Planetary Transits and Oscillations of Stars

PLATO

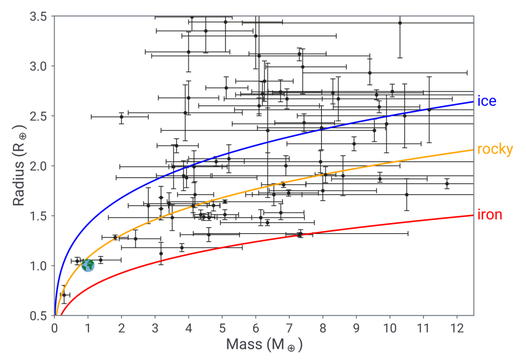
On behalf on the **PLATO Mission Consortium**:
Ruth Titz-Weider, DLR, Institut für Planetenforschung, 12489 Berlin, ruth.titz@dlr.de

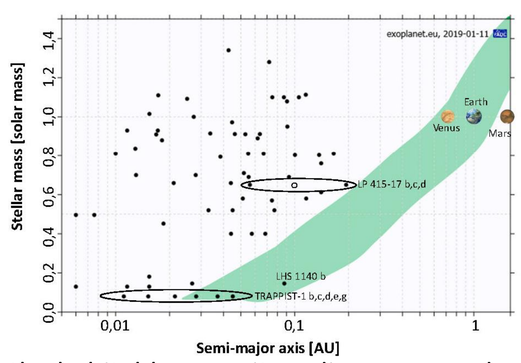
Introduction

Up to now, no Earth-like planet in the habitable zone around a sun-like star has been found. The majority of the detected exoplanets lack the full set of bulk parameters, i.e. radius, mass, stellar type and age. That is what PLATO is designed for: to find terrestrial planets in the habitable zone and determine their bulk densities with a precision never reached before.

PLATO is a M-class mission in ESA's Cosmic Vision Programme 2015-2025. The international PLATO Consortium is lead by DLR (Prof. Heike Rauer). It will be launched in 2026 with an Ariane-6 rocket from Kourou, French Guyana. The mission duration is 4 years, an extension up to 6 years is possible. There are consumables for 8 years.

About known Super-Earths*

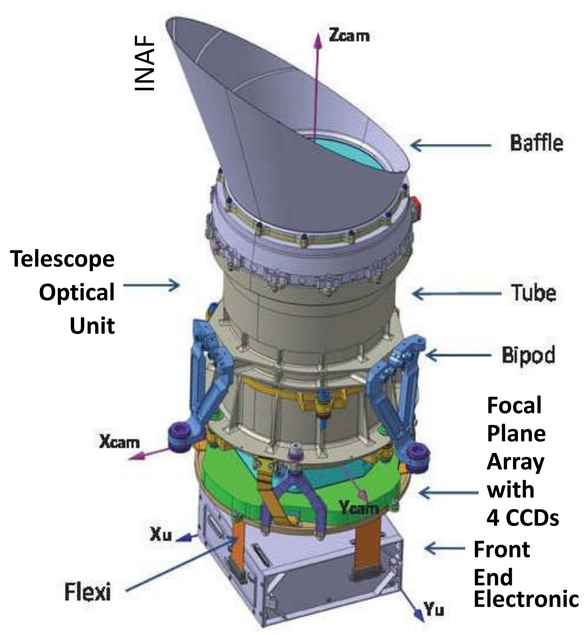




To be sure about a terrestrial planet in the habitable zone, its radius, mass and stellar parameters have to be determined with high precision. Otherwise, its nature cannot be revealed on account of the ambiguity.

** In both graphics all planets with radius ≤ 2 R_{Earth} and mass ≤ 10 M_{Earth} are considered. Data from exoplanet.eu.*

Single Telescope Design



Spectral range: 500-1000 nm
Pupil diameter: 12 cm

Normal camera:
4 full-frame CCD
(4510 x 4510 pixels each)
25 sec cadence

Fast camera:
4 frame-transfer CCDs
(4510 x 2255 pixels each)
2.5 sec cadence

Pixel length: 18 µm
Pixel scale: 15"/pixel

Scientific Goals

- **Detection of terrestrial exoplanets up to the habitable zone of solar-type stars** and characterisation of their bulk properties needed to determine their habitability.
- **Characterisation** of hundreds of rocky, icy or giant planets, including the architecture of their planetary system, to fundamentally enhance our understanding of the formation and the evolution of planetary systems.

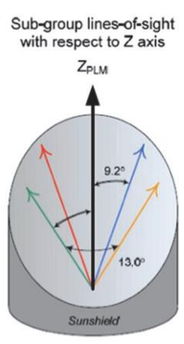
Methods

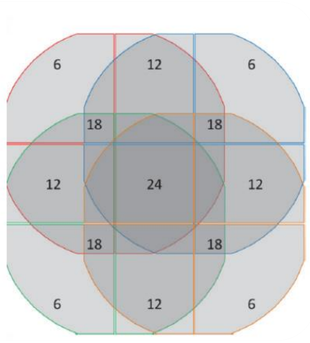
- **Planet detection and radius determination** (3% precision) from *photometric transits.*
- **Determination of planet masses** (≤ 10% precision) from ground-based *radial velocity follow-up.*
- **Determination of accurate stellar masses, radii, and ages** (10% precision) from *asteroseismology.*
- Identification of **bright targets for atmospheric spectroscopy**.

from ESA Definition Study Report, April 2017

Instrumental Design

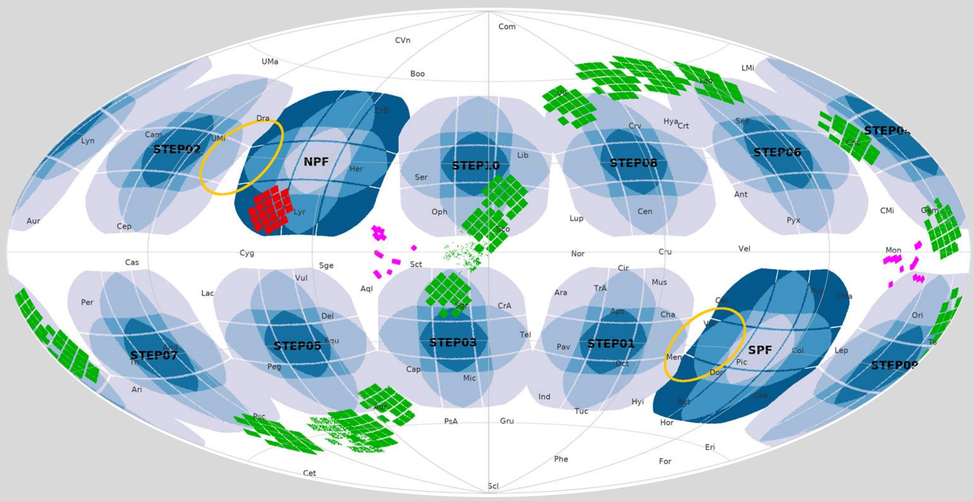
OHB System AG





- 26 telescopes are mounted on a common plattform
- 4 groups of 6 telescopes („normal" telescopes)
- 1 group of 2 telescopes („fast" telescopes) used for fine guidance
- „Normal" telescopes with an overlapping field of view, covering about 2,123 deg² - almost 20 times the active field of the *Kepler* instrument. (Marchiori et al 2019)

Sky Coverage



Sky coverage in Galactic coordinates of PLATO's provisional **long duration fields** (NPF and SPF) and the possible **short-duration fields** (ST01-ST10). Other planet finding missions are in different colours: **red**– Kepler, **green** – Kepler/K2 **magenta**– CoRoT, **yellow** – TESS continous viewing zone. (Courtesy of Valerio Nascimbeni, U Padua)

Jahrestagung der Astronomischen Gesellschaft, Stuttgart, 16. – 20. September 2019

DLR **Deutsches Zentrum für Luft- und Raumfahrt**

PLATO Mission Consortium: platomission.com
ESA: sci.esa.int/plato
DLR: www.dlr.de/pf/plato

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