

The NCORES program: HARPS follow-up of TESS discoveries near the photoevaporation gap

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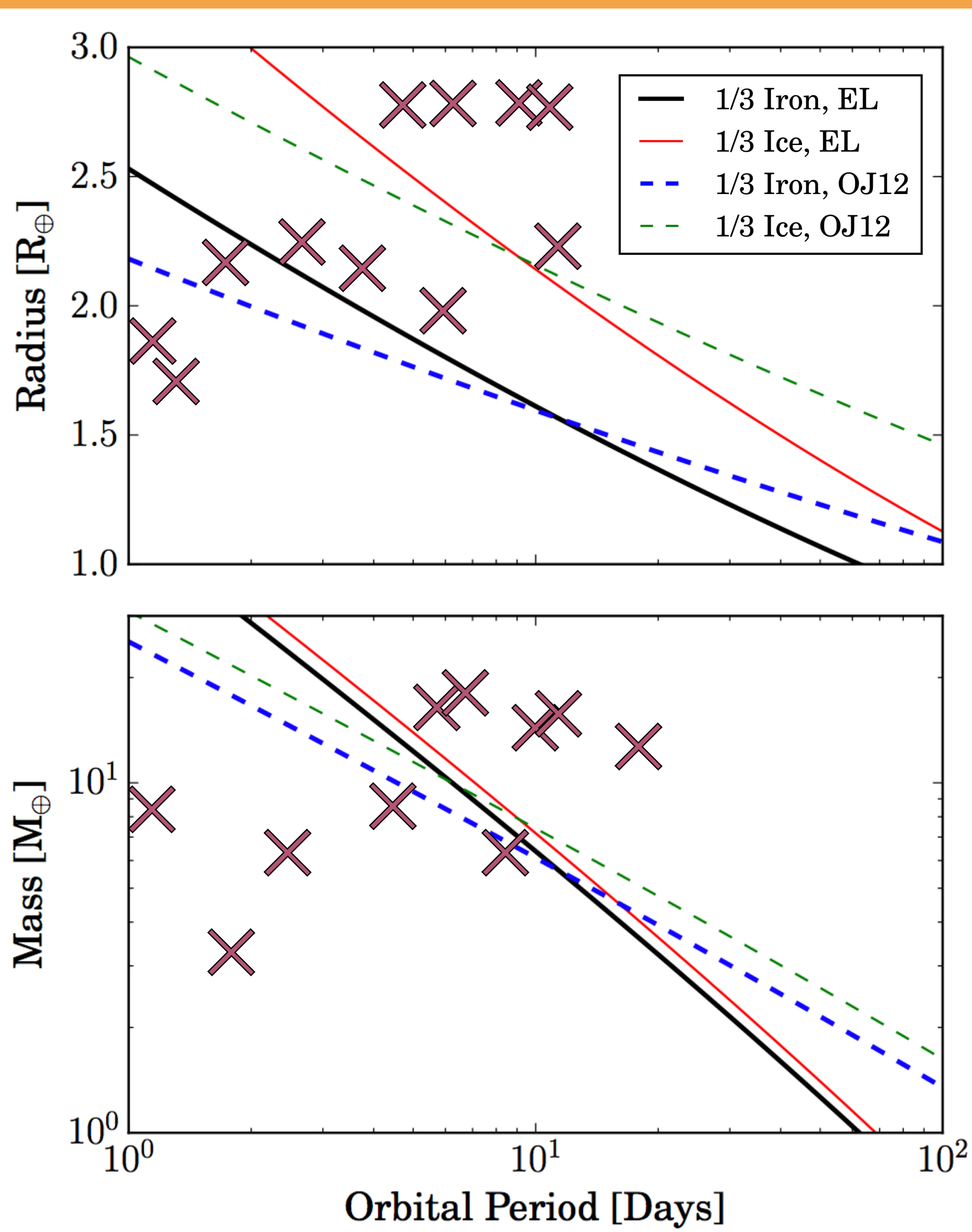
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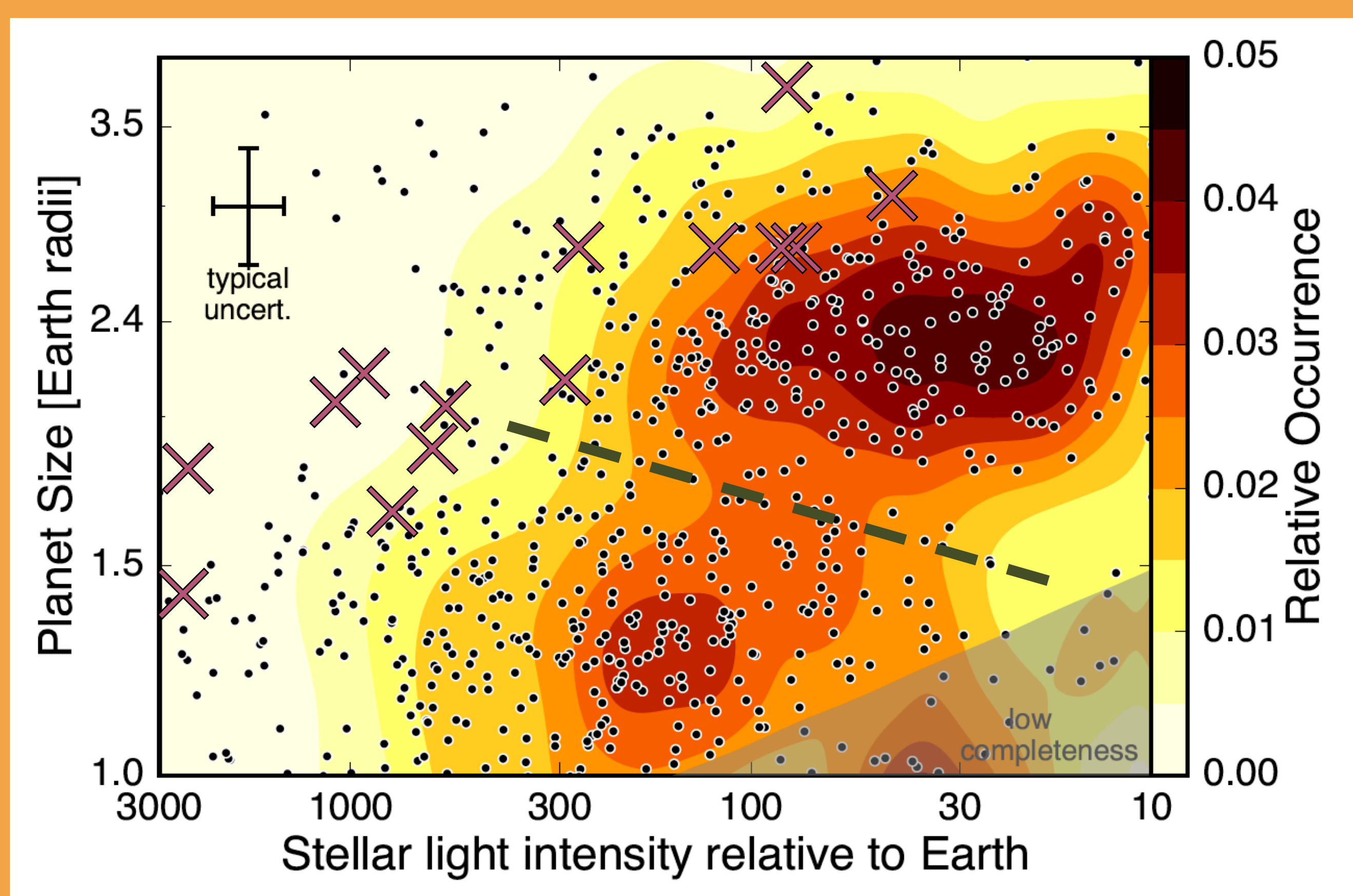
The Survey

The NCORES program has 72 nights of HARPS time to determine masses for TESS discovered planets near the photoevaporation gap. Our goal is to investigate the mass dependence of the gap at small planet-star separation. To date we are 1/3 through the survey, with 7 planets published or in prep and a further 5 with preliminary mass measurements awaiting more data. We are a member of TFOP, and the majority of our targets will contribute to the TESS Level 1 science requirement to measure masses for planets smaller than $4R_{\oplus}$.

Targets and Early Results



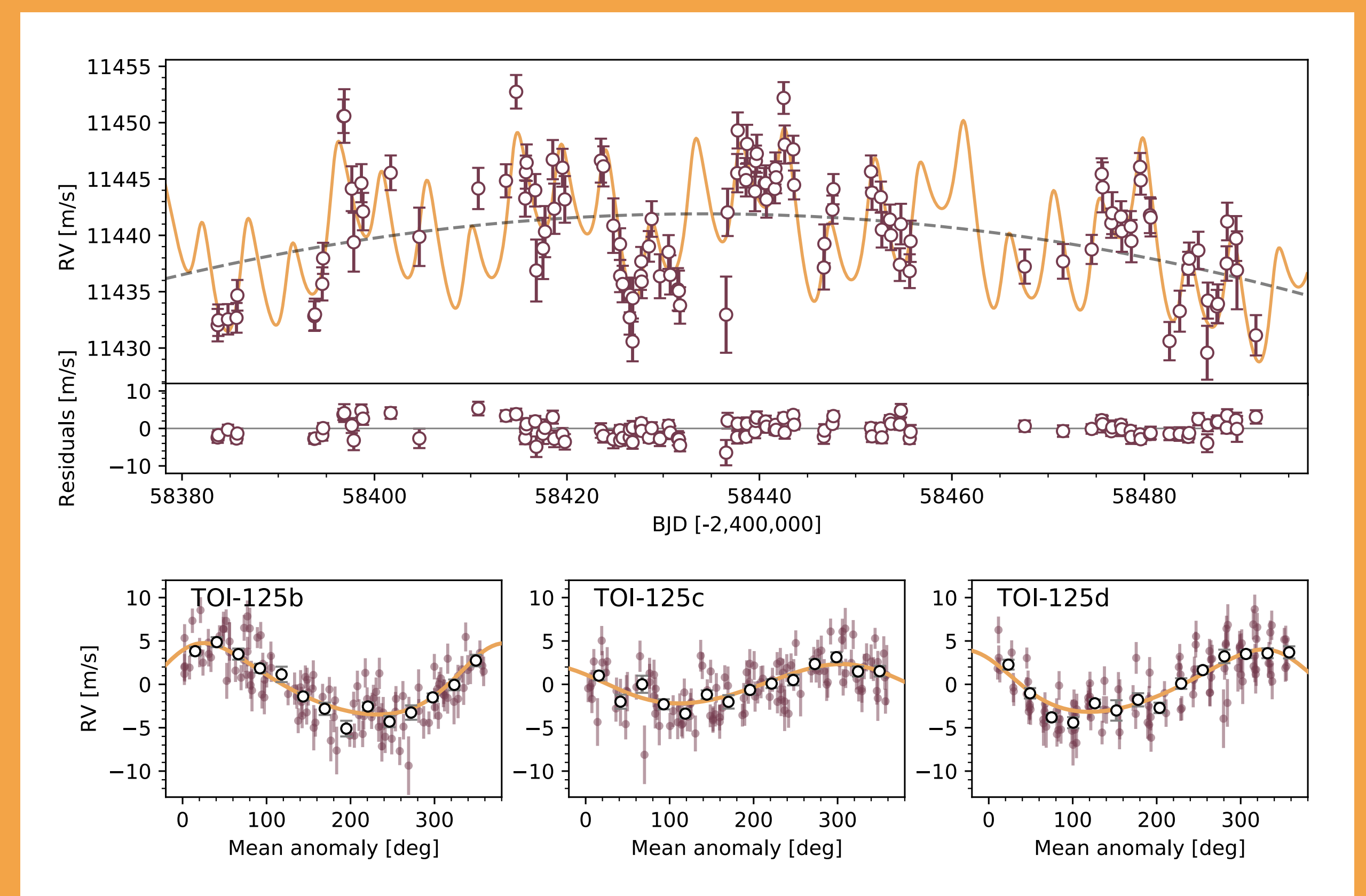
Current targets in radius (top) and mass (bottom) as compared to the theoretical gap lower edge from *Owen and Wu (2017), ApJ 847, 1*. The gap is shown for different planet core compositions, and evaporation models. Mass values are preliminary. Points outside the figure axes are not shown.



Current targets as a function of insolation and planet radius, as compared to the original photoevaporation gap detection in *Fulton et al (2017), AJ 154, 3* (dashed line)

TOI-125

TOI-125 is a $V=10.9$ K0 dwarf star hosting at least 3 mini-Neptunes discovered in TESS sectors 1 and 2. The two inner planets were validated by *Quinn et al 2019*. With 122 RVs we can measure masses for 3 planets, which have similar radii but differing density, indicating variable formation or evolution pathways within the system. See the talk by Louise Nielsen.



HARPS RV timeseries of TOI-125, with quadratic drift

Current State

Target	Period (d)	Radius (R_{\oplus})	Number HARPS RVs	Status
TOI-141.01 [^]	1.008	1.8	14	Published
	4.79	-		RV-only
TOI-118.01 [*]	6.04	4.7	24	Published
TOI-125.01 ^{*\$}	4.65	2.8	122	In prep
	.02	9.15		see talk by
	.03	19.98		Nielsen
TOI-220.01 [*]	10.7	2.8	99	In prep
TOI-396.01 [*]	3.59	2.1	74	Ongoing
	.02	5.97		
	.03	11.2		
TOI-431.01	0.49	1.4	31	Ongoing
	.02	12.5		
TOI-755.01	2.54	2.2	33	Ongoing
TOI-238.01	1.27	1.6	50	Ongoing
TOI-560.01 [*]	6.4	2.8	27	Ongoing
K2 C15	1.6	2.1	104	Ongoing

^{*} = in collaboration with KESPRINT consortium

[^] = with Chile-MPIA, ^{\$} = with J. Jenkins