

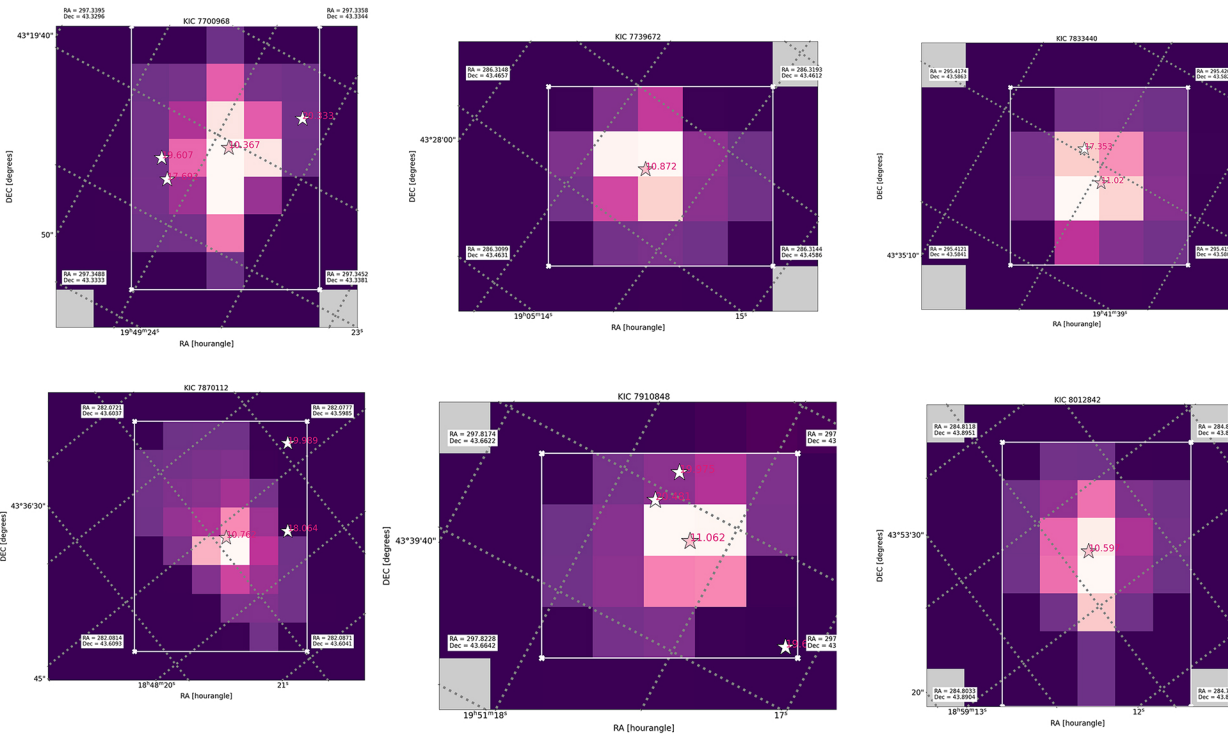


# The Flux Contamination Web Tool: Determining Contamination in Kepler and TESS Target Pixel Files using Gaia DR3



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### Motivation:

The *Kepler* and TESS missions have revolutionized our understanding of the stars in our Galaxy, but the large size of these missions' pixels (4" and 21", respectively), and their larger pixel apertures can cause light curves to become contaminated by visual pairs. This excess flux can lead to incorrect parameterization, such as the underestimation of candidate planet radii.

### The Tool:

The Flux Contamination Tool for *Kepler* and TESS, uses a cross-match between the target pixel files (TPFs) used to create light curves and Gaia eDR3 to determine possible contamination by excess flux from visual pairs.

The web tool creates a unique Gaia polygon search for each of the targets, based on the aperture mask used for the *Kepler* or TESS observation, allowing the user to accurately find visual pairs causing possible contamination, without having to assume contamination from a purely radial search.

### Tool Outputs:

The user inputs a KIC or TIC number and receives a plot of the area (shown below) and a companion .csv file detailing all the stellar parameters for any visual pairs found in Gaia, and calculations for contamination such as underestimation of planet radii (if applicable), magnitude differences, flux ratios, and bound probability.

### Audience:

This tool aims to allow researchers and students of all levels to quickly determine whether their chosen target(s) have possible flux contamination. A vital component of the tool is ease-of-use, and we hope to see it utilized by researchers of all levels, as well as in education environments.



Don't have a favourite KIC?  
Try these for an example of:

A star with no contaminating flux:  
**KIC 12011630**

A star with contamination in the  
TPF:  
**KIC 11971746**

A star with contamination in the  
same pixel as the target star:  
**KIC 3430893**

Test it out!

1

KIC 7833440

2

RA = 295.4174  
Dec = 43.5863

RA = 295.4204  
Dec = 43.5824

3

5

17.353

4

11.02

6

7

8

RA [hourangle]

19<sup>h</sup>41<sup>m</sup>39<sup>s</sup>

### Example output plot for KIC 7833440

- 1: Name of the star searched.
- 2: RA and Dec coordinates defining the corners of the Gaia polygon.
- 3: Smallest possible Gaia polygon for the aperture mask used.
- 4: Target star labeled with the Gaia magnitude.
- 5: A visual pair that has been found in Gaia, labeled with its Gaia magnitude.
- 6: Lighter purple area indicates the Kepler aperture mask used to determine the light curve.
- 7: Dark purple areas are Kepler pixels.
- 8: x- and y-axis show RA and Dec, with lines of RA and Dec on sky shown in grey.

Comment, suggestions, ideas and addition to the web tool users would like to see should be sent to:  
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