MaJEStiC

space Mission for cold Jupiter-like planEts Search with Coronography

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instrument description

- Mirror size : 2.5 m
- Coronagraph
- Contrast: 10^-10
- Inner Working Angle: 0.13”, Outer working Angle: 0.9”
- Mission Lifetime: 3 years
- Cost: $1491 million out of $1500 million max

Predicted planet detections

Jupiters: 3.69

Earths: 1.16

Neptunes: 0.17

mini Neptunes: 0.83

Exozodi

Default value :

exozodi = 3, 3.69 jupiters

exozodi = 3.3, 3.66 jupiters

exozodi = 2.7, 3.70 jupiters

Varying the exozodi value by 10% makes almost no difference (within errors of random fluctuations)

eta_planet

Default Value:

eta_jupiter = 0.01, 3.69 jupiters

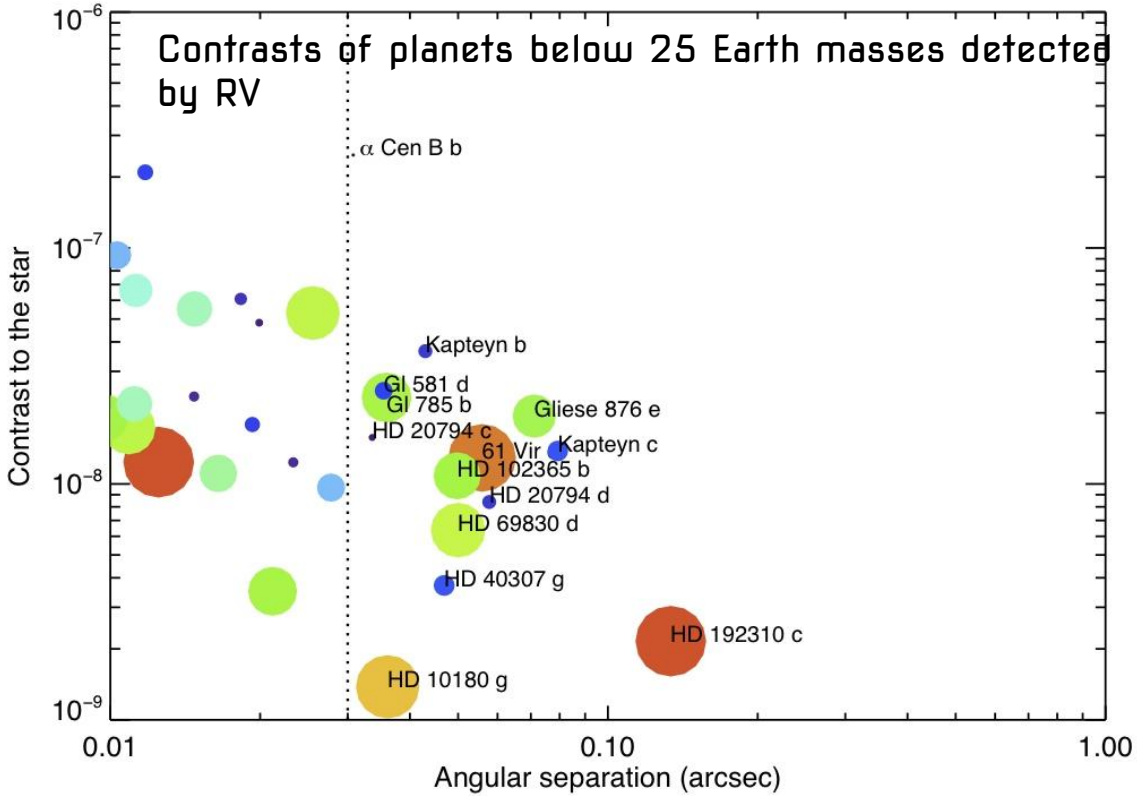
vary eta_jupiter by 10% changes the number of planets by 10%:

eta_jupiter = 0.011, 4.04 jupiters

eta_jupiter = 0.009, 3.34 jupiters

make eta_jupiter very large:
eta_jupiter=0.05, 18 jupiters!

Ground-based alternatives: polarimetry



8m telescope → IWA of 30 mas @ 600nm

A much larger population becomes accessible even with a decreased contrast.

Best contrast achievable with SPHERE / ZIMPOL in broad band I in polarized light : 10^{-7} (2hrs)

This yields 3.78 Jupiters

Some Earth-like planets become accessible !

Lessons Learned

- Varying exozodi does not significantly affect the yield.
- Doubling the mission duration does not necessarily double your yield -- may run out of targets.
- Coming up with acronyms is really hard!
- Ground-based telescopes may be better suited for this probe-class science.

Contrast expected with SPHERE / ZIMPOL