The PLATO 2.0 Mission

Candidate for ESA M3 launch window 2022/24

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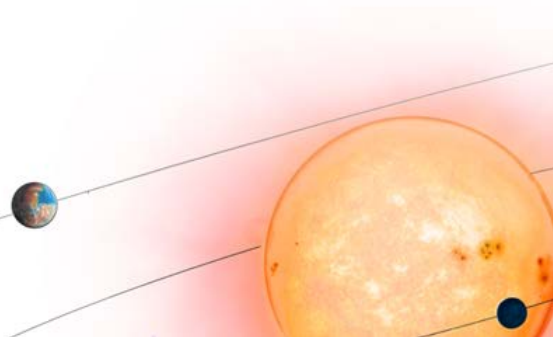
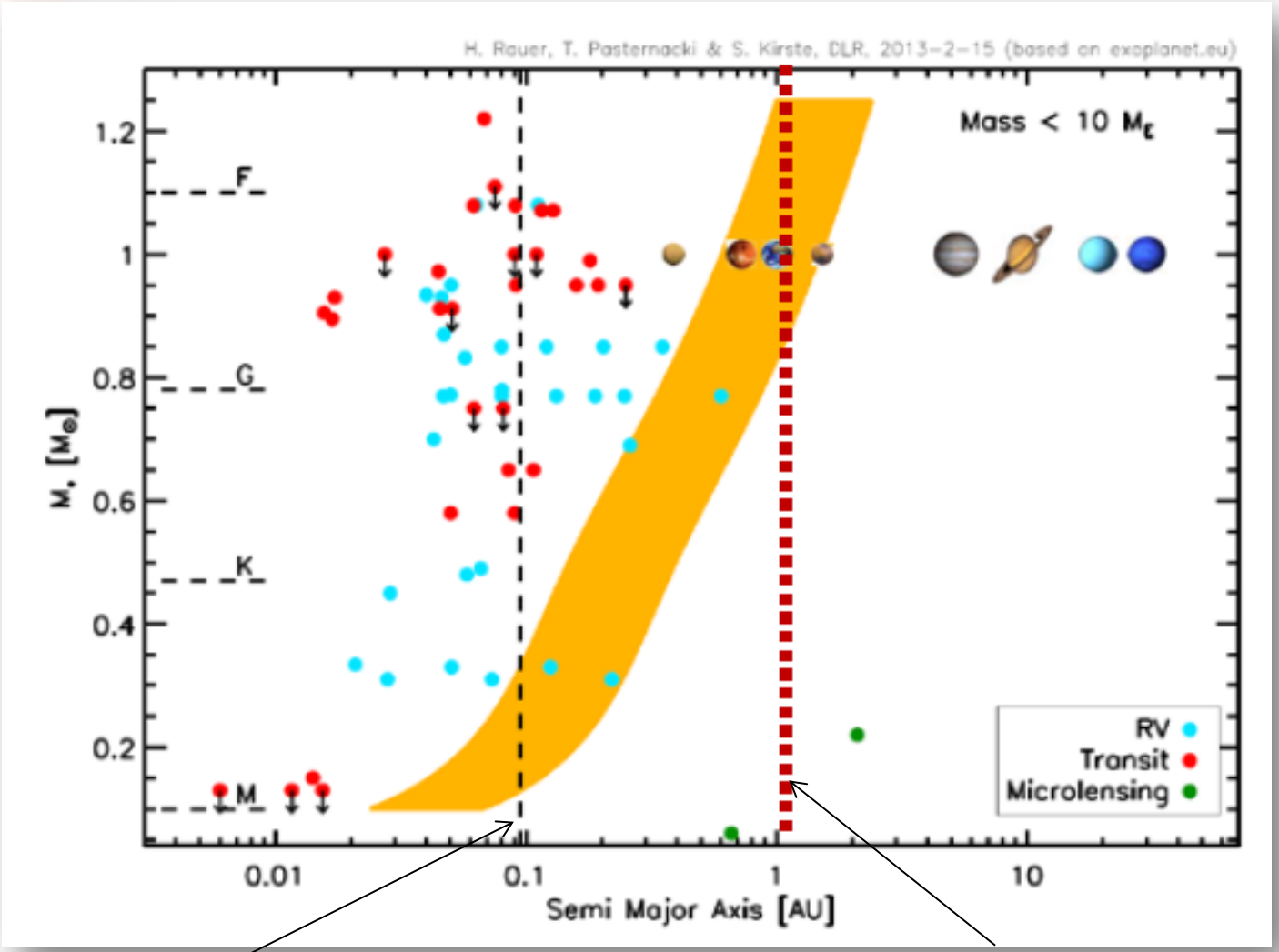


The PLATO 2.0 Mission

From planet detection frequency towards planetary physics!

- reveal the interior of planets and stars - in large numbers
- detect planets over the whole sky, including terrestrial planets in the habitable zone
- provide accurate ages of planetary systems
- constrain planet formation and evolution models
- provide targets for atmosphere spectroscopy
- Boost stellar science, inputs for galactic science

Status – Super-Earth

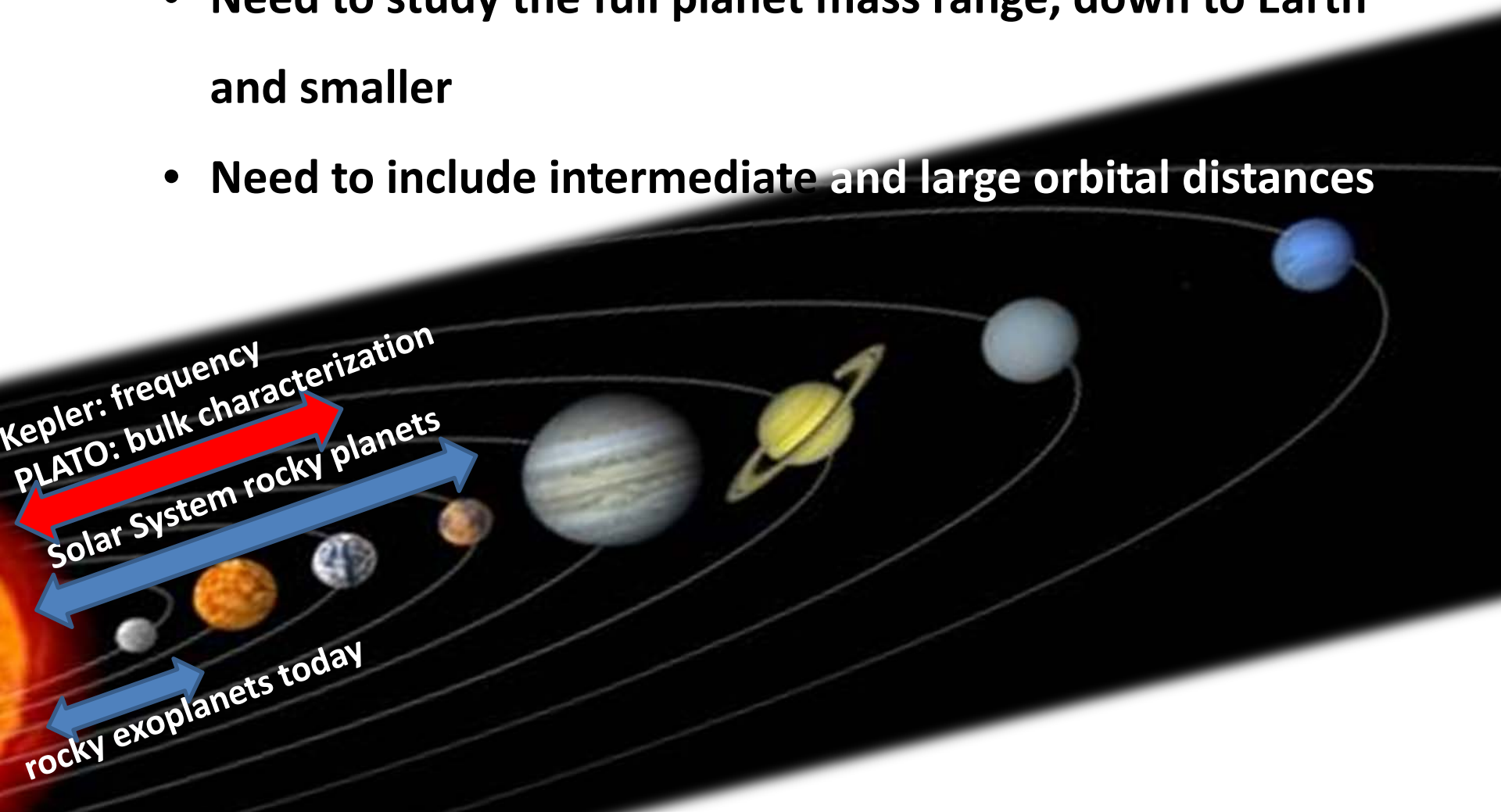


Ground-based transit detections

space-based transit detections

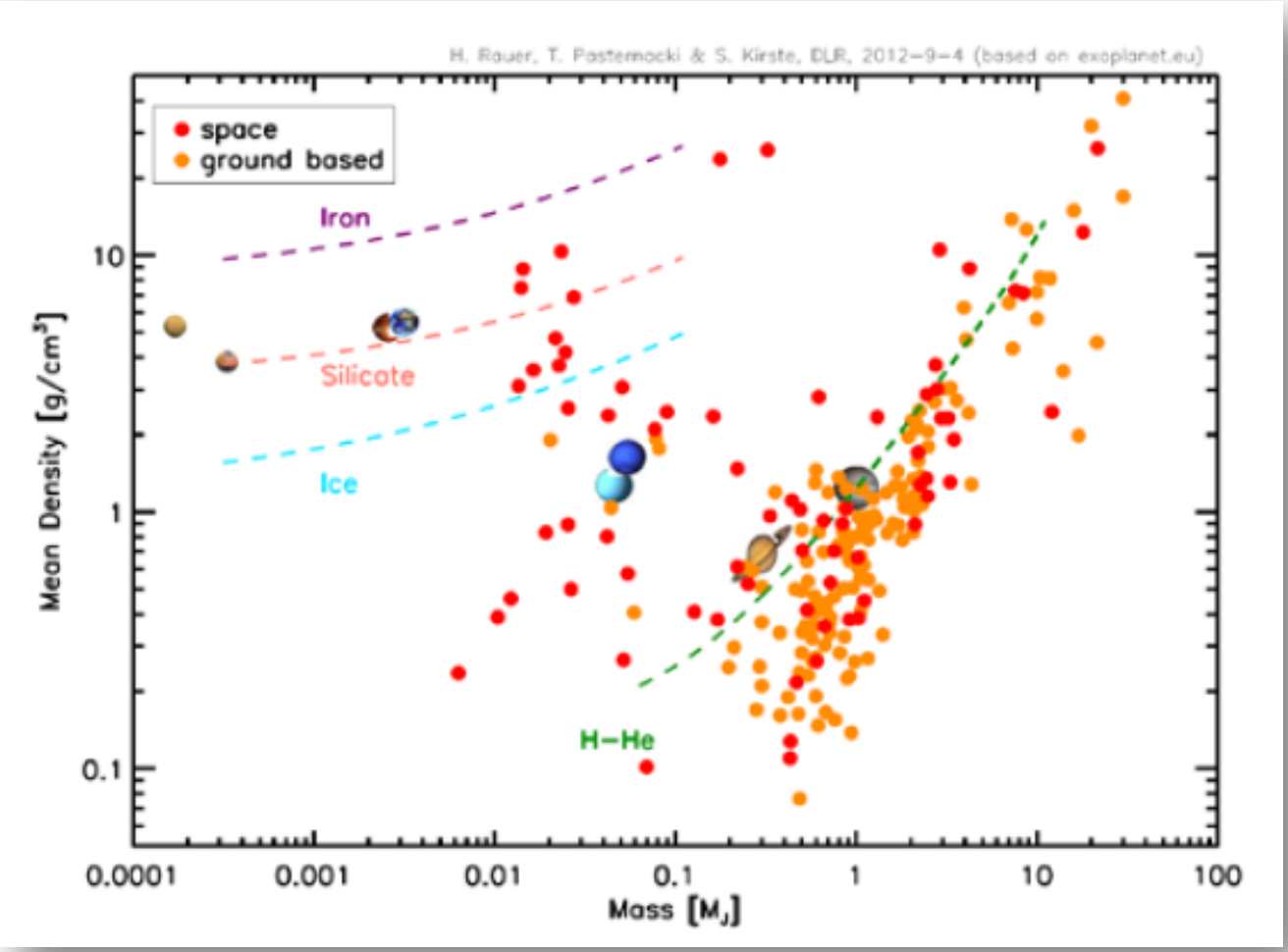
How typical is our Solar System?

- Need to study the full planet mass range, down to Earth and smaller
- Need to include intermediate and large orbital distances



Planet diversity

Rocky and icy planets



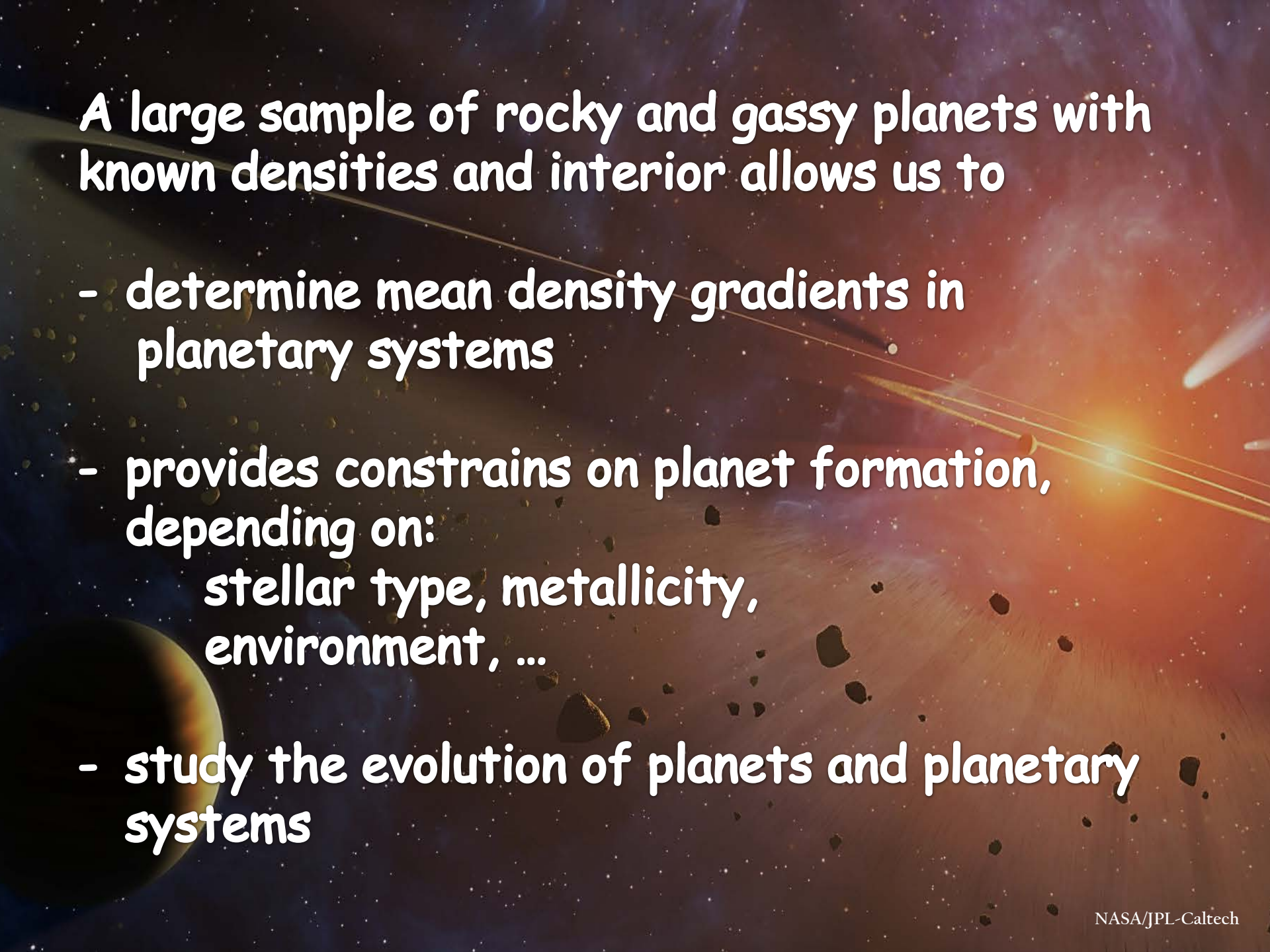
Gas giants

A large sample of rocky and gassy planets with known densities and interior allows us to

- determine mean density gradients in planetary systems

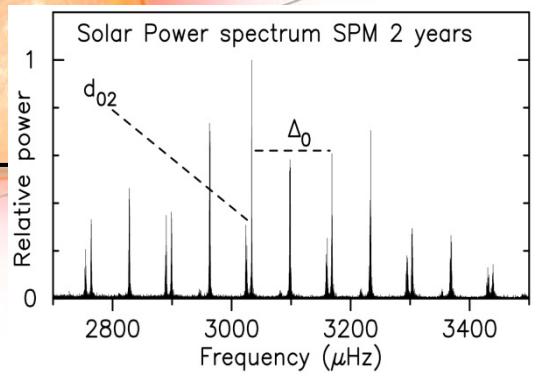
- provides constrains on planet formation, depending on:
  stellar type, metallicity, environment, …

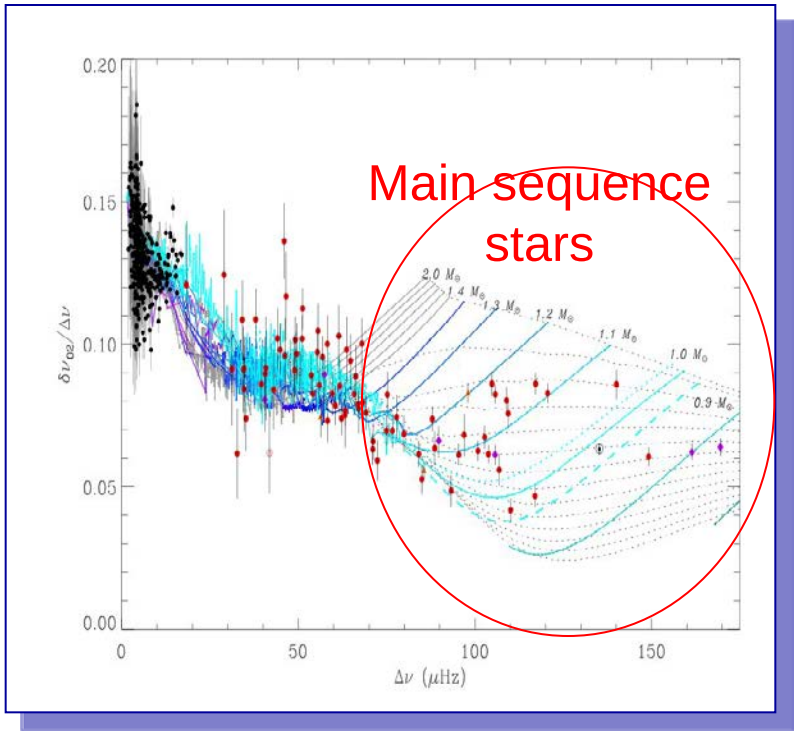
- study the evolution of planets and planetary systems



NASA/JPL-Caltech

Asteroseismology
mass and age of host stars





Normalized mean small separation as a function of the mean large separation and evolutionary tracks (blue solid lines). Horizontal dotted lines are isochrones in 1 Gyr steps (White et al. 2011)

1. Large separations $\Delta_0 \propto \sqrt{M/R3}$
   → mean density
2. Small separations d_{02}
   → probe the core → age
3. Inversions + mode fitting
   → consistent ρ, M, age

Asteroseismology has been successfully applied to bright Kepler stars, showing how powerful this technique is.

PLATO will improve the achieved accuracies to:

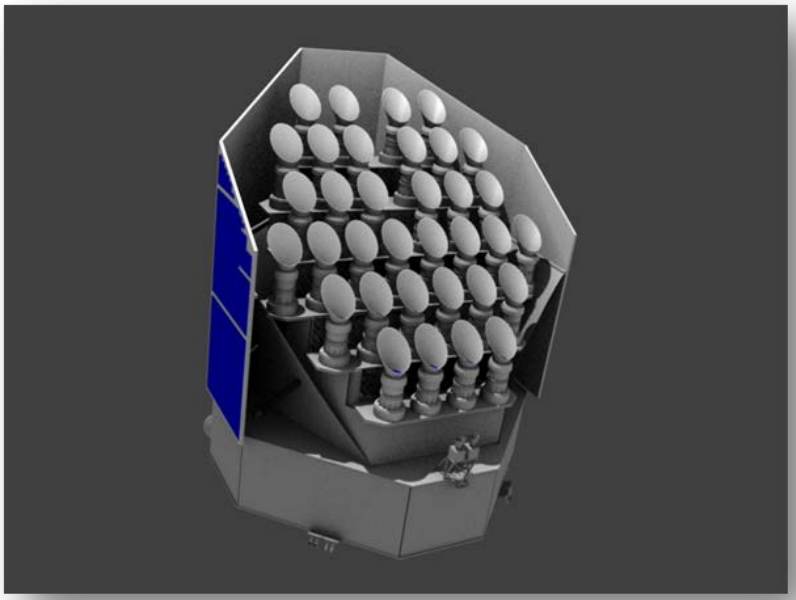
- Uncertainty in Mass ≤ 2%
- Uncertainty in Age ~ 10%

The PLATO 2.0 Mission

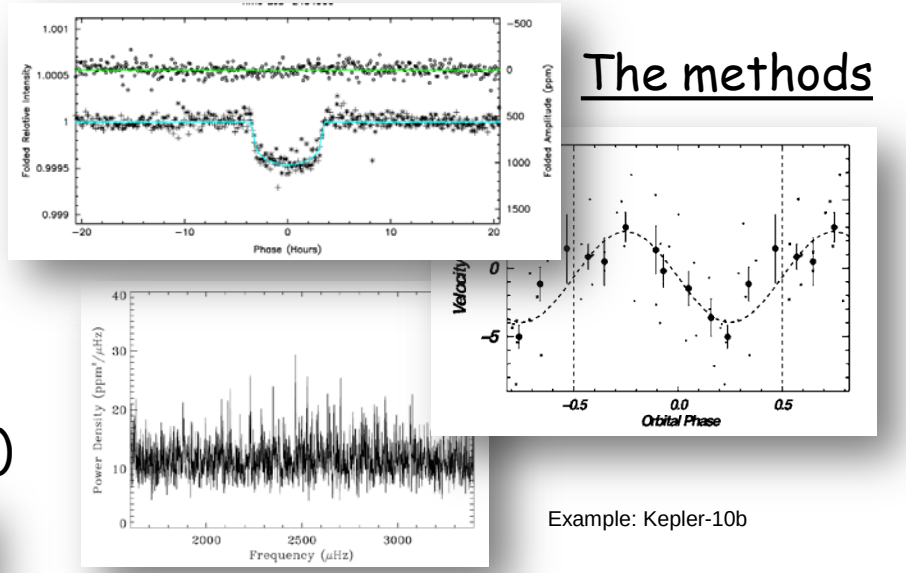
Mission proposal for ESA M3 launch selection

The instrument:

- 32 «normal» cameras :
  cadence 25 sec
- 2 «fast» cameras :
  cadence 2.5 sec,
  2 colours
- pupil: 120 mm
- dynamical range: $4 \leq m_V \leq 11$ (16)



The methods



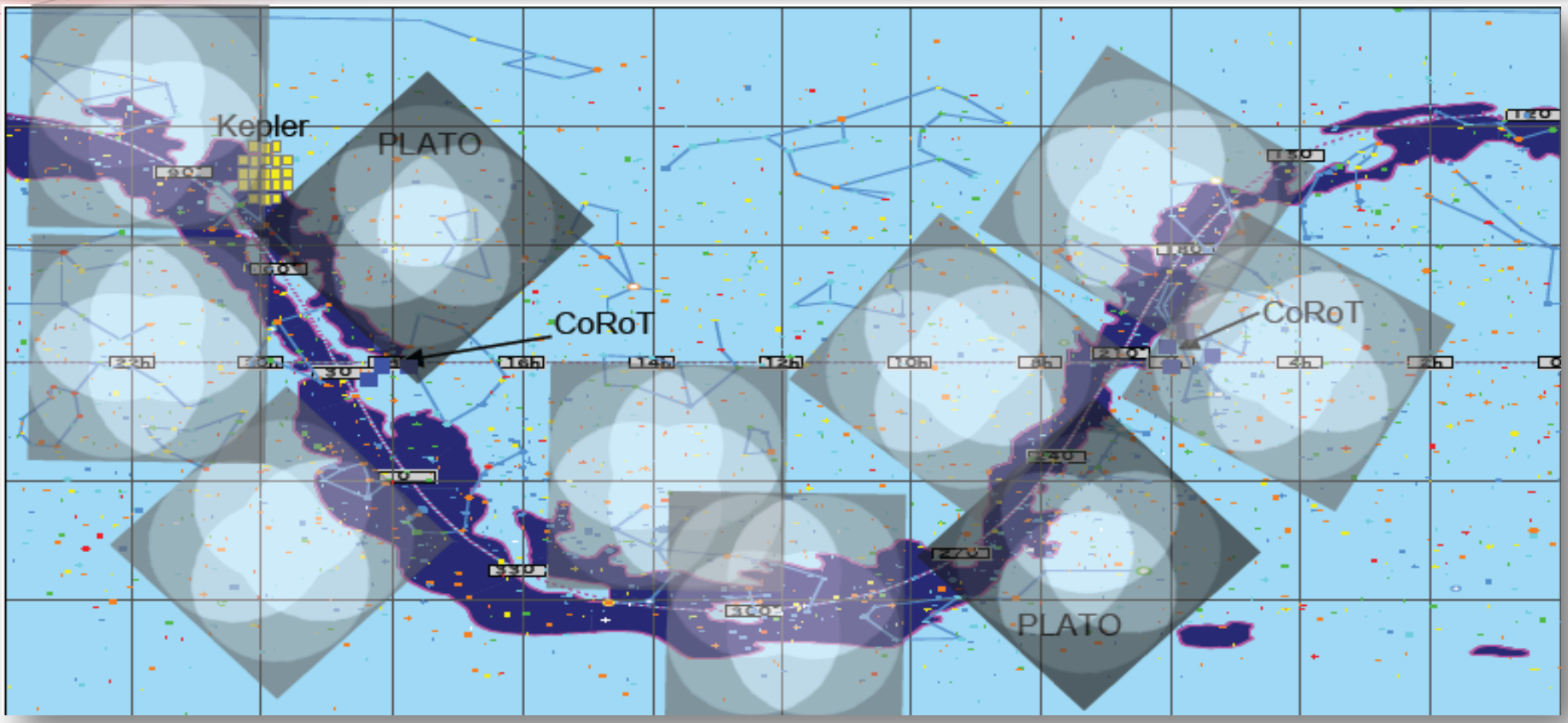
Example: Kepler-10b

Accuracy:

An Earth around a Sun :

- radius up to 2%
- mass up to 10%
- age known to 10%

Field of View



The M2 baseline assumed 2 long pointing + step-and-stare phase

For M3: Other observing other strategies are possible, e.g.:

- Start with step-and-stare phase for large coverage in the early phase → ›50% coverage
- Start at regions with interesting objects

Number of observed stars

		PLATO		*Kepler*
Noise level (ppm/h)	**m_V**	**2 long pointings**	**2 long pointings + step-and-stare**	**Fixed *Kepler* field**
8	**8**	>1000	>3000	30
34	**11**	22000	85000	1300
80	**13**	267000	1000000	25000

astroseismology

Summary: PLATO 2.0 (2022/24 launch)

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understand planet formation and perform planetary science

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What PLATO will provide for a large number of planets:

- **planets with accurately characterized bulk properties, wide parameter range, including Earths in the HZ of solar-like stars**
  - **Stellar masses and ages through astroseismology**
  - **RV-follow-up (accurate planet masses) also for terrestrial planets**
- **Survey of the physical properties of planets and planetary systems**
- **future spectroscopy of a sample of bright targets!**

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- **future spectroscopy of a sample of bright targets!**

Join the PLATO Team!

PLATO 2.0 Workshop

Attend the

PLATO 2.0 Workshop

July 29 – 31, 2013

At: ESTEC, Noordwijk, NL

Announcement and call for registration will follow shortly.