Stellar magnetic field manifestations: flares

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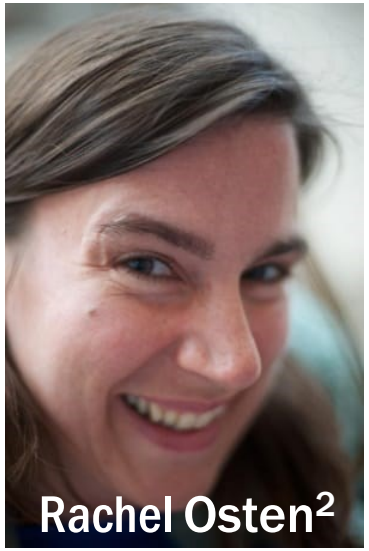
The Teams



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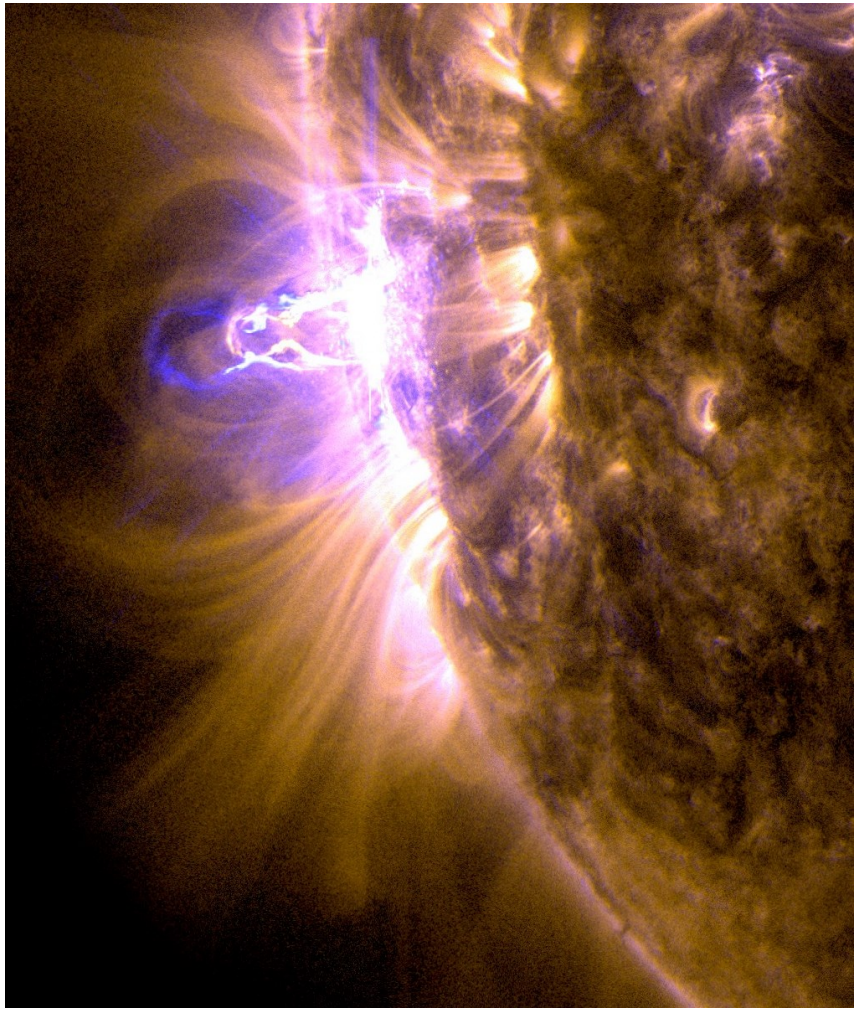
Stellar Flares

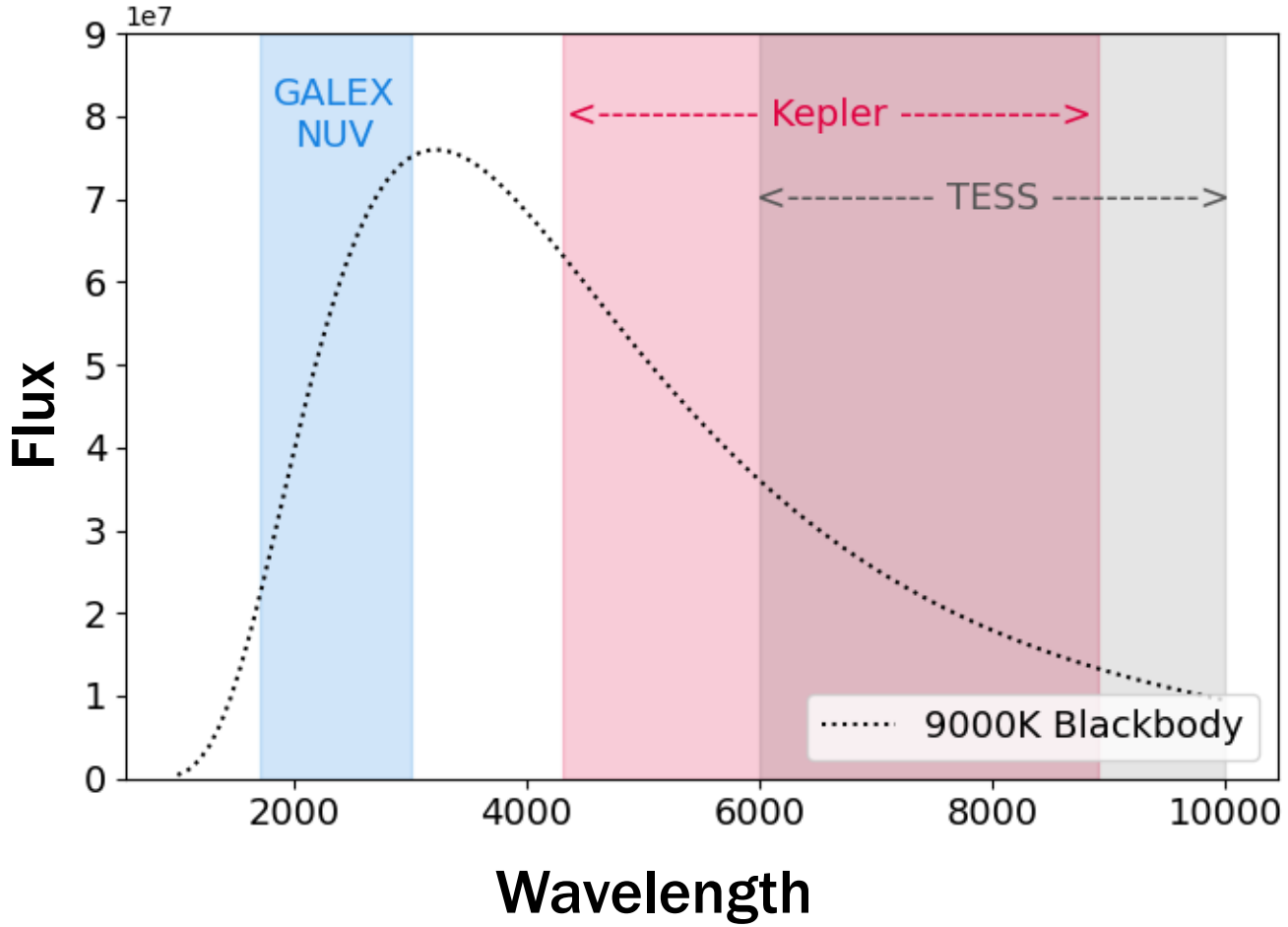
- Short-term brightening powered by the coronal magnetic field
- Most dramatic event experienced by cool main sequence stars
- Observed on a range of cool stars across the electromagnetic spectrum
- On the Sun flares are associated with coronal mass ejections (CMES)



NASA/SDO

Multiwavelength observations

Multiwavelength observations allow energy fractionation exploration.



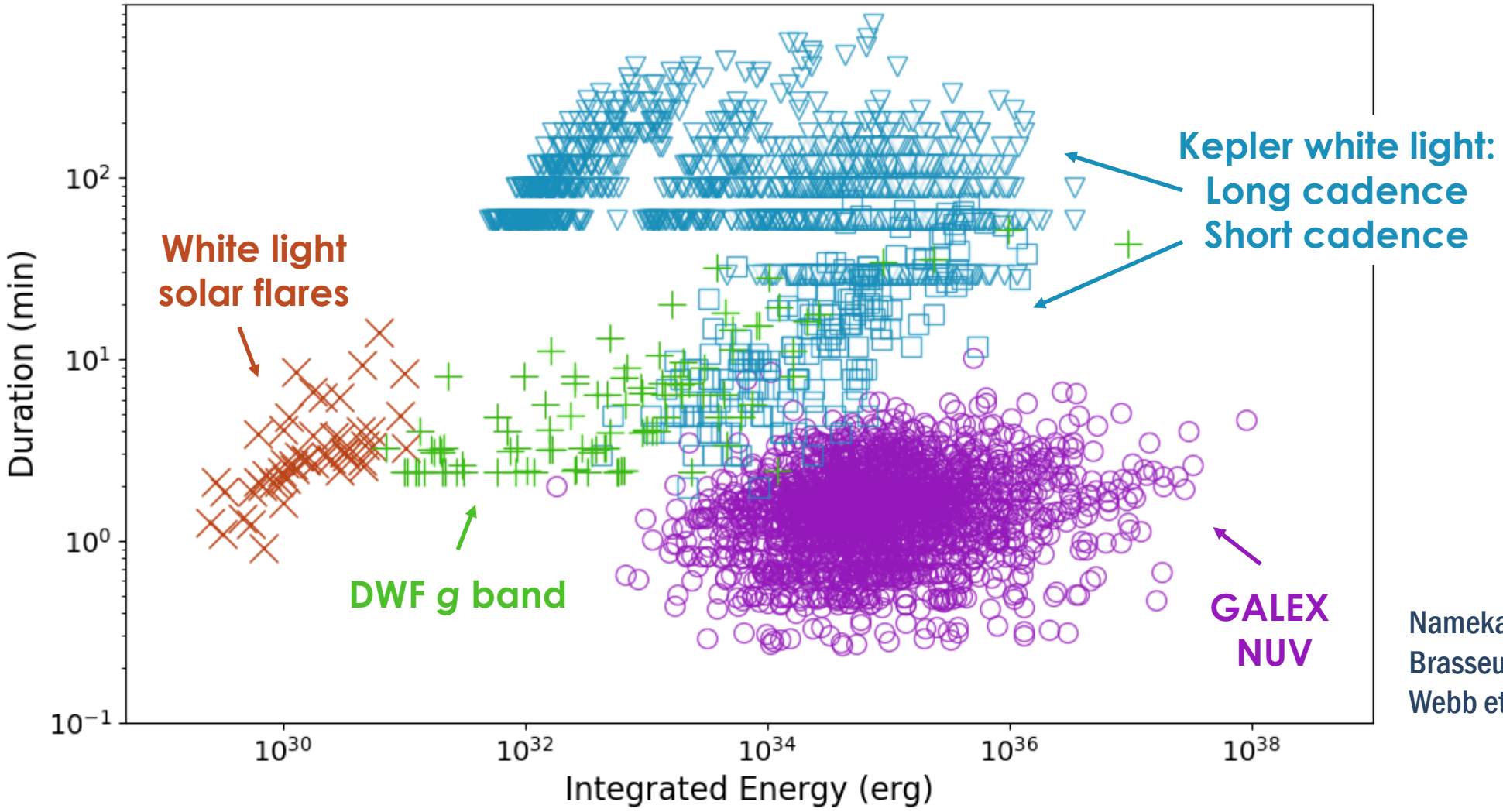
Kepler:

- Optical (430-890 nm) detector
- Continuous collection
- 30 min and 1 min cadence light curves

GALEX:

- NUV (~1700-3000Å) detector
- ~30 minute “visits”
- 10 second cadence light curves

Flare populations



Namekata et al. 2017
Brasseur et al. 2019
Webb et al. 2021

Overlapping data

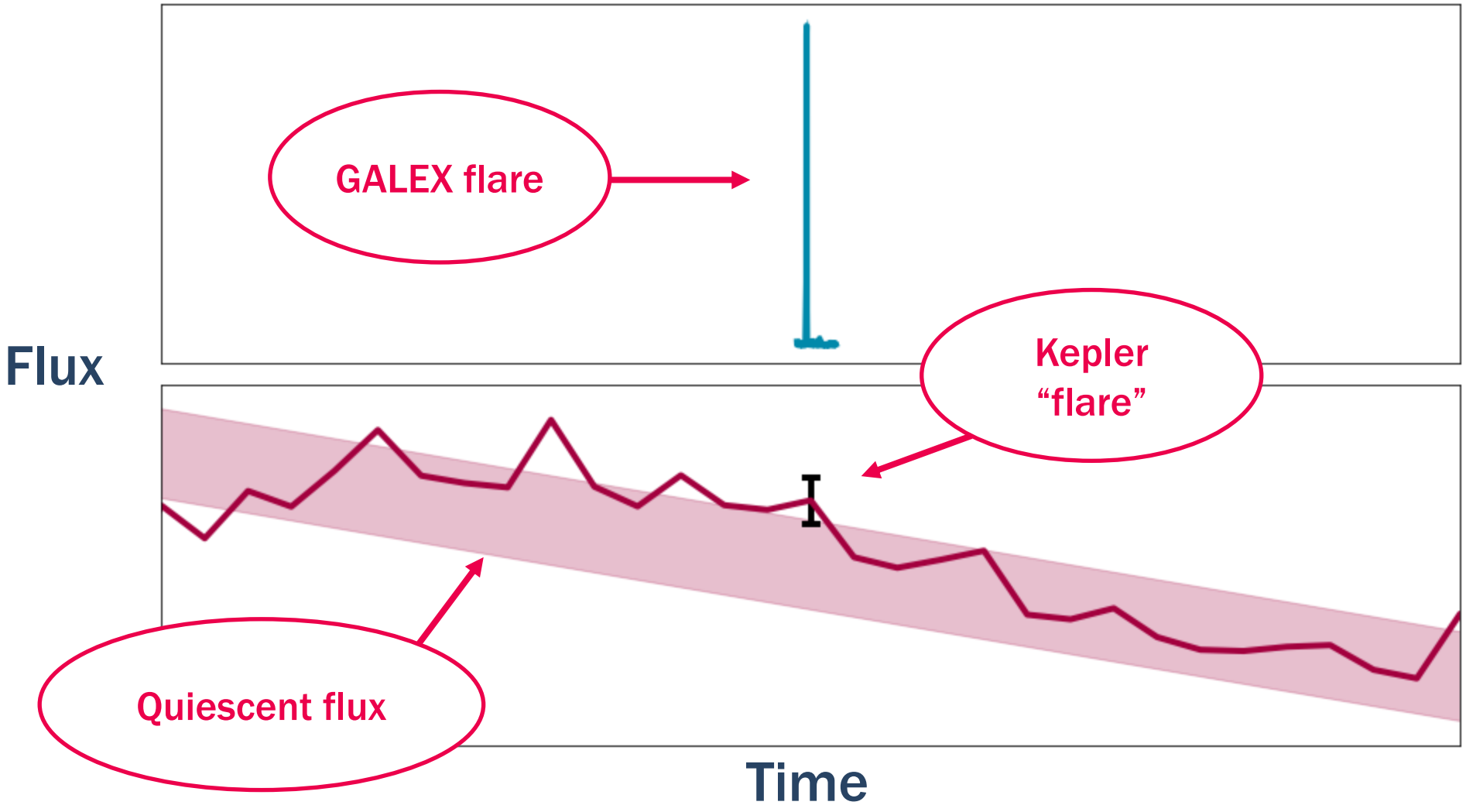
1557 GALEX flares with simultaneous Kepler data

Flares are not detectable in Kepler data

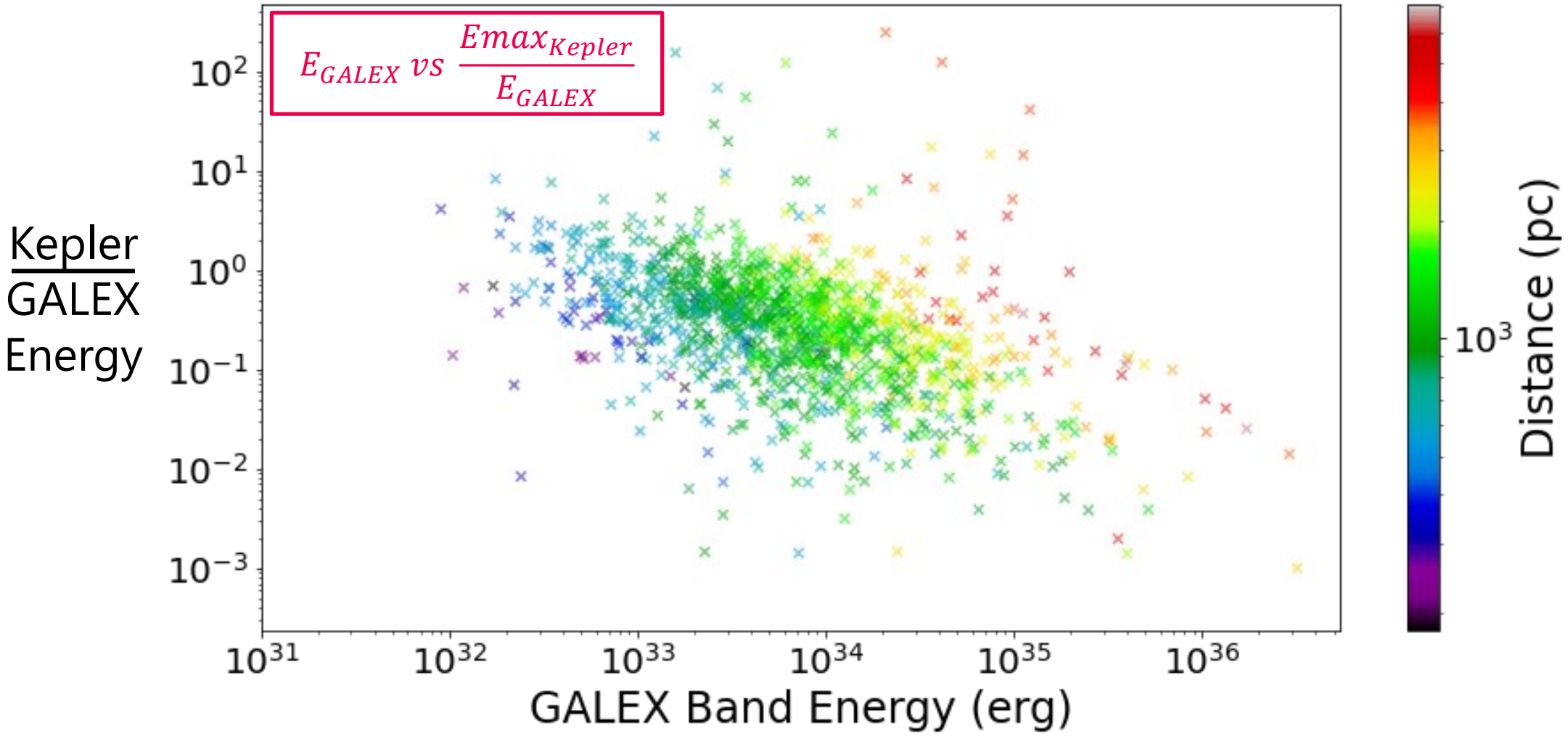
12 stars with flares detected in both GALEX and Kepler data

No simultaneous flare detections

Energy fractionation: temporal mismatch

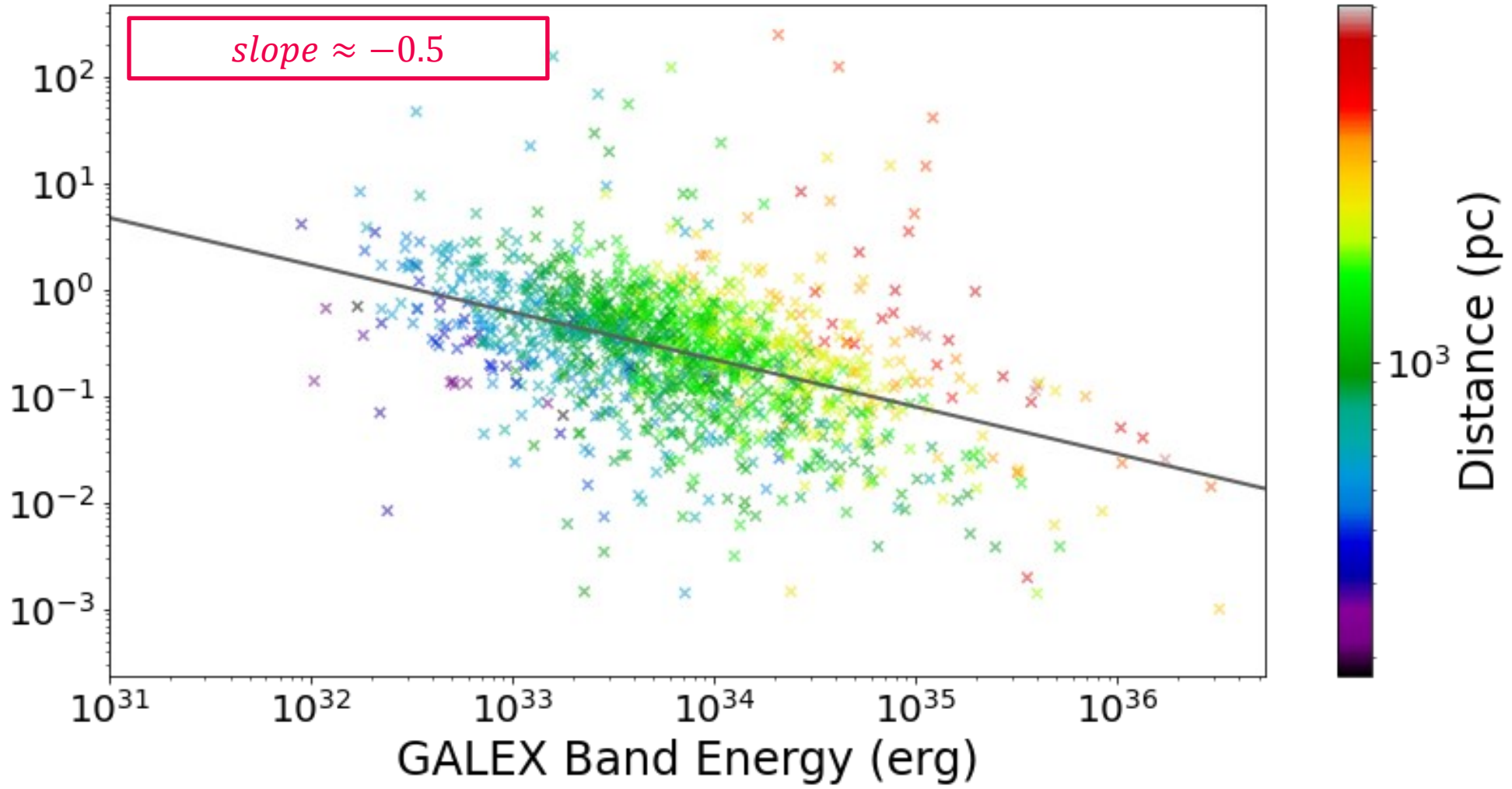


Energy fractionation: optical vs UV

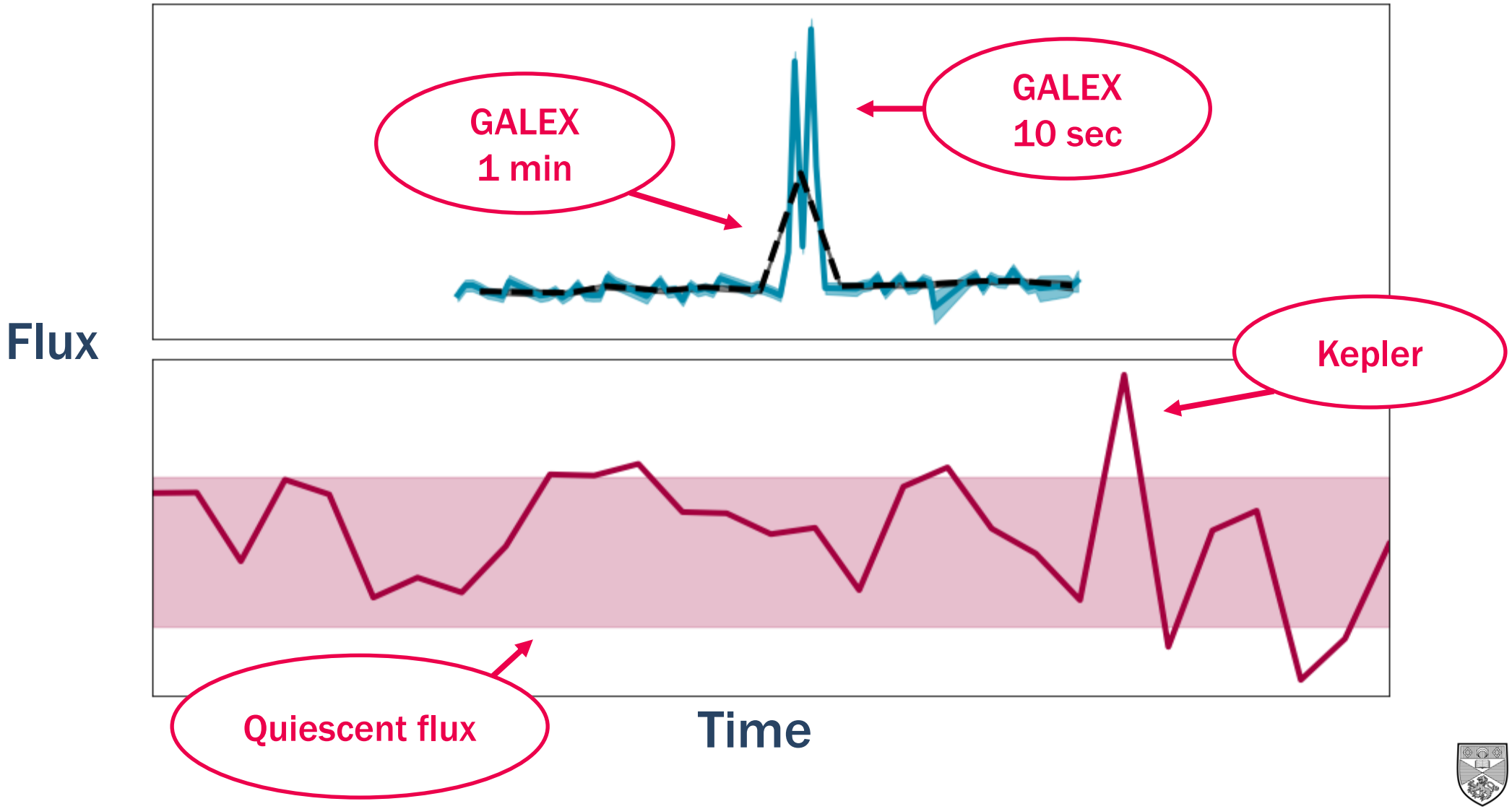


Energy fractionation: not constant

Kepler
GALEX
Energy

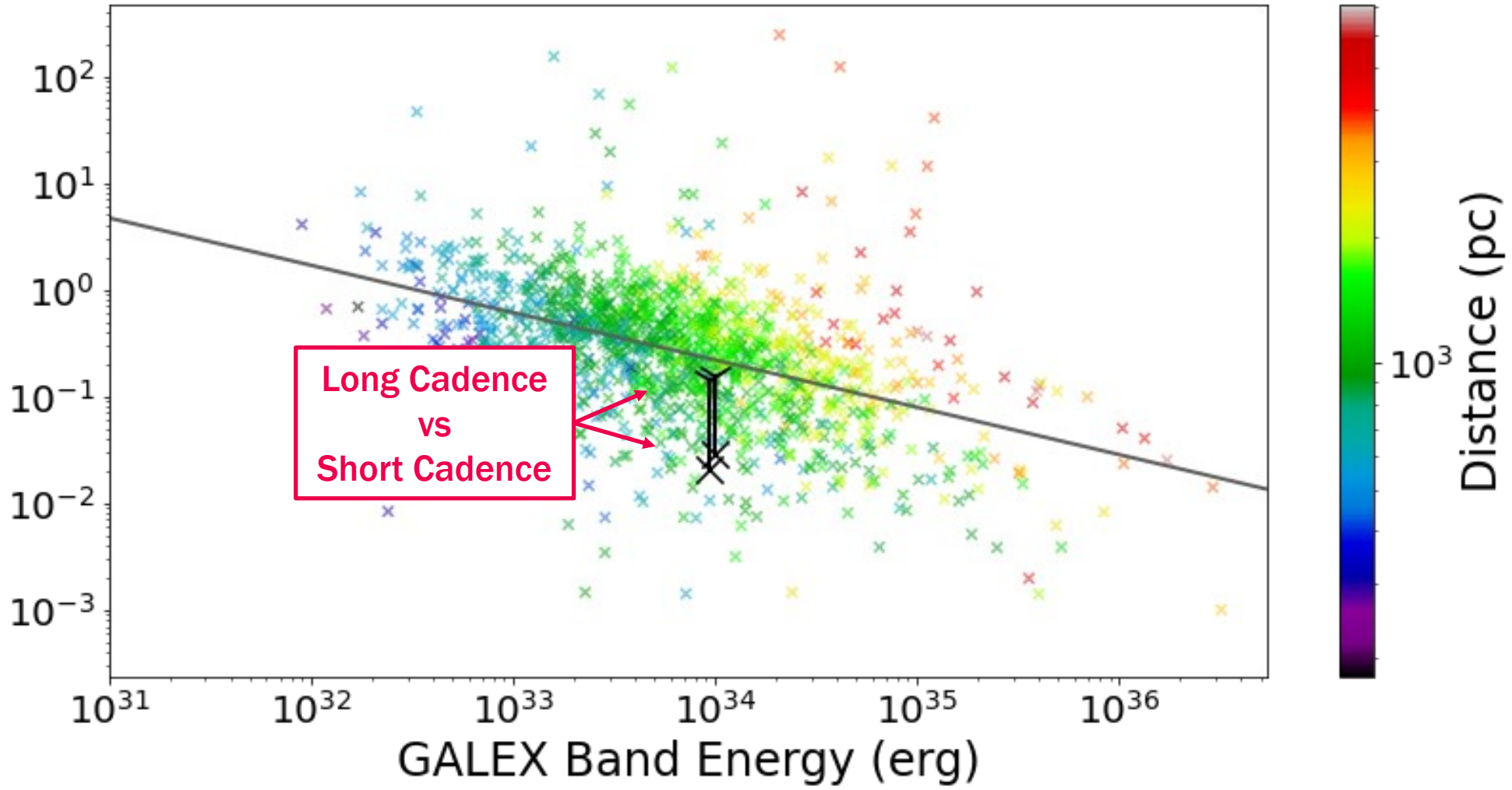


Energy fractionation: 1 minute cadence



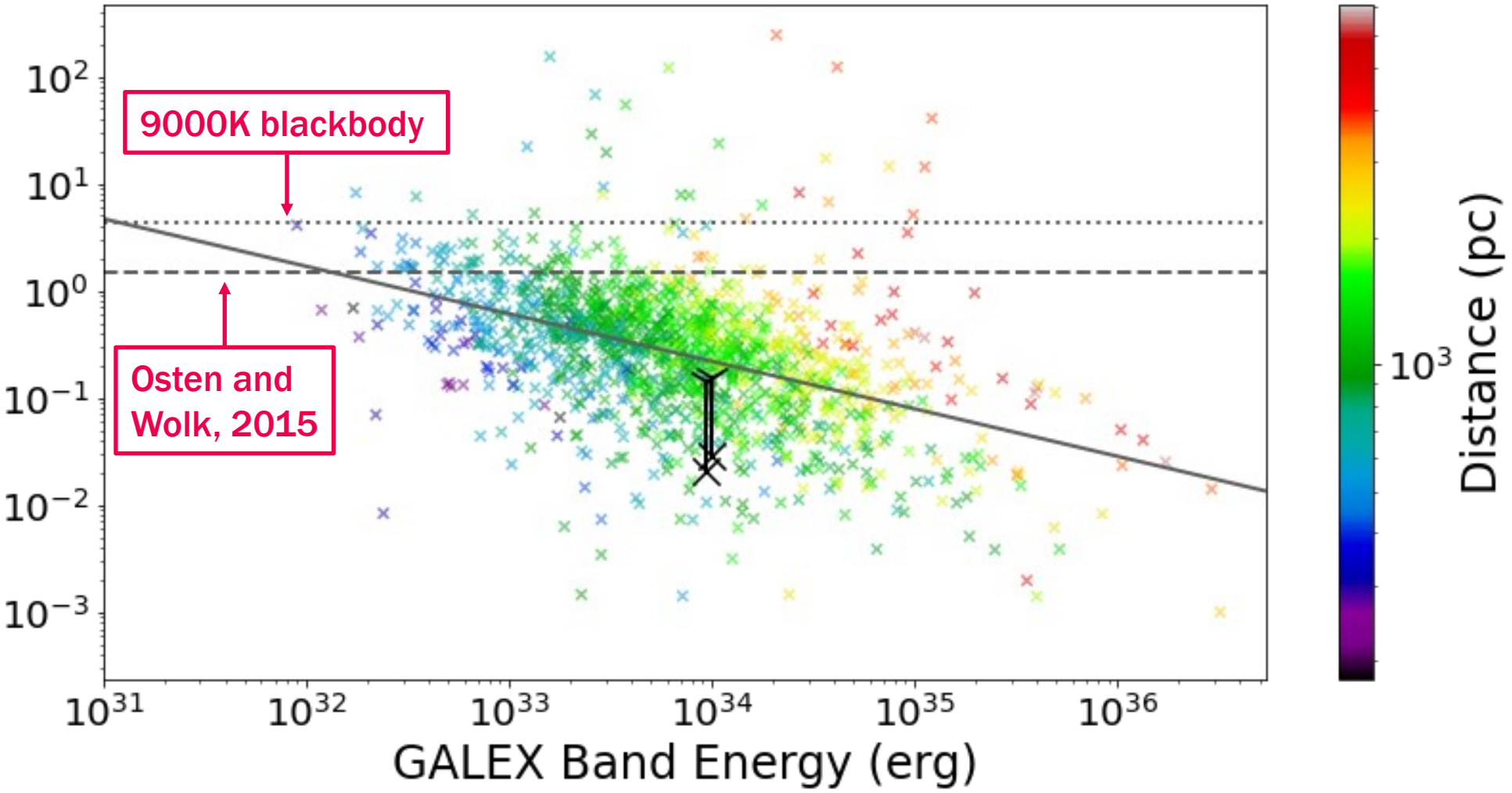
Energy fractionation: tighter constraints

Kepler
GALEX
Energy

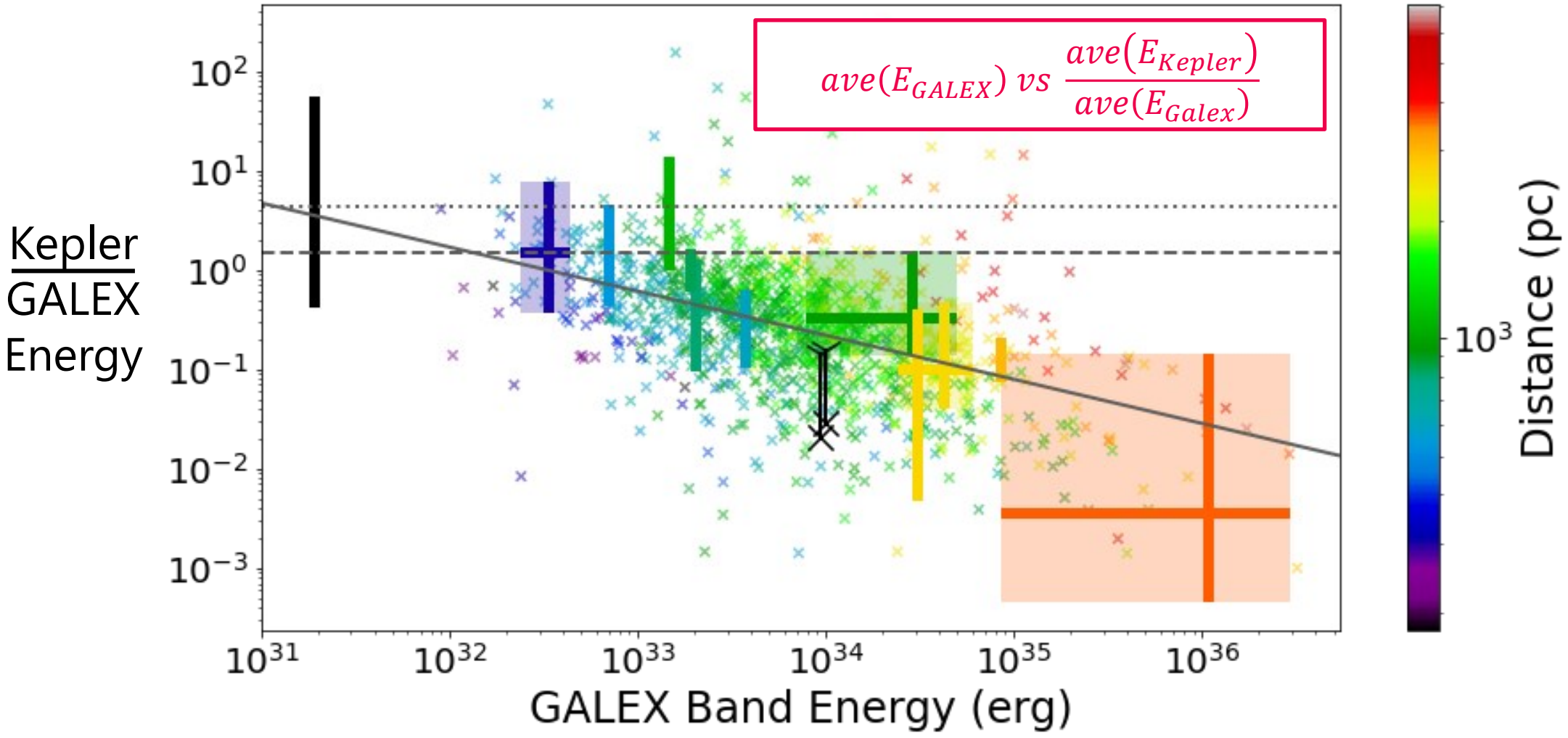


Energy fractionation: model comparison

Kepler
GALEX
Energy

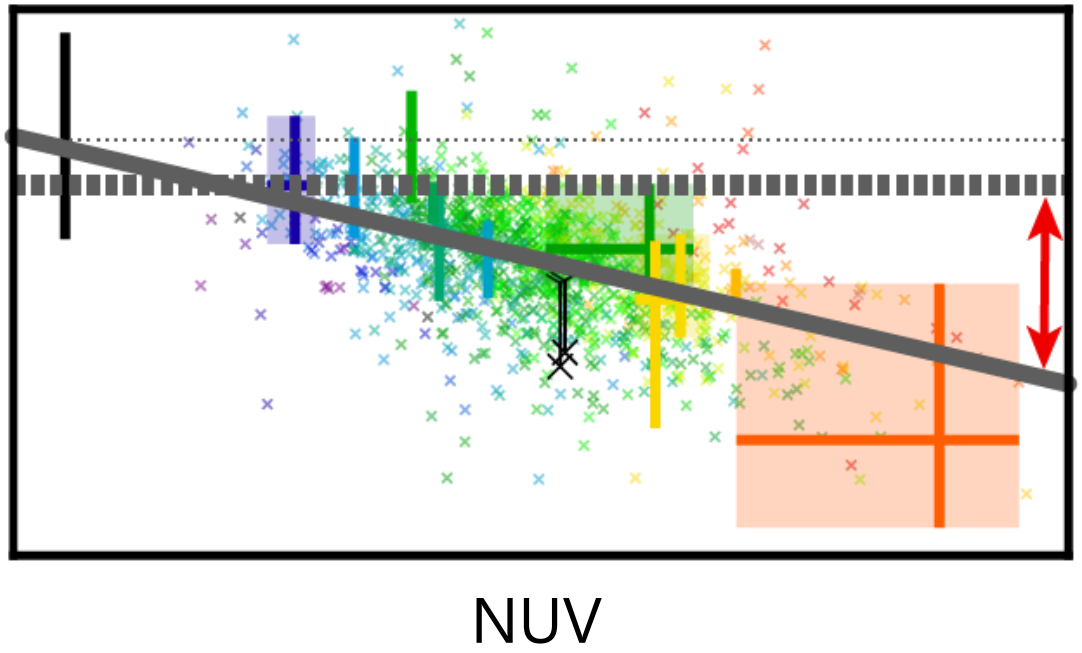


Energy fractionation: bulk properties



Key points: where does all the UV come from?

- UV versus optical energy fractionation is not fixed
- Current flare models underestimate UV flux from white light flares



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