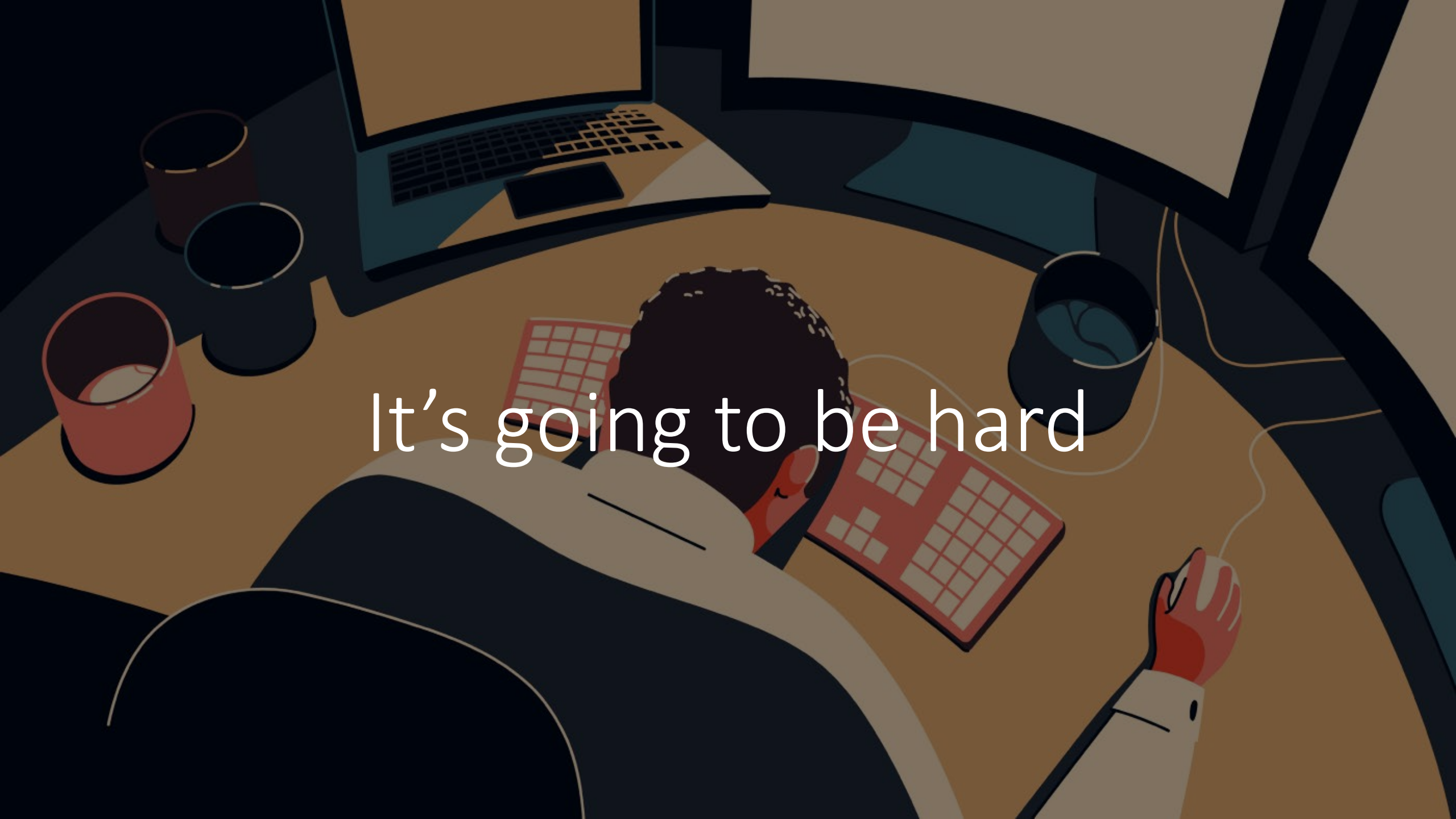
Rocky exoplanet science with ground-based ELTs

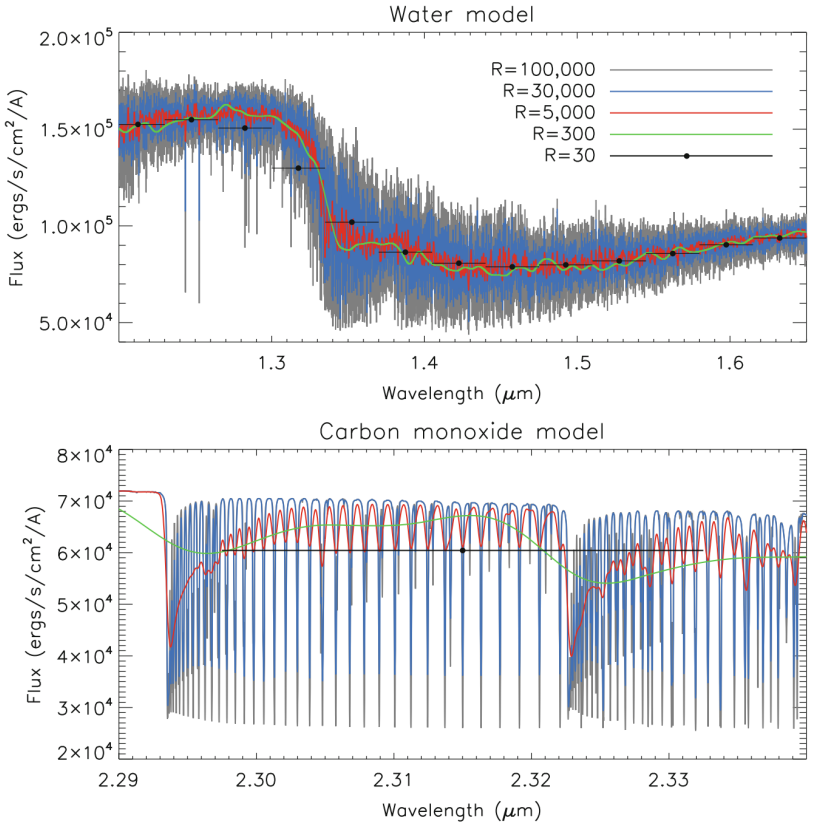
Dimitri Mawet, November 2022


It’s going to be hard

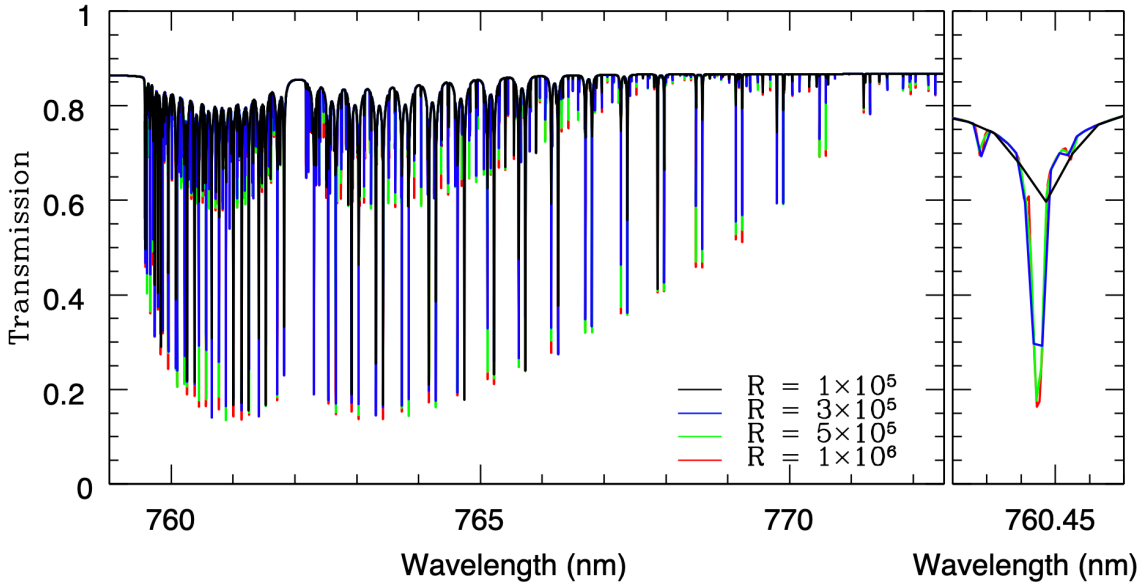
Three main thrusts

- Transit/close-in planet high-resolution spectroscopy in the optical/NIR
- Direct imaging in thermal IR
- Direct imaging in reflected light

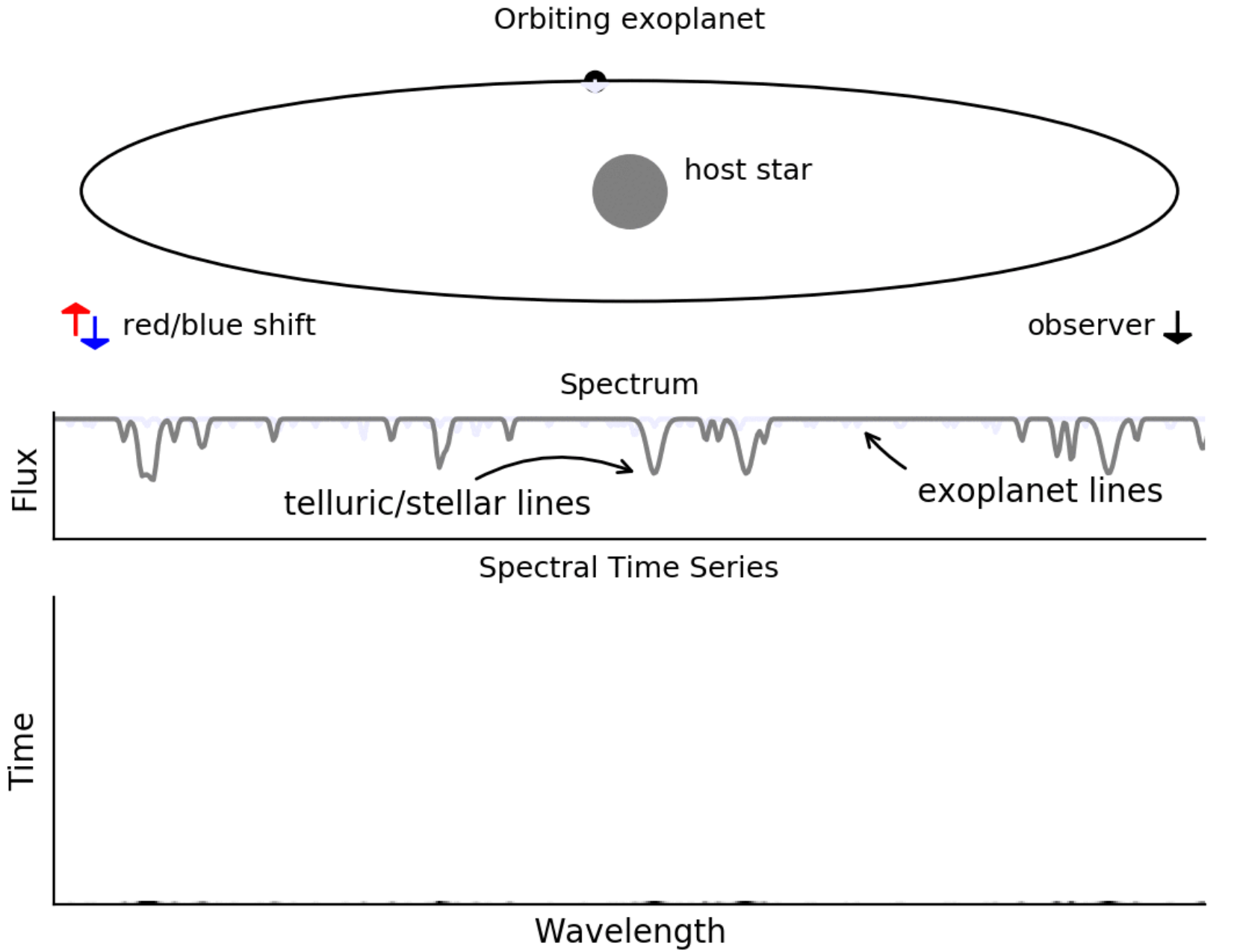
High-resolution transit spectroscopy



Birkby 2018



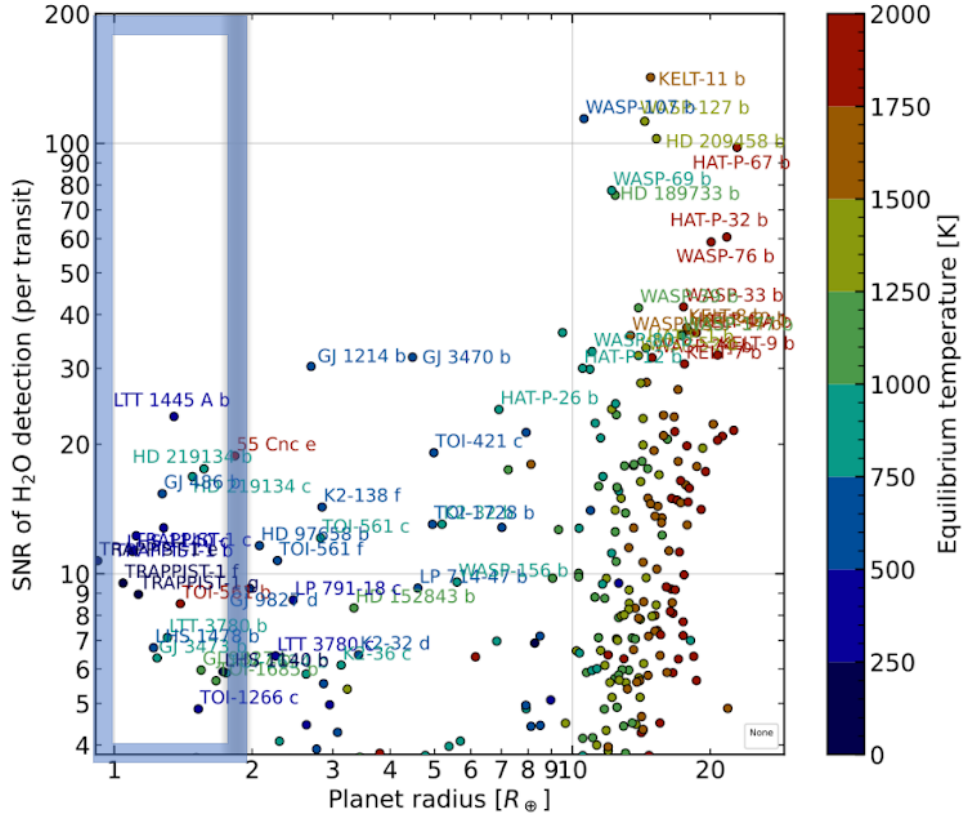
Lopez-Morales+ 2019

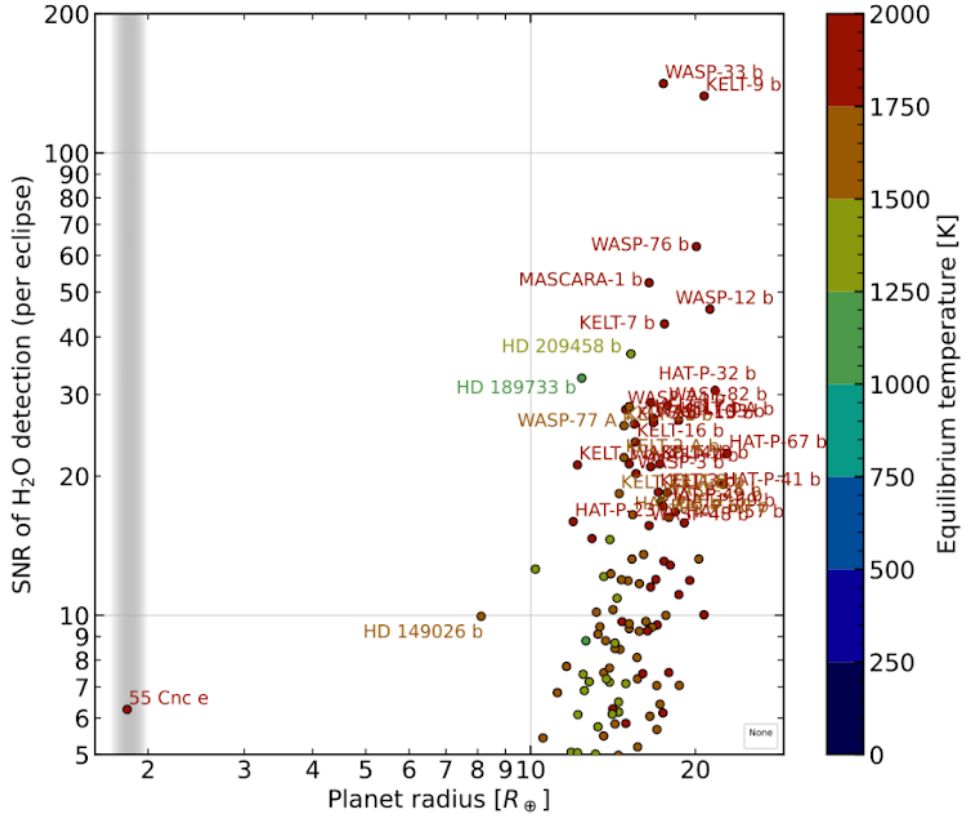


Animation by Lennart van Sluijs

Detection of water using high-resolution NIR transit spectroscopy on 30-meter class telescopes (TMT-MODHIS, ELT-ANDES, GMTNIRS, G-CLEF)

Benneke+2021 (MODHIS science case)

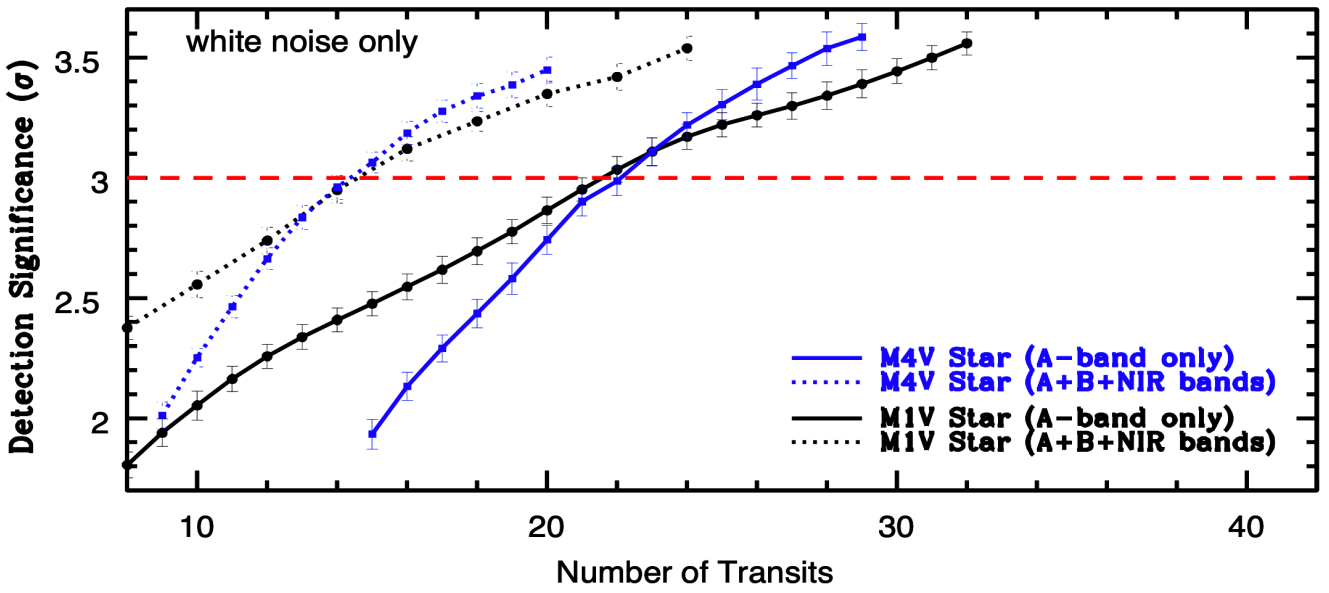


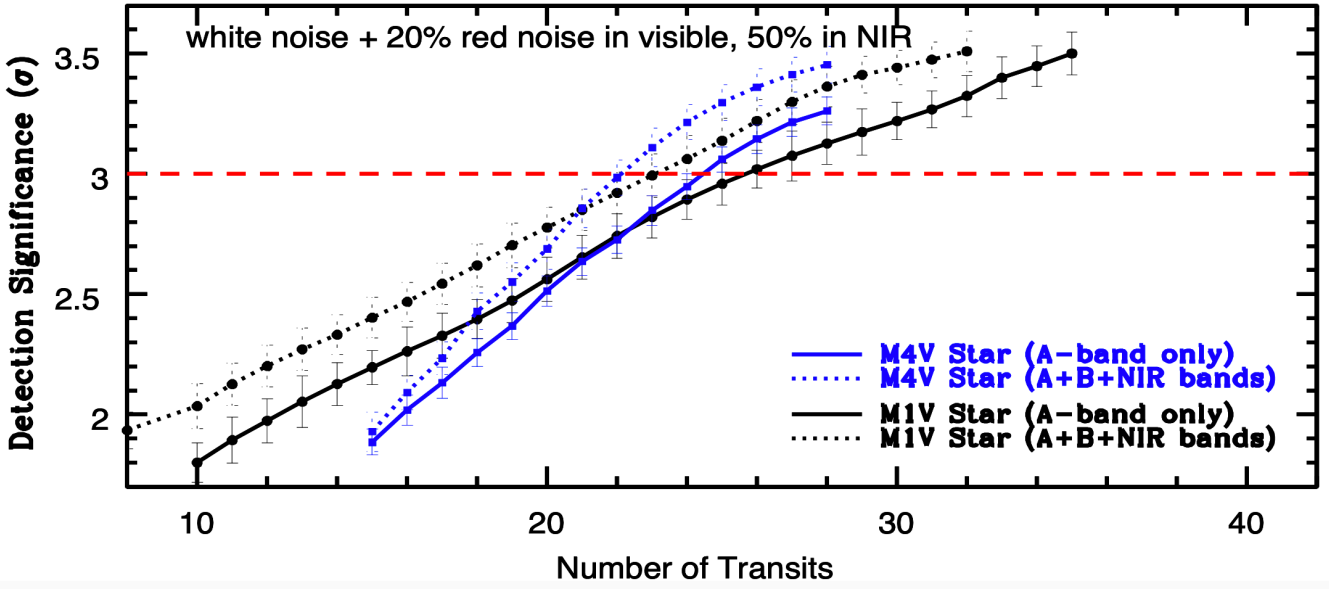


M-type star hosts

Detection of Oxygen at ultra-high R (>>100,000)

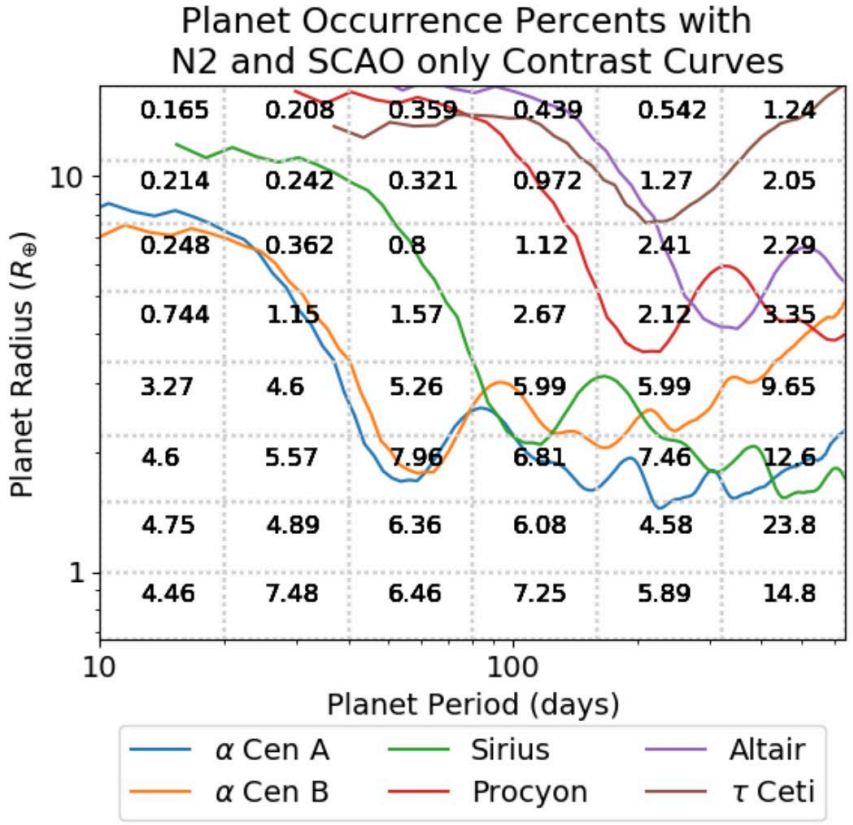
Lopez-Morales+2019

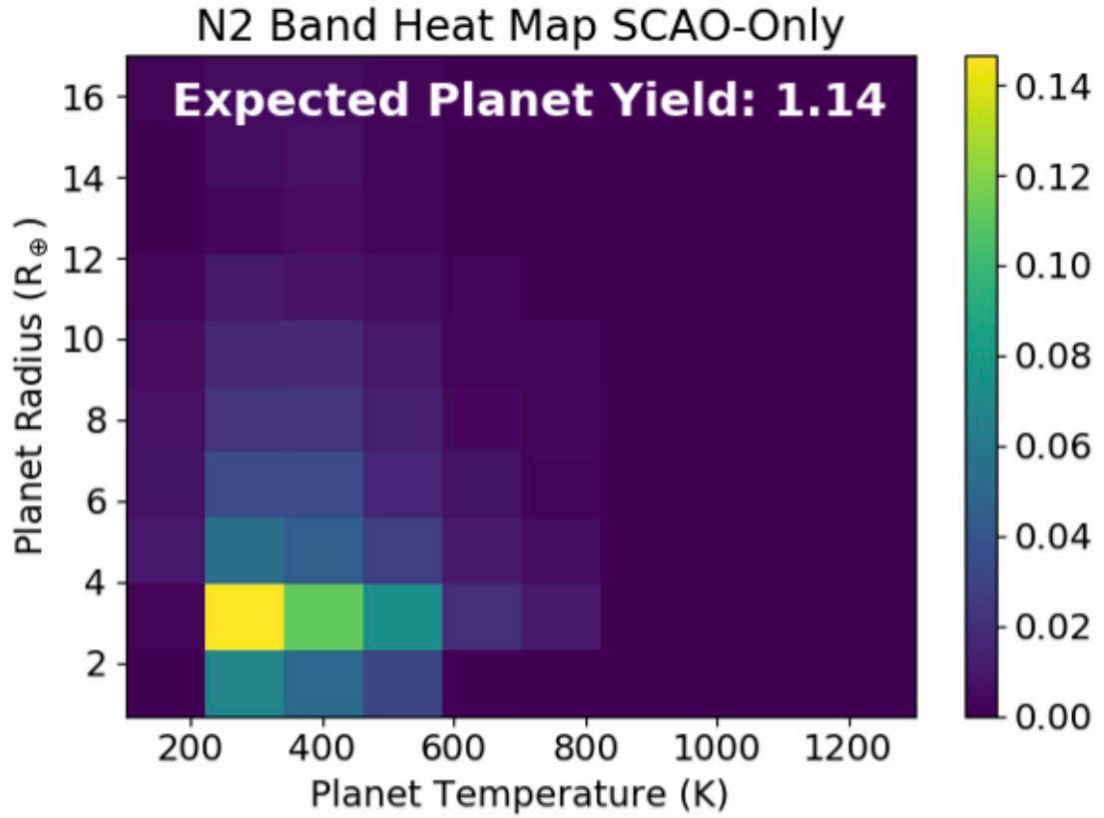




G-type stars thermal IR HCI: ELT-METIS

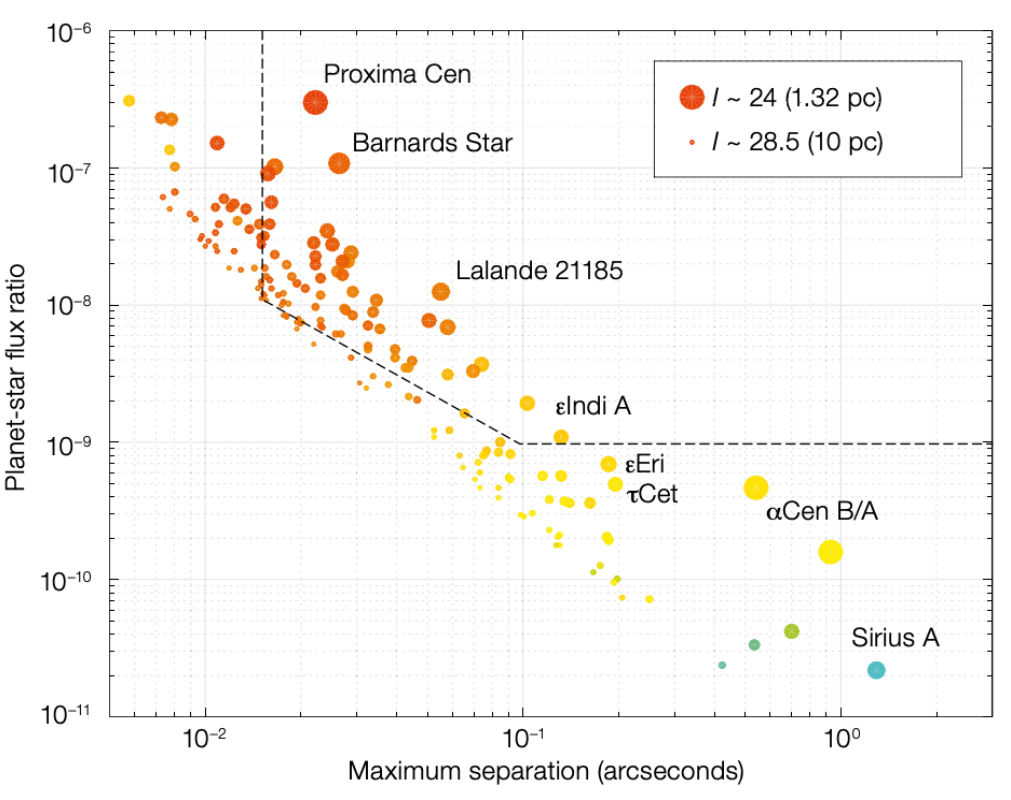
Quanz et al. 2015, Bowens et al. 2021

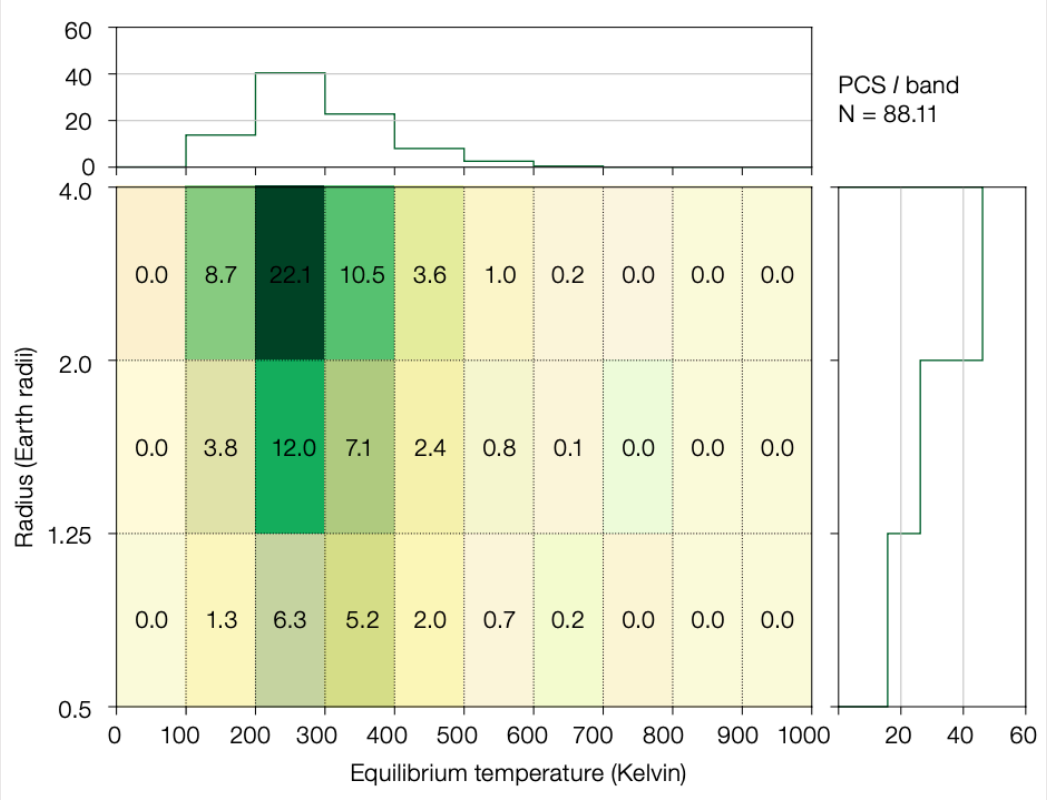




M-type stars reflected light HCI – ELT-PCS

Kasper et al. 2021

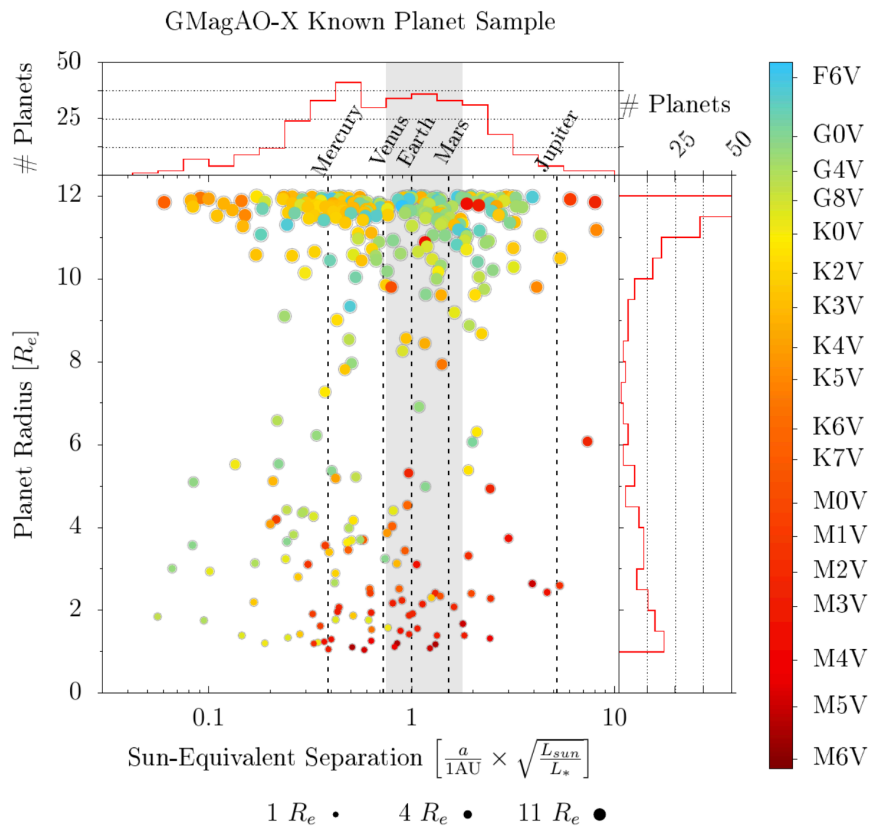


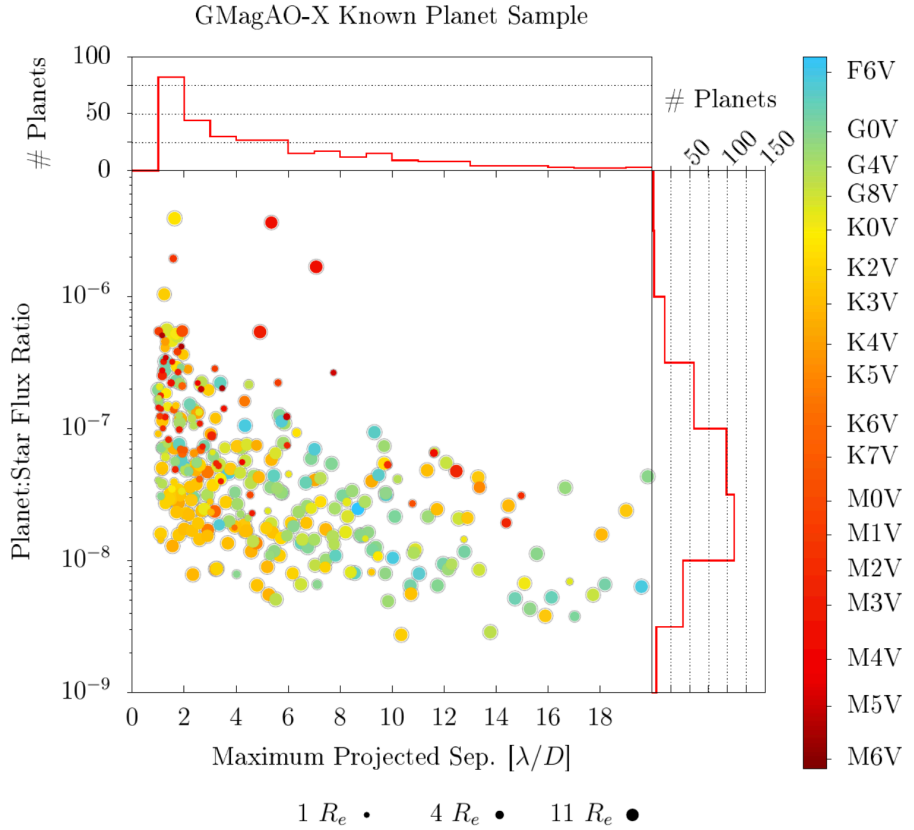


Overoptimistic assumptions regarding HDC gains

Reflected light – GMT-GMagAOX, TMT-PSI

Males et al. 2022





Optimistic assumptions about HCI (AO+coronagraph) performance

Best guest phasing