Testing stellar flares and fast photometry

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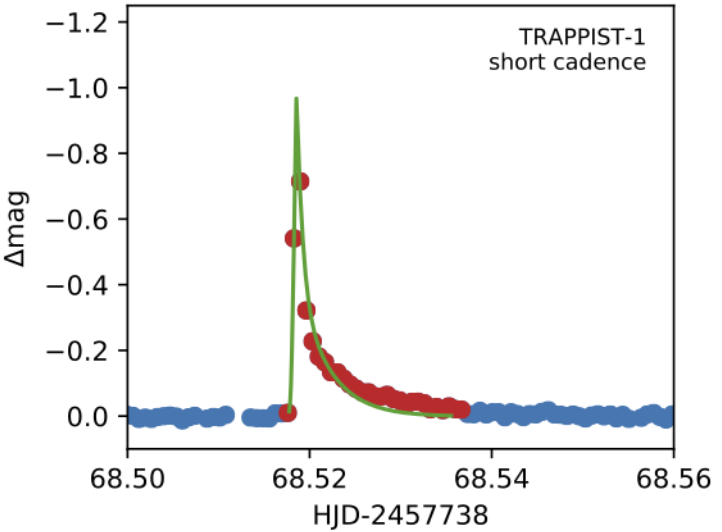
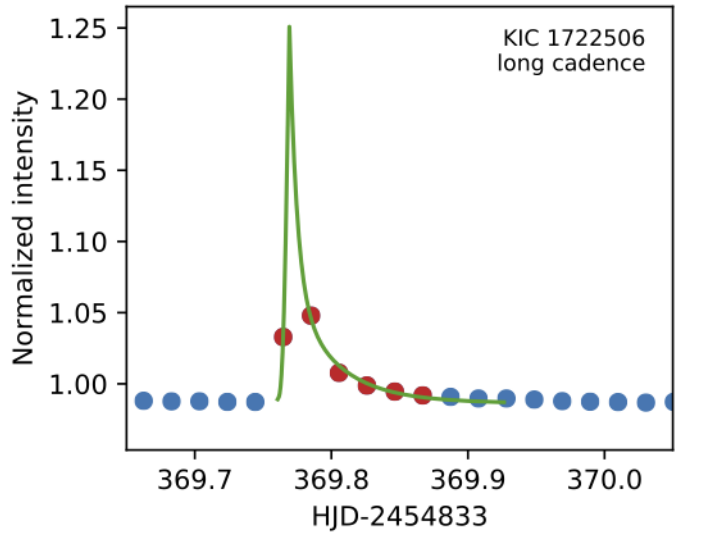
Motivation

High resolution photometry can be crucial for fast transients – e.g. determining flare parameters: energy estimation depends heavily on sampling!

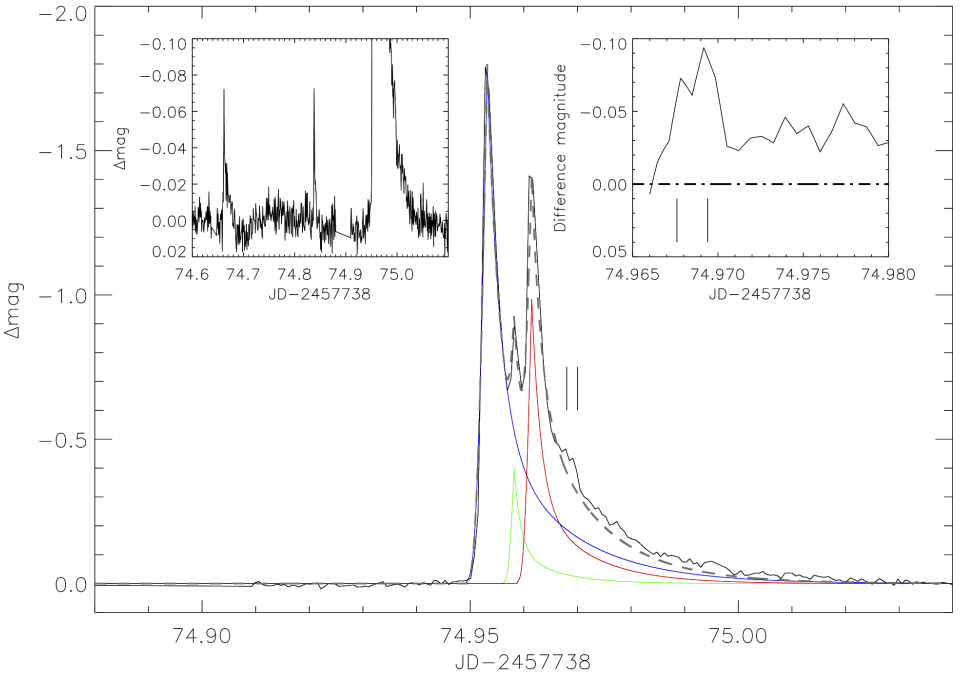
Flare analysis with machine learning on Kepler light curves: energy estimation of long cadence events can be nasty...





Motivation

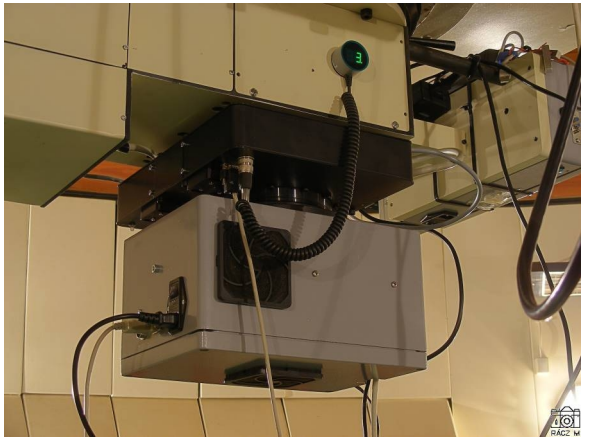
There could be several smaller events (microflares) that we are missing, that we see e.g. on the Sun



OCELOT EMCCD

Specifications

- Sensor: e2V CCD201-20
- Sensor size: 1024*1024
- Pixel size: 13 µm * 13 µm
- Image area: 13.3 mm * 13.3 mm
- Active area pixel well depth: 80 000 electron (typ.)
- Gain regeister pixel well depth: 730 000 electron (typ.)
- Max readout rate: 10 MHz
- Frame rates (full frame): 8.9 frames per sec
- Read noise (10 MHz): 1 to 47 electron
- Peak quantum efficiency (575 nm, typ.): 92.5%
- Cooling: thermoelectric + liquid, -90°C



we could test what ARIEL would see...

From a list of nearby (bright) flare stars we selected potential candidates:

- GX And
- DK Leo
- SZ UMa
- BY Dra
- Wolf 359
- EV Lac
- AD Leo
- GJ 51

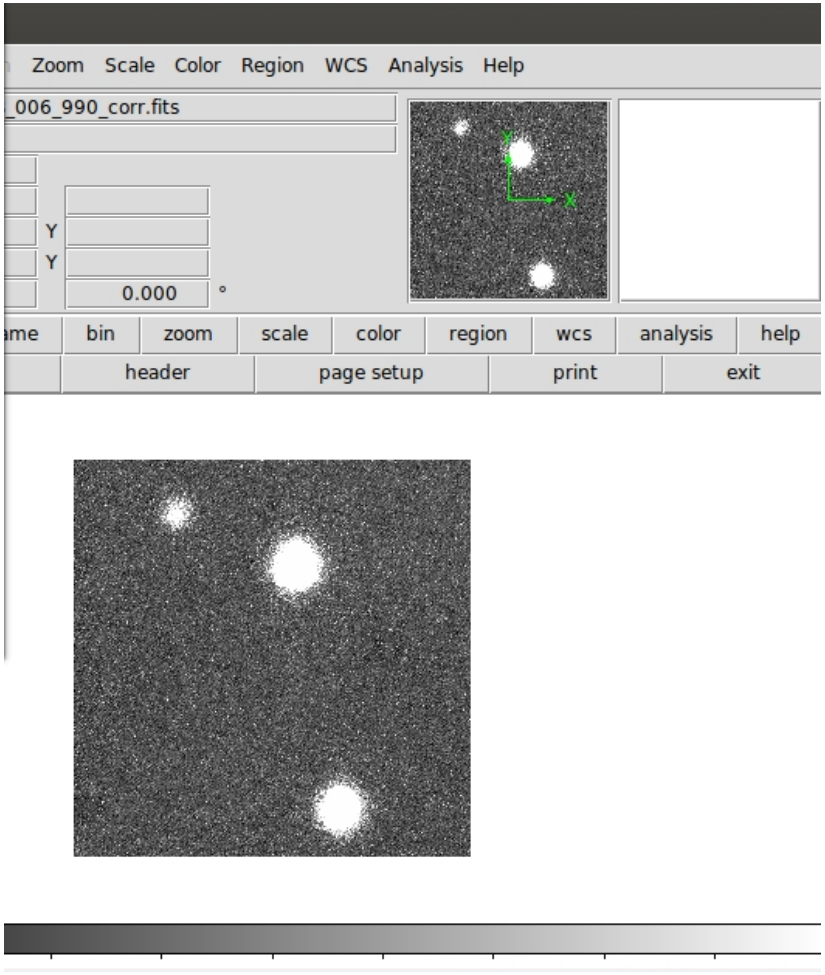
circumstellar, but behind the telescope pier

probably best candidate flares every ~1.5 hours, behind full moon on the only clear night

Table 1. Nearby flare stars.

Variable name	Gliese/ Giclas	V	B-V	M_V	Dist. (pc)	Spectrum	Remarks
GX And	15 A	8.07	1.56	10.34	3.5	dM2.5	
GQ And	15 B	11.03	1.80	13.30	3.5	dM4.5	*VB*
V547 Cas	22 AB	10.29	1.54	10.16	10.6	dM2.5	T
FF And	29.1	10.38	1.46	8.60	22.7	dM1e	SB2
	48	9.96	1.46	10.17	9.1	dM3.5	
V388 Cas	51	13.66	1.68	13.85	9.2	dM5e	
YZ Cet	54.1	12.03	1.85	14.15	3.8	dM5.5e	
BL Cet	65 A	12.63	1.85	15.45	2.7	dM5.5e	*VB*
UV Cet	65 B	13.13		15.95	2.7	dM6e	
V596 Cas	82	12.10		11.56	12.8	dM4e	
TZ Ari	83.1	12.26	1.80	14.47	3.6	dM5	
CC Eri	103	8.89	1.39	8.33	12.0	K7Ve+MV	SB
VX Ari	109	10.58	1.56	11.17	7.6	dM3.5	
VY Ari	113.1	6.78	0.96	5.05	22.2	G9	SB1
	157 B	11.48	1.52	11.00	12.3	dM3e	VB, SB

GX And (B~10.1mag) with 286msec exptime
(fastest with 512x512px size and 2x2 binning)



...first “results” are not so promising :\