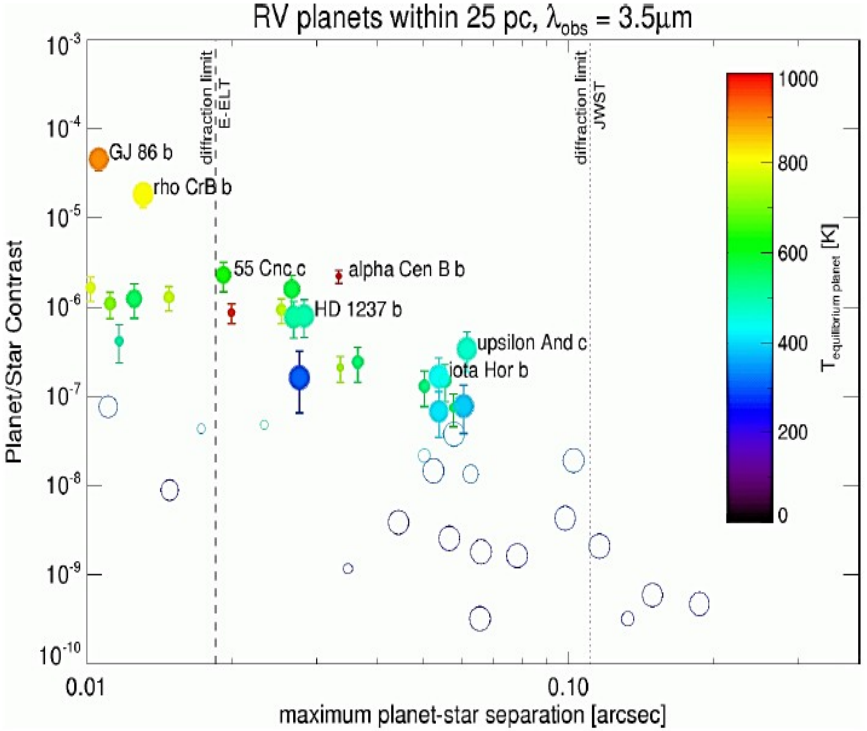
Direct imaging & charac. with the ELT (1/2)

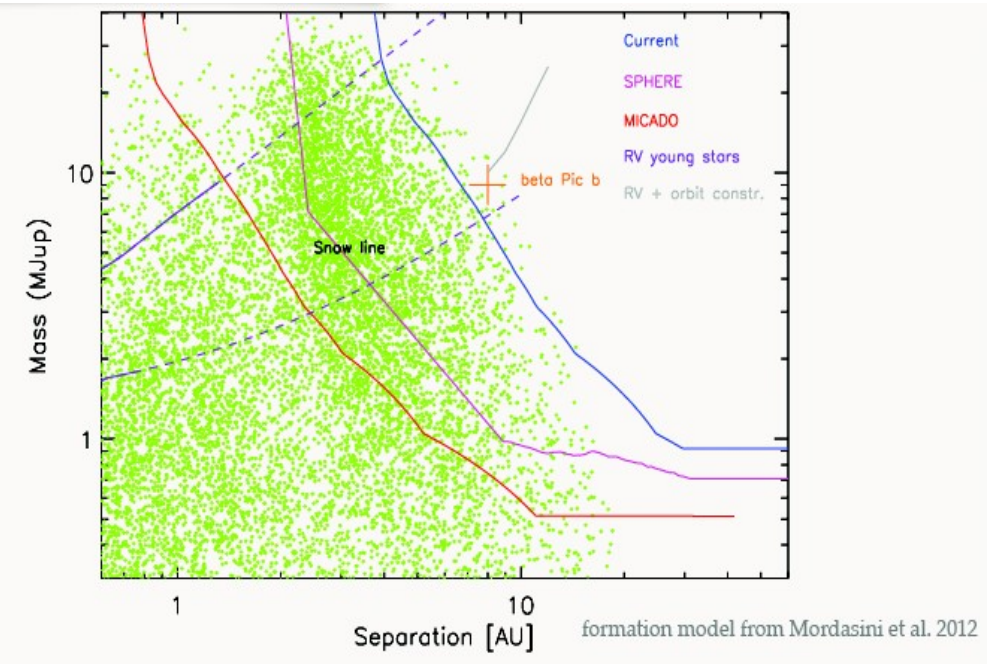
* **Stars observables with the ELT: brightness limits** for first light? for the PCS era? (note there are besides min. brightness limits for the AO)
* **What planets can the instruments detect** according to the foreseen contrast performances? according to the goal capabilities? Cf Christophe's and other's talks. Directly linked with the ELT SCAO performance (Harmoni, METIS, HIRES). Need for more unified inputs..

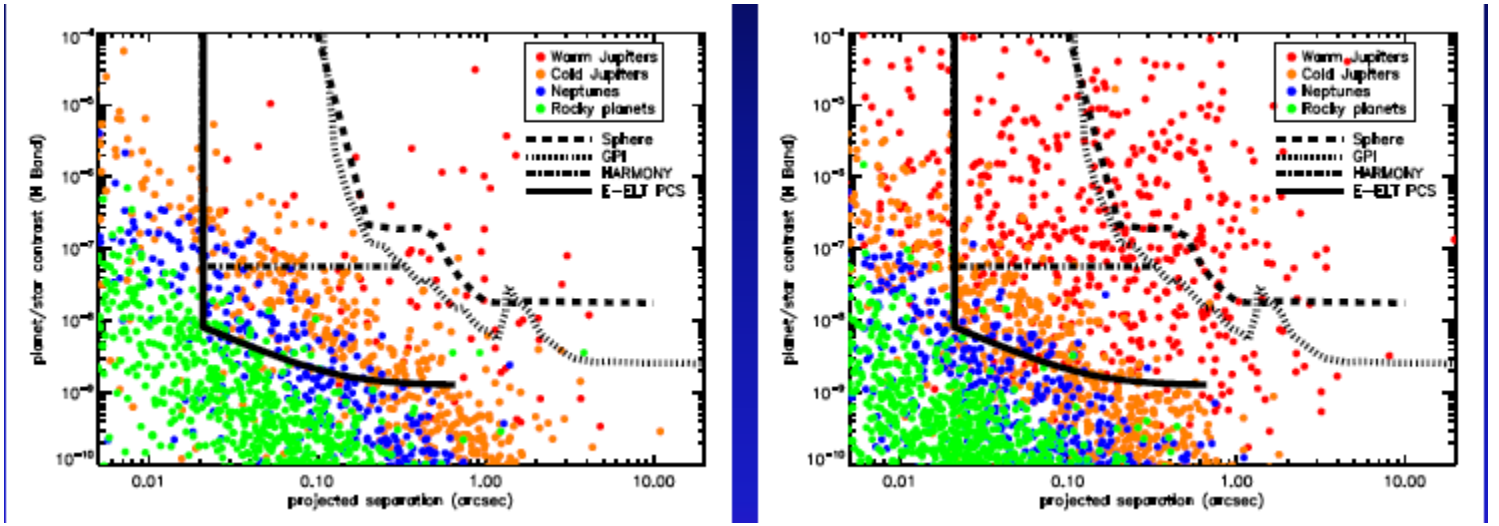
* **Surveys on the ELT:** what kind of meaningful DI (incl. Charactrization) surveys, given the expected pressure ? Sizes of surveys ? Complementarity with the VLT & with other telescopes & instruments. (spectral charac?, clouds variability, ..)

* **Coupling techniques** to test the impact of the primary star properties (e.g. masses, ages) or planet formation scenari (CA vs GI)? Some coupling possible in the VLT era; what can we expect in the ELT era ?

- JWST and ELT complementarity? Niches? Cf Raffele's talk


RV planets within 25 pc, λ_{obs} = 3.5µm
Planet/Star Contrast
maximum planet-star separation [arcsec]
$T_{equilibrium\ planet}$ [K]
diffraction limit E-ELT
diffraction limit JWST
GJ 86 b
rho CrB b
55 Cnc c
alpha Cen B b
HD 1237 b
upsilon And c
iota Hor b


Current
SPHERE
MICADO
RV young stars
RV + orbit constr.
beta Pic b
Snow line
Mass (MJup)
Separation [AU]
formation model from Mordasini et al. 2012


Warm Jupiters
Cold Jupiters
Neptunes
Rocky planets
Sphere
GPI
HARMONY
E-ELT PCS
planet/star contrast (N Band)
projected separation (arcsec)

Direct imaging/charac with the ELT (2/2)

more "technical" aspects

*** Detection limits:**

- The metrics used to estimate the detection limits in DI differ from one author to the other; **need for more unified approaches ?**

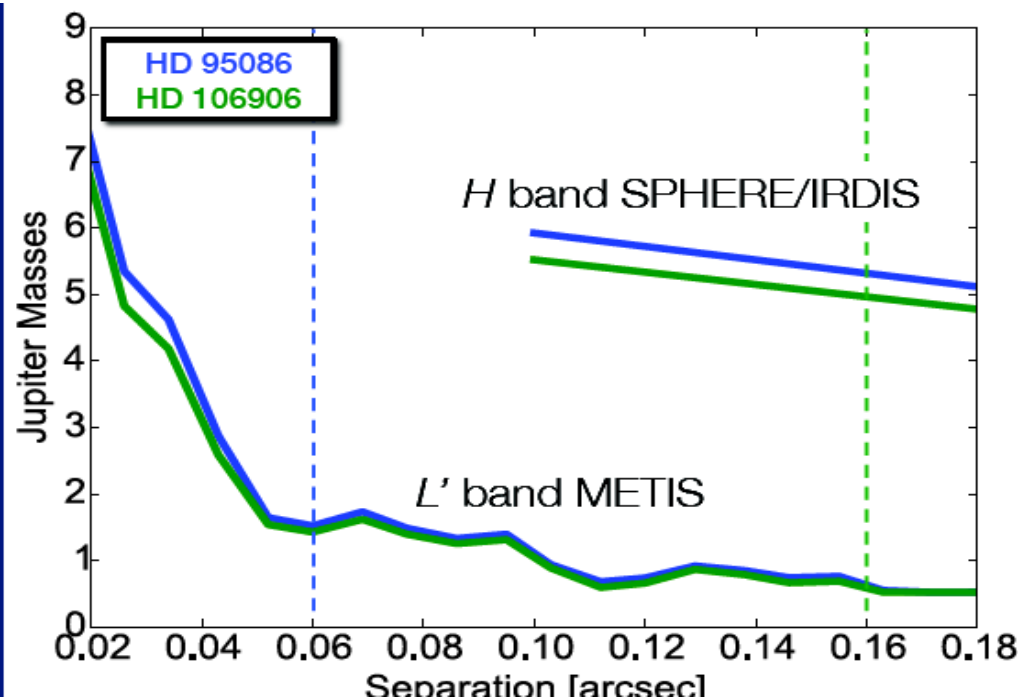
*** Models & preparatory works**

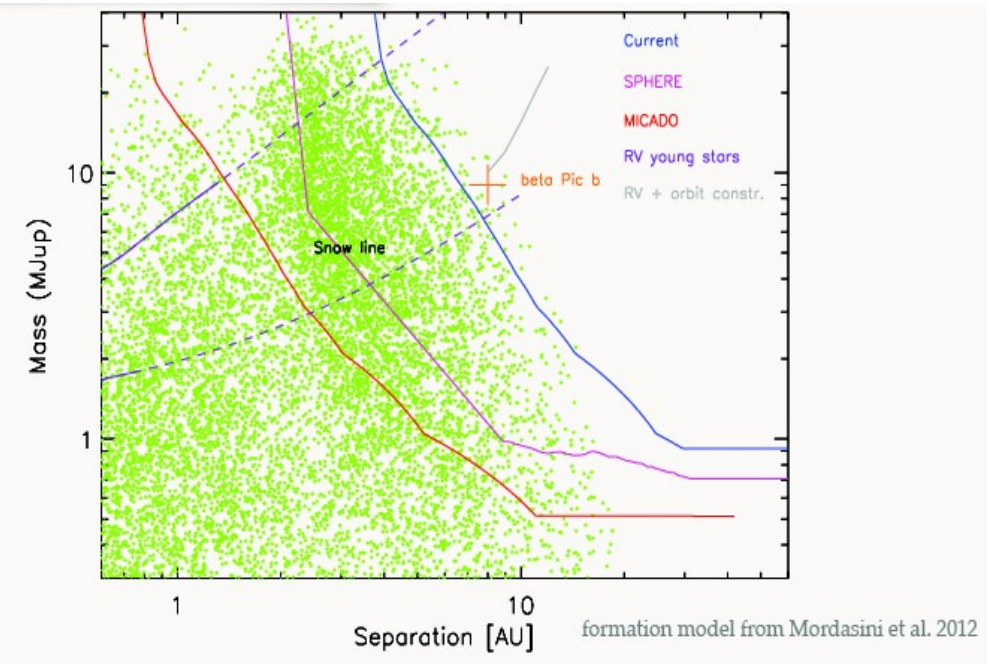
- DI masses and spectral analysis rely on models that are limited because they are not calibrated by observations. The situation may be even more complex for Earth mass planets. **What is needed to calibrate the models in the scope of the ELT data?**

- DI masses (and spectra interpretation) rely on assumptions on stellar parameters (e.g. ages); **preparatory work to constrain them?**

***** What quality of data are needed in order to exploit 'spectral retrieval' for **spectral characterization of imaged exoplanets?**

Planet/star combination	Transmission	Reflected light	Thermal emission
Mini-Neptune, a = 0.1 AU, Teq = 700 K, K0 star, d = 10/30 pc (non-transiting/transiting)	10^{-4}	10^{-6} @ λ=1.0 μm s = 2 λ/D	10^{-5} @ λ=3.5 μm s = 0.6 λ/D
Super-Earth, a = 0.1 AU, Teq = 255 K, M4 star, d = 5/15 pc (non-transiting/transiting)	10^{-5}	10^{-7} @ λ=1.0 μm s = 4 λ/D	10^{-5} @ λ=10 μm s = 0.4 λ/D
Jupiter, a = 2 AU, Teq = 180 K, G2 star, d = 15/110 pc (non-transiting/transiting)	10^{-5}	10^{-8} @ λ=1.0 μm s = 27 λ/D	10^{-7} @ λ=10 μm s = 2.7 λ/D
Young Jupiter, a = 10 AU, Teq = 1200 K, G2 star, d = 30 pc (non-transiting)	N/A	10^{-9} @ λ=1.0 μm s = 67 λ/D	10^{-4} @ λ=2.0 μm s = 33 λ/D
...	...	...	...





formation model from Mordasini et al. 2012