

# Disproving validated planets

## K2-78b, K2-82b, and K2-92b

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edge for Tomorrow





# Researching the diversity of planetary systems

ISSI International Team

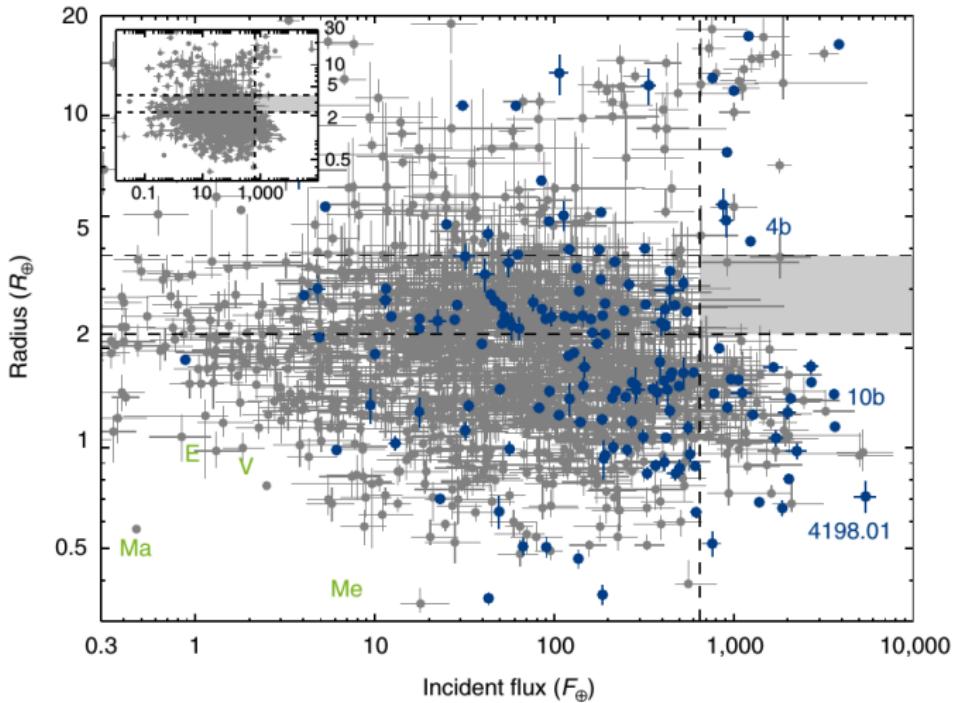
## ISSI International Team

- ▶ 8-15 scientists from different institutes
- ▶ holding a series (2) of one-week meetings
- ▶ the aim of Teams is to carry out a research project leading to publications in scientific journals

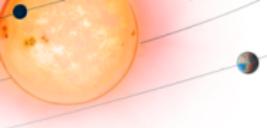
## Team Goals

- ▶ optimizing the yield of transiting surveys
- ▶ detection of planets in presence of stellar activity
- ▶ strategies to search and characterize small planets



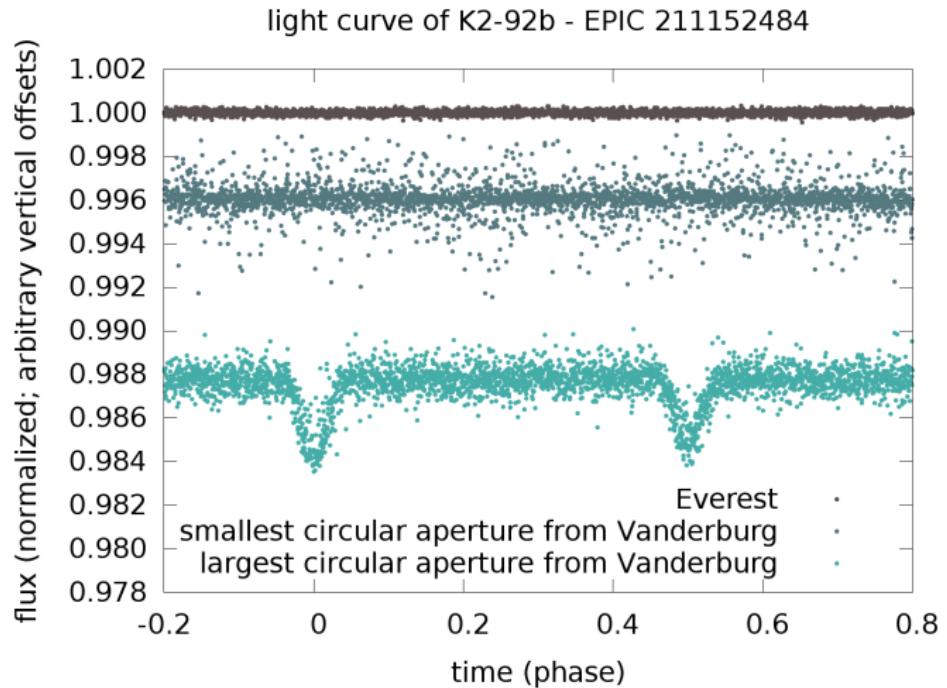


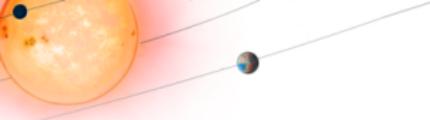
Lundkvist et al 2016; see also Mazeh et al. 2016



# K2-92b

## validation process

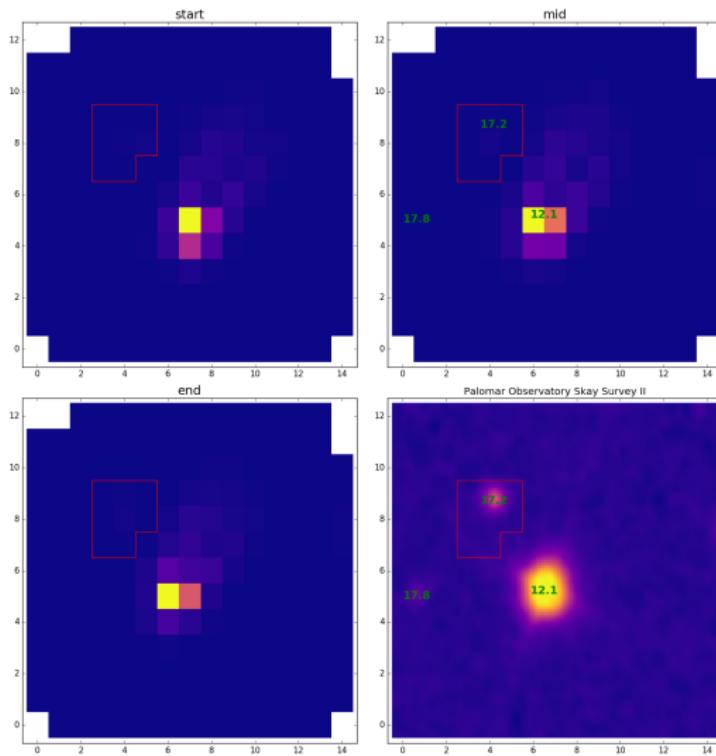


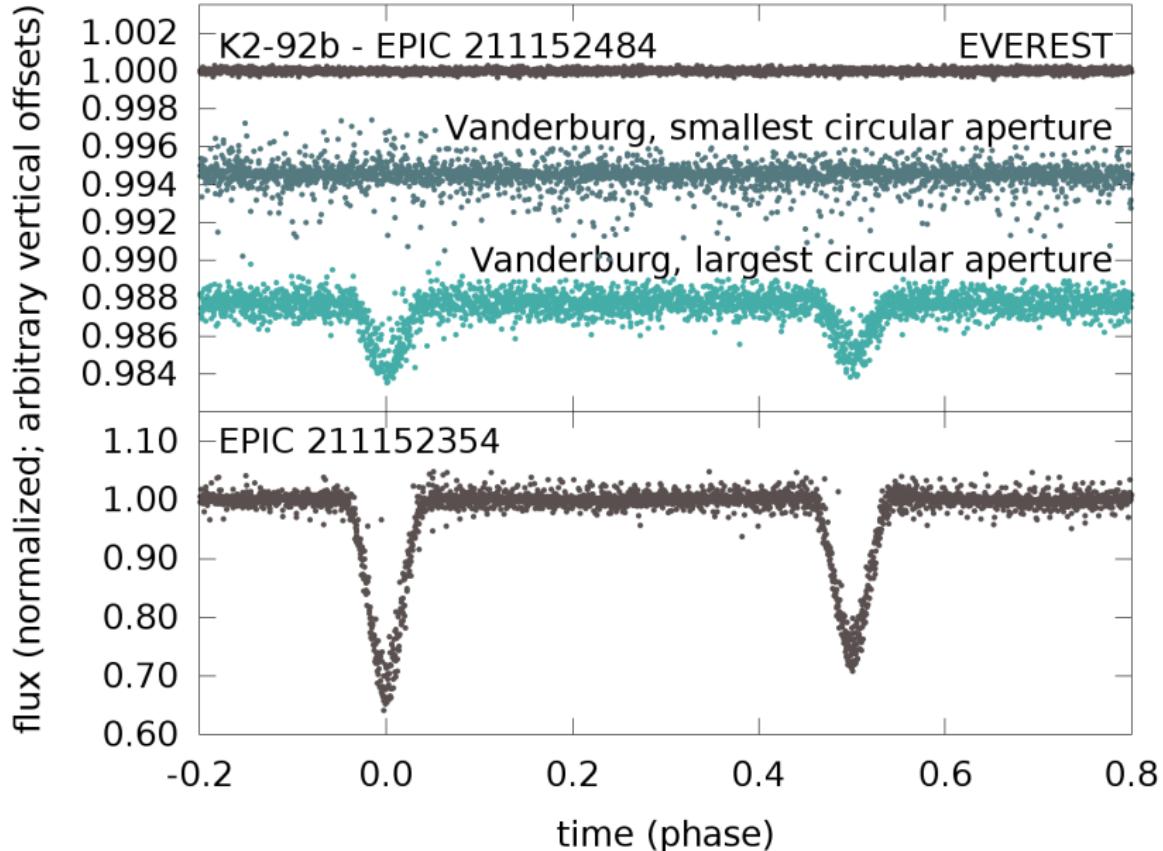


# K2-92b

## photometric extraction

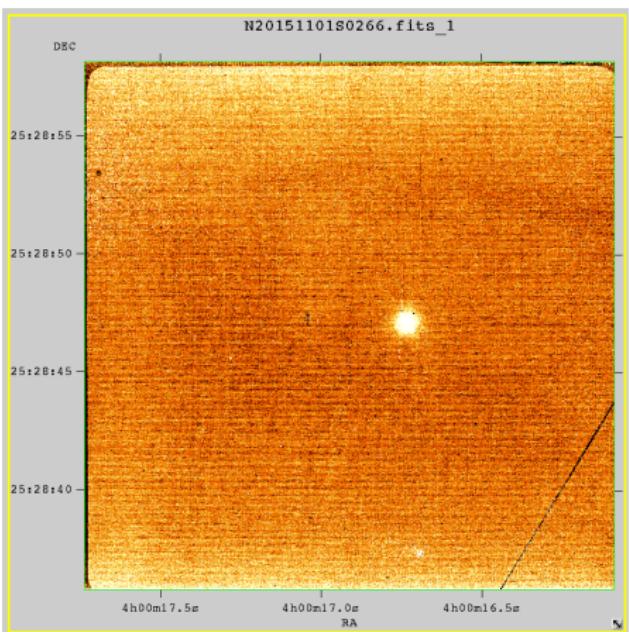
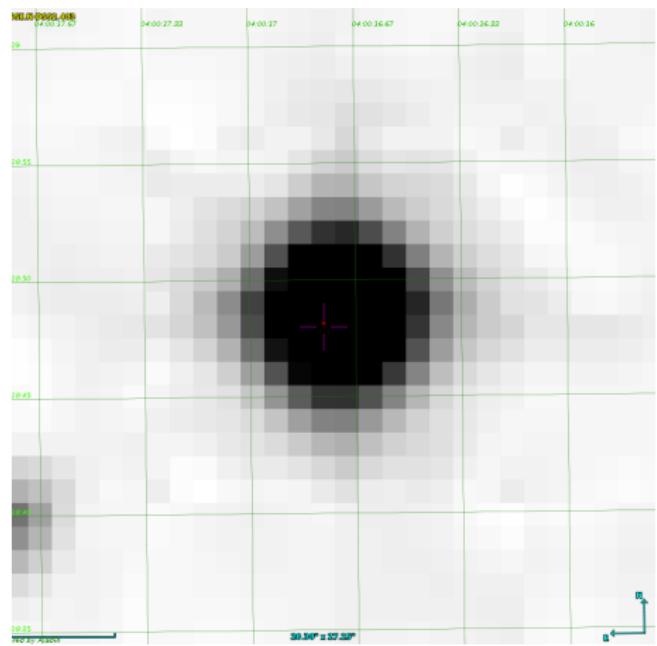
EPIC 211152484





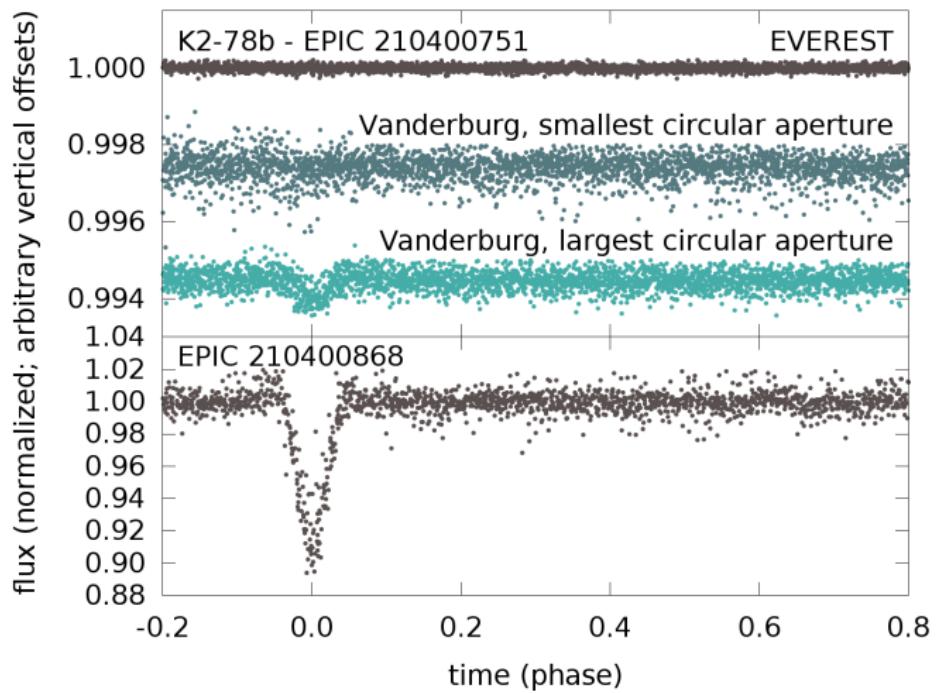


K2-92b  
high resolution imaging



(mind the N-S flip with respect to the previous image)



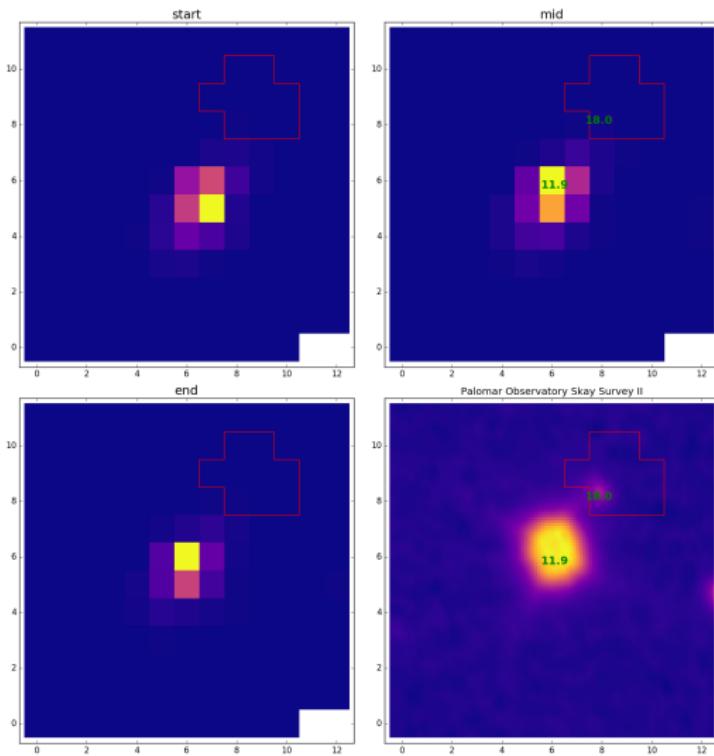


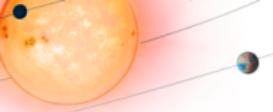


# K2-78b

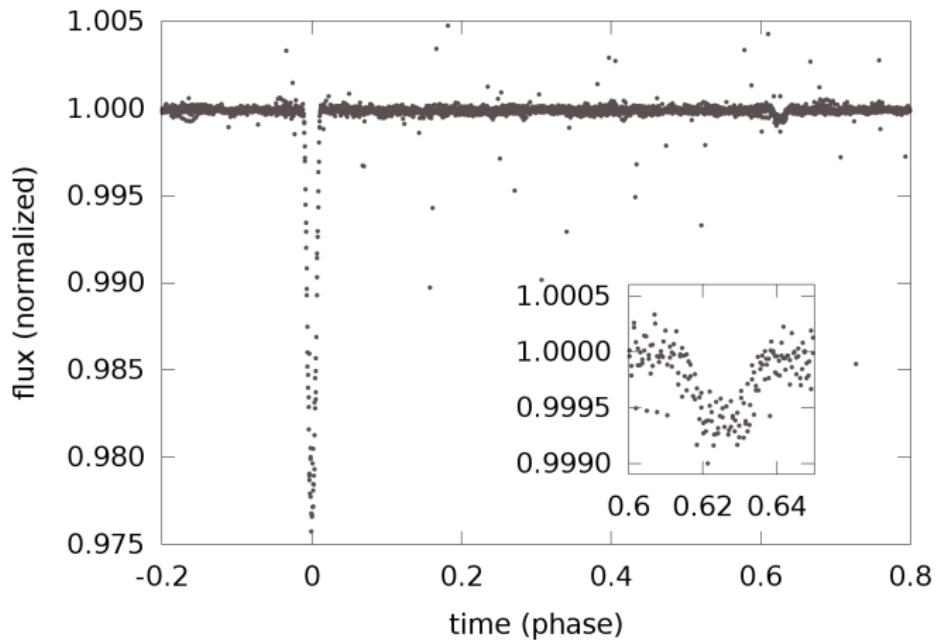
## photometric extraction

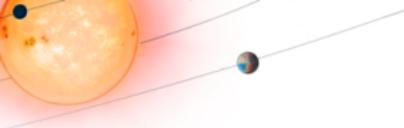
EPIC 210400751





light curve of K2-82b - EPIC 210483889

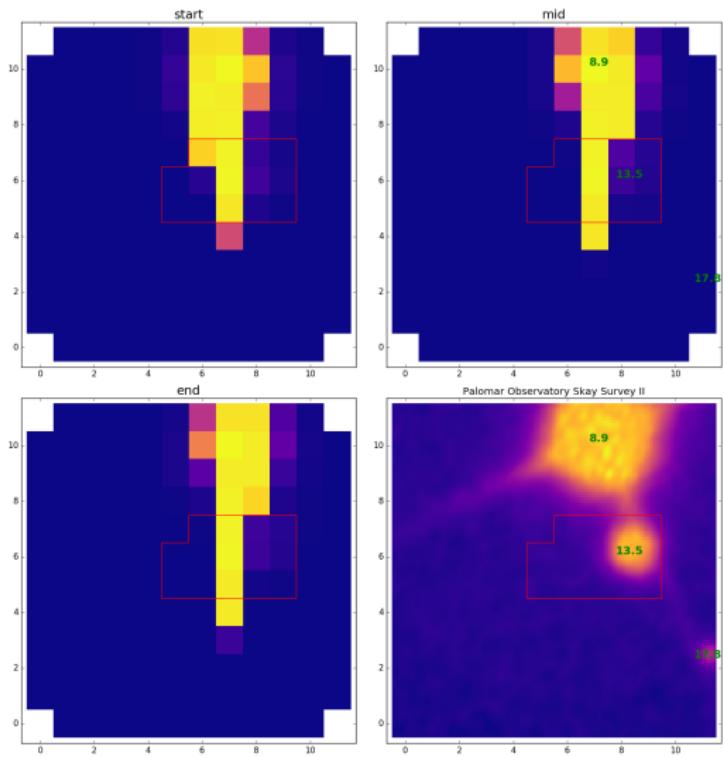




# K2-82b

## photometric extraction

EPIC 210483889



- ▶ planet validation methods are useful tools for exoplanet surveys
- ▶ we have found 3 cases of **super-Earth** planets where the impact of contaminant sources was underestimated, resulting in a wrong assessment of the planetary false positive probability:
  - ▶ **K2-92b**, FPP 0.12%; **K2-78b**, FPP 0.31%; **K2-82b**, FPP 0.06%
  - ▶ (FPPs from Crossfield et al. 2016 with VESPA, Morton et al. 2016)
- ▶ biases are probably different than for **Jupiter-sized** planets, where low-mass stellar companions might mimick the planetary signal, for example see Shporer et al. 2017 (arXiv 1708.08455):
  - ▶ **K2-51b**, FPP 0.13%; **K2-67b**, FPP 0.24%; **K2-76b**, FPP 0.014%
  - ▶ (FPPs from Crossfield et al. 2016 with VESPA, Morton et al. 2016)
- ▶ these biases compromise the reliability of the calculated FPPs



# Conclusion

## planet validation improvements

- ▶ planet validation methods are useful tools for exoplanet surveys
- ▶ the issue discovered in our research is instrument dependent
  - ▶ in PLATO, WP 113000 is responsible for planet ranking procedures
- ▶ lessons learned from past surveys (ground and space) apply
  - ▶ different apertures used for photometric extraction
- ▶ independent confirmation is best way to avoid wasting scarce telescope resources
- ▶ more info:
  - ▶ <http://www.issibern.ch/teams/divplansys/>
  - ▶ Armstrong et al. (2017) MNRAS, 465, 2634
  - ▶ Cabrera et al. (2017) A&A, in press