Masses & Radii
from
Kepler, K2, & TESS

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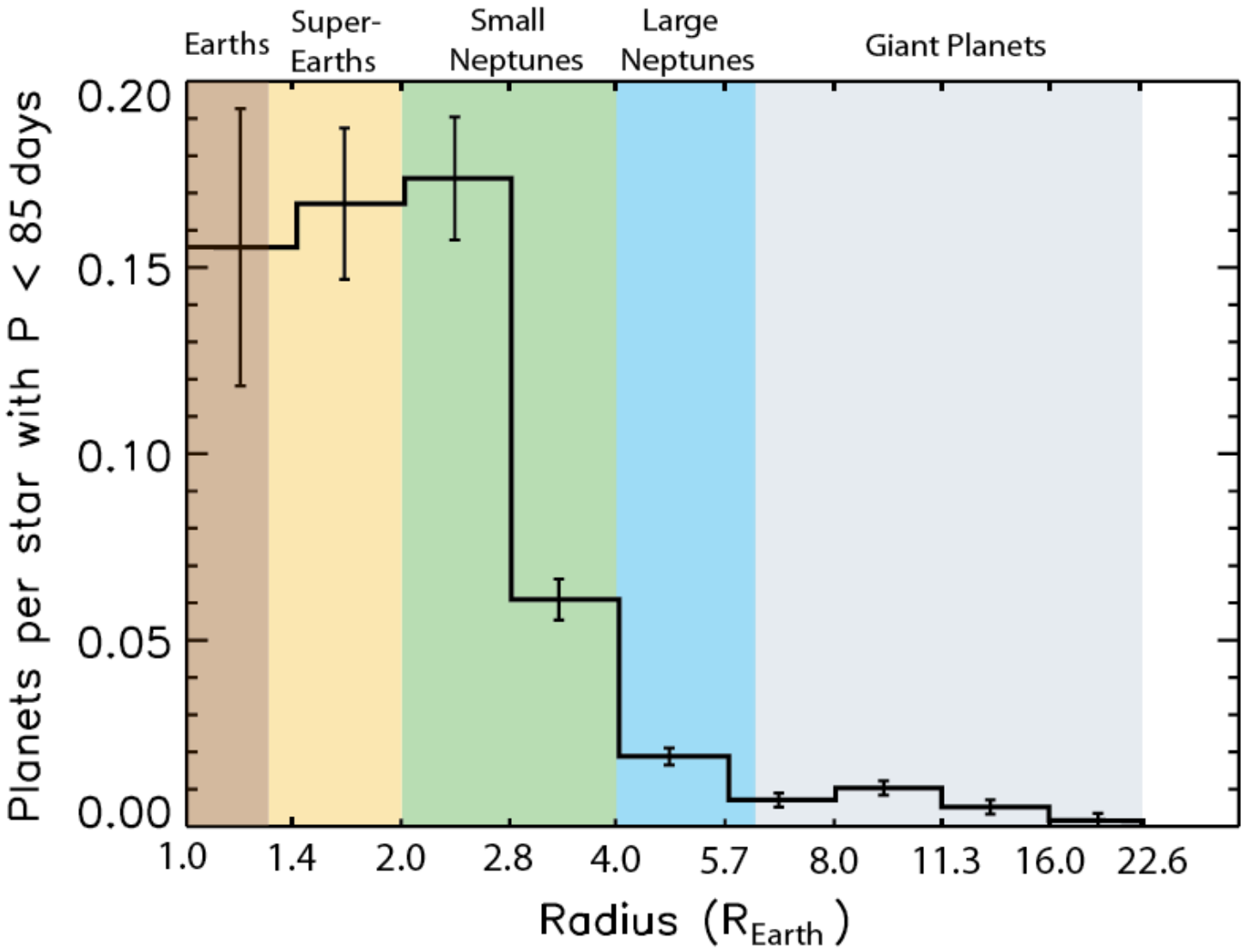
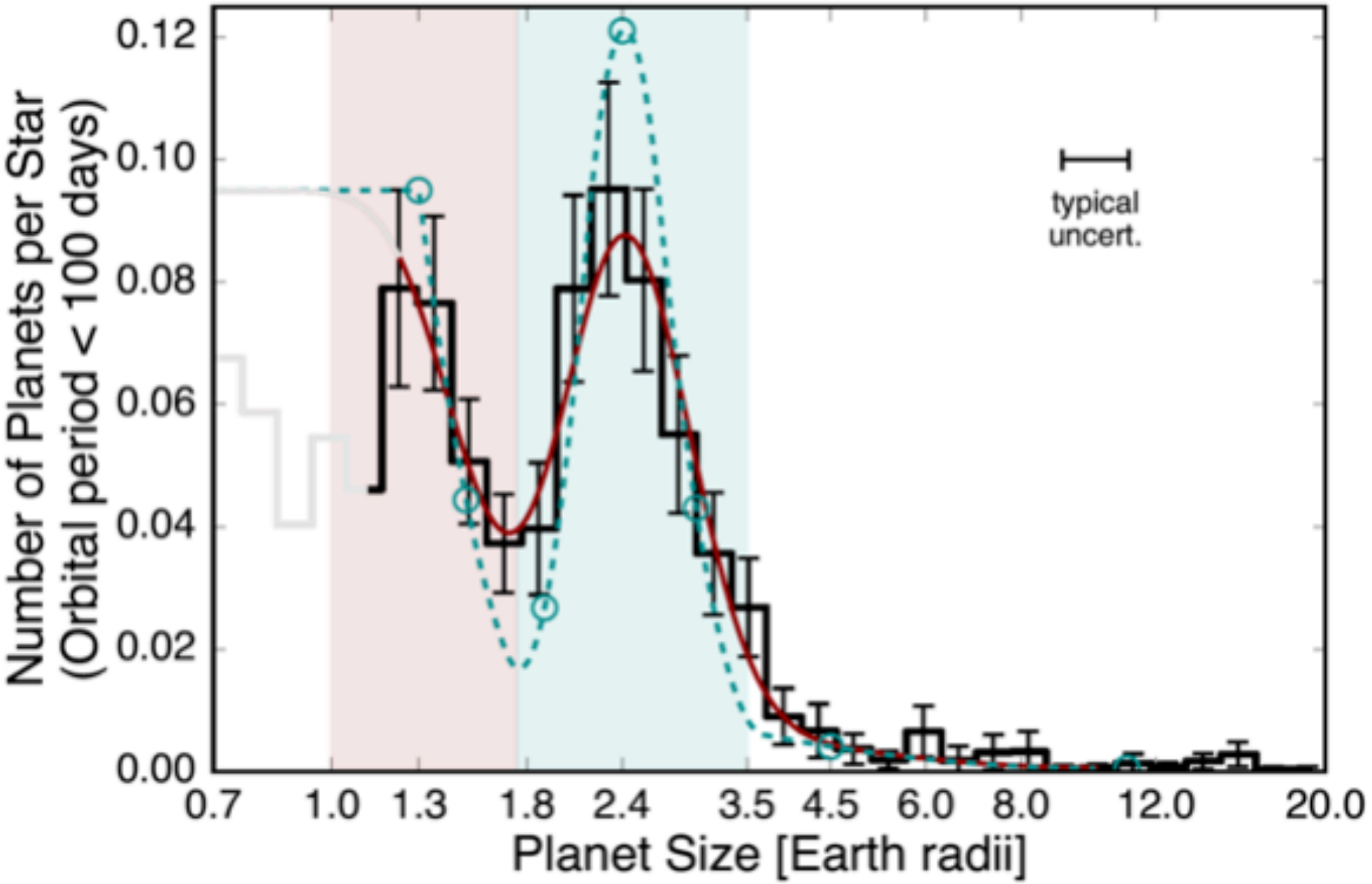
Center for Astrophysics | Harvard & Smithsonian
TESS Science Conference I - 29 July 2019

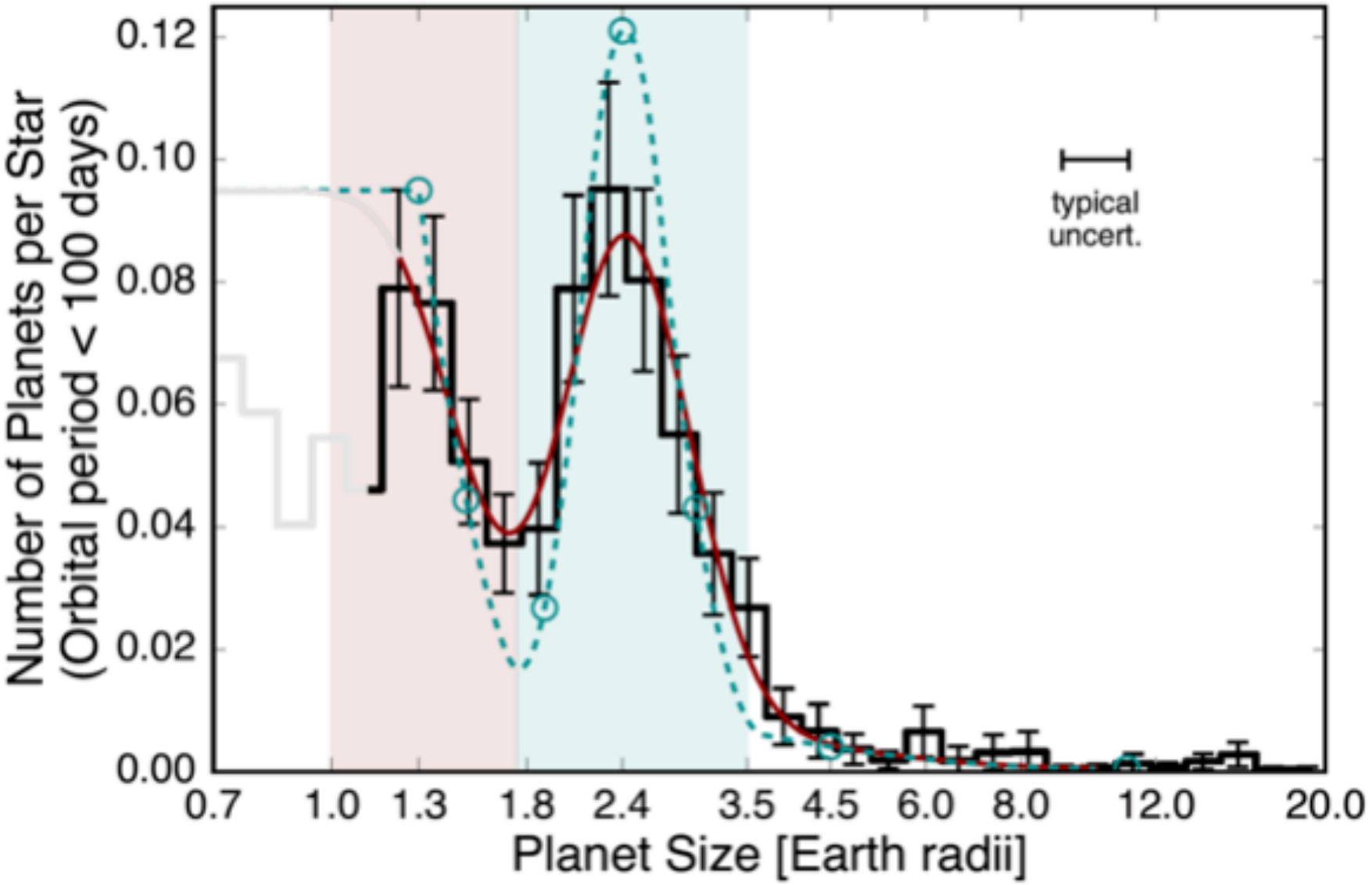

USAF
ULA
DELTA



Fressin et al. 2013



Fulton, et al. 2017



Are planets smaller than 1.8 R_E rocky?

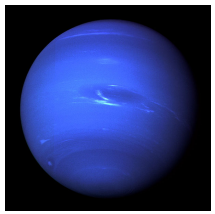
Masses better than 3 σ

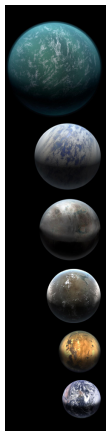
- Published, planet radius < 1.85 R_{Earth}
  - Kepler (10)
  - K2 (10)
  - TESS (5): TOI-141, 175c, 175d, 402b, 562b
  - Mearth (3): GJ 1132b, LHS 1140 b&c
  - HD 209134 b&c
  - CoRoT-7 b

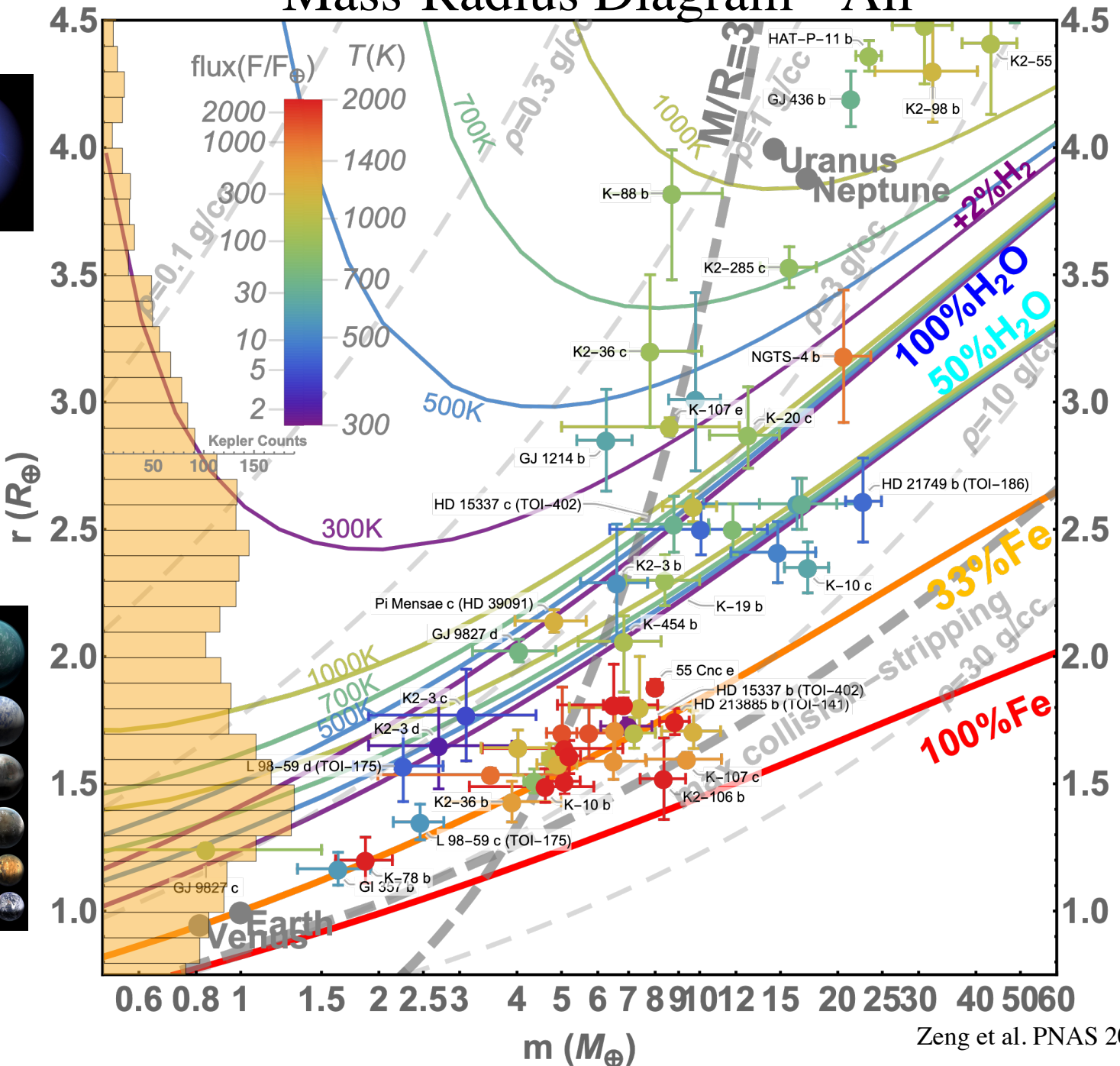
Masses better than 3 σ

- Published, planet radius > 1.85 R_{Earth}
  - Kepler (13)
  - K2 (10)
  - TESS (3): TOI-144c, 402c, 186b
  - Mearth: GJ 1214 b
  - HD 97658 b
  - 55 Cancri e

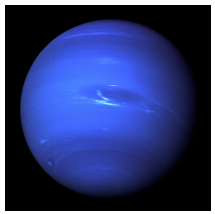
Mass-Radius Diagram - All

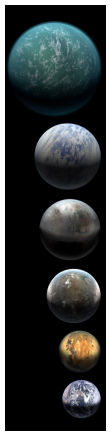


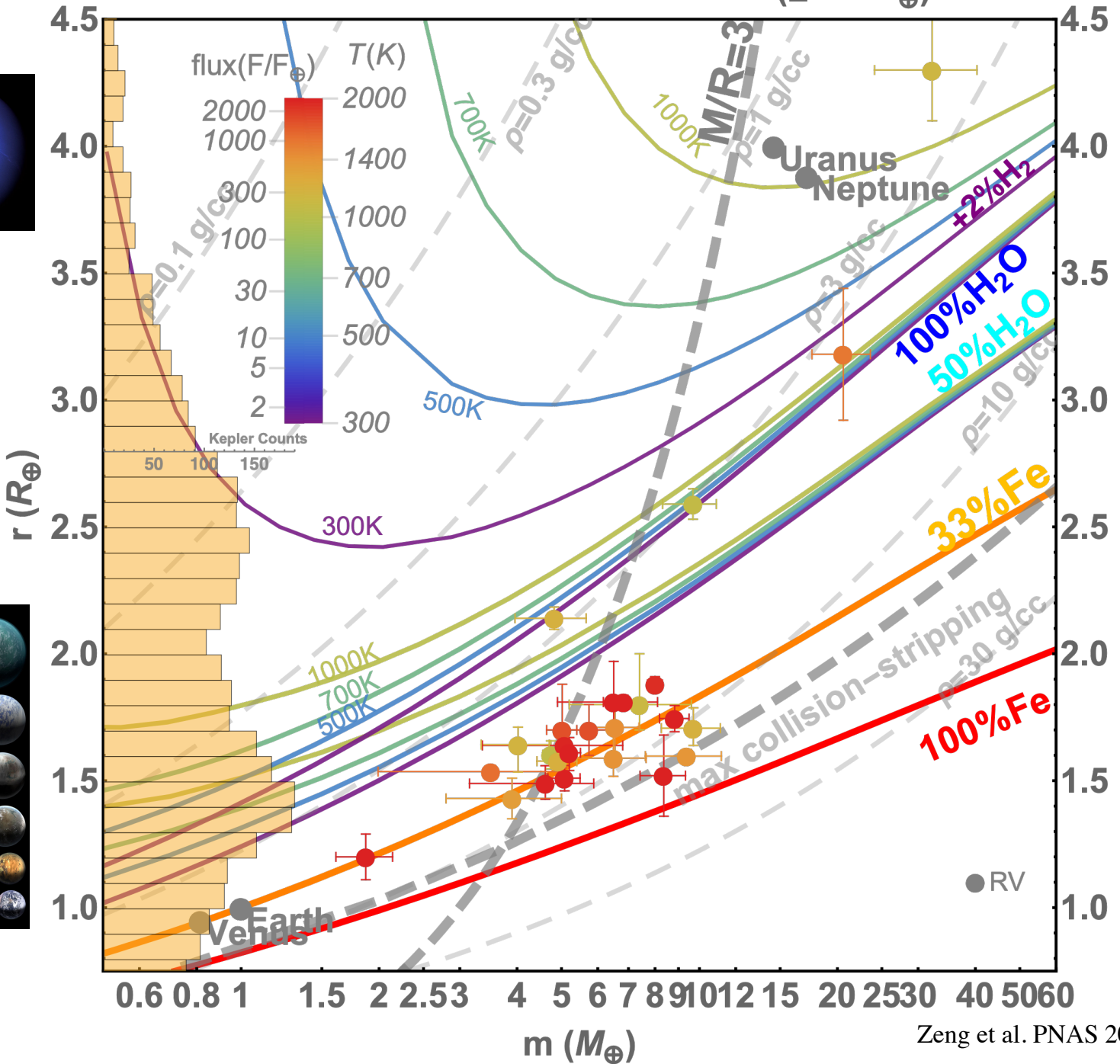




Zeng et al. PNAS 2019







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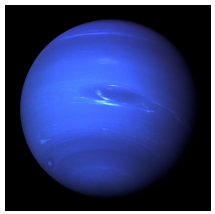
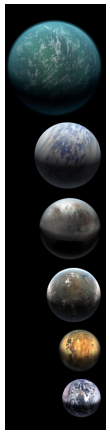
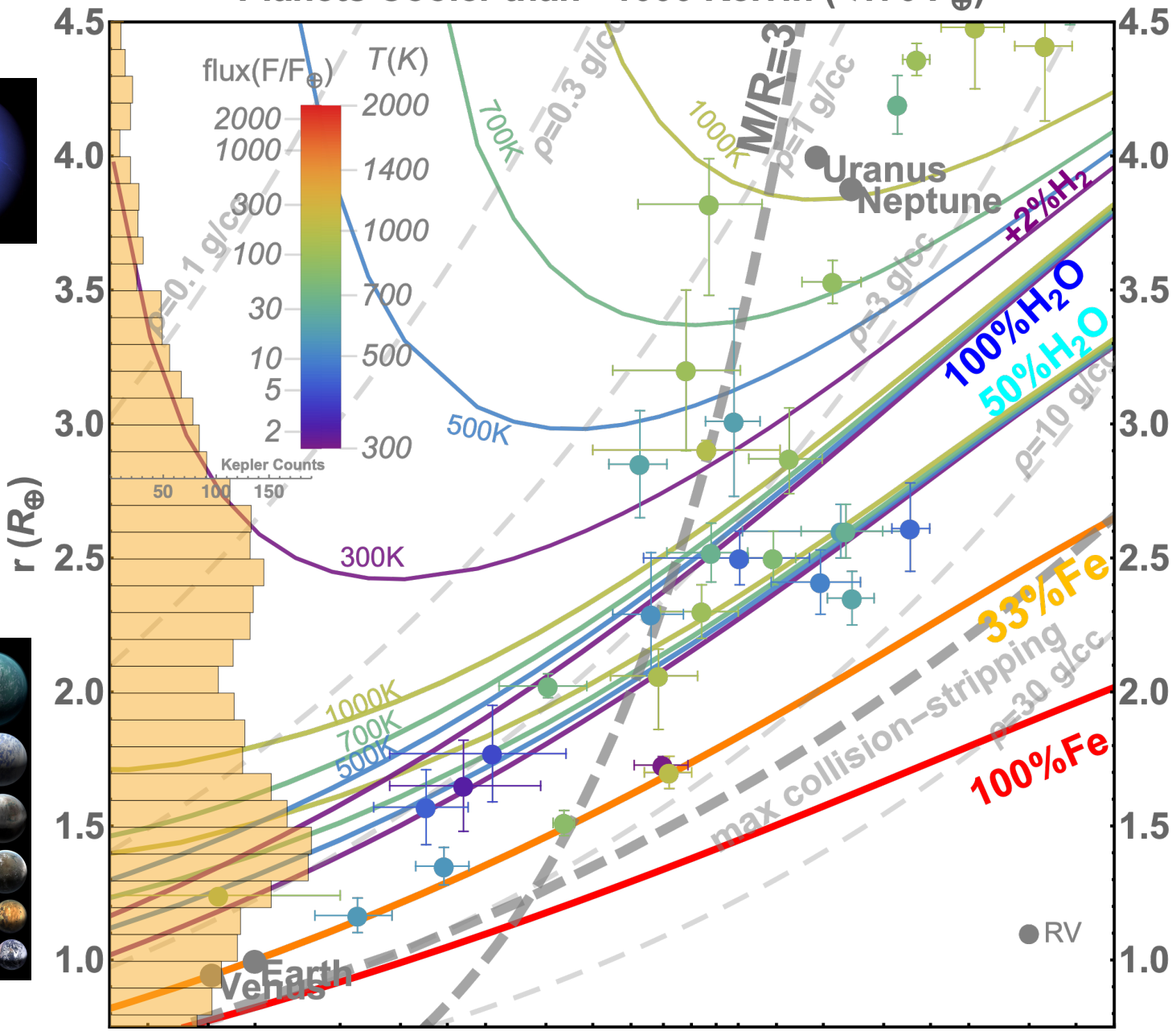




Planets Cooler than ~1000 Kelvin (<170 $F_\oplus$)



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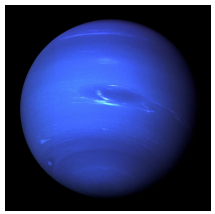
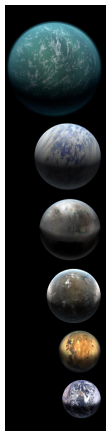
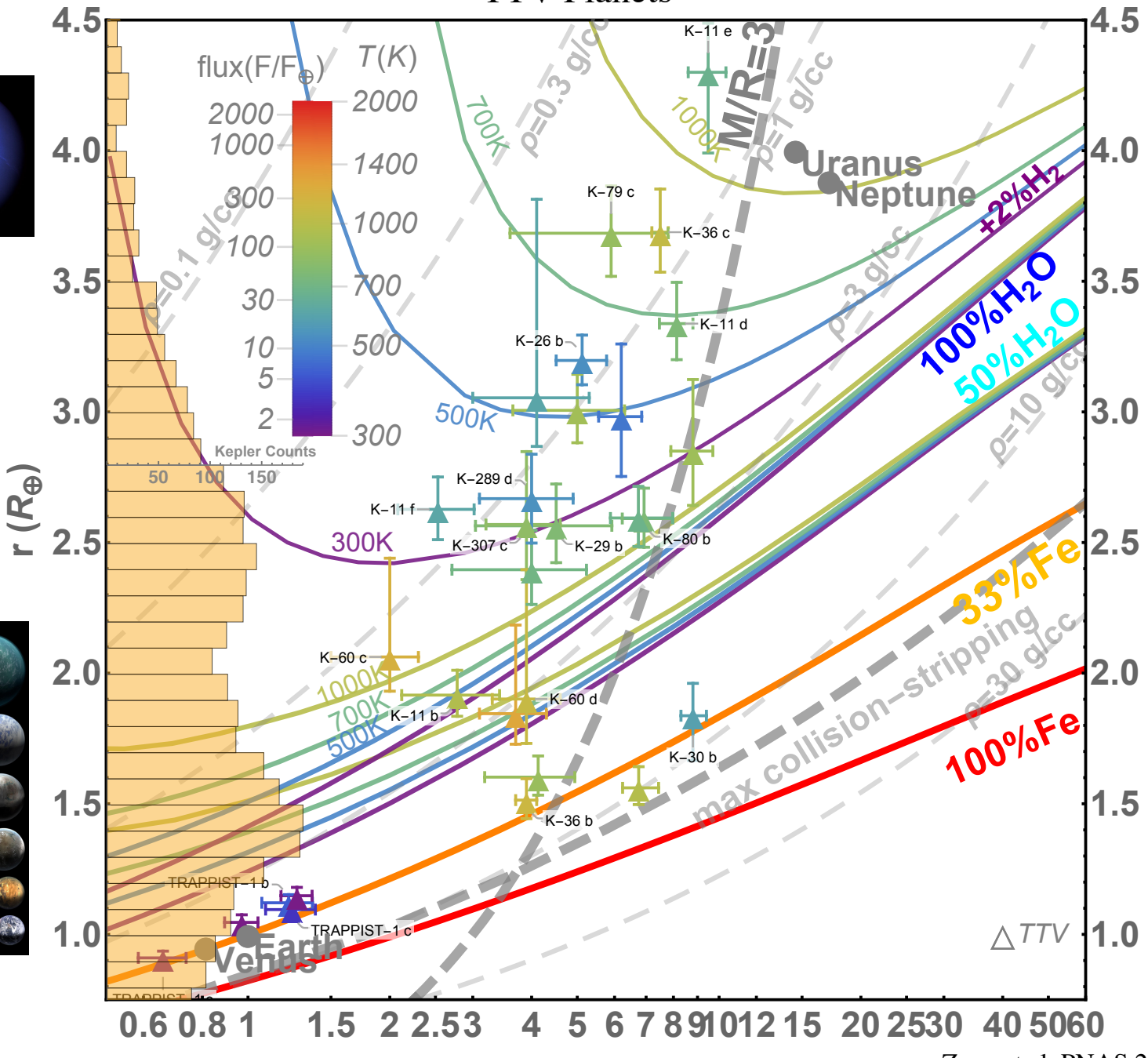
TTV Planets







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Is it an Evaporation Gap?

- The clump of hot planets between 5 and 10 Earth masses appears to support photo-evaporation as a source of the radius gap
- But cooler planets on both sides of the radius gap suggests that other mechanisms may be in play
- TESS will provide many more masses and radii for small planets