Disproving validated planets
K2-78b, K2-82b, and K2-92b

J. Cabrera\(^1\), S.C.C. Barros\(^2\), D. Armstrong\(^3\), D. Hidalgo\(^4\), N. C. Santos\(^2,5\), J. M. Almenara\(^6,7\), R. Alonso\(^4\), M. Deleuil\(^8\), O. Demangeon\(^2\), R. F. Díaz\(^9,6\), M. Lendl\(^10\), J. Pfaff\(^11\), H. Rauer\(^1,11\), A. Santerne\(^8\), L. M. Serrano\(^2,5\), S. Zucker\(^12\)

\(^1\)DLR, Berlin, \(^2\)IA, Porto, \(^3\)U. Warwick, \(^4\)IAC, U. La Laguna, \(^5\)U. Porto, \(^6\)U. Genève, \(^7\)U. Grenoble, \(^8\)LAM, Marseille, \(^9\)U. Buenos Aires, CONICET, \(^10\)IWF Graz, \(^11\)TU Berlin, \(^12\)U. Tel Aviv

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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
motivation
detailed characterization of planetary systems

Lundkvist et al. 2016; see also Mazeh et al. 2016
EPIC 211152484

K2-92b
photometric extraction
K2-92b photometric extraction

**Figure:**

- **K2-92b - EPIC 211152484**
  - EVEREST
  - Vanderburg, smallest circular aperture
  - Vanderburg, largest circular aperture

**Flux (normalized; arbitrary vertical offsets):**

- **EPIC 211152354**

**Time (phase):**

- From -0.2 to 0.8
K2-92b
high resolution imaging

(mind the N-S flip with respect to the previous image)
K2-78b validation process

- K2-78b - EPIC 210400751
- EVEREST
- Vanderburg, smallest circular aperture
- Vanderburg, largest circular aperture
- EPIC 210400868

Flux (normalized; arbitrary vertical offsets)

Time (phase)
Conclusion

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/