

Llamaradas Estelares: Modeling the Morphology of White-light Flares

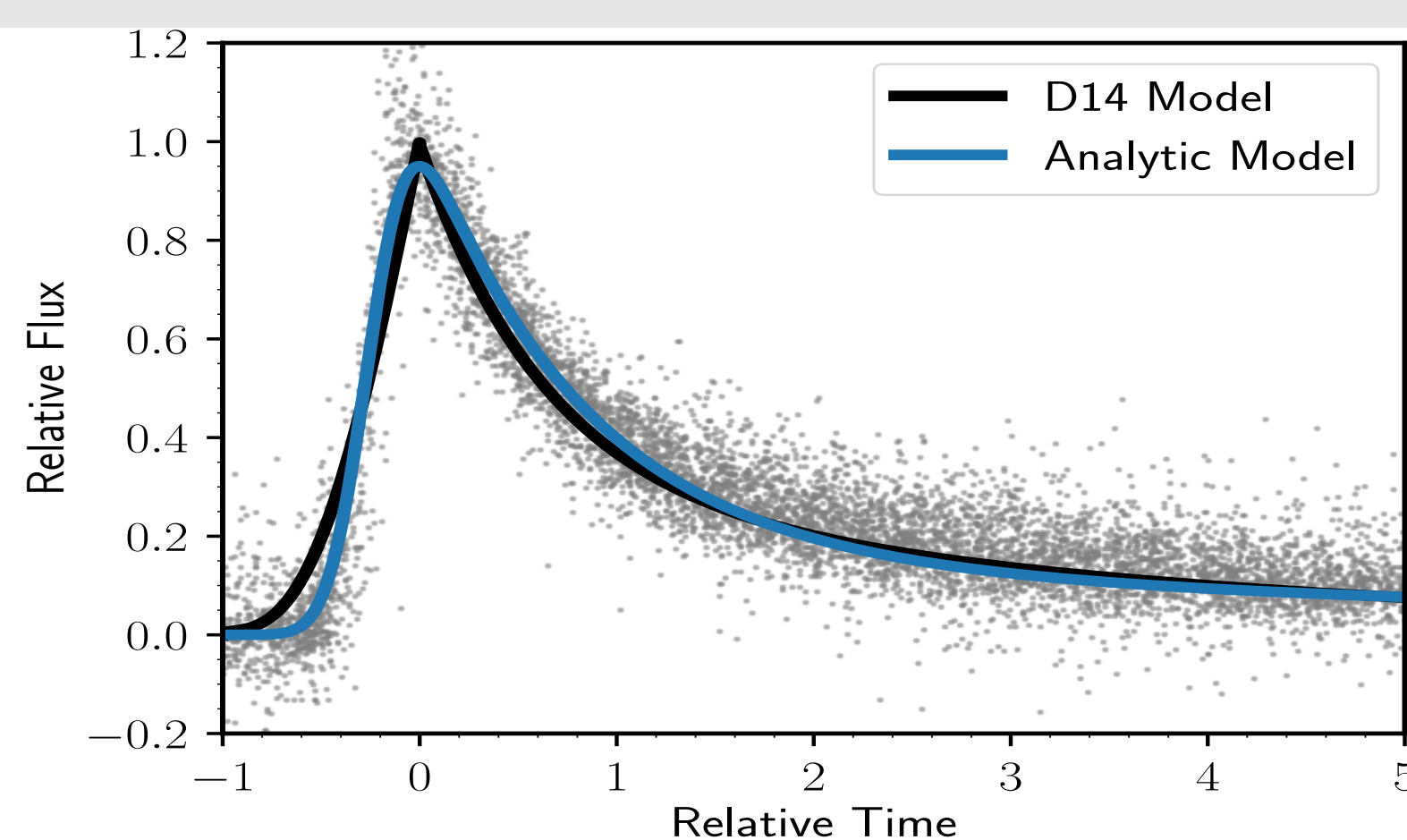


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WHITE-LIGHT FLARES: GJ 1243

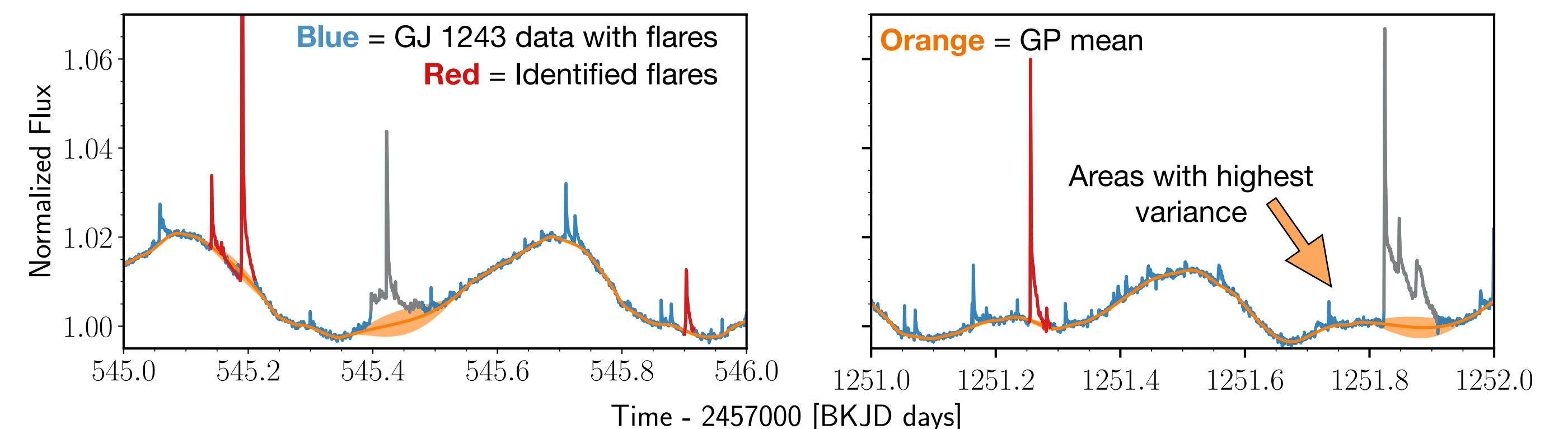
FLARE MORPHOLOGY



- Previous studies have shown **flares have a time dependent profile** and have derived an empirical template (Davenport et al. 2014).

- However, the model is based on a piece-wise function that creates a discontinuity at the flare peak & systematically under samples the peaks of flares.
- By using a vetted flare sample + GP starspot detrending + new parameterization (Jackman et al. 2018) the updated template addresses the limitations of the previous flare model.

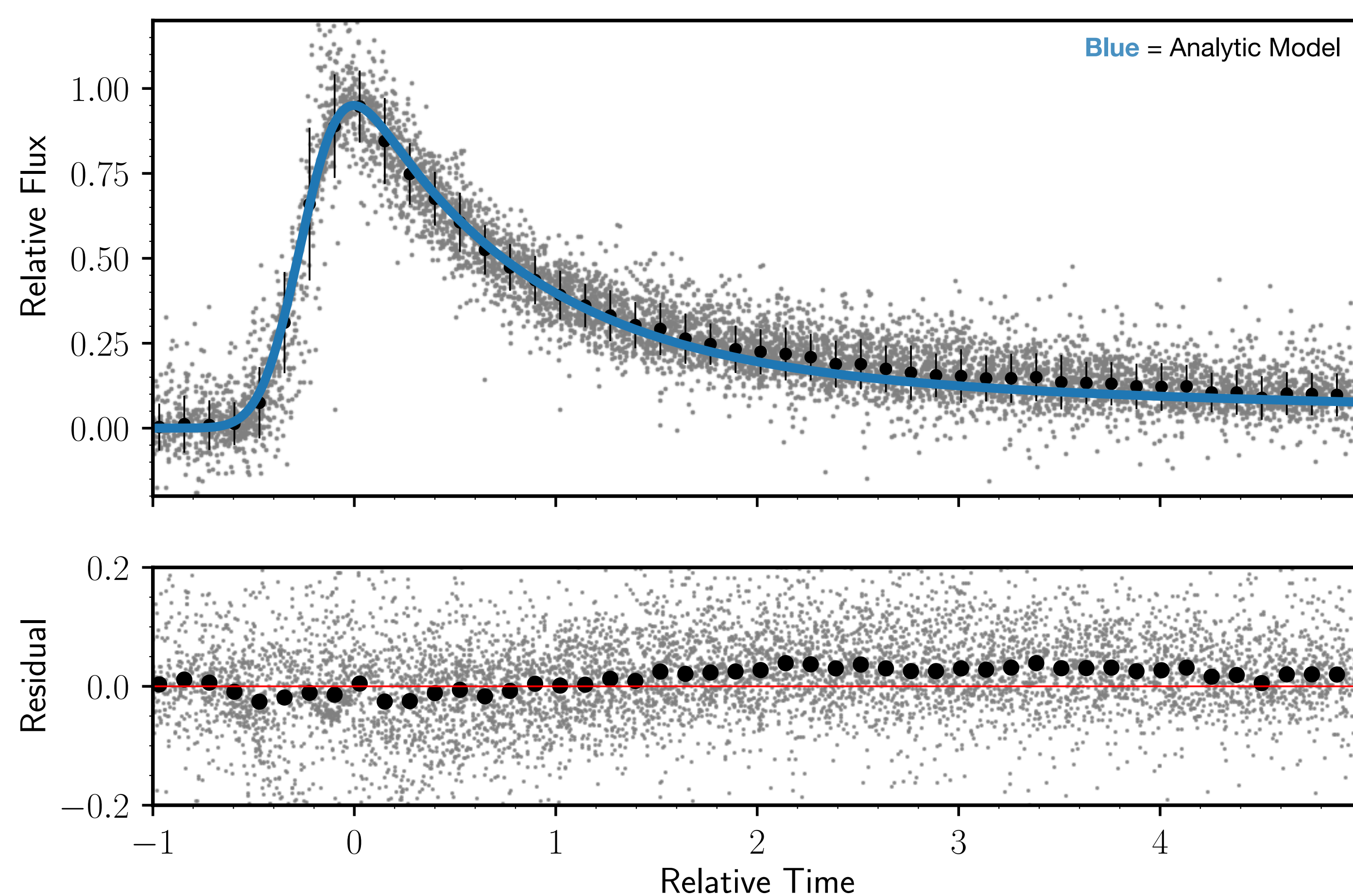
MODELING STARSPOT VARIATIONS



- Gaussian Processes (GPs) have been used to model stochastic variability in light curves. Here we use a simple harmonic oscillator kernel (Foreman-Mackey 2018) to robustly model the starspots on GJ 1243.
- We mask out the underlying flares in the light curve to prevent the GP from being skewed by frequent flaring events. **We expect the GP to have the highest variance in areas where flares occur.**

FLARE TEMPLATE

- We use a new stacking procedure that is less sensitive to sampling effects and scales each flare to a relative time and amplitude.
- The residuals are mostly uniform and flat. The structure in the decay phase of the flares is caused by uncertainties in the stop times of flares and the starspot detrending.



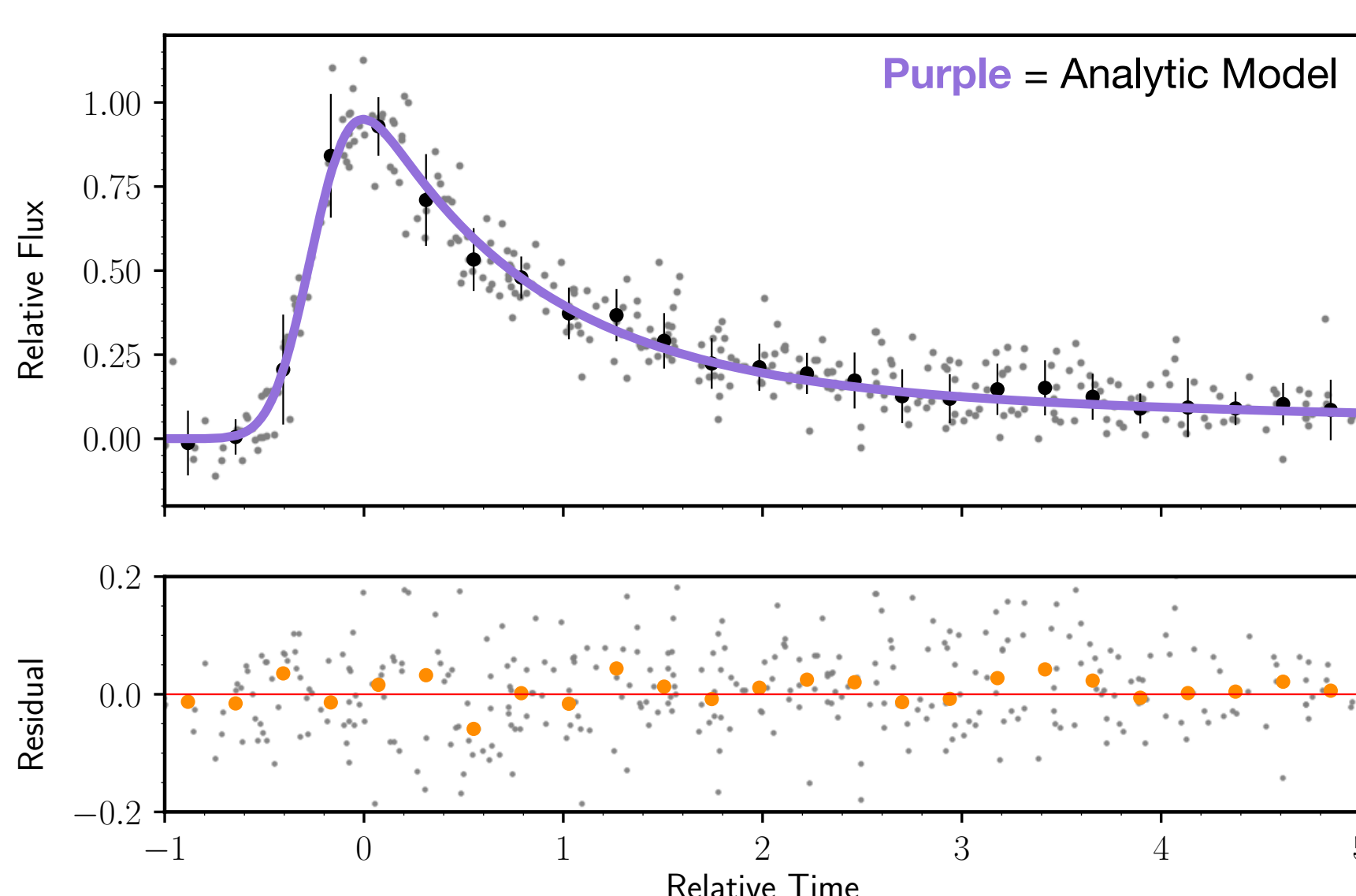
- We present an updated analytic and continuous flare template to describe the morphology of white-light flares on active stars.

Scan QR code to use the flare template!



arXiv: 2205.05706

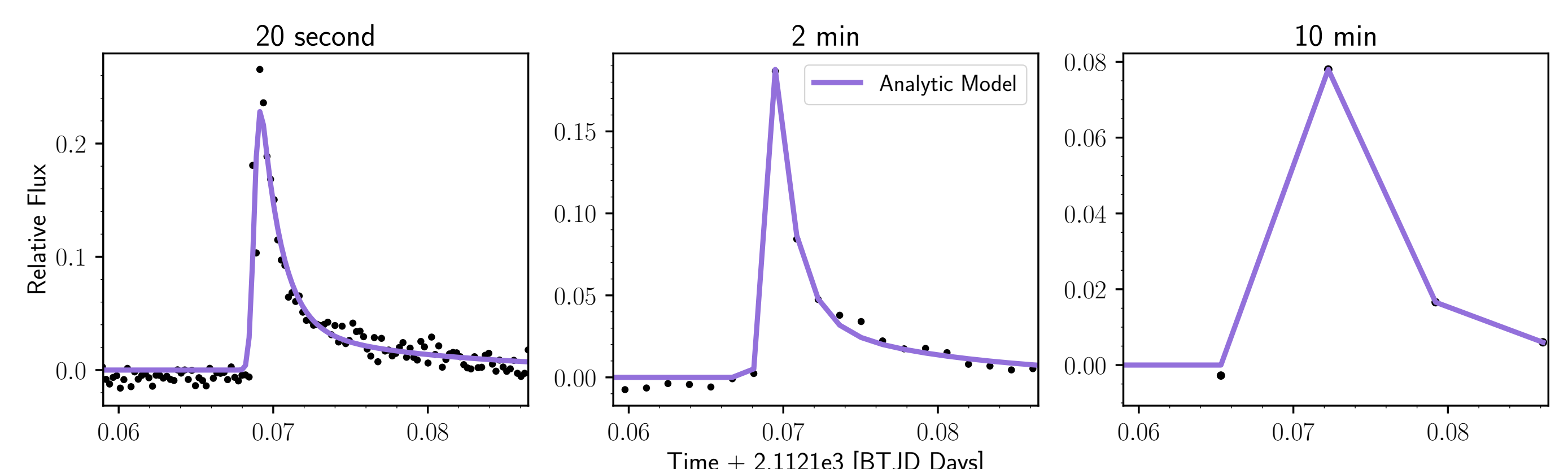
TESS FLARES: GJ 1243



- We use GJ 1243 data from *TESS* sectors 14 & 15 to identify 25 classical flares.
- Each flare is scaled to a relative amplitude, peak and timescale.

- Our flare template can be used to model photometric flare data at different cadence modes and from various telescopes (e.g *Kepler*, *TESS*).

FLARES AT VARIOUS CADENCES



- We apply our model to *TESS* data and fit a flare on the M3.5 star at various cadence modes.
- We compare *TESS* 20-sec, 2-min, and 10-min flare data and find finer stellar flare structure is revealed in the shorter cadence data.