



Eclipsing binaries hiding in the background: The Kepler Pixel Project

Adrienn Forró¹²³, Róbert Szabó¹², Tamás Hajdu¹²³

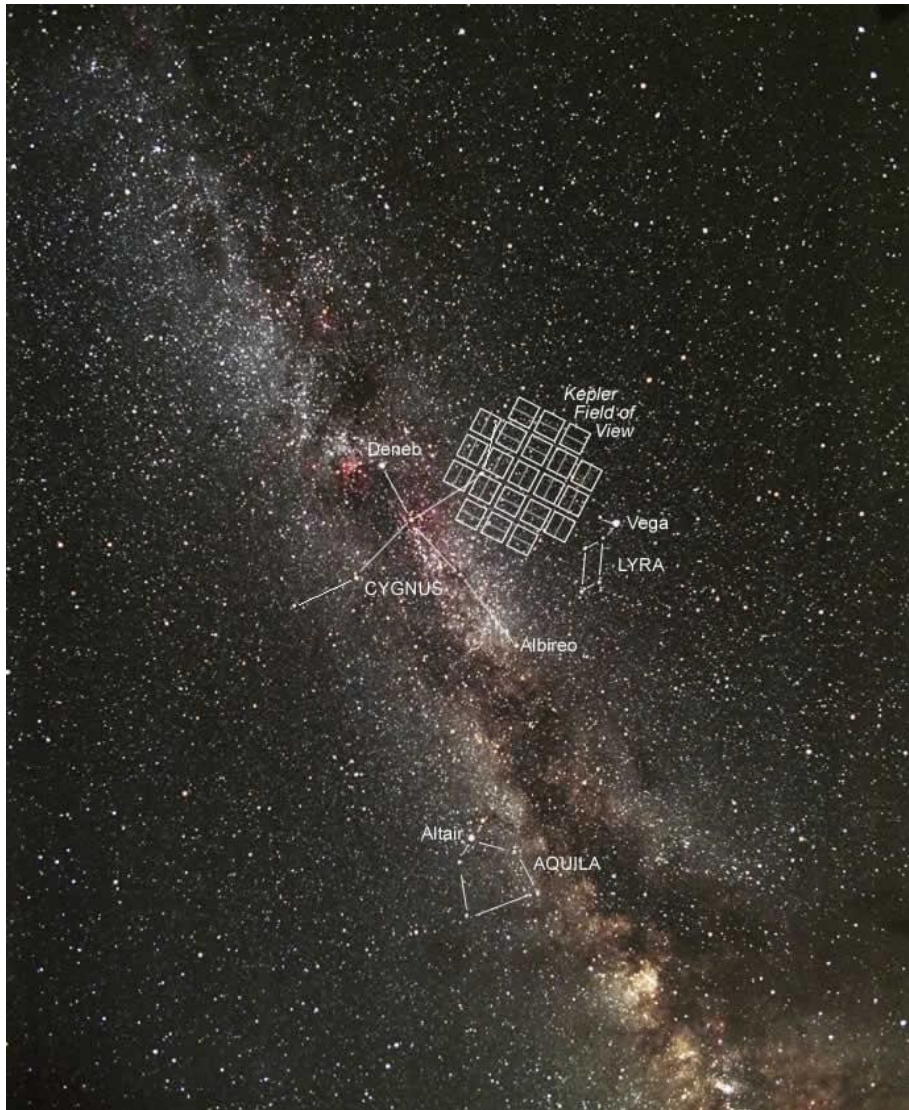
1 Konkoly Thege Miklós Astronomical Institute, Research Centre for Astronomy and Earth Sciences, Hungarian Academy of Sciences

2 MTA CSFK Lendület Near-Field Cosmology Research Group

3 Eötvös Loránd University, Department of Astronomy

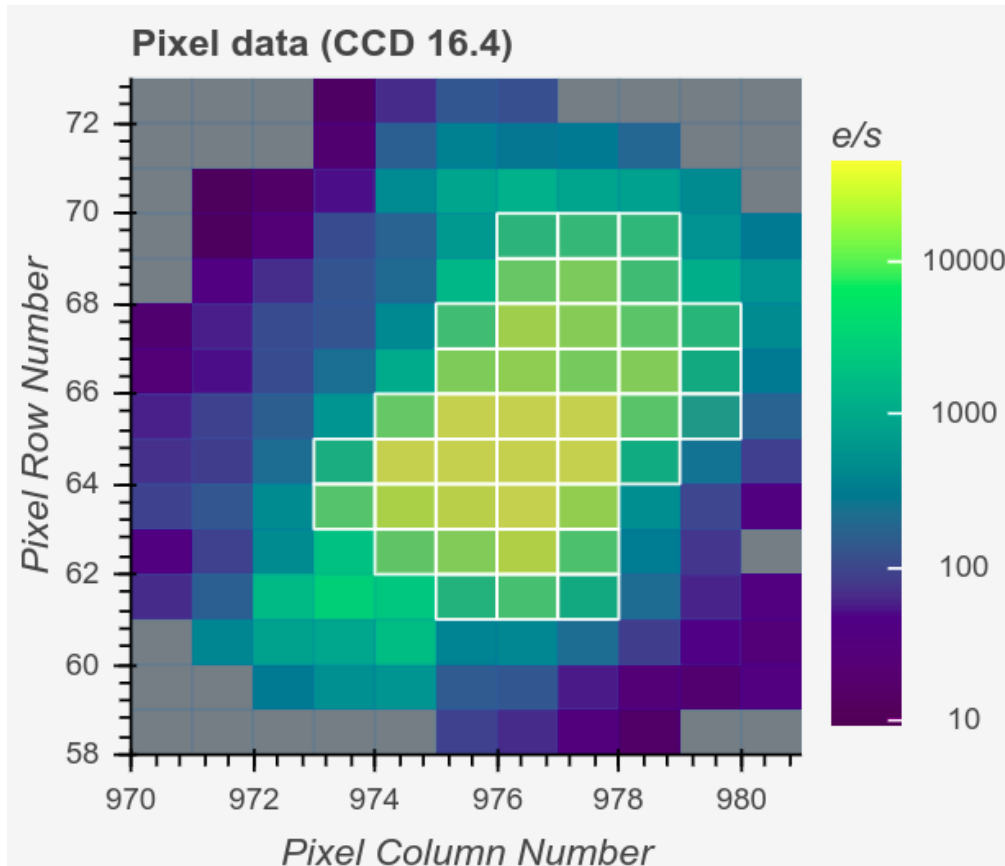
Universe of Binaries, Binaries in the Universe Conference
Telč 2019

Introduction



- Kepler's original mission: 2009-2013
- continuous observations for ~150000 stars

The Kepler Pixel Project

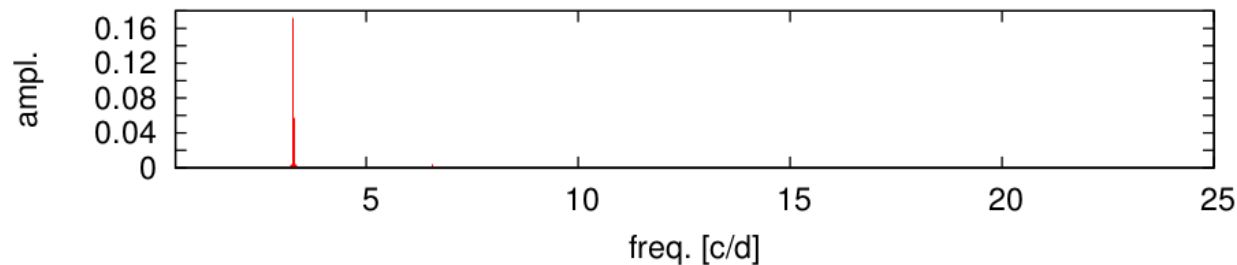
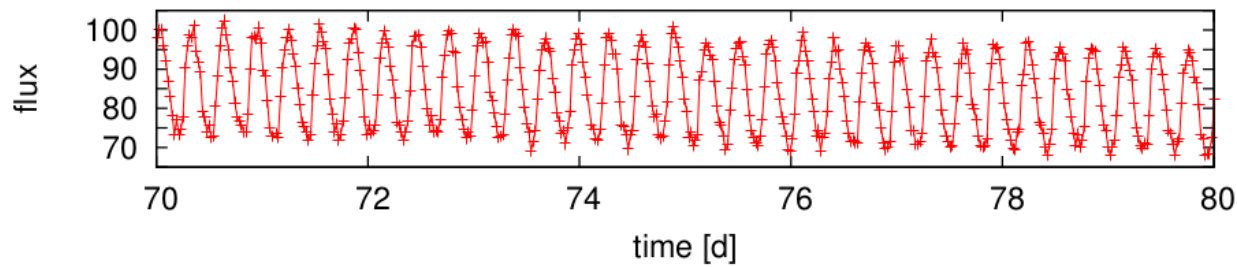
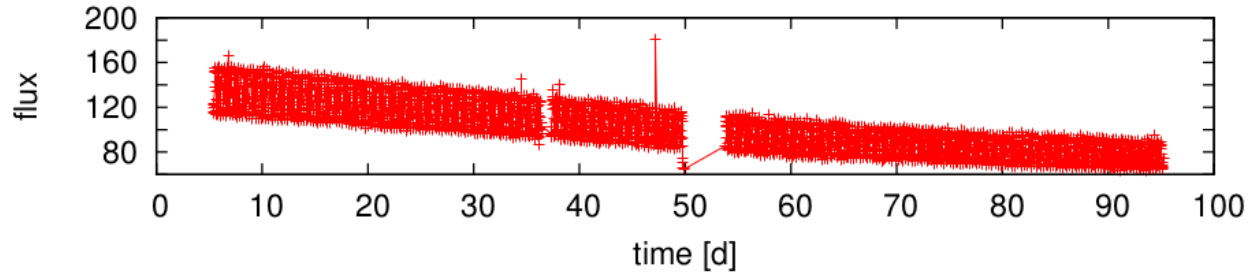


Q4: 2009 Dec – 2010 March

Primary goal:

to find new variable stars in
the background pixels

The Kepler Pixel Project



Searching criteria:

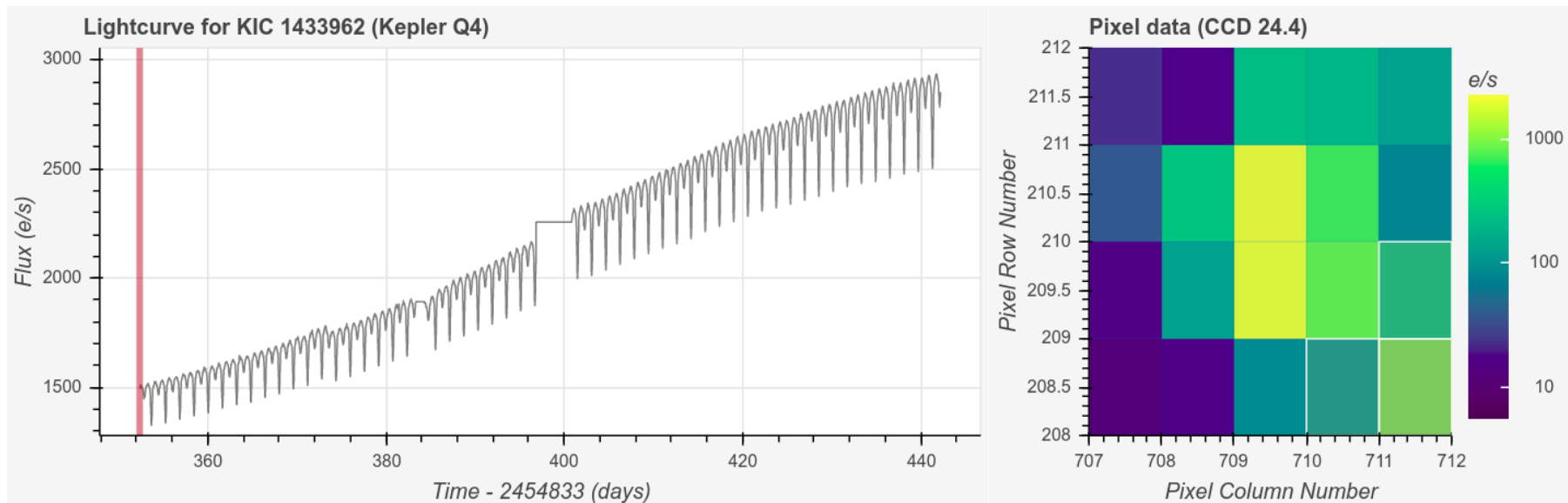
- period: 0.25 - 1 day
- the presence of at least 2 harmonics

Search results

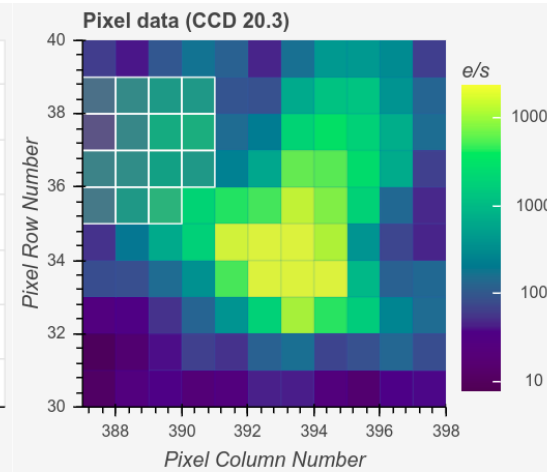
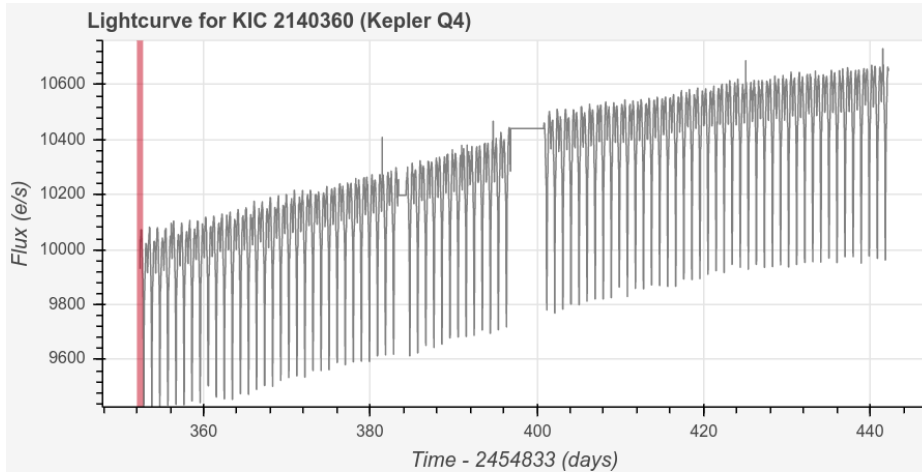
- ~ 12500 candidate pixels in total
- mostly eclipsing binaries, 1272 TPFs

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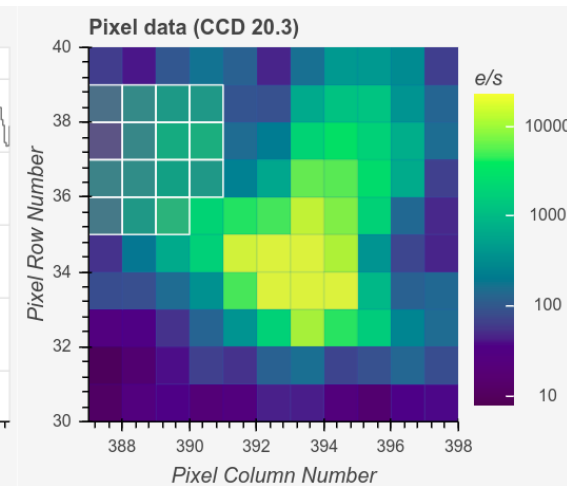
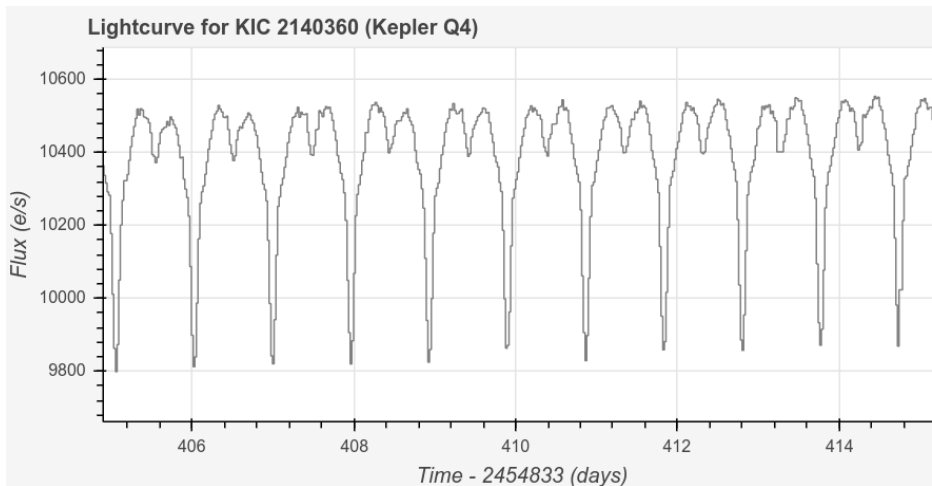
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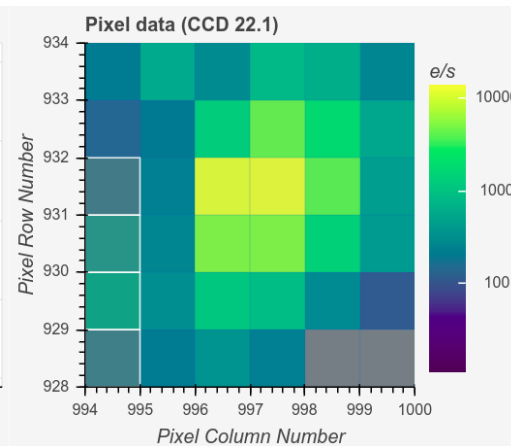
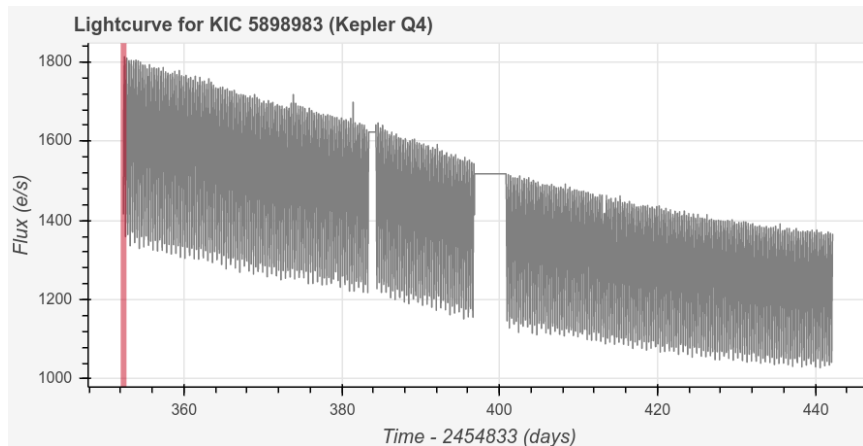
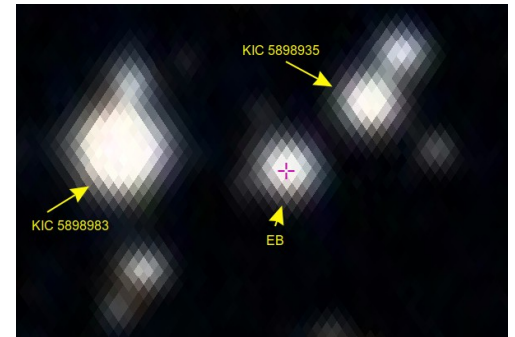
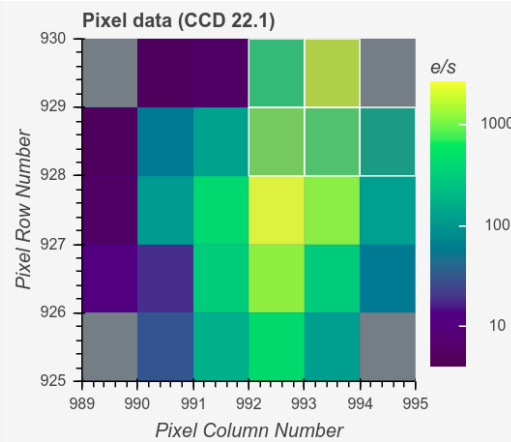
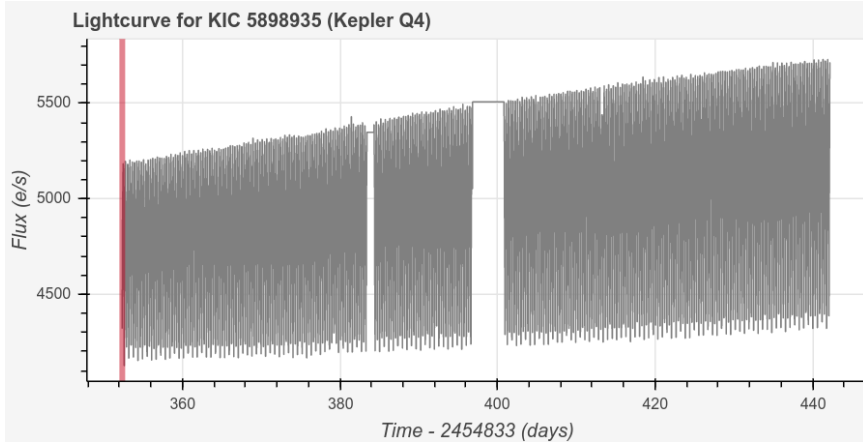
Search results



P=0.96745d



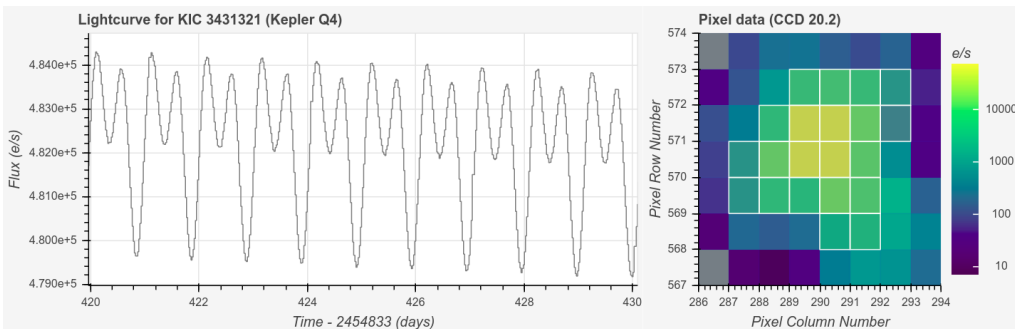
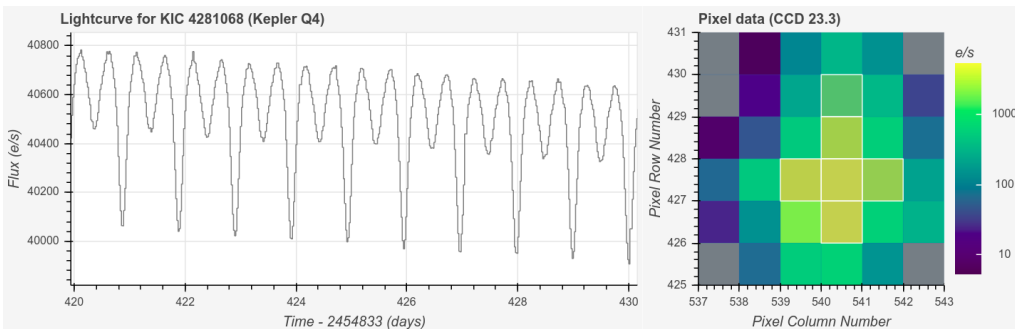
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$P=0.5787d$

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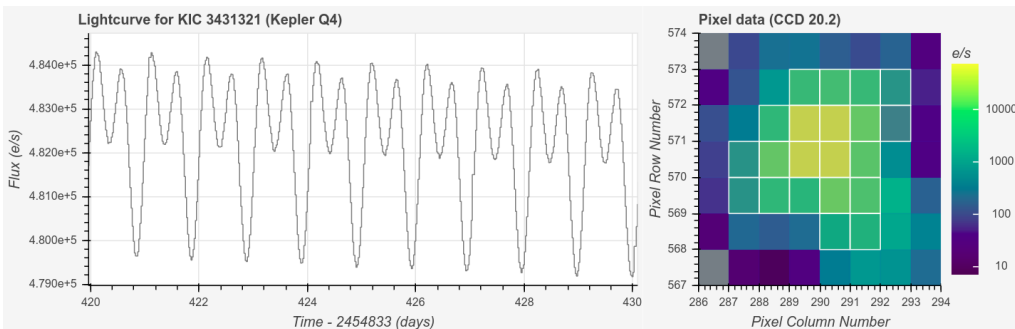
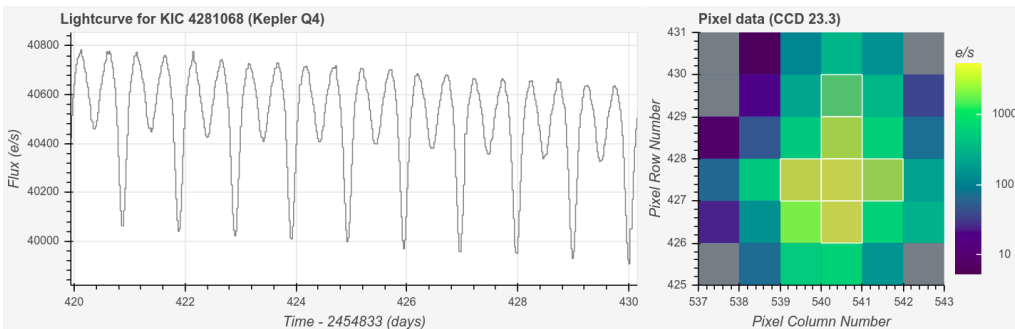
- we looked for duplicates/contamination – 1 candidate
- we cross-matched them with the Kepler Eclipsing Binary Catalog (by the Villanova University) – 495 candidates



$P=1.015d$

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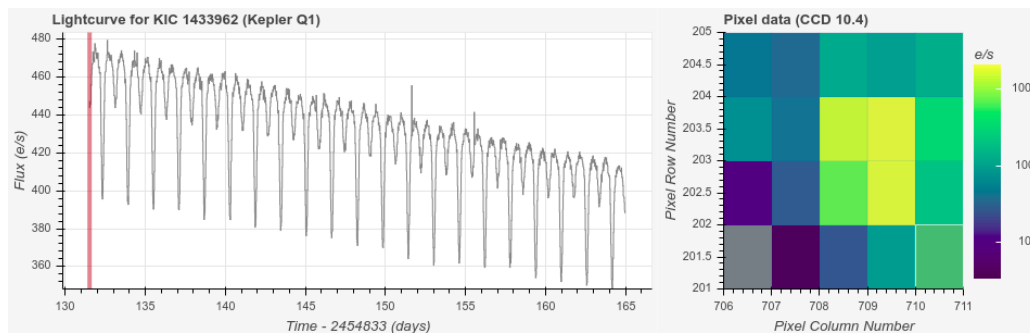
- 776 new EB candidates in the original Kepler field

- substantial increase in the number of binaries, the catalog lists 2922 EBs

$P=1.015d$

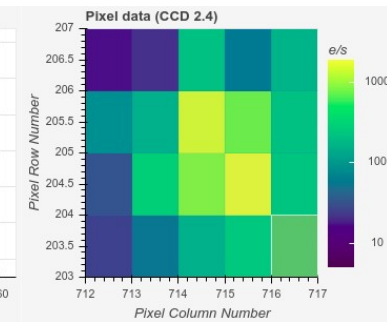
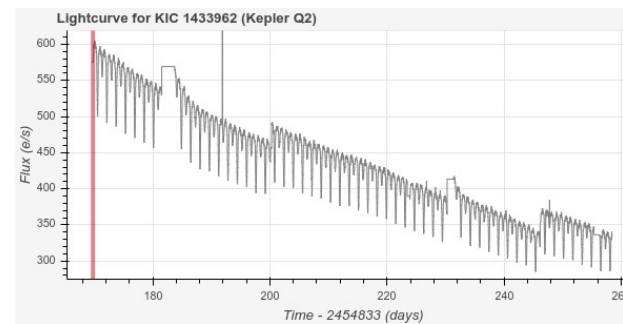
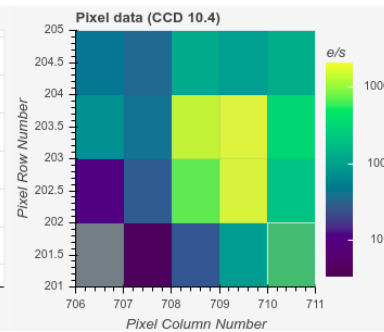
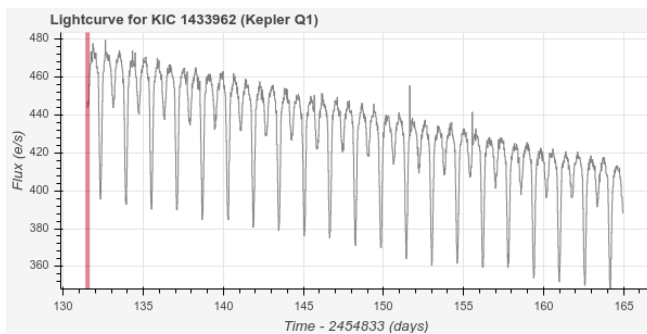
Stitching the lightcurves

- some quarters might be missing
- TPFs from different quarters are not necessarily the same size



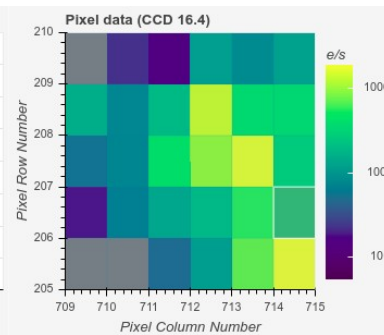
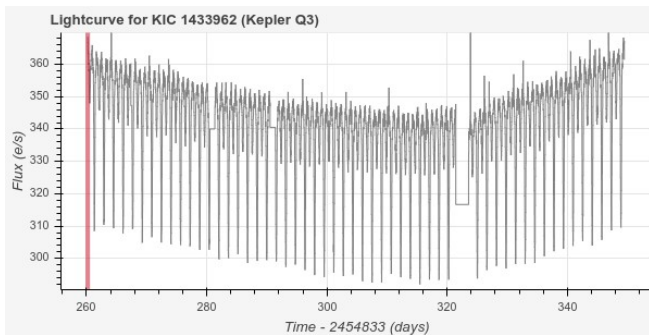
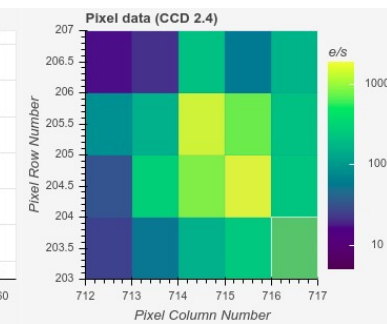
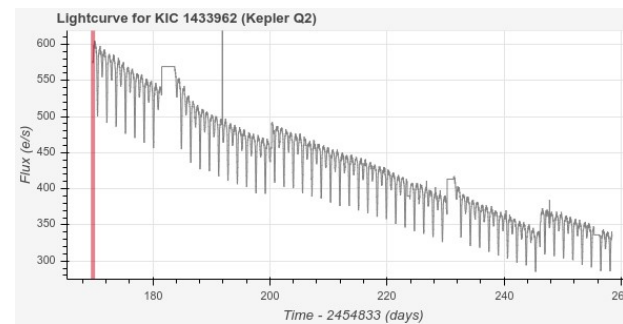
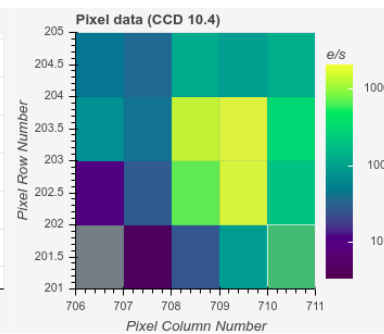
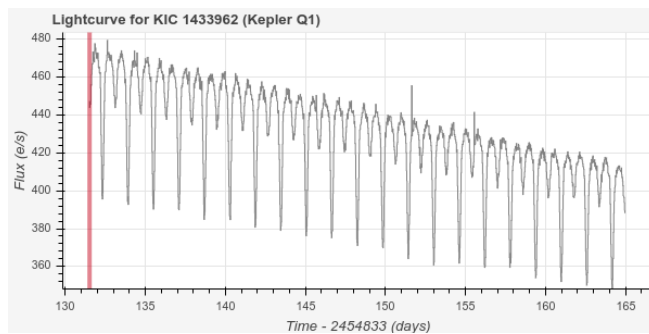
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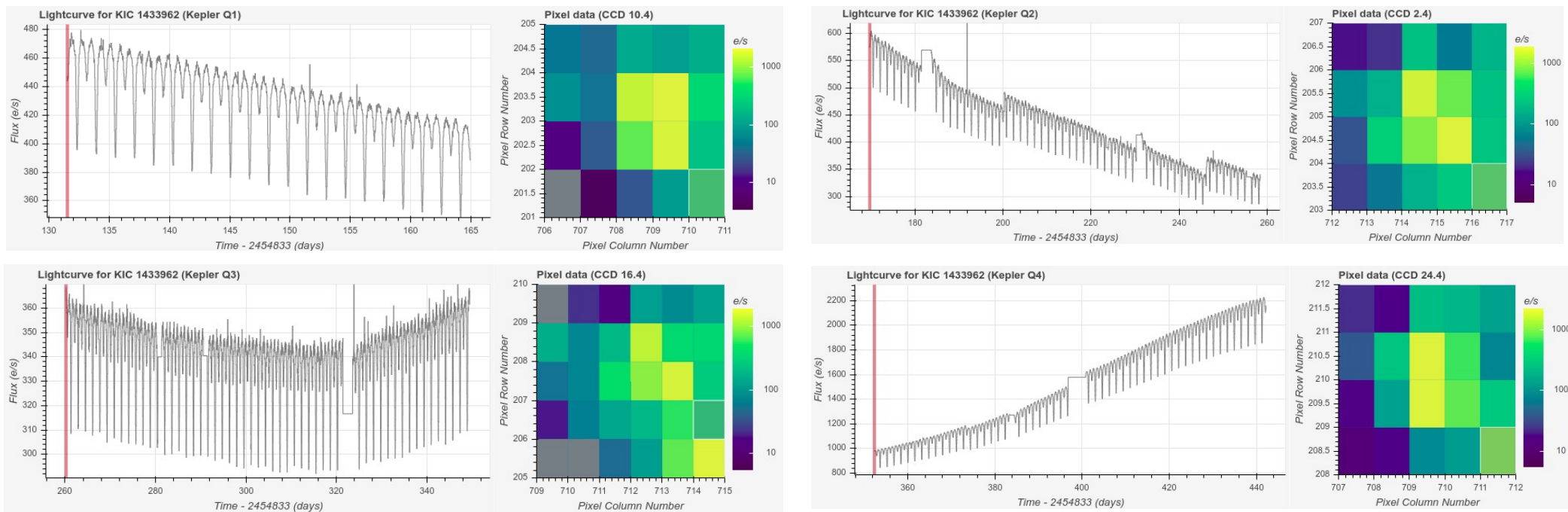
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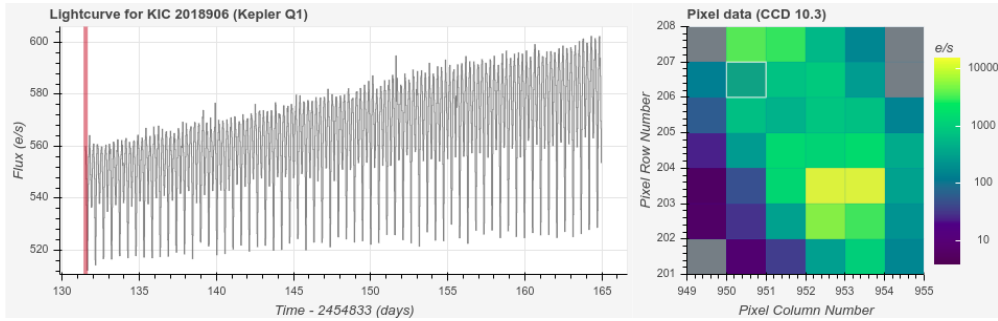


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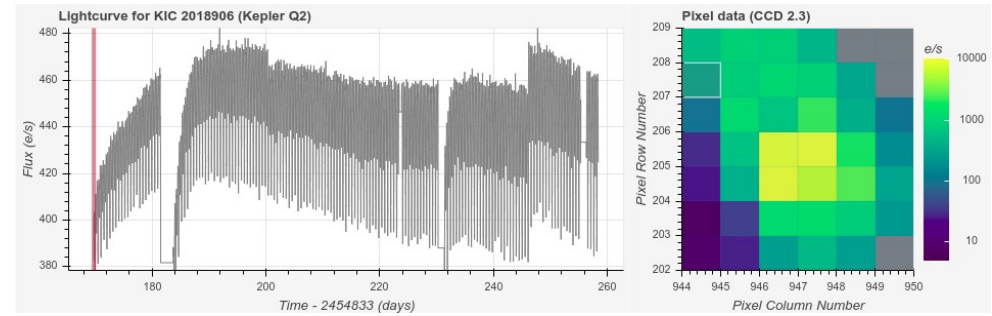
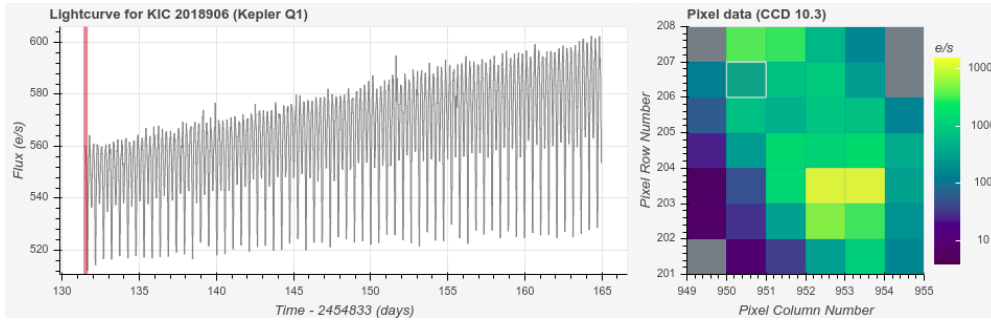
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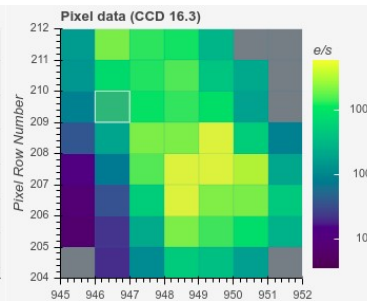
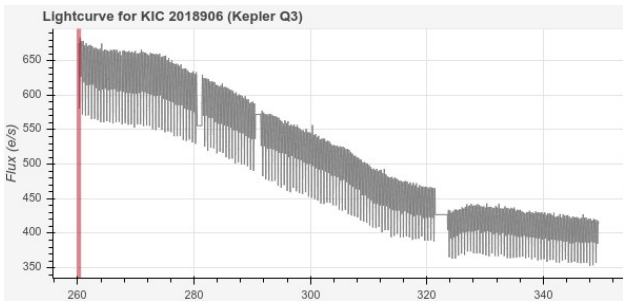
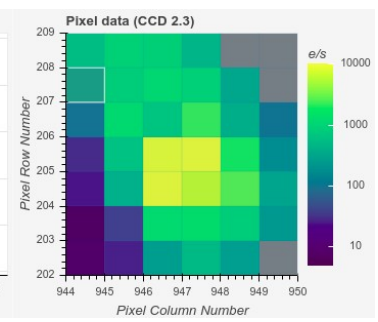
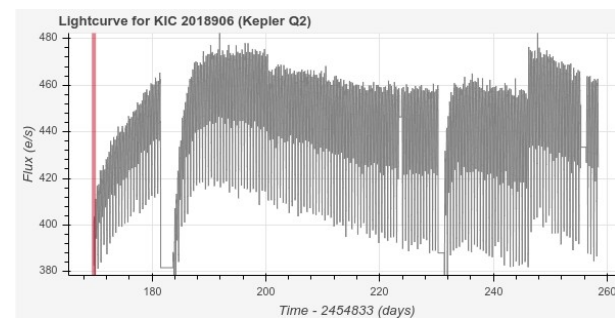
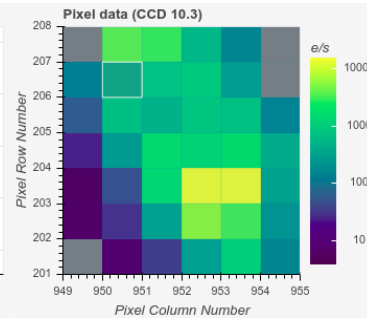
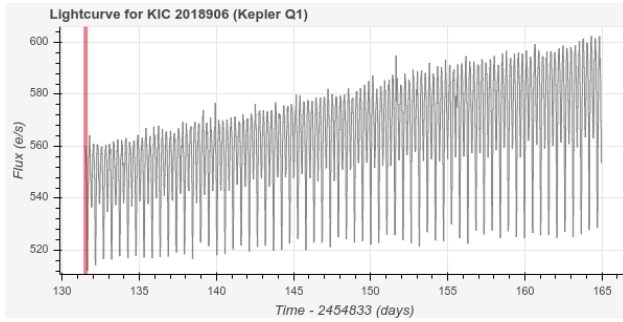
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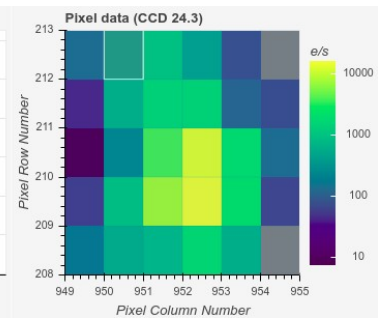
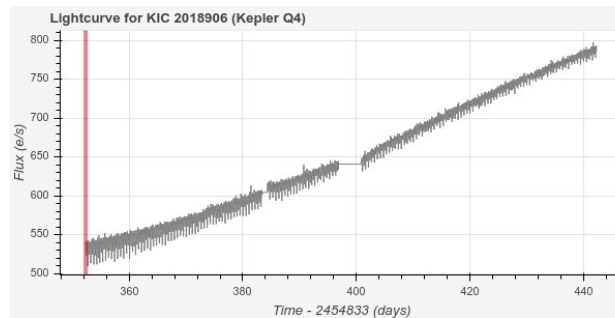
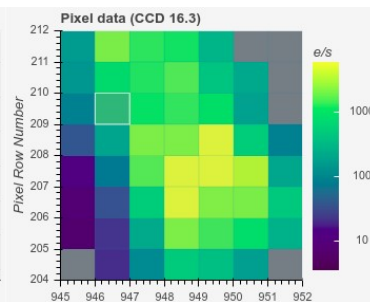
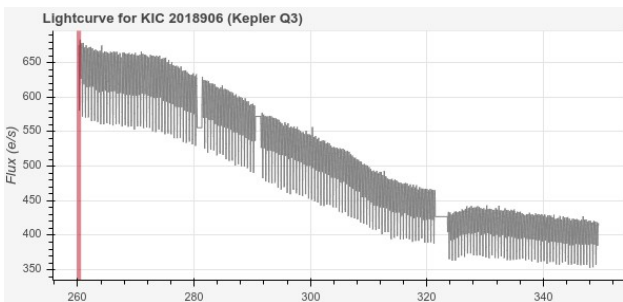
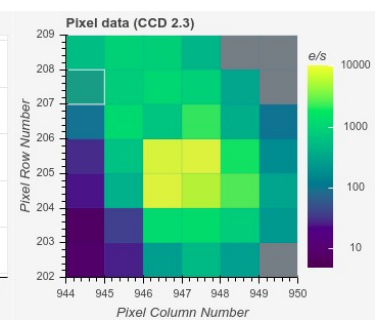
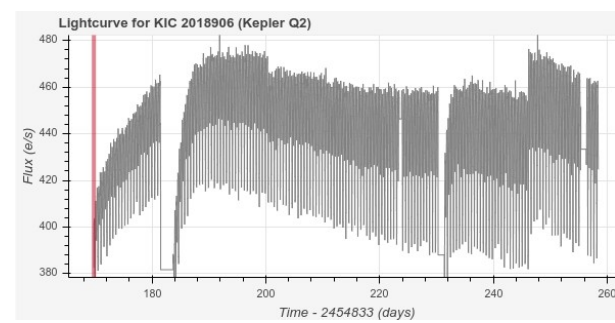
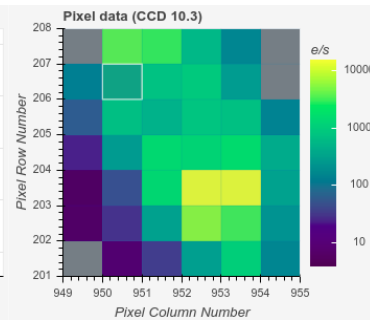
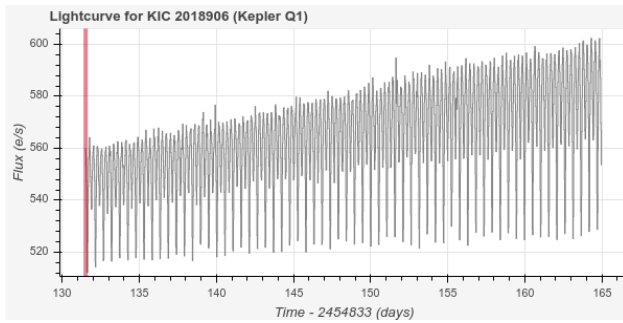
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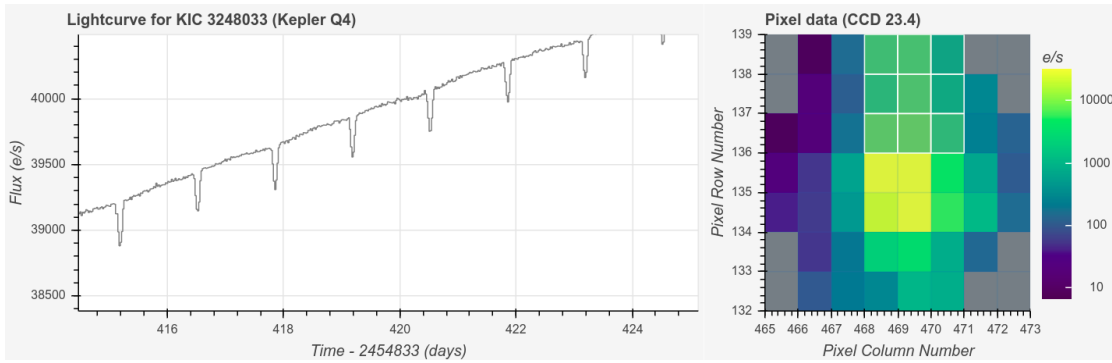
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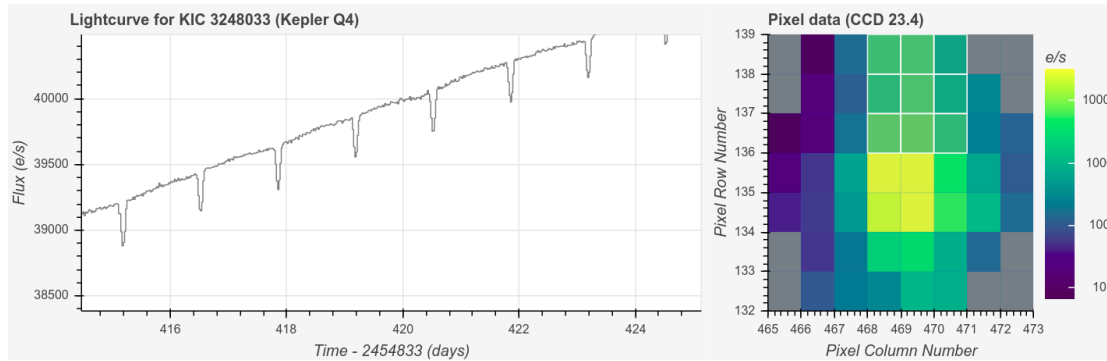
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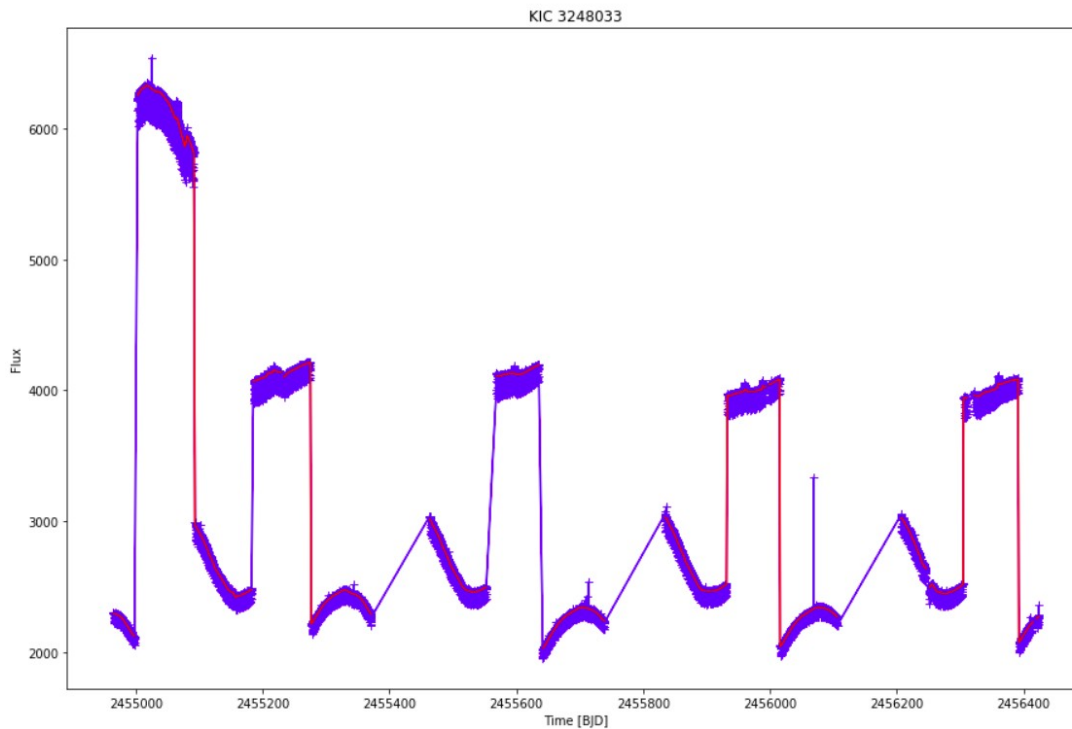
Examples: 4-year lightcurves



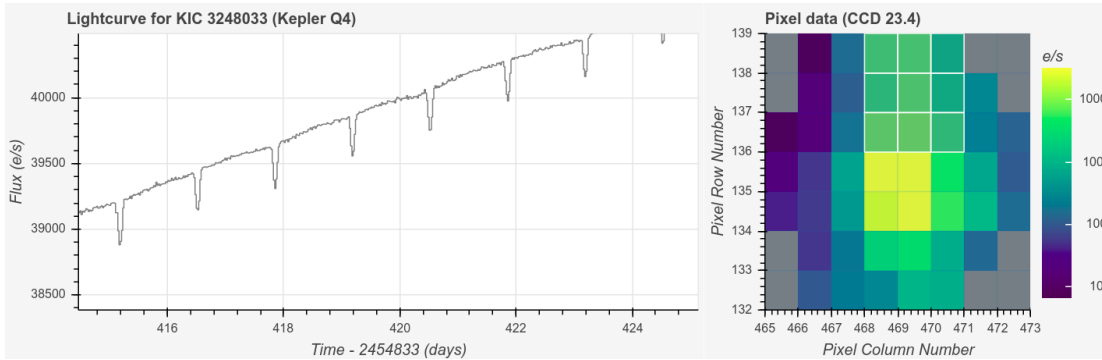
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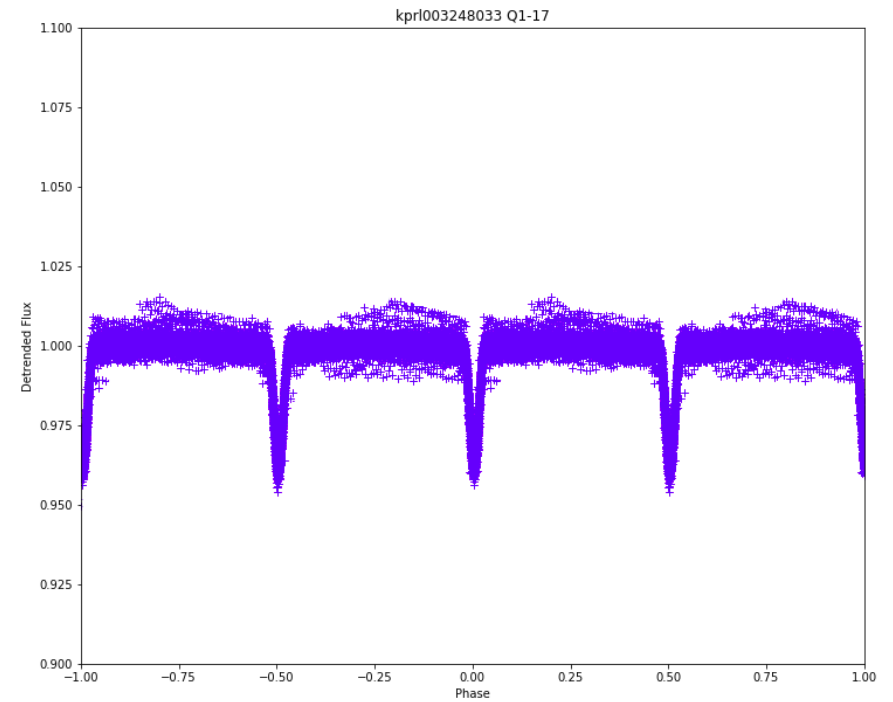
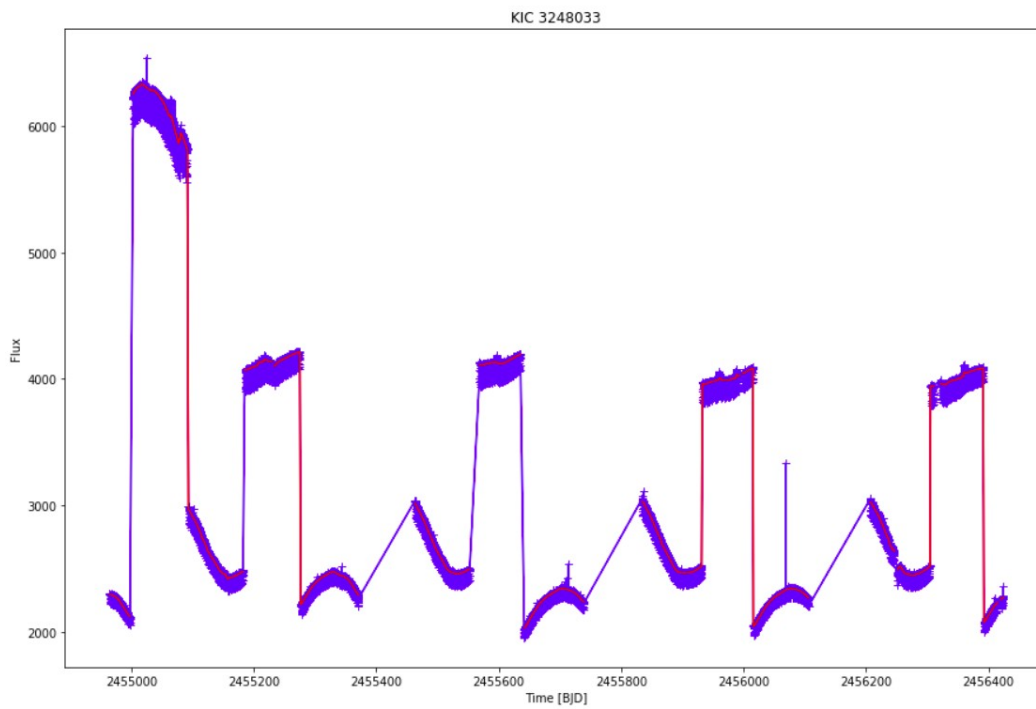
Detrending with Wötan
(Hippke et al. 2019)



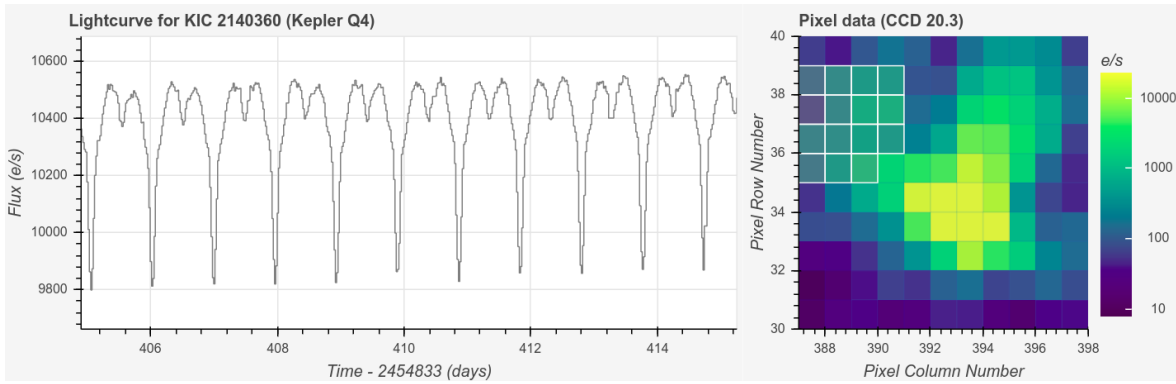
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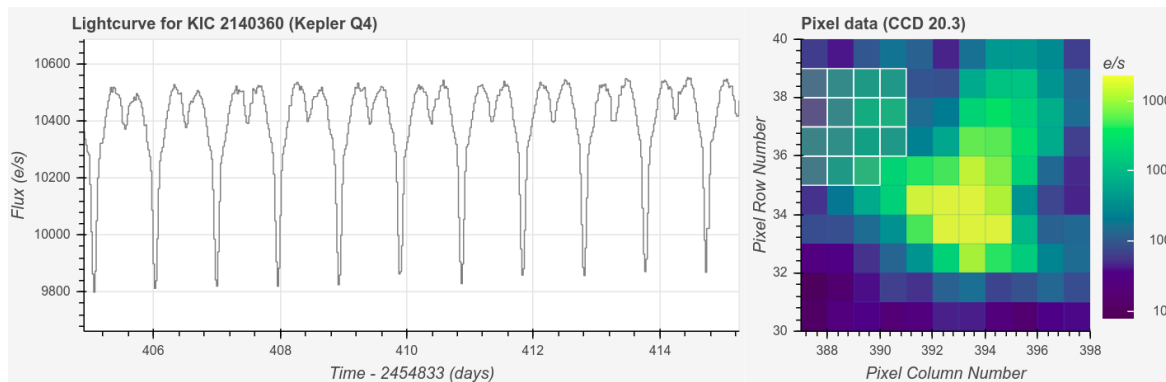
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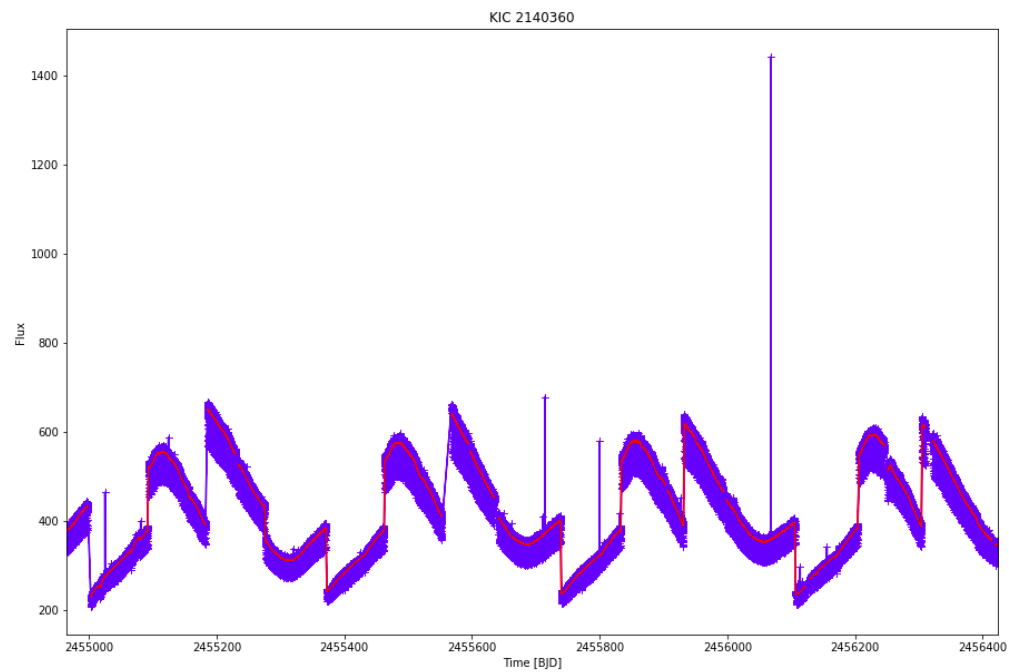
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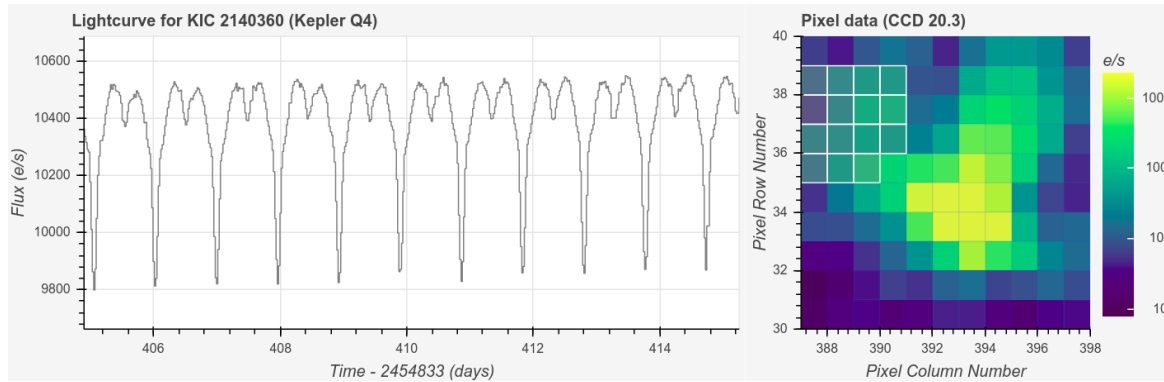
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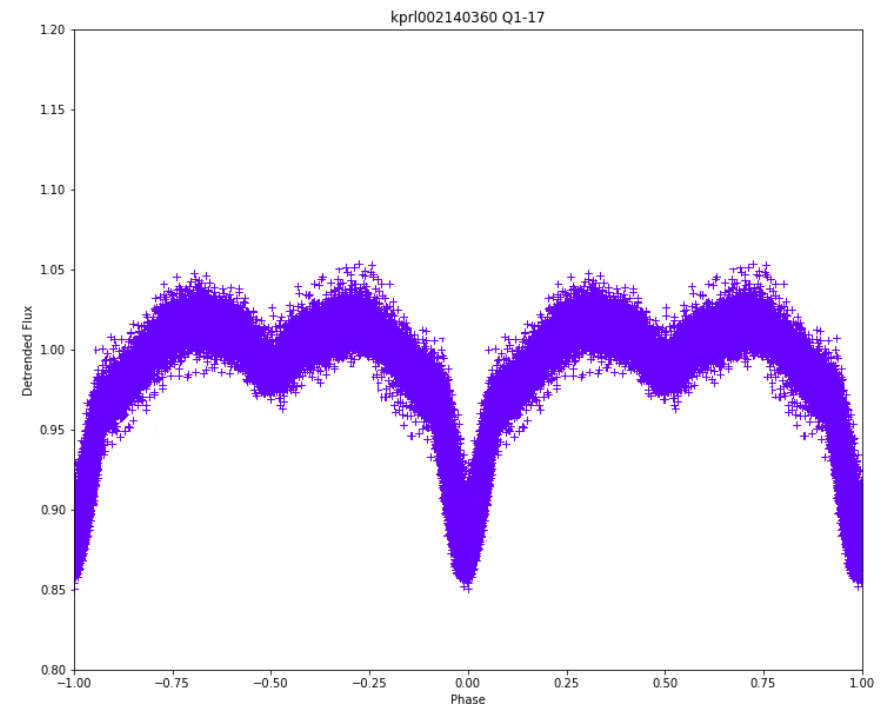
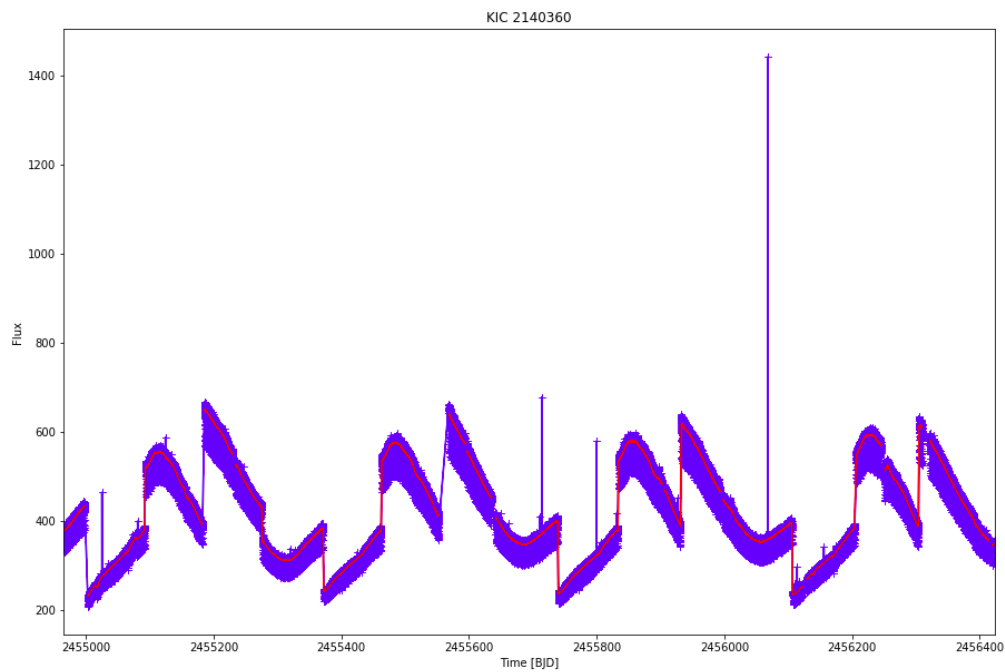
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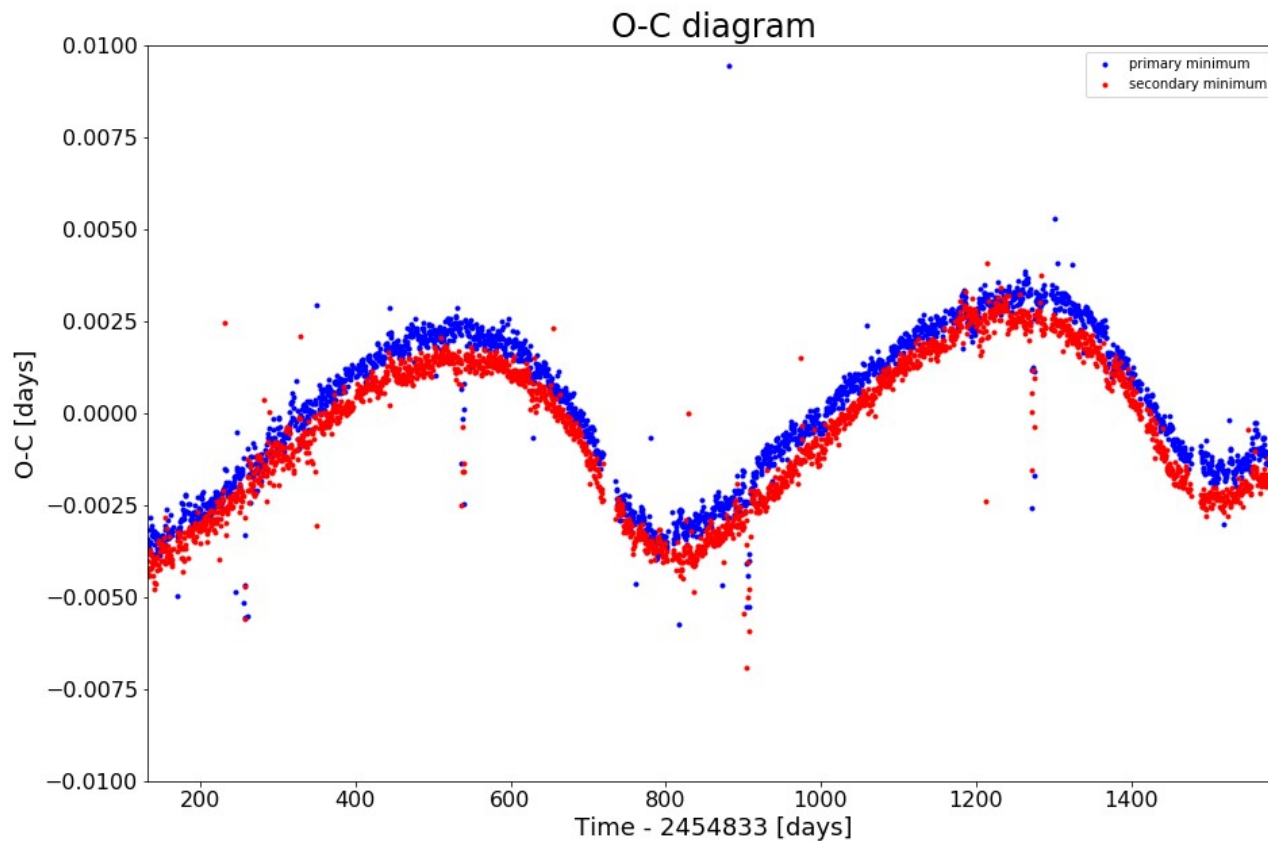
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Detrending with Wötan
(Hippke et al. 2019)



Triple-star system candidates?



Candidate located
on 2 TPFs:
KIC 5898935 &
KIC 5898983

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 - P=0.25-1d
 - at least 2 harmonics

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- we created their 4-year lightcurves
- searching for potential triple-star systems: 25+ candidates
- search in other period ranges as well: P<0.25: John Bienias