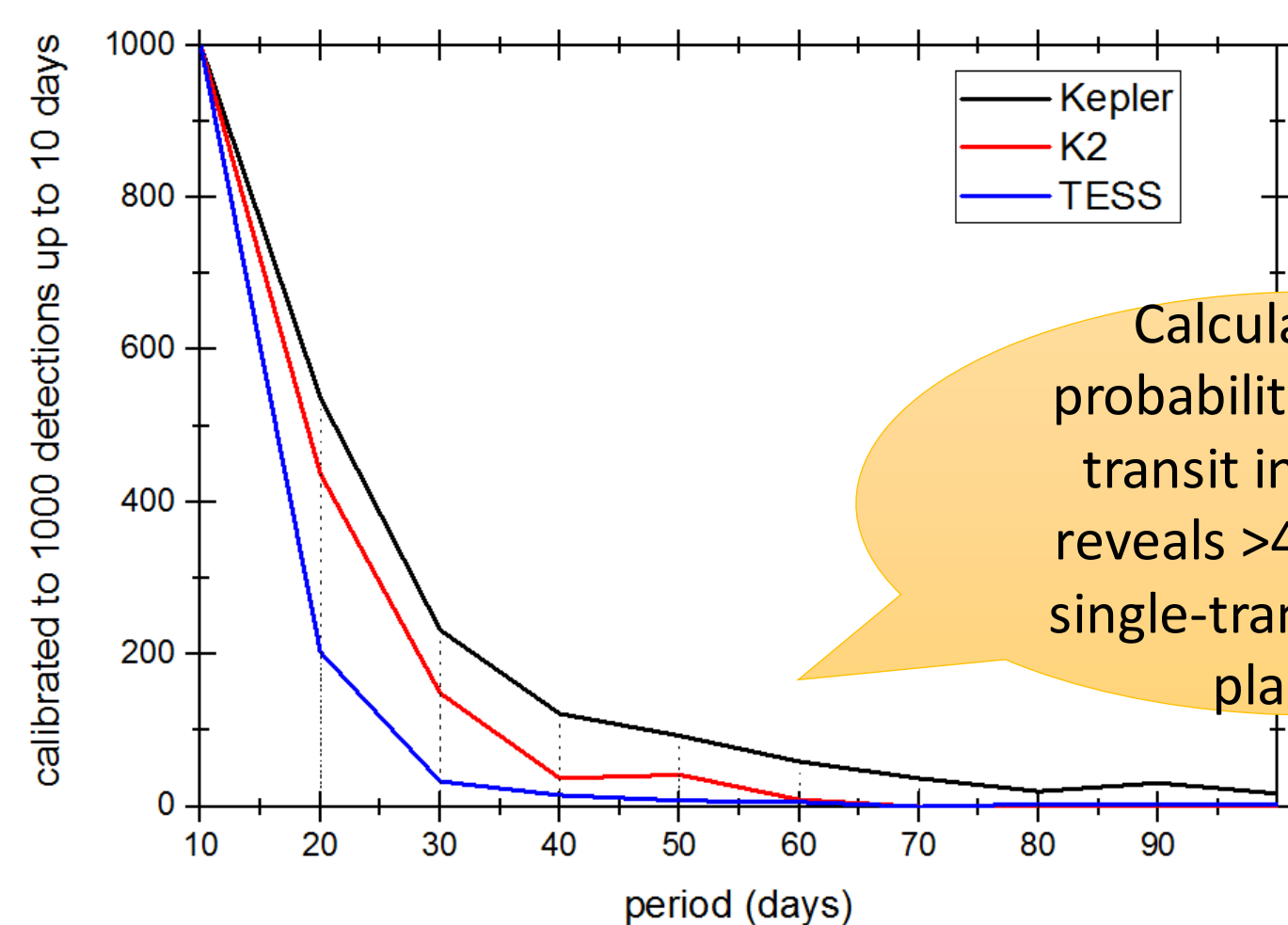
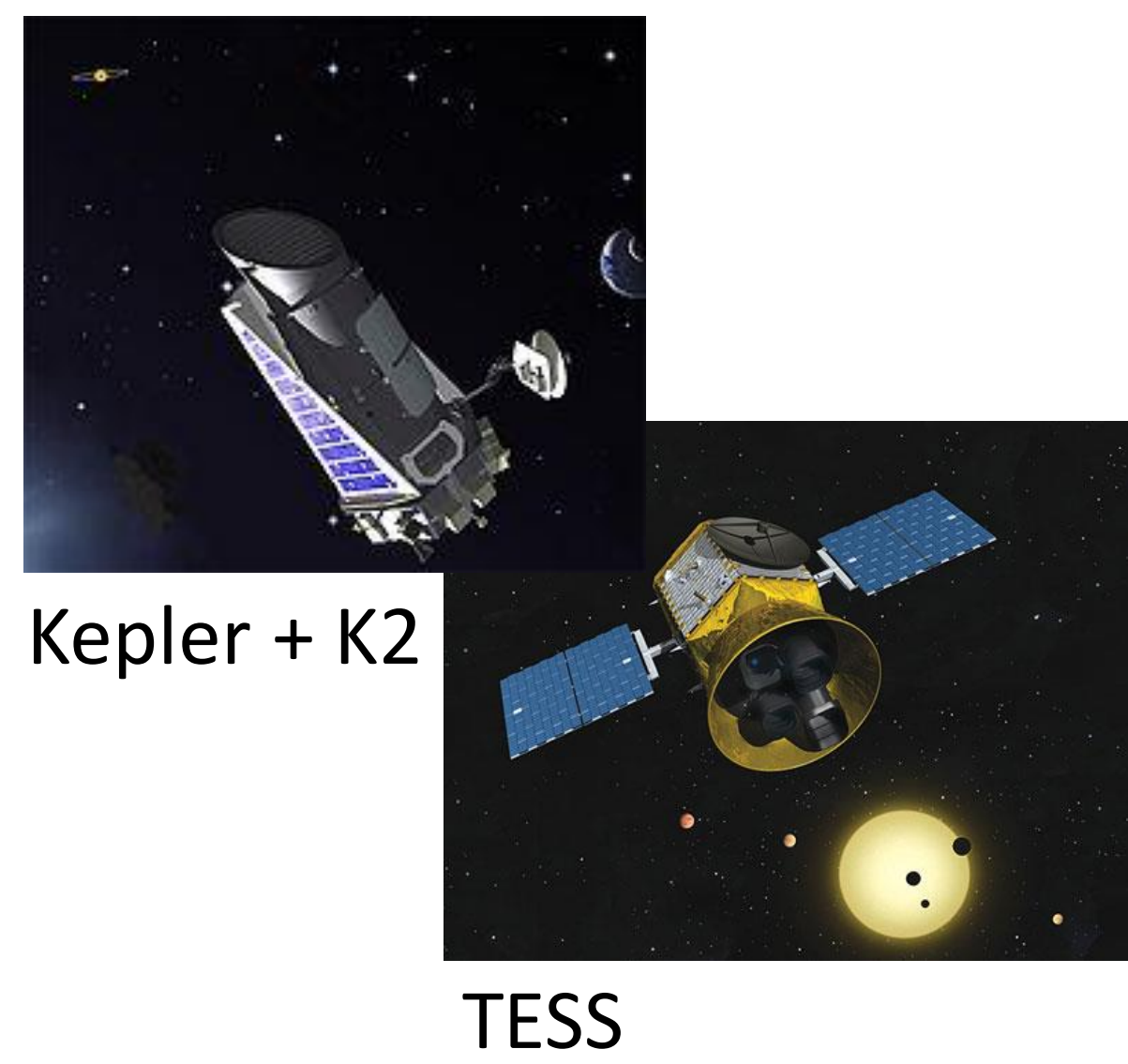


Comparing the detection rate of Kepler (long observation) and TESS (shorter observation) for different orbital periods reveals that many single transits of small planets shall be hidden in TESS data.

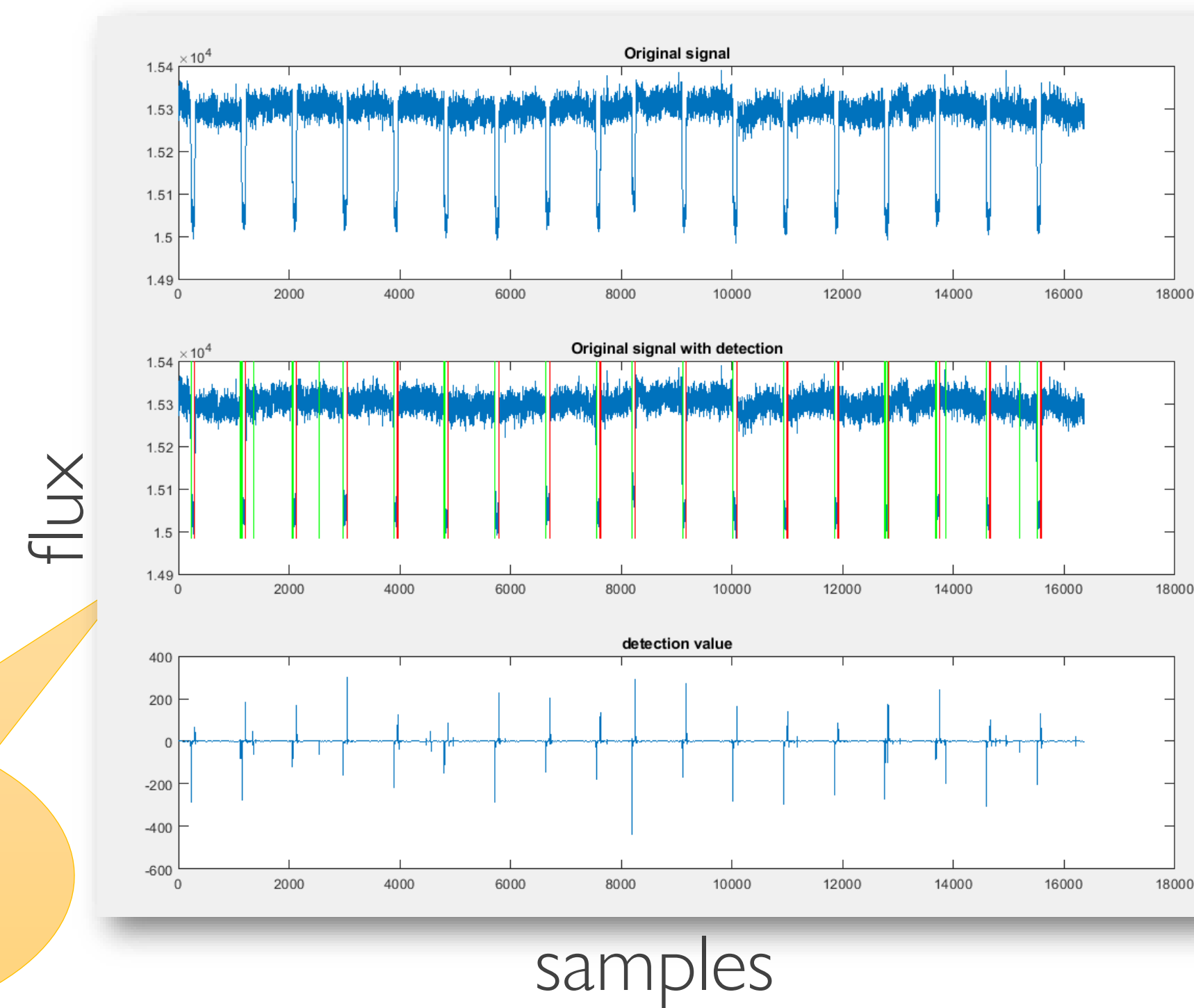


Idea

Calculating the probability of a single transit in TESS data reveals >400 possible single-transiting small planets.

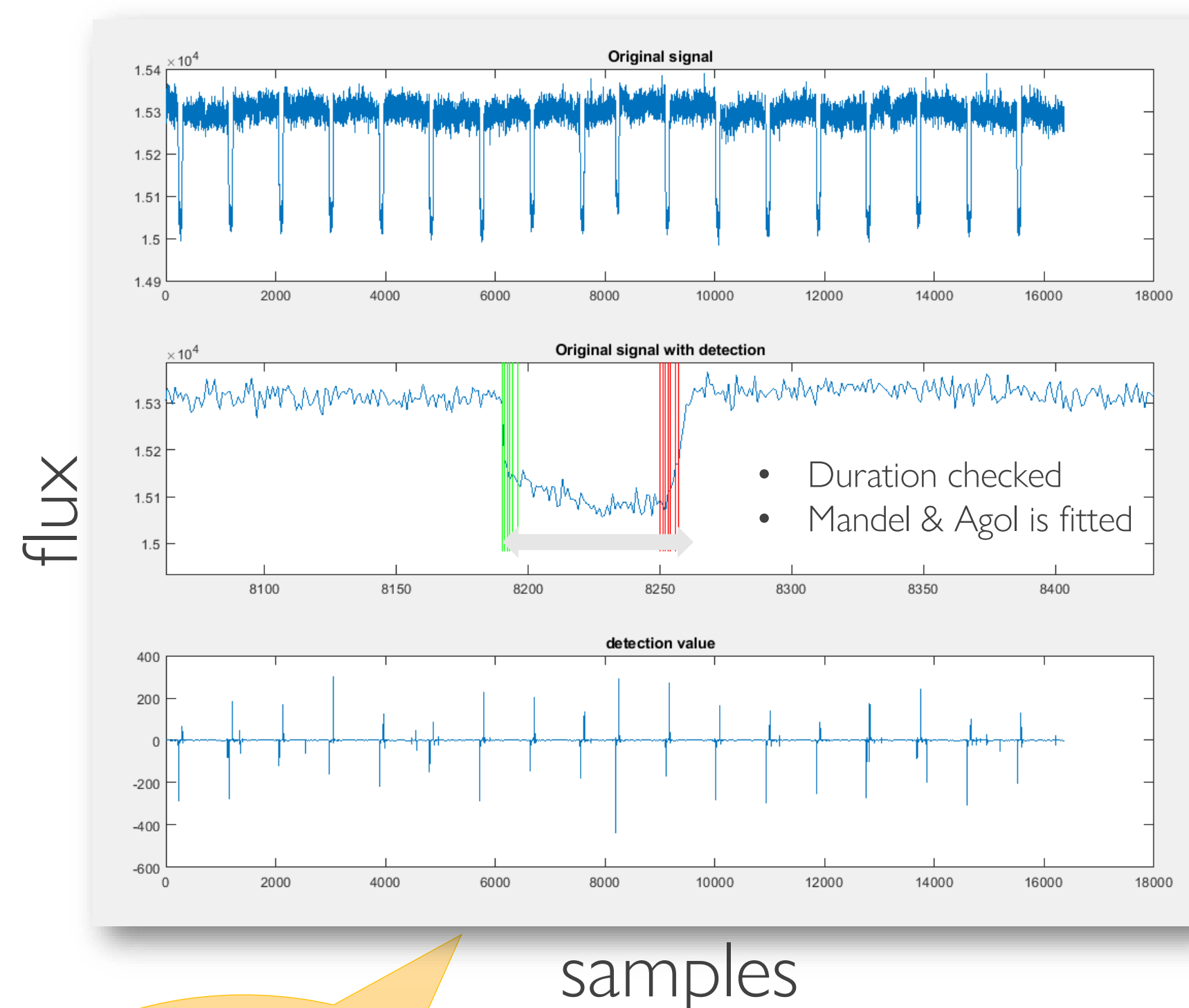
We developed an algorithm combining our well approved wavelet techniques with a new method to detect ingress (green) and egress (red) of single transits.

The order of the detection (green, red) helps excluding false detections.



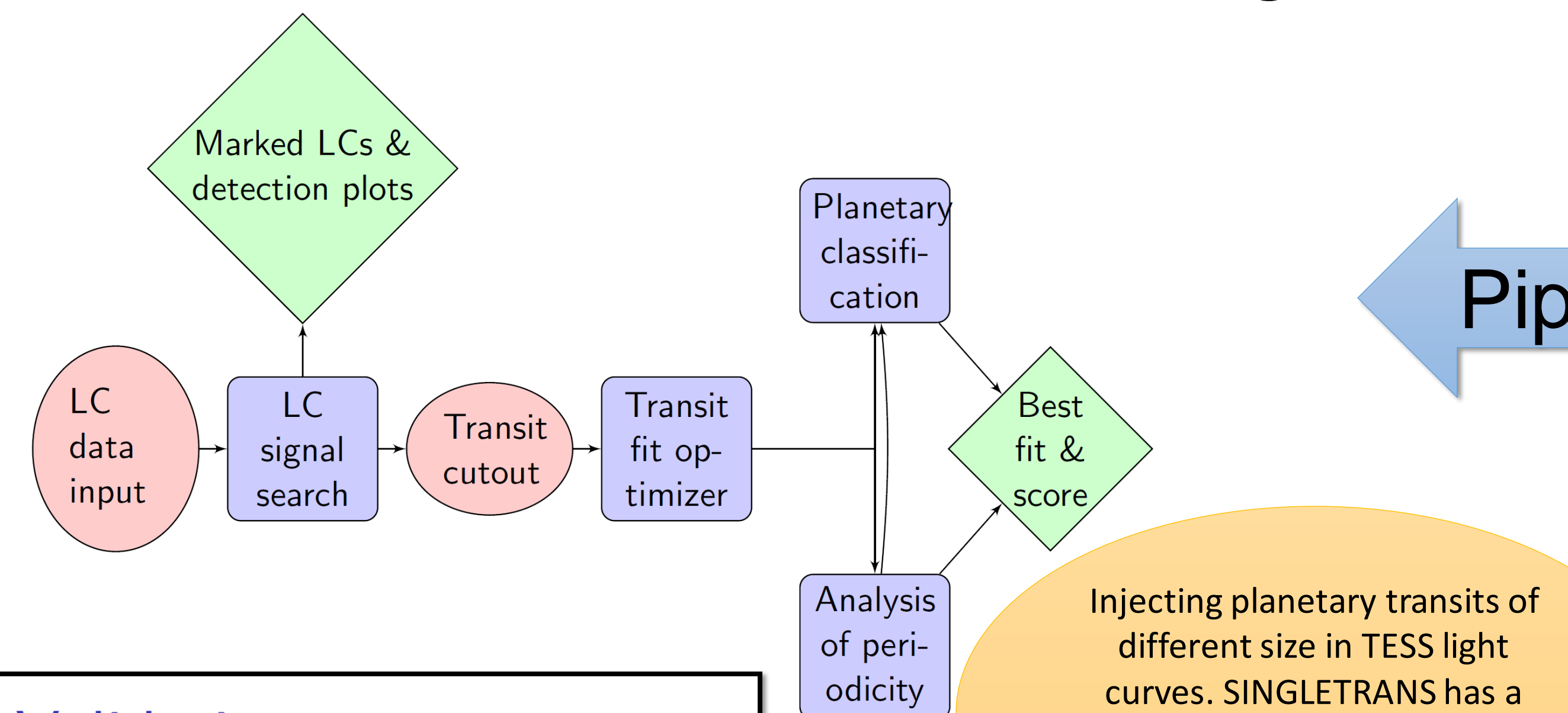
Without the knowledge of the period many false detections (fast variation, discontinuities) have to be excluded:

- Upper limits for the transit duration are checked.
- Mandel & Agol fit is used to identify the nature of the event.



Additional calculations are needed to remove false detections.

SINGLETRANS works well on all kind of light curves.



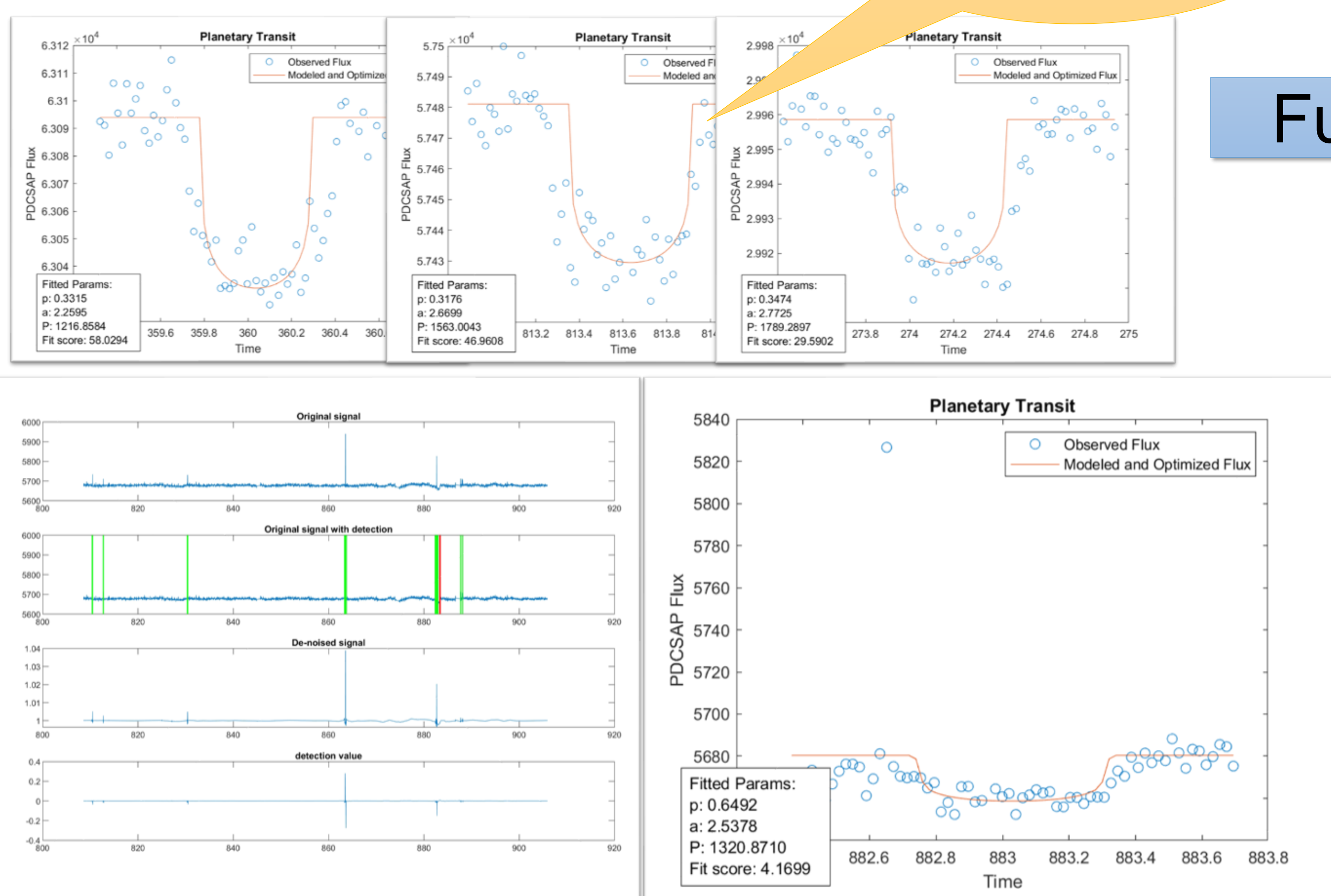
Pipeline

Validation

Jupiters	81%
Neptunes	69%
Super Earths	18%
False positives	33%

Injecting planetary transits of different size in TESS light curves. SINGLETRANS has a detection rate higher than expected, keeping in mind that these are single detections!!!

Various single transit candidates were detected in Kepler data.

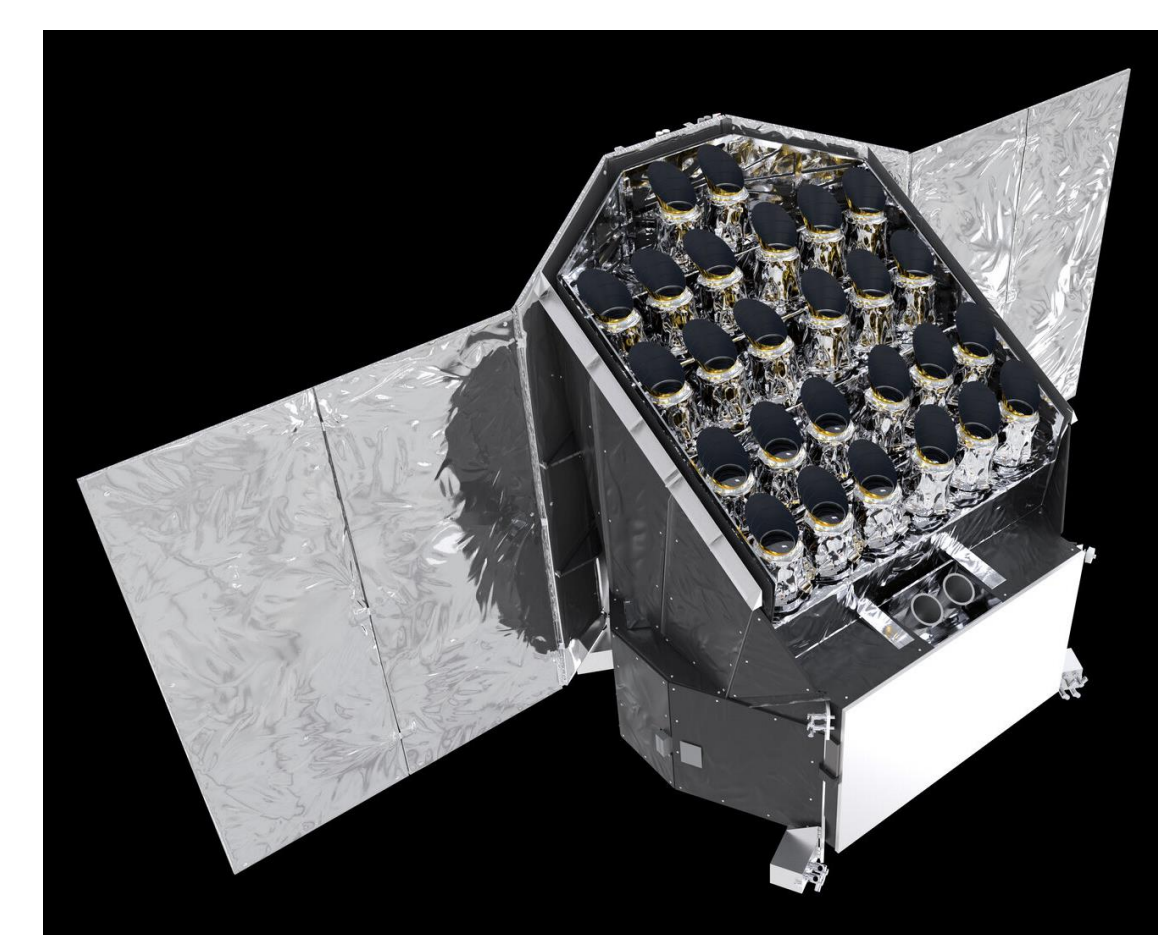


SINGLETRANS detected various long period single transits in KEPLER data. Some examples are shown.

Future

Single or Mono transits are a great chance to find planets with larger orbital periods.

- A single transit search is ongoing using archival data from CoRoT, Kepler, K2 and TESS.
- The results can be used to search for additional transits with photometric missions like CHEOPS.
- Early detection of mono transits in PLATO long observation runs can be used to forecast upcoming transits or prioritize targets (imagettes etc.).
- Single transit detections in PLATO long observation runs can lead to detect candidates with very long orbital periods.



Follow-up

- Confirmation and characterization of transiting planets with well determined radii, masses and densities to investigate their internal structure and composition.
- Combining specialists from different scientific fields (transit detection, transit characterization, photometric and spectroscopic follow-up observation) to use telescope time efficiently.



Acknowledgements:

This project is part of the DFG Priority Programme 'Exploring the Diversity of Extrasolar Planets' (SPP 1992) which brings together different aspects of exoplanet research, theoretical as well as observational. For more information visit the programmes webpage: <http://www-astro.physik.tu-berlin.de/exoplanet-diversity>