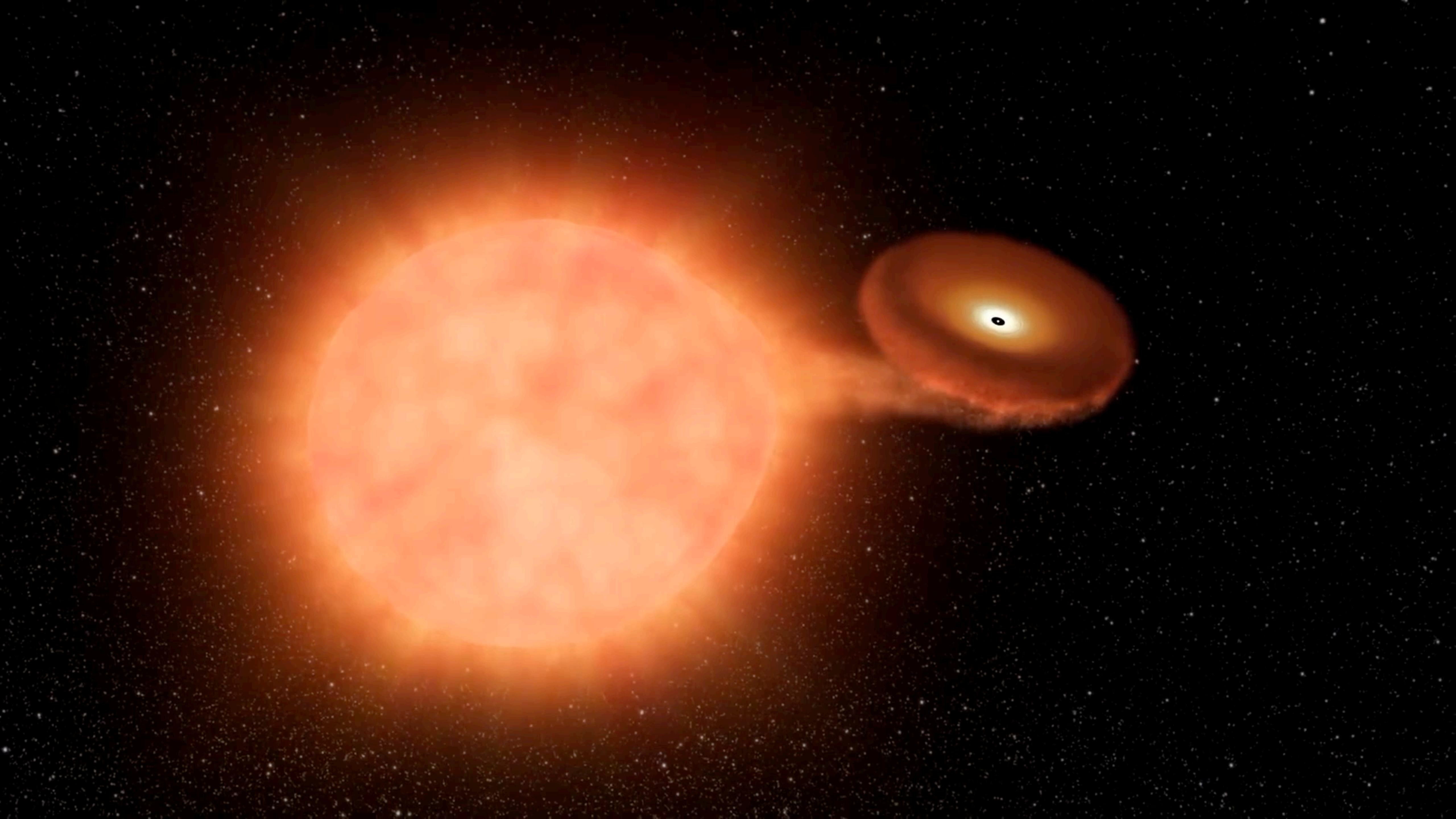




Supernovae and TESS

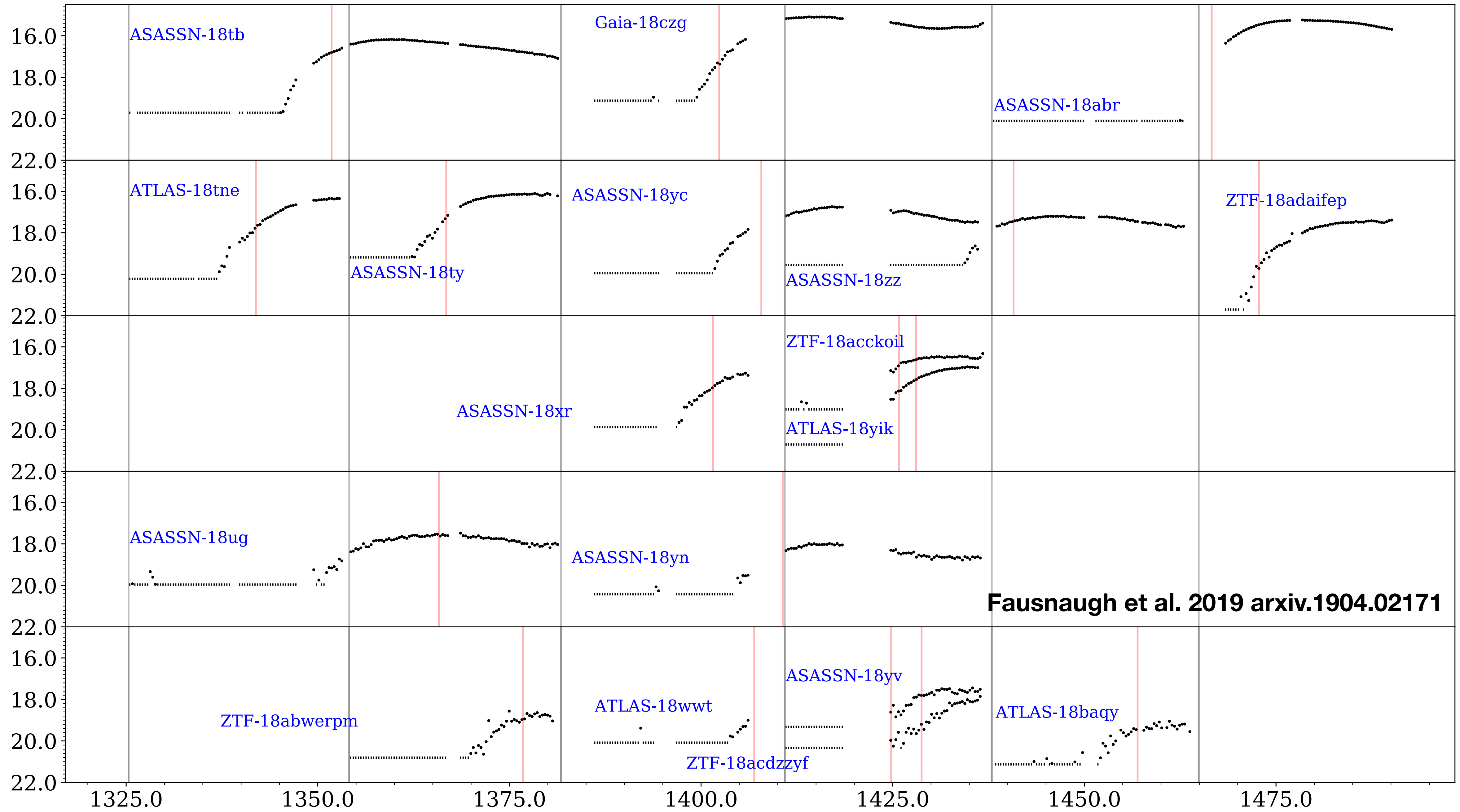
- Light curve at moment of explosion
- Explosion physics
 - Shock breakout
 - Shock cooling
- Progenitor composition/density profile
- Circumstellar material
- **Companion stars**
 - Type Ia:
 - Companion likely involved with the detonation





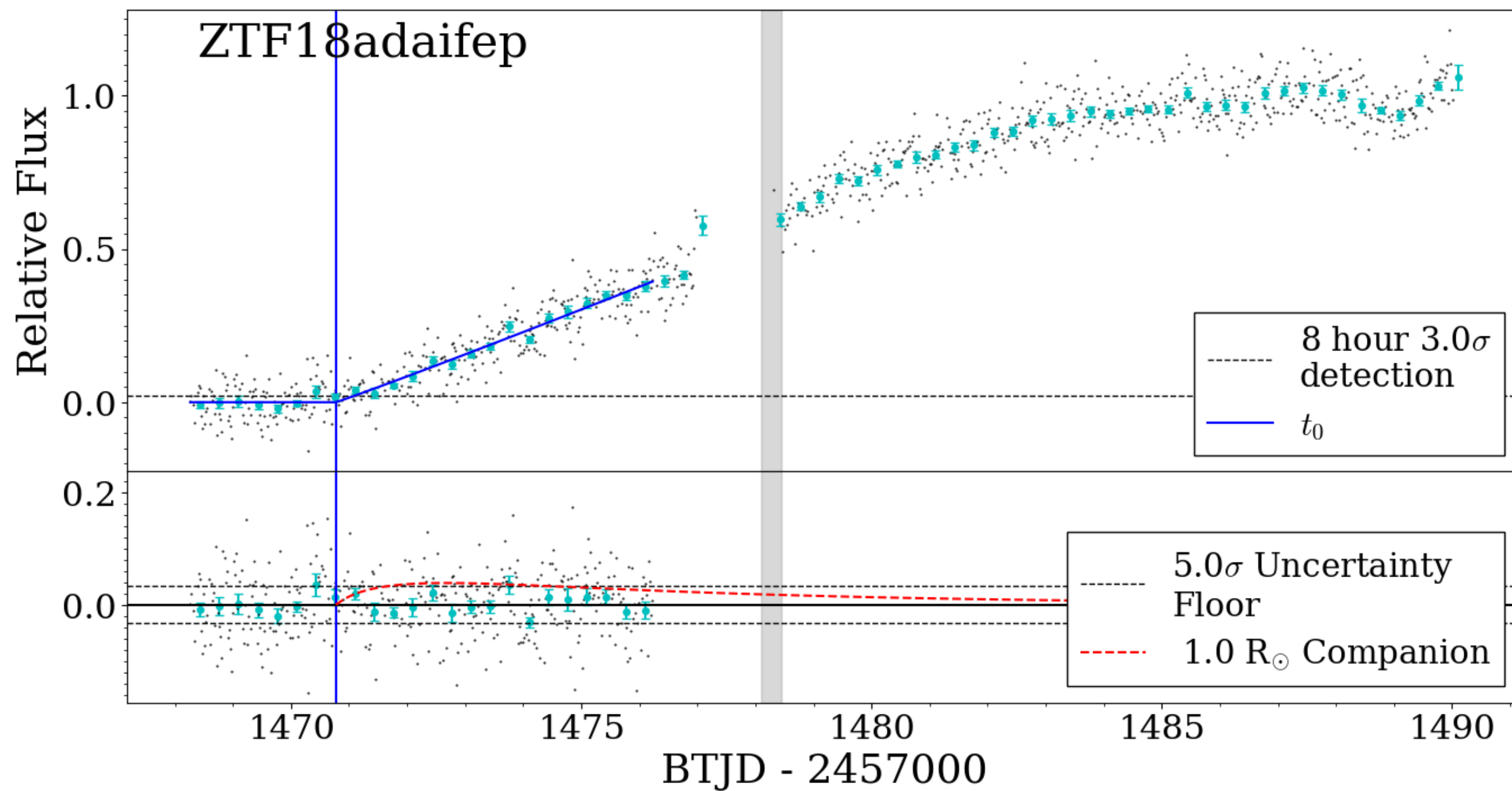
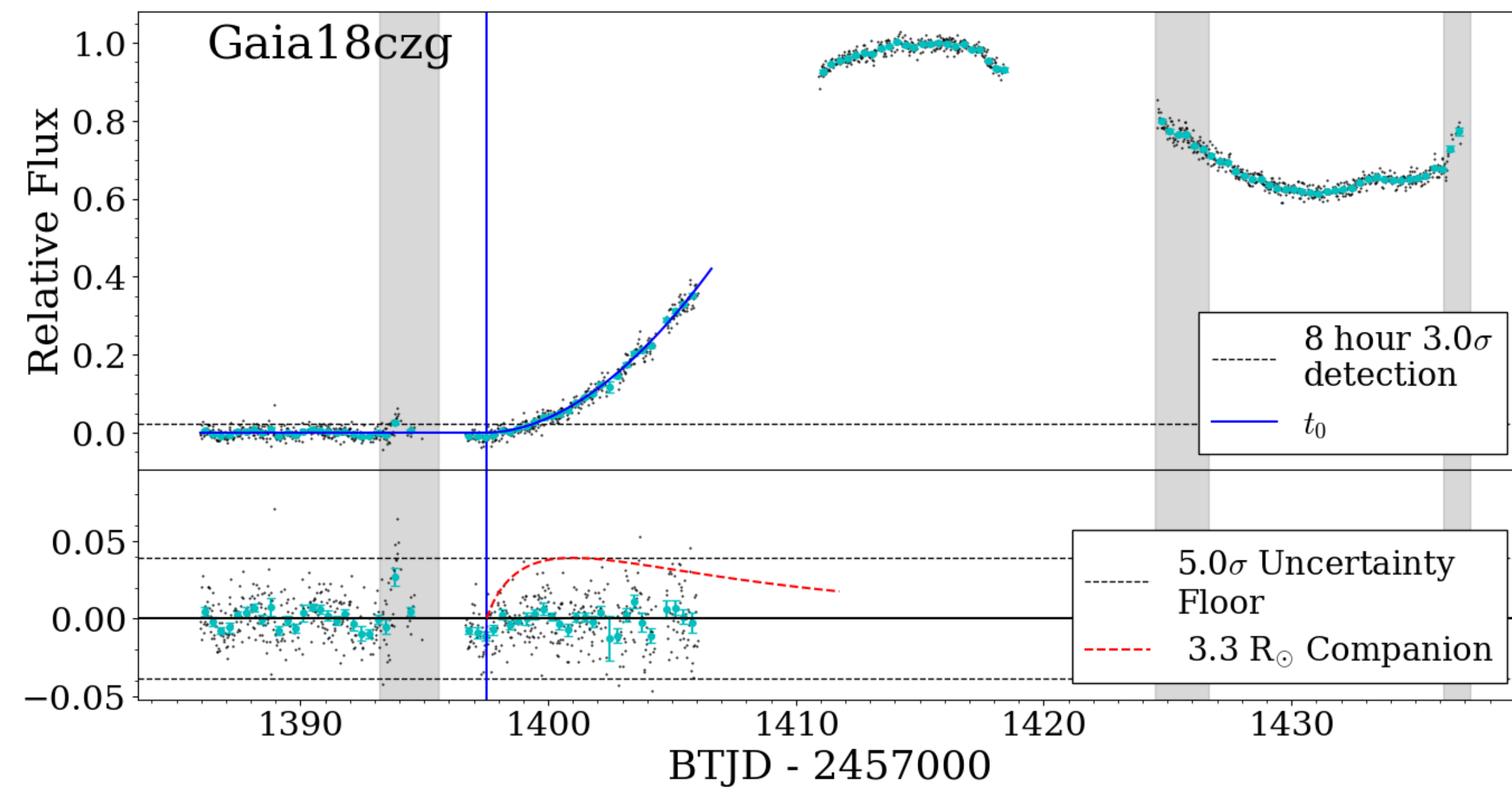
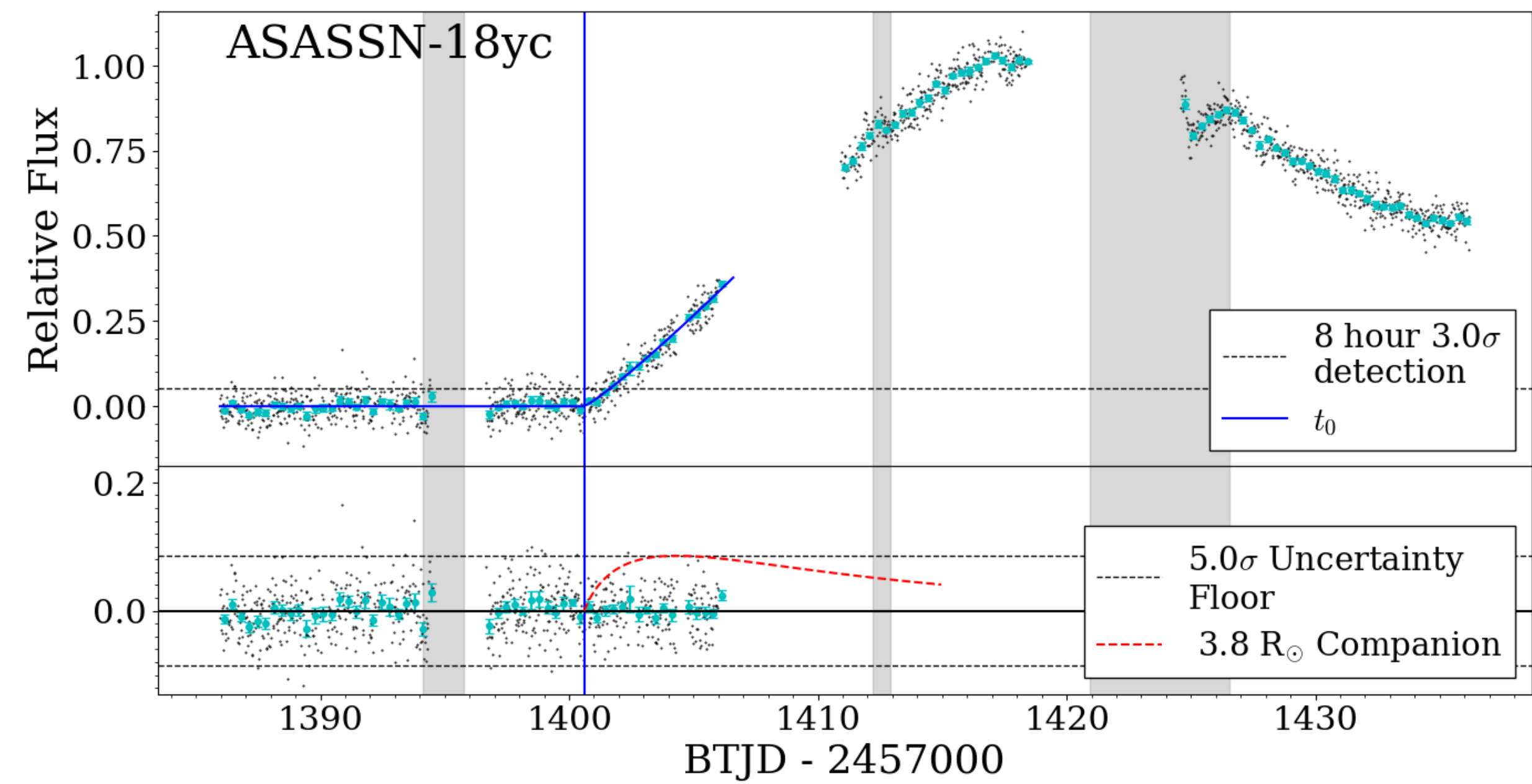
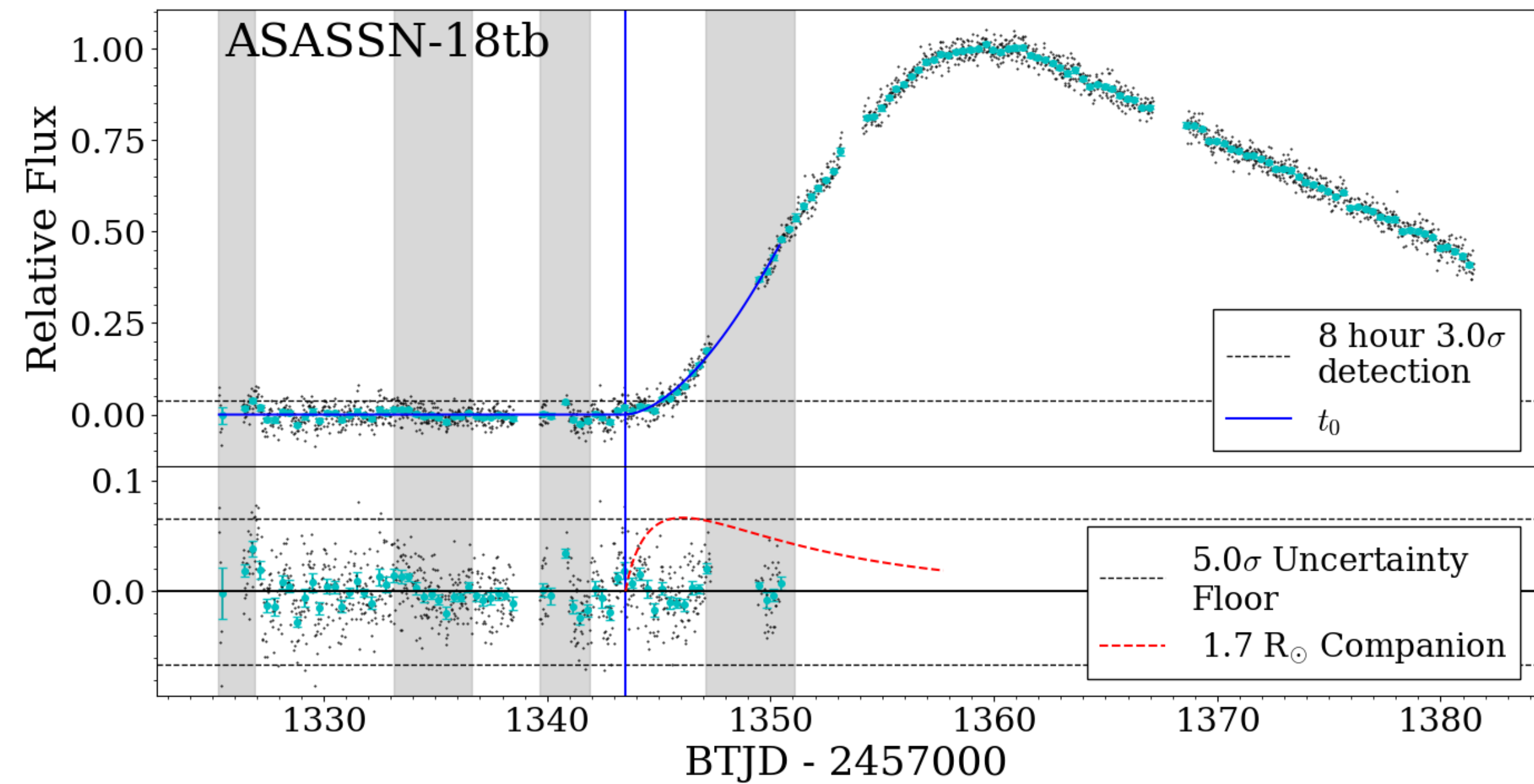
S1 S2 S3 S4 S5 S6

Apparent TESS magnitude

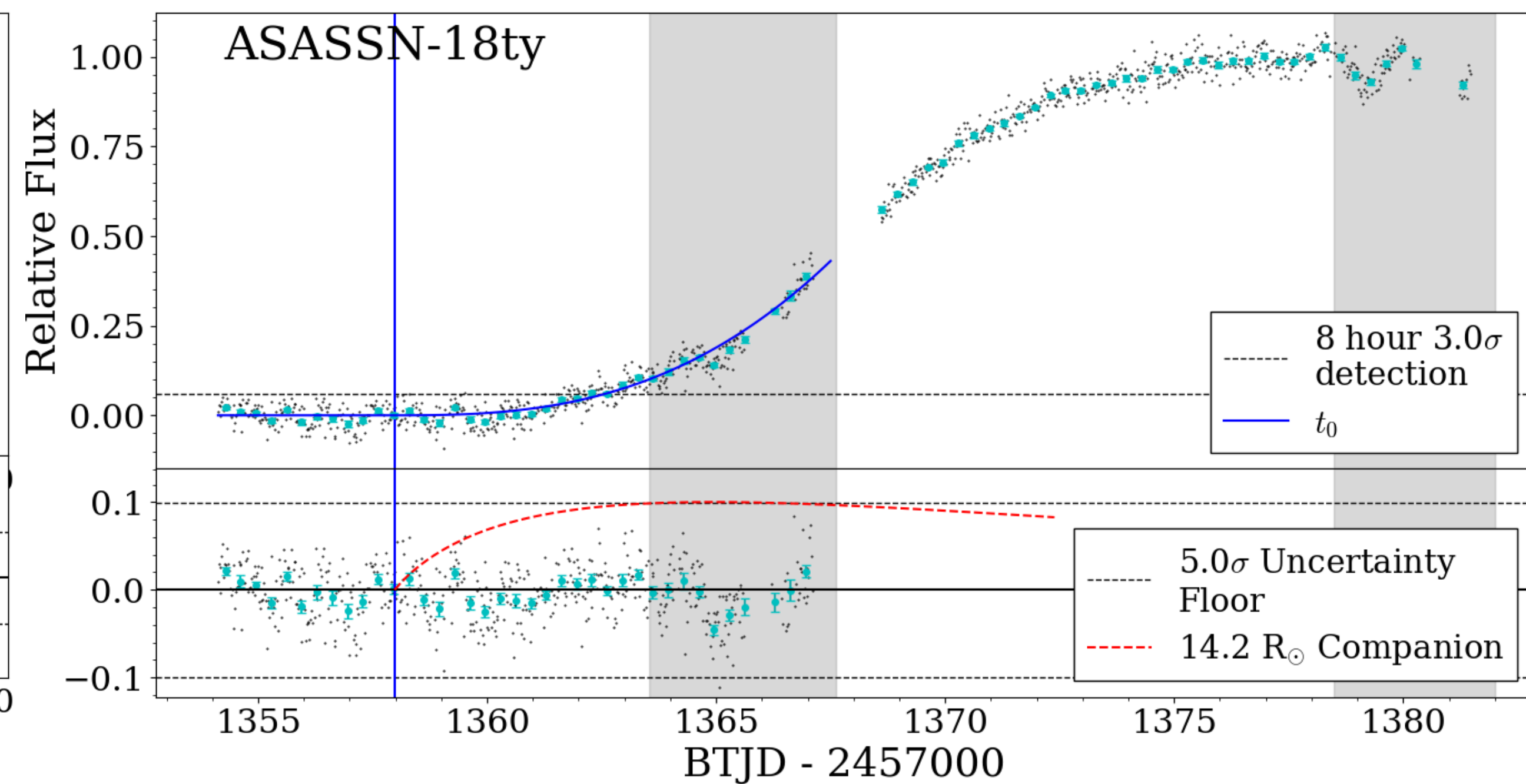
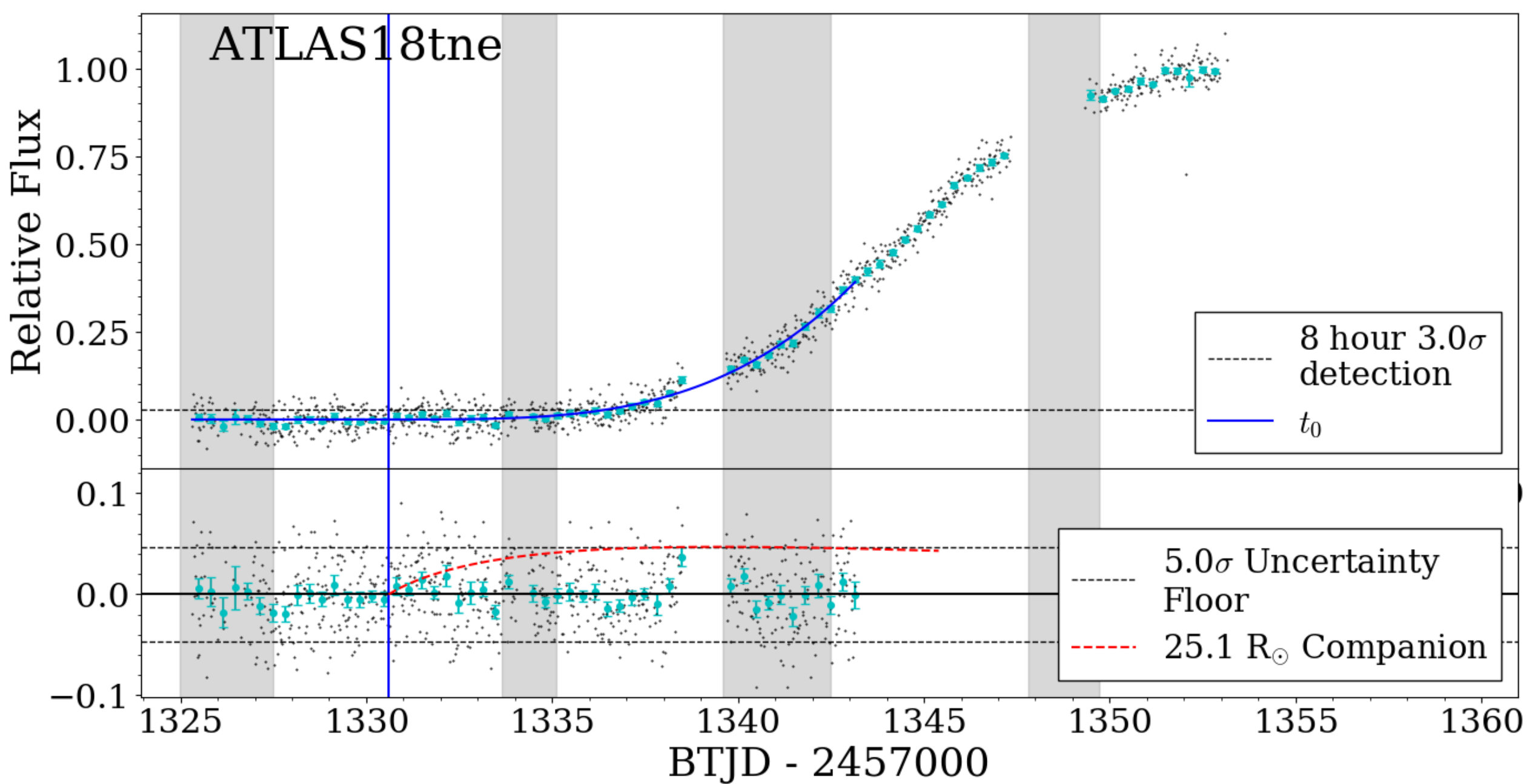


Fausnaugh et al. 2019 arxiv.1904.02171

BJD - 2457000

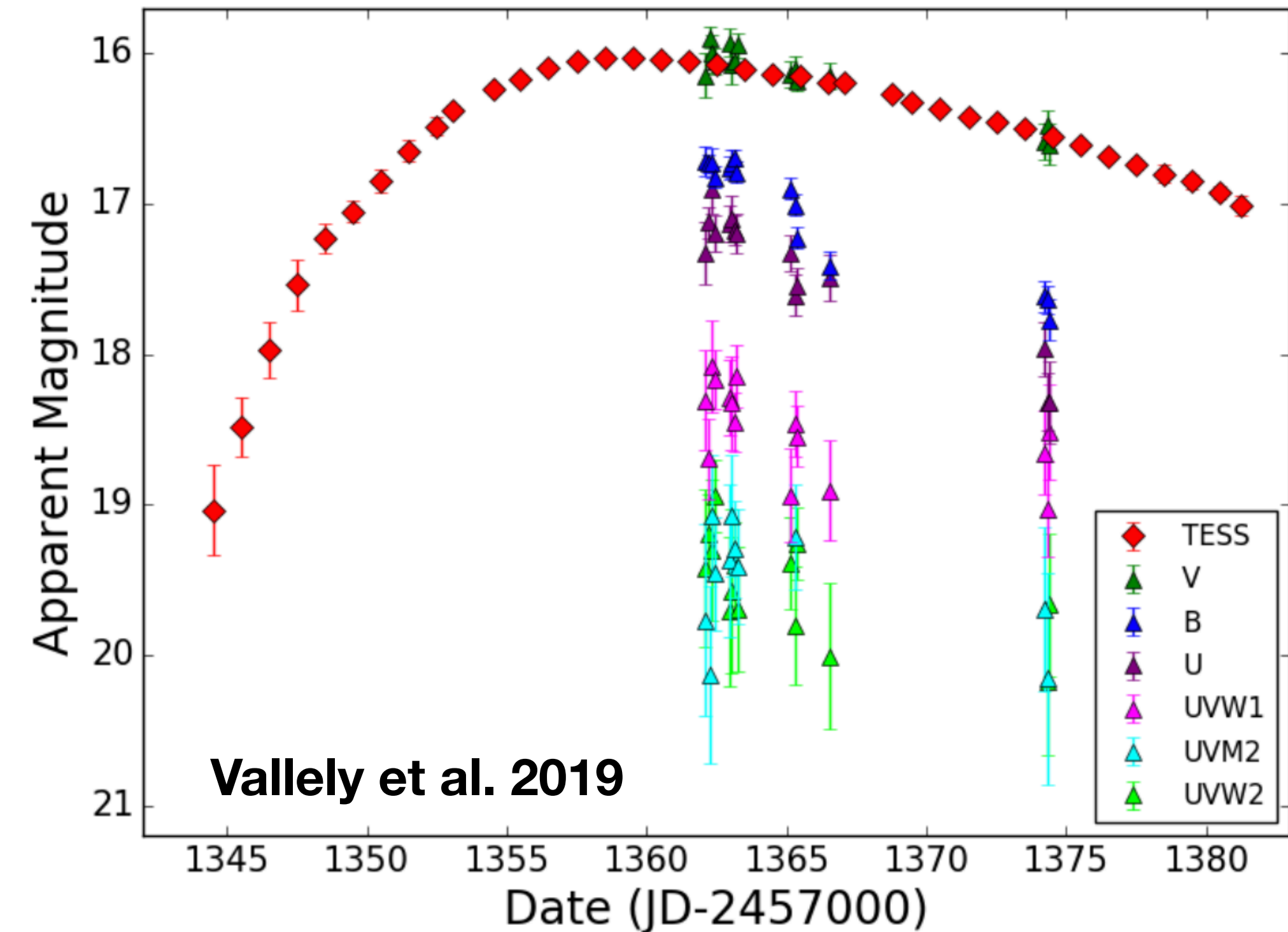
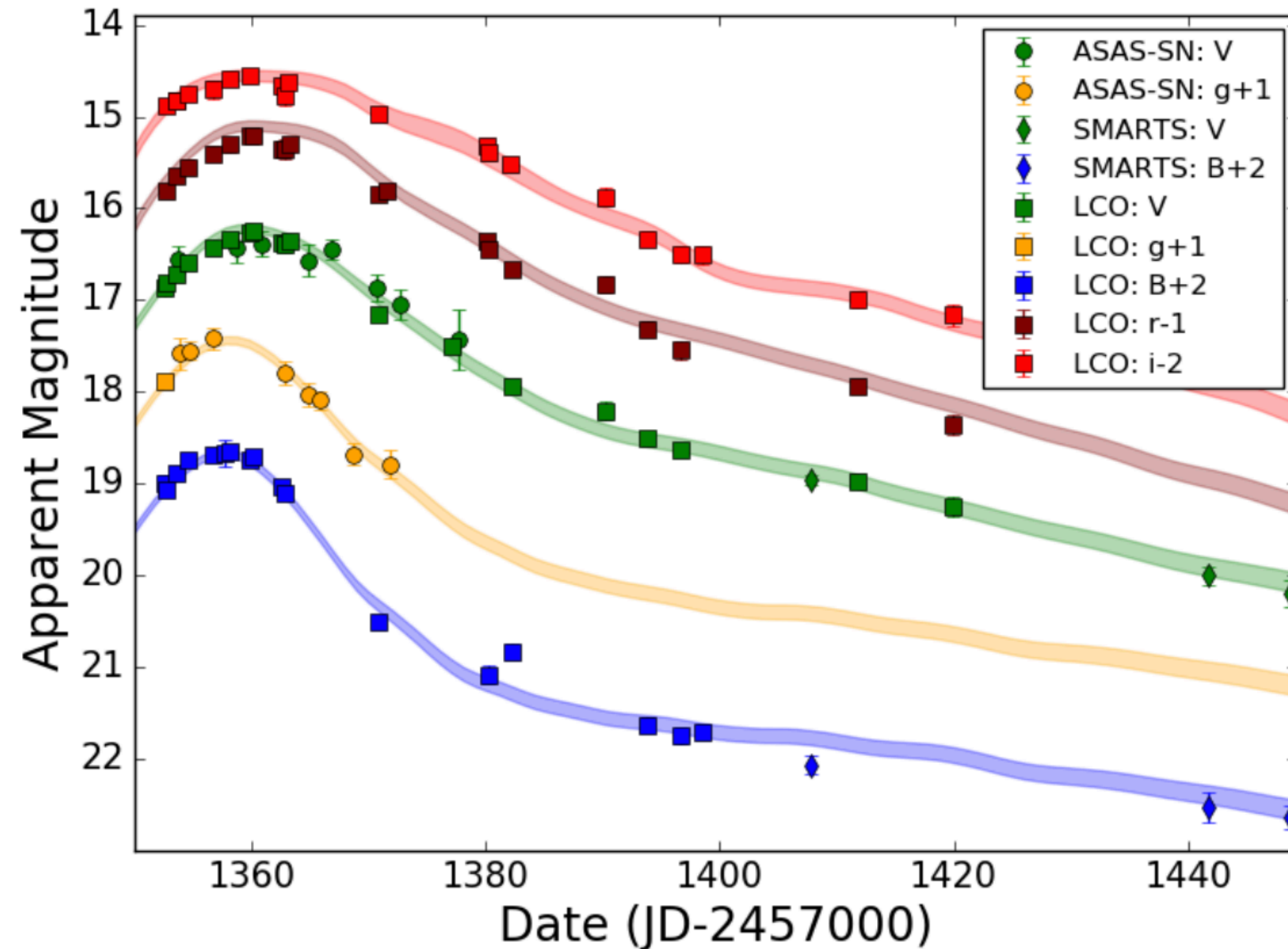
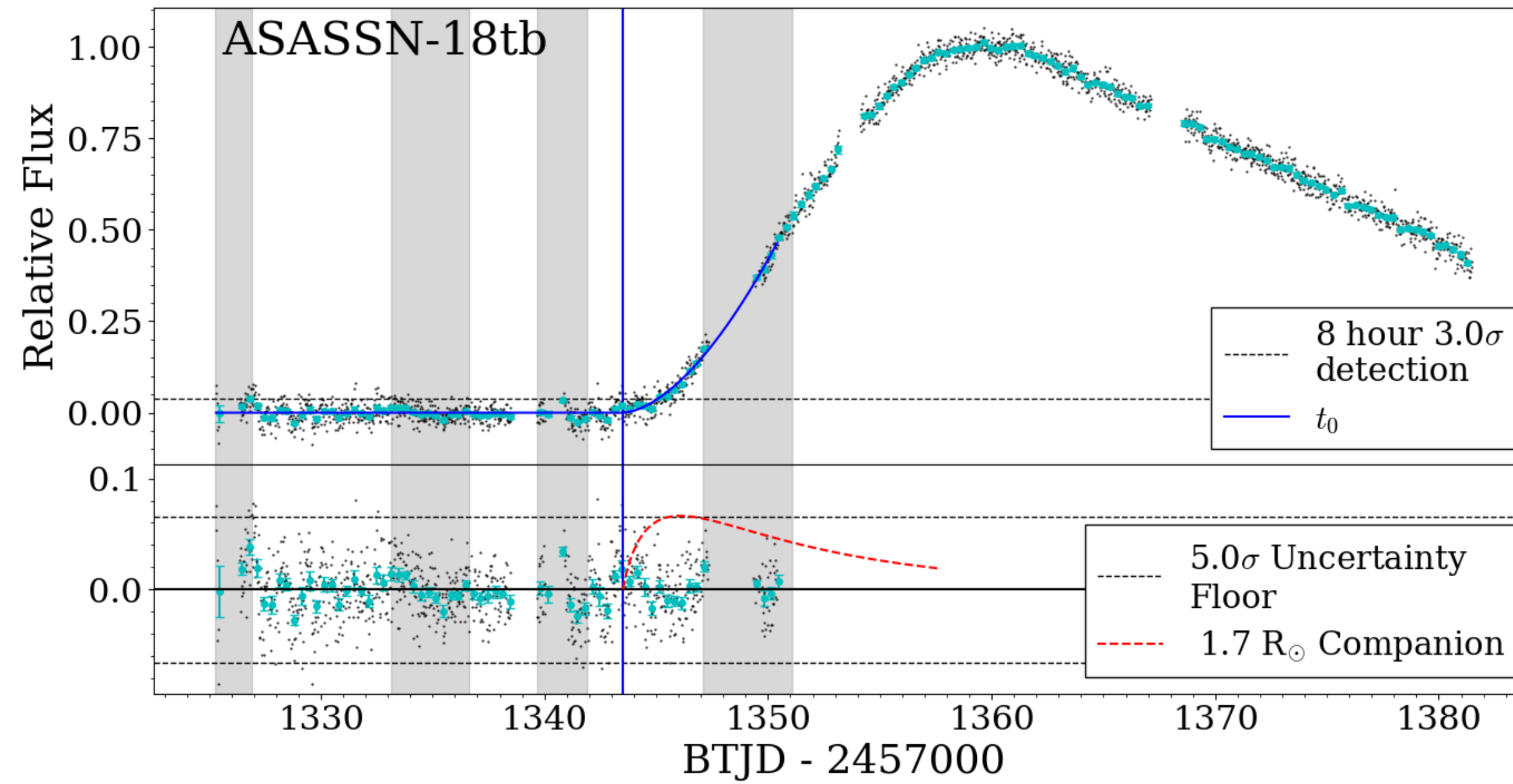


Fausnaugh et al. 2019 arxiv.1904.02171

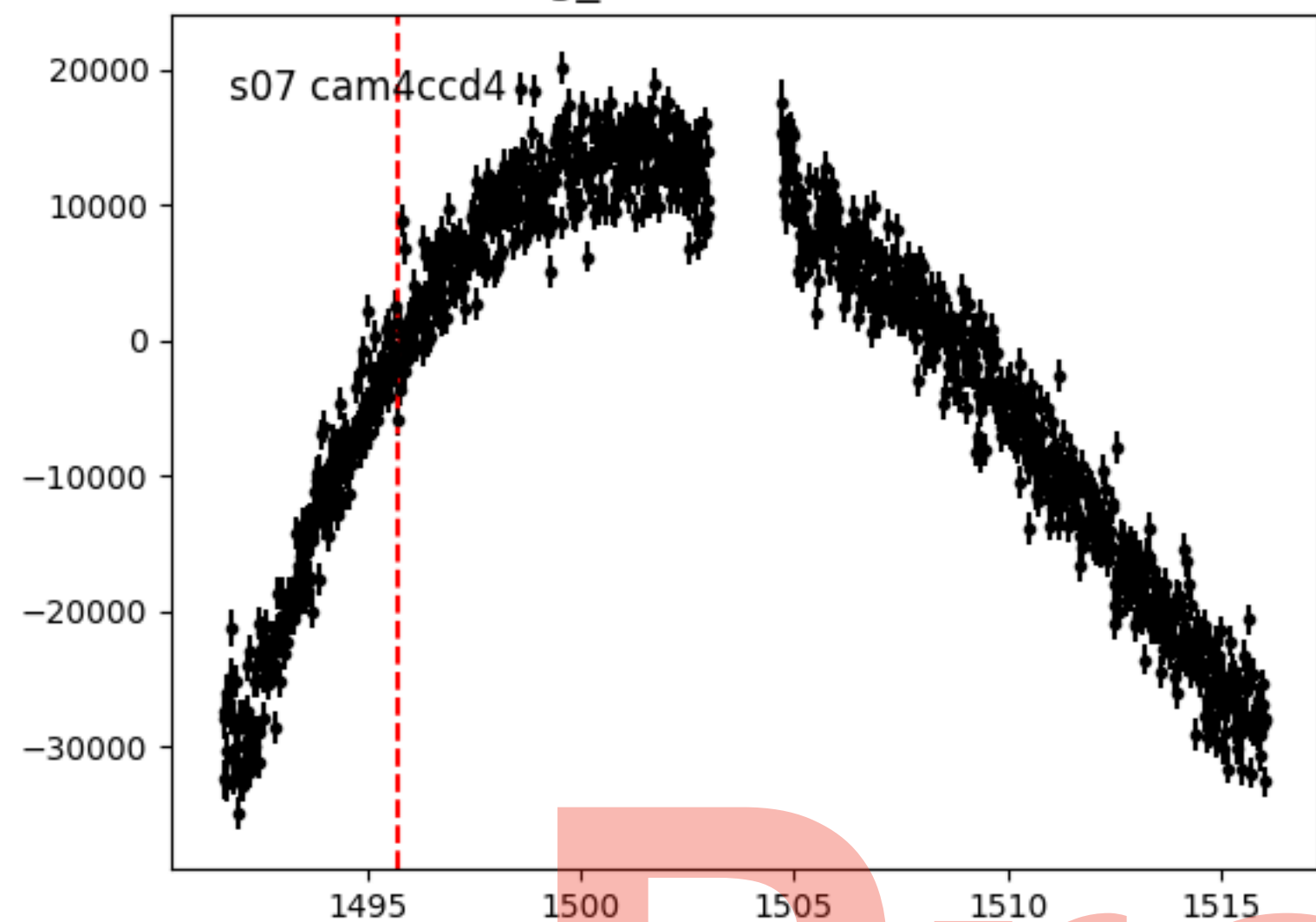


Additional data for 18tb

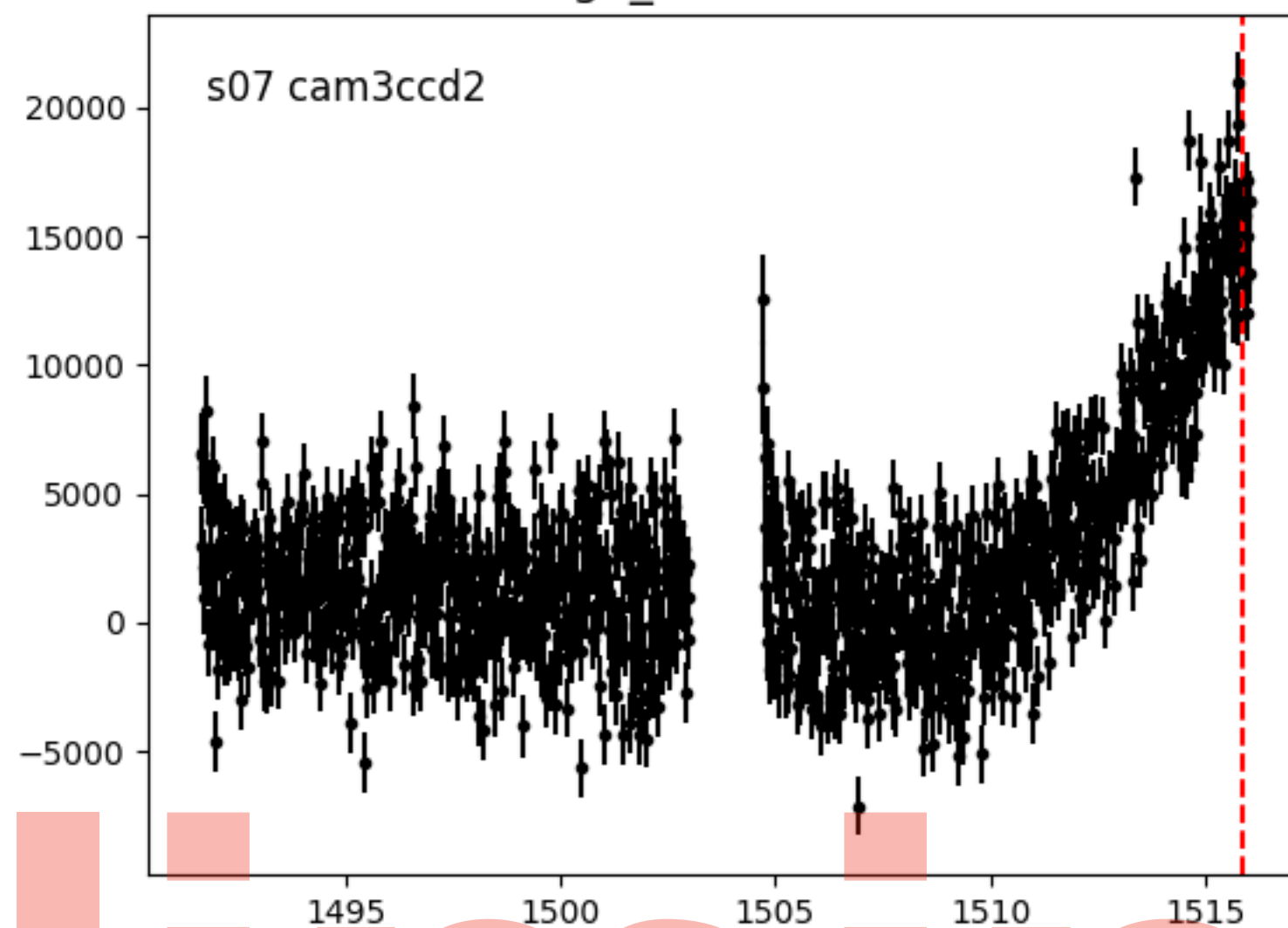
See Vallely et al. poster #92



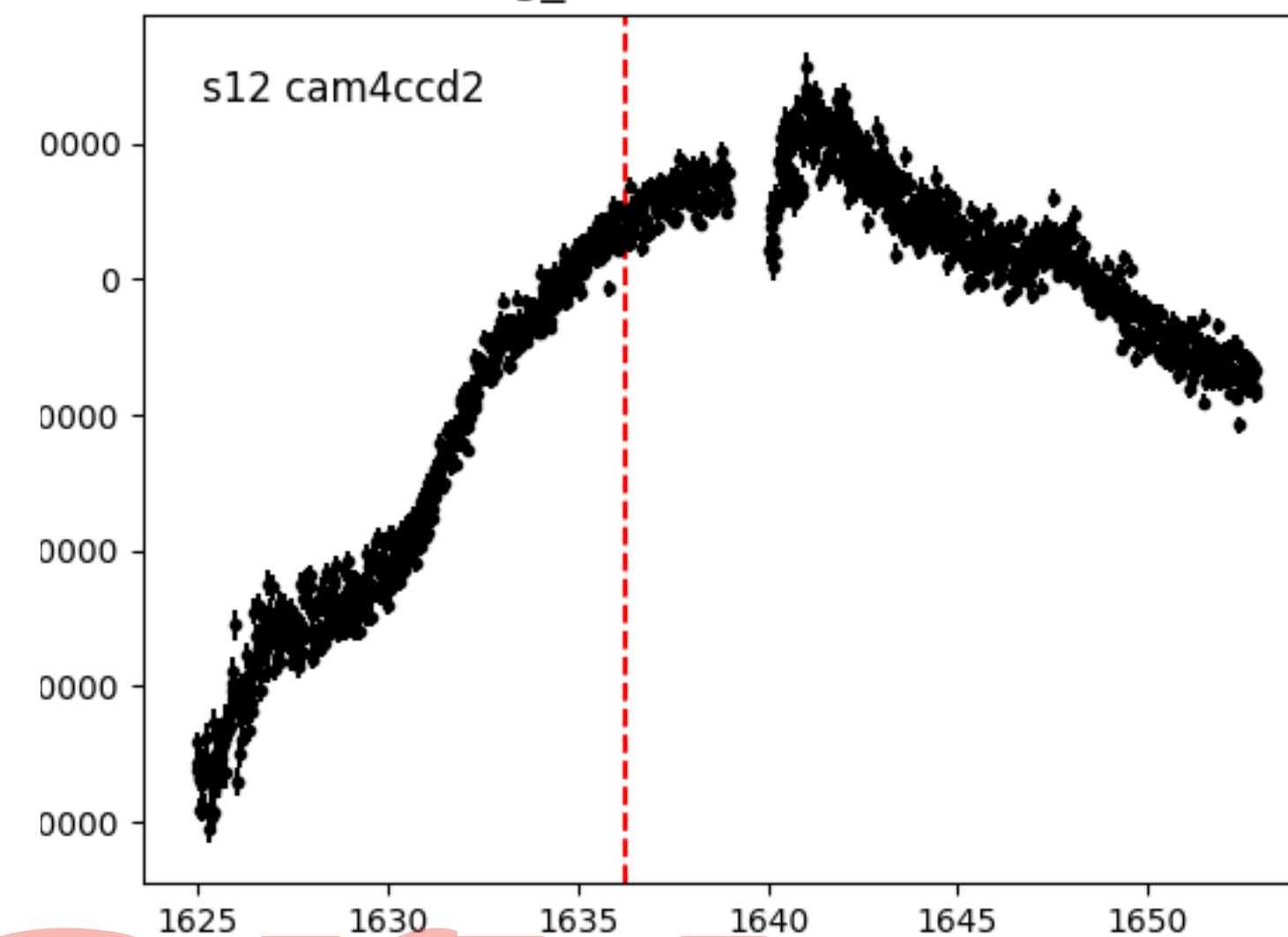
SN2019rm ASASSN-19at
16.2g_Sloan SNIa z= 0.02



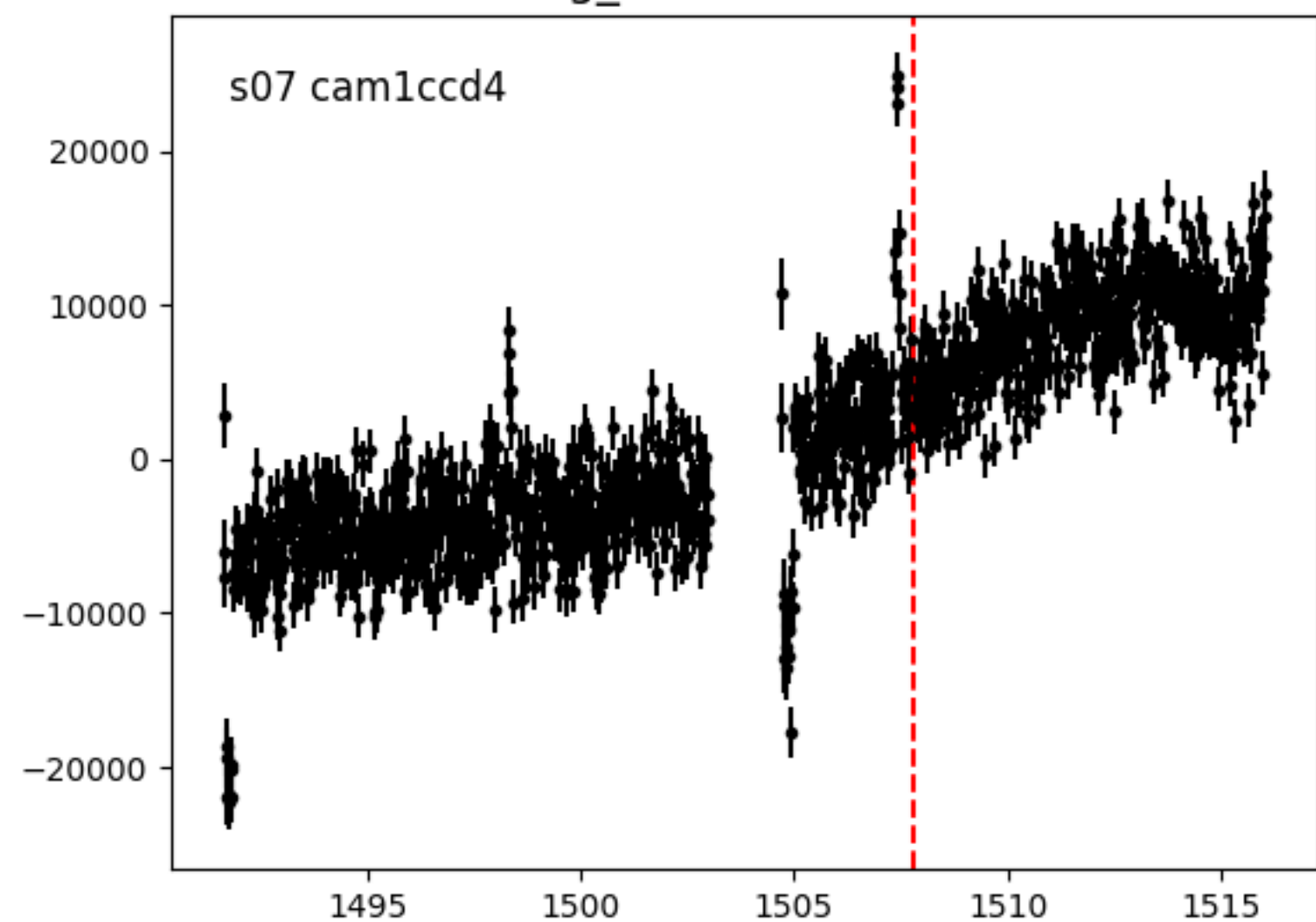
SN2019ako ATLAS19cdg
18.538orange_ATLAS SNIa z= 0.029



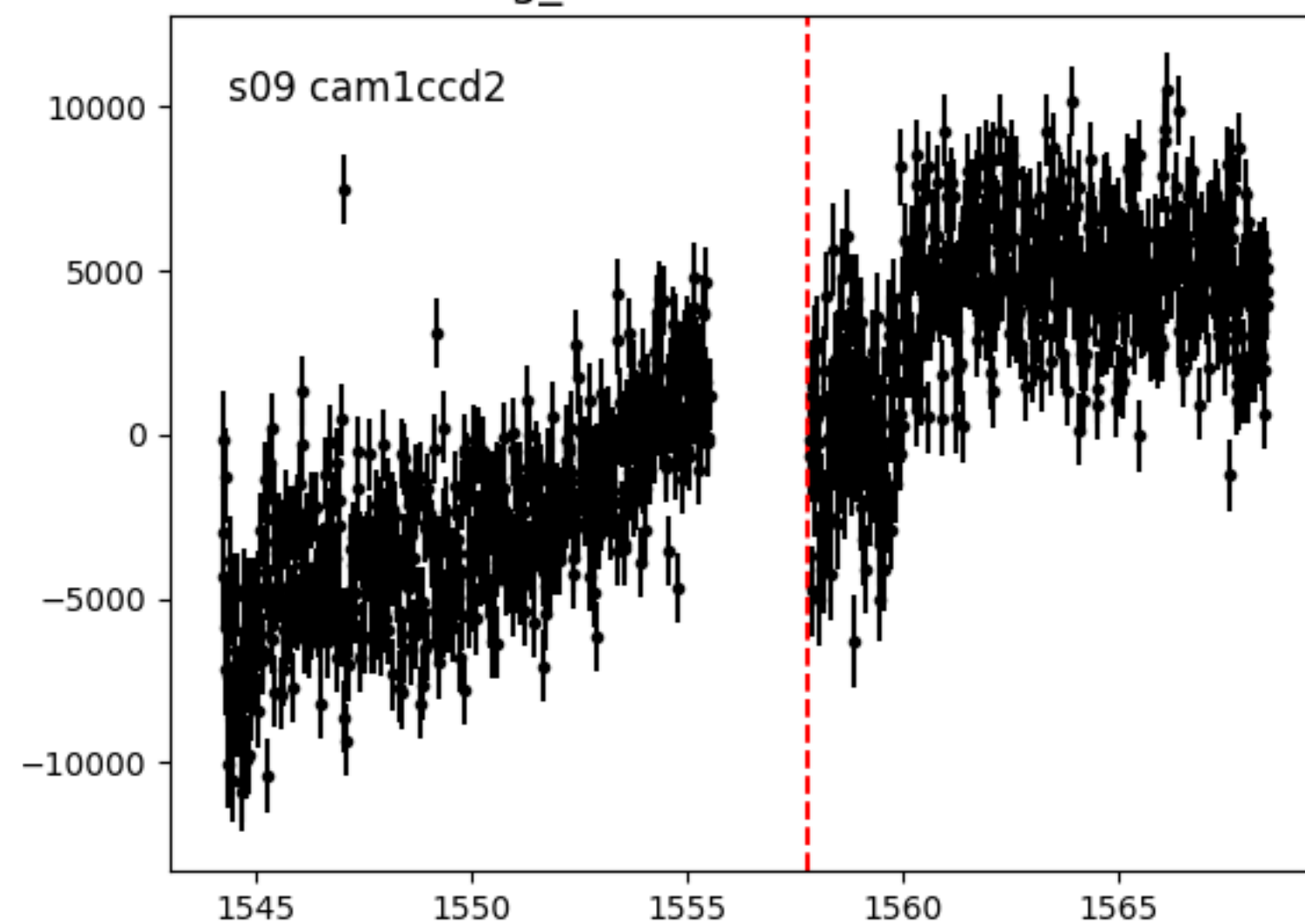
SN2019gqv ASASSN-19ny
16.7g_Sloan SNIa z= 0.017



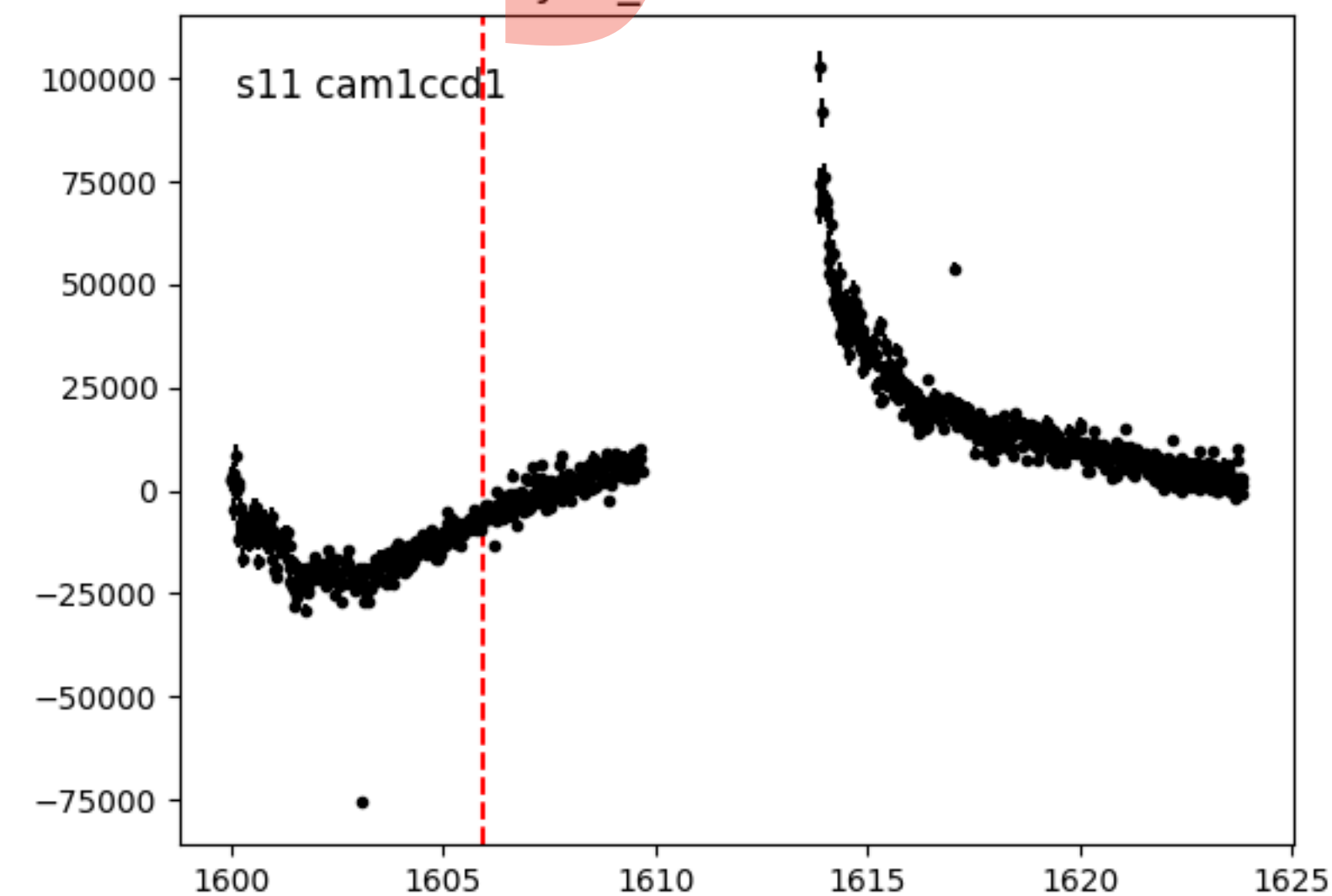
SN2019aba ZTF19aaeicsm
18.74g_ZTF SNIa z= 0.062



SN2019bxi ZTF19aamoidt
18.9g_ZTF SNIa z= 0.058752



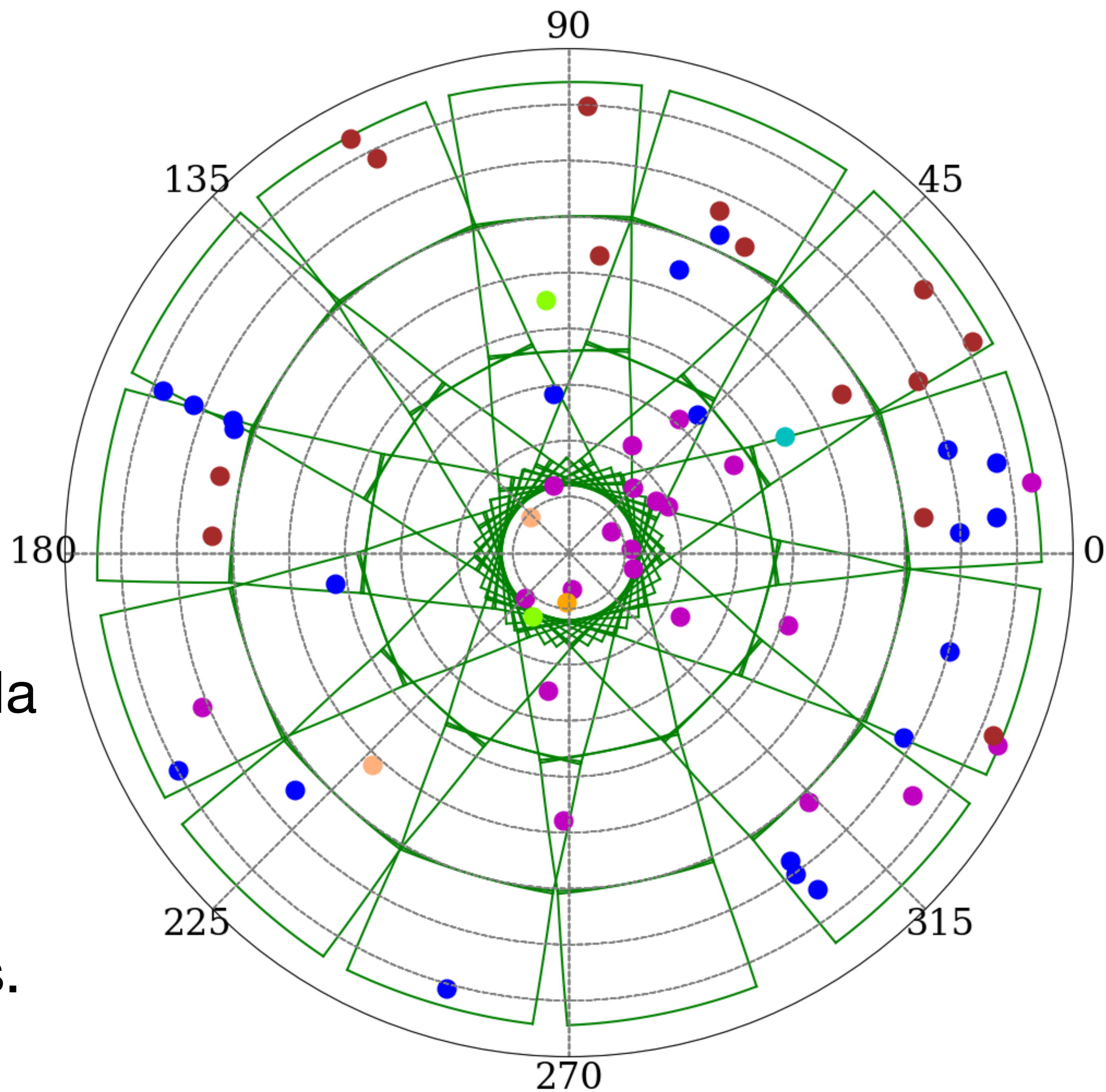
SN2019ekn ATLAS19imc
17.235cyan_ATLAS SNIa z= 0.036



Preliminary

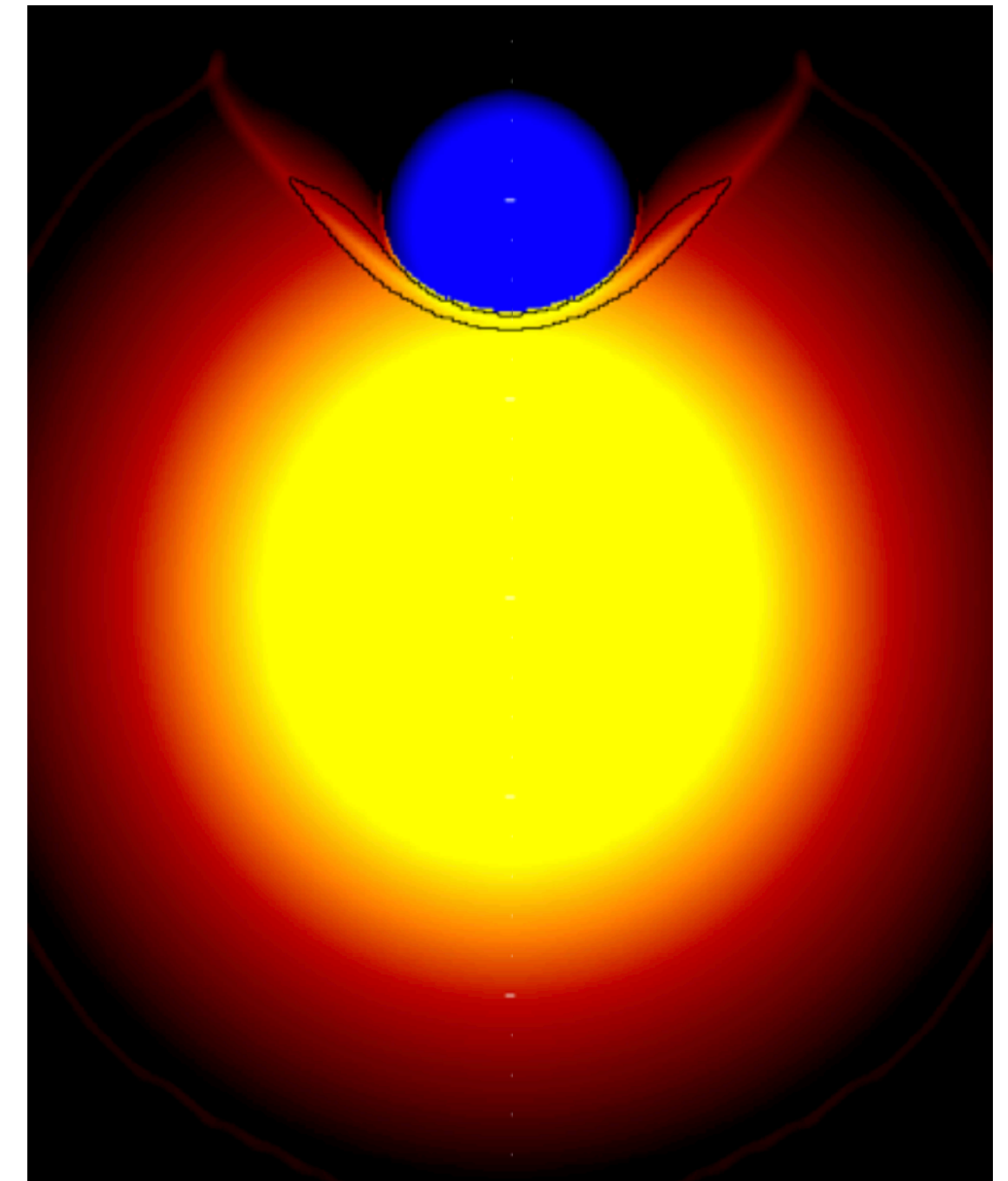
Summary

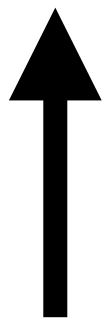
- Early-time TESS open a new window on transients
- 62 supernovae in year 1
- 407 hundred transients
- Type Ias:
 - Strong Constraints on type Ia progenitor systems
 - Six good measurements in first 6 months
 - Expecting 20—30 in 2 years.



Brighter

Fainter faus@mit.edu



Kasen 2010  To Observer

 To Observer

 To Observer



Odds of obscured companion:

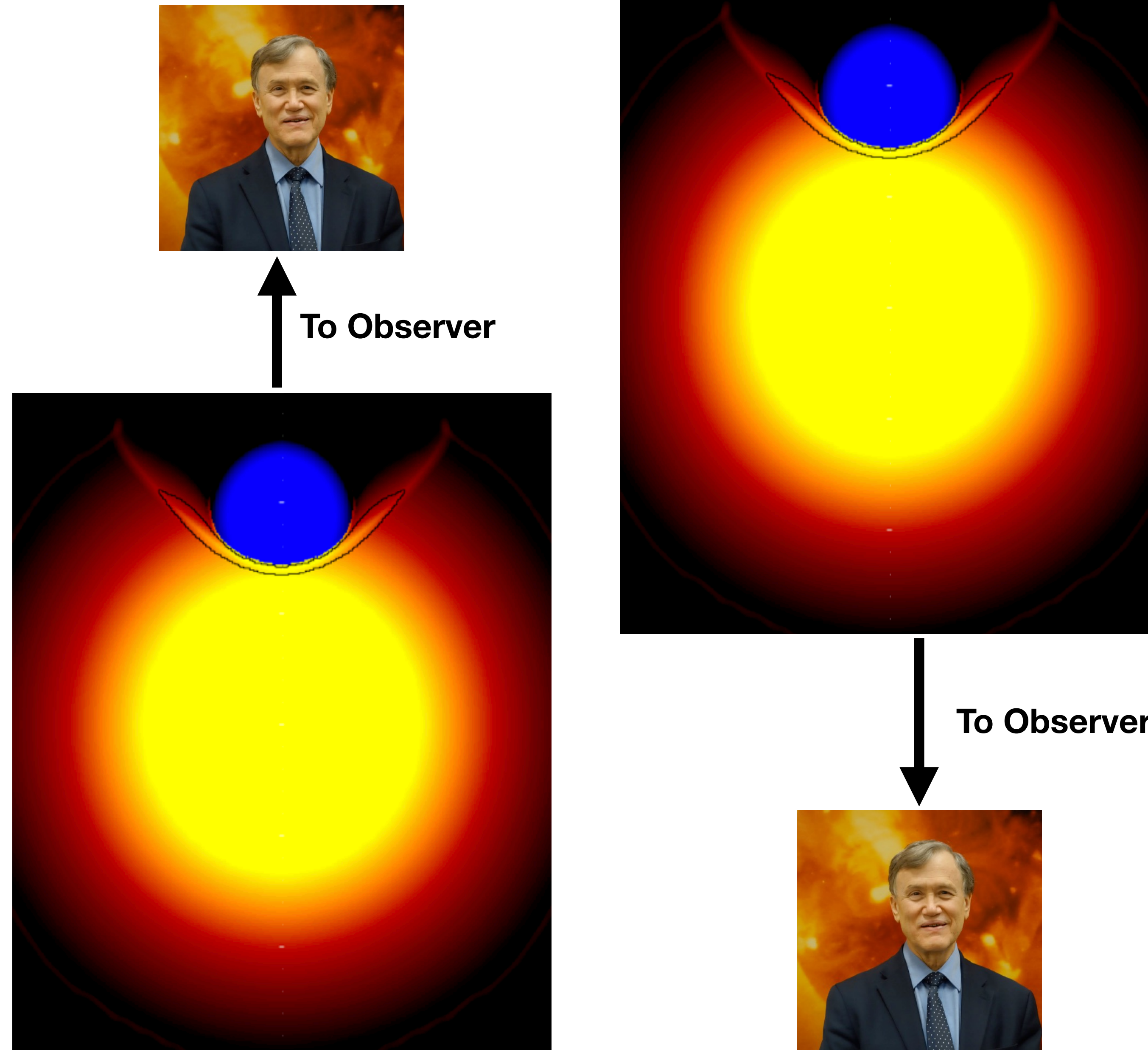
- 52% for 4 objects
- 38% for 6 objects

To increase confidence level:

- 95% for 18 objects
- 99% for 28 objects

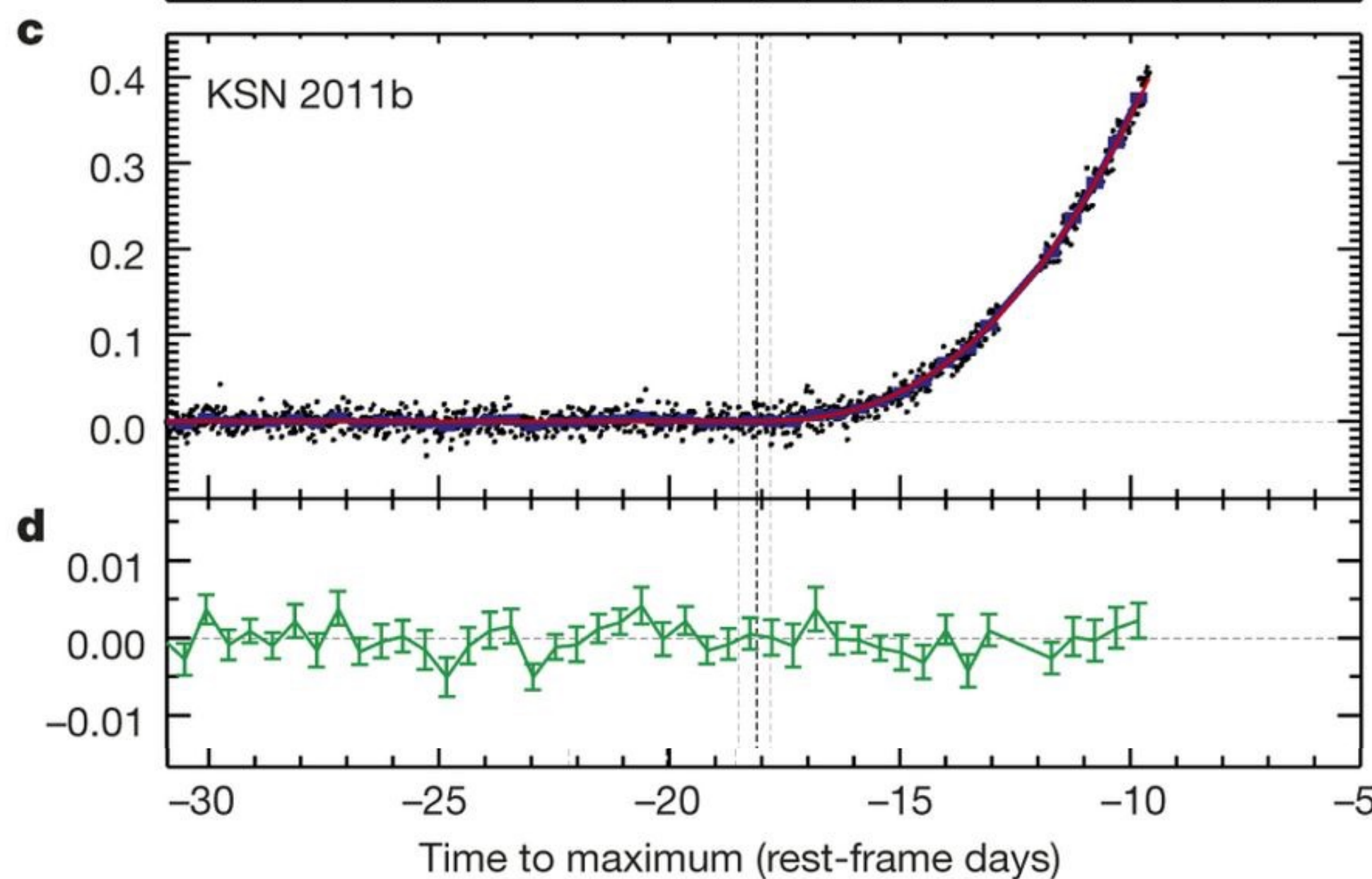
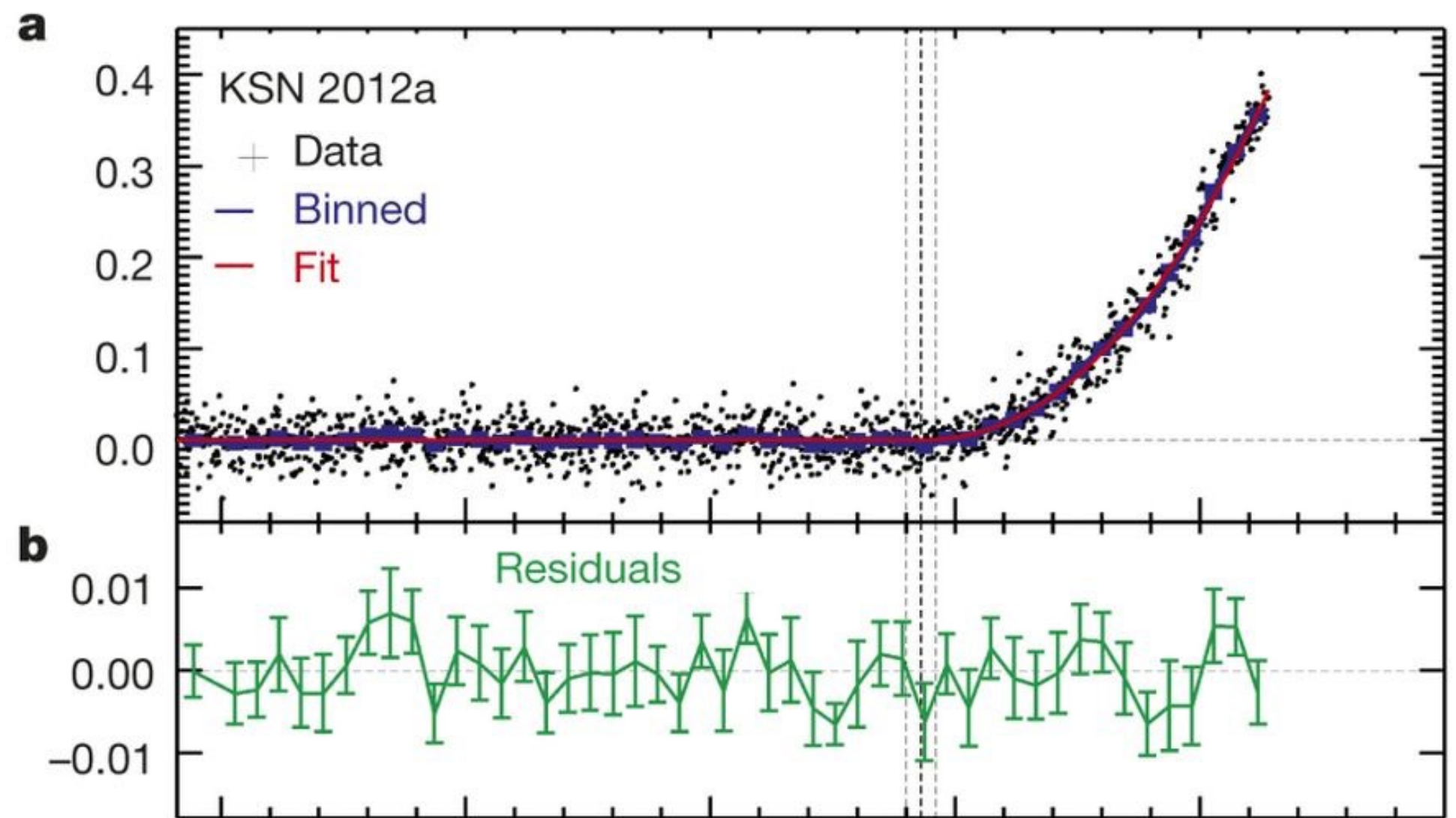
We expect 16—28 bright supernovae over 2 years

Strong test of single/double degenerate scenarios

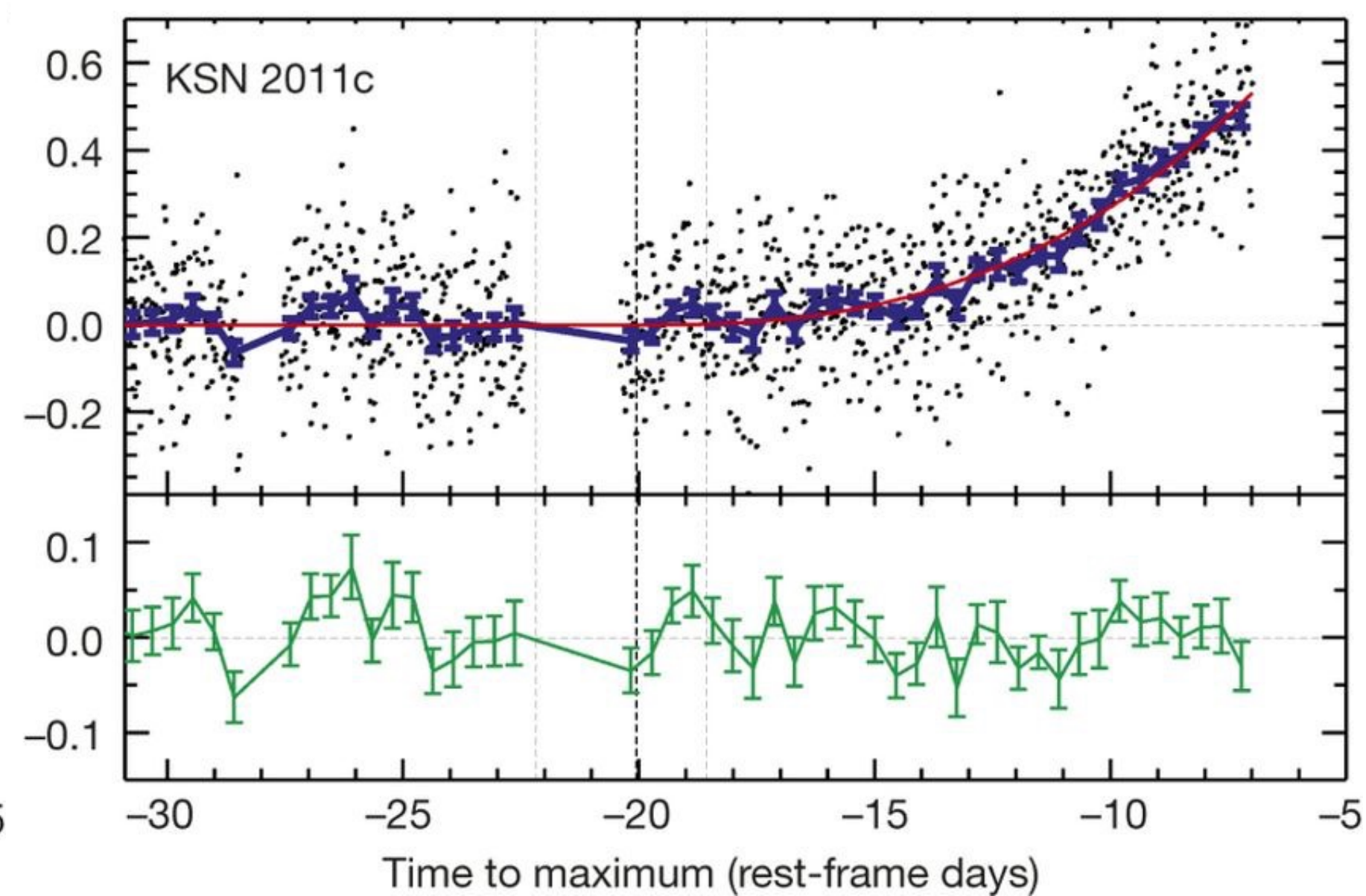
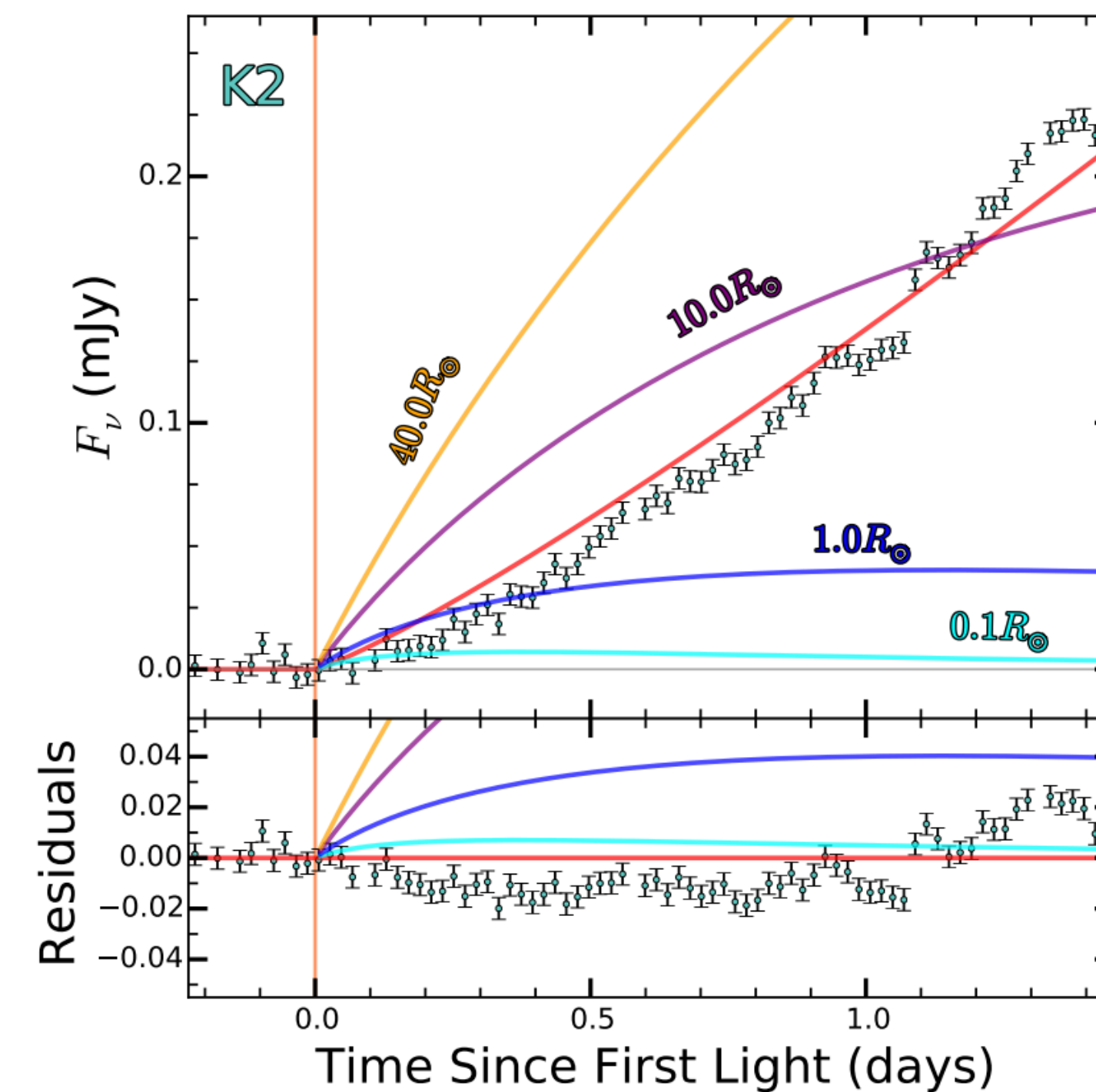
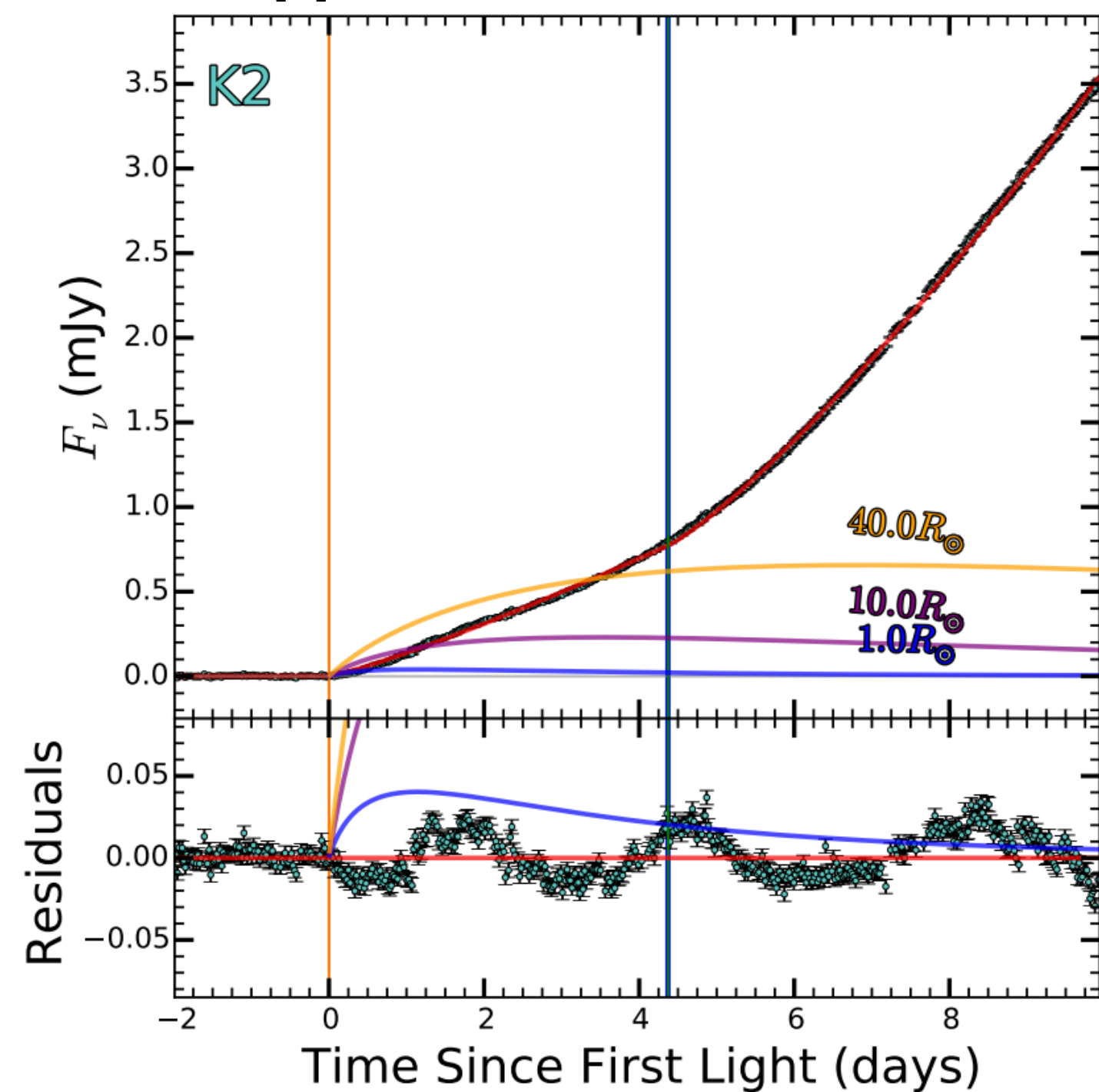


Results from Kepler

Olling et al. 2015



Shappee et al. 2019





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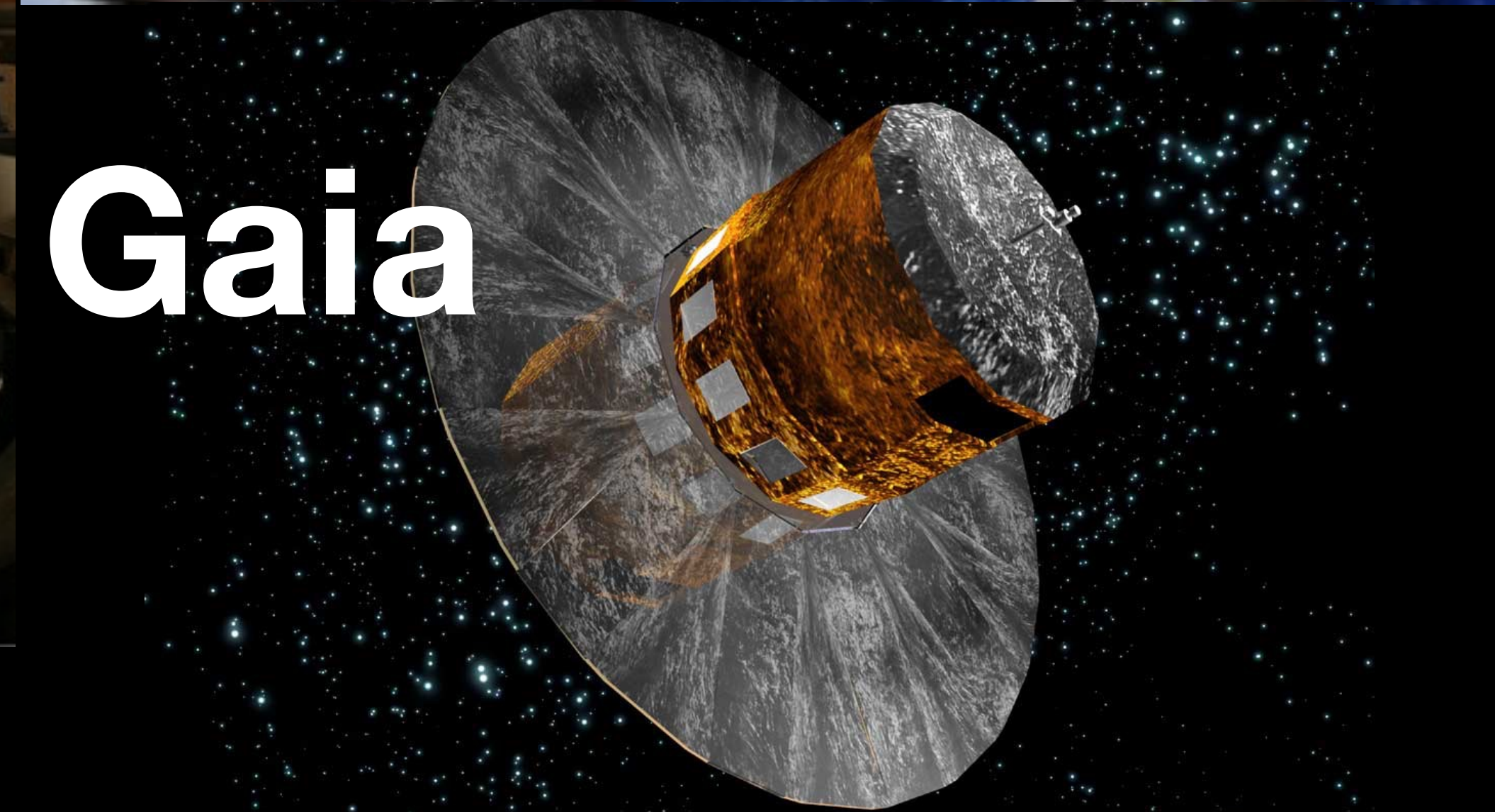


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Transient Surveys



and many Others....