Flares Big and Small: a K2 and TESS View of ASAS-SN Superflares

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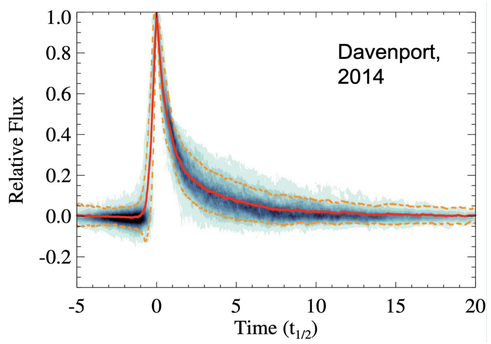
INTRO

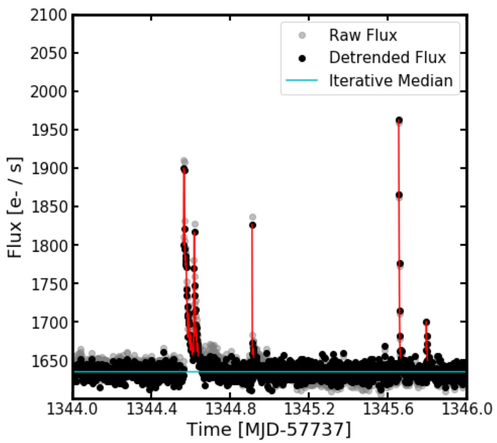
- 70% of habitable zone planets are estimated to orbit low-mass stars.
- Many of these stars routinely flare with energies as large as or larger than solar type stars.
- Constraining the nature and frequency of these flares is crucial to studies of exoplanet habitability.



The canonical flare template. Most flares are well described by a single parameter, $t_{1/2}$

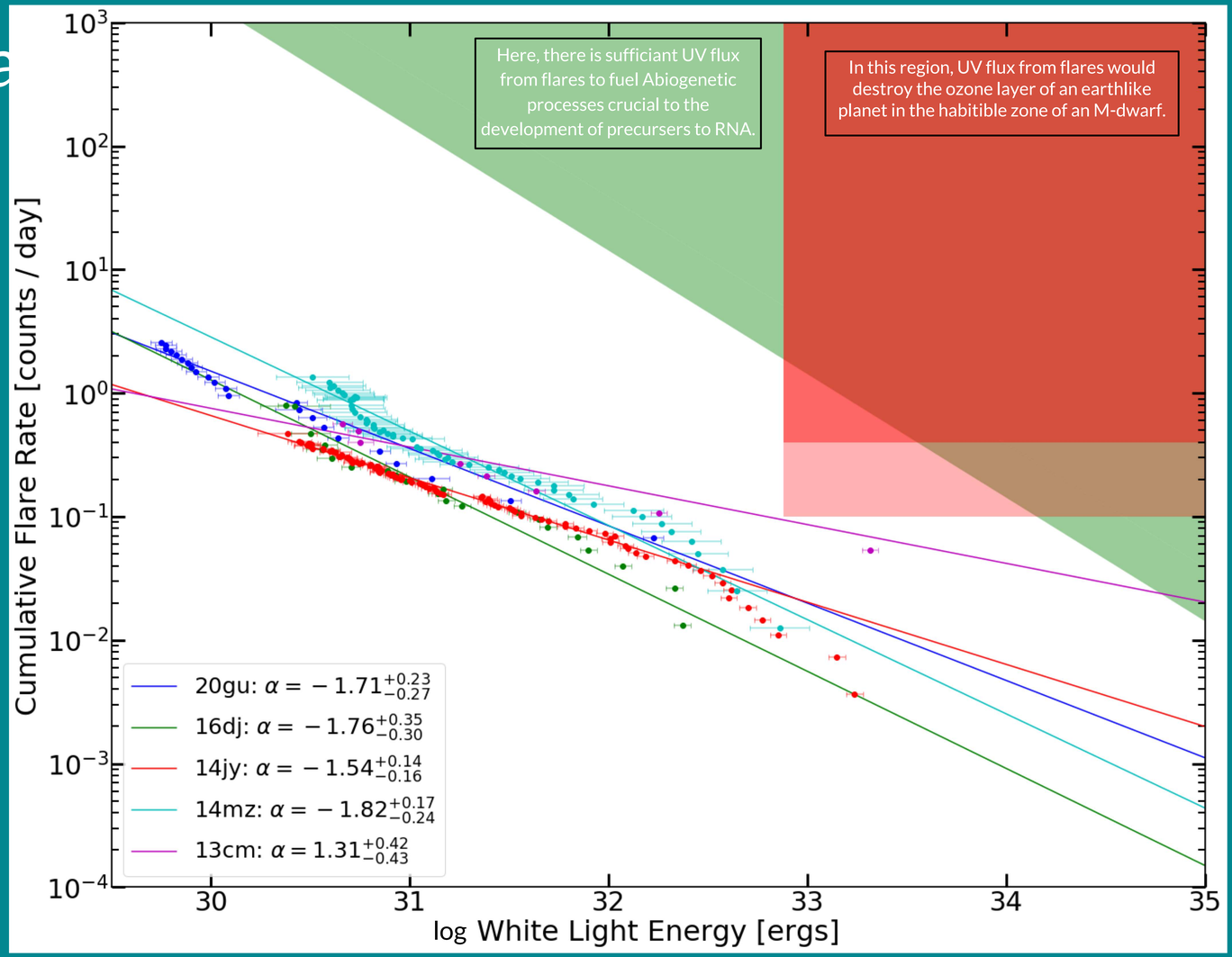
METHODS

- Identify stars which experienced a superflare with energy > 10^{33} ergs in ASAS-SN data. Follow up using K2 and TESS data.
- Injection and recovery allows us to correct for missed flares, as well as for missed flux within flares.
- We use fourier, wavelet, and autocorrelation analysis to recover a rotation rate for 4 of our targets.



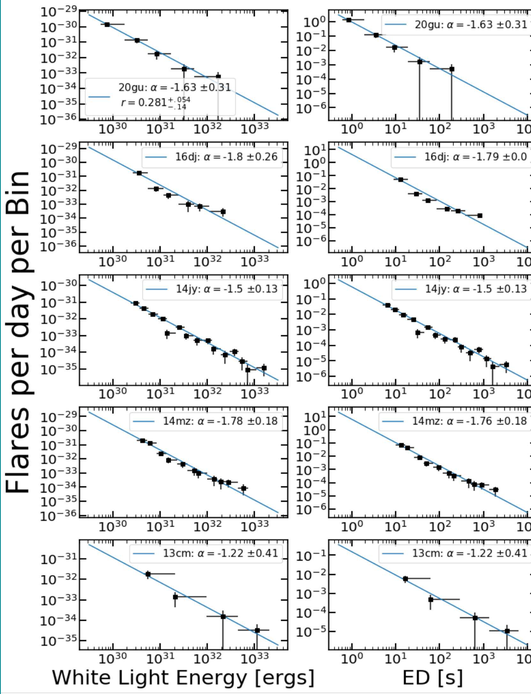
A section of the lightcurve for the TESS target ASASSN-14jy, which demonstrates our flare finding and detrending methods.

M-Dwarfs selected for their **superflaring** activity in ASAS-SN have **flare frequency distributions** with **flatter slopes** in Kepler & TESS



RESULTS

- Targets selected for superflaring behavior in ASAS-SN have similar overall flare rates to other fast-rotating stars.
- Fitting a power law to each of our flare frequency distributions, we find that 3 of them have $\alpha<2$, a benchmark in the literature.
- Flatter slopes enable stars to provide sufficient UV flux to fuel abiogenesis, without depleting exoplanetary ozone.



Fitting to a binned distribution allows us to remove frequency covariences

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