

A composite image of space. In the upper right, a large, bright orange-red star is visible. A blue comet with a long tail is streaking across the center. A small planet is visible in the upper left. The Earth's horizon is at the bottom, with a satellite in orbit. The text 'PLATO Science Preparation' is overlaid in white.

PLATO Science Preparation

Don Pollacco (Warwick)

How the scene has changed in the last year.....

The Goals of Exoplanet Research

Long term goals of exoplanet research are to understand :

- how planetary systems form and evolve
- what makes a planet habitable
- if the earth is unique or if life has developed elsewhere

In order to reach these goals, we first need:

- to detect and characterise planetary systems
- around different types of stars and at all ages
- in particular rocky planets in the habitable zones of their stars



Goals of PLATO

opening up new era in exoplanet research

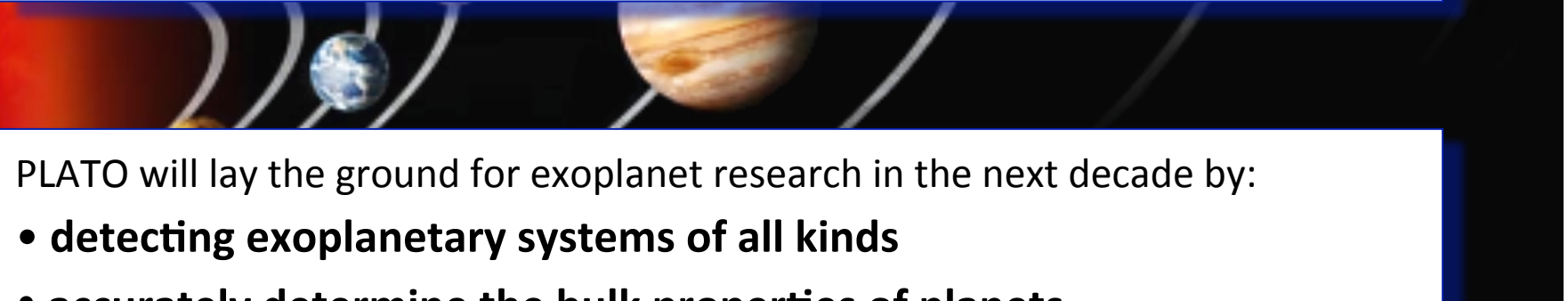
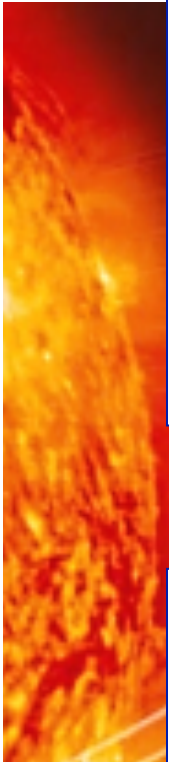
Scientific Objectives

PLATO science questions:

- **Did the Earth form in a special place in the Universe and/or under extraordinary circumstances?**
- **How diverse are planets and planetary systems?**
- **How do planets and planetary systems differ with age?**
- **What are the characteristics of terrestrial planets in the habitable zones of stars?**

PLATO will lay the ground for exoplanet research in the next decade by:

- **detecting exoplanetary systems of all kinds**
- **accurately determine the bulk properties of planets**
- **determine accurate ages of planetary systems**
- **provide a huge legacy for future exoplanet characterization**



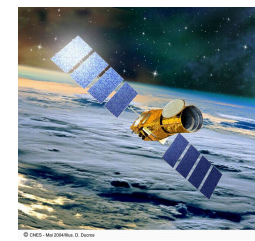
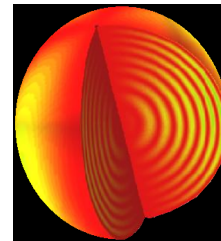
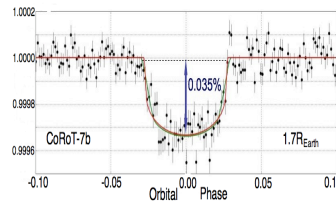
PLATO Techniques (Summary)

Objective: detect and characterise (M , R , age) exoplanetary systems

- Census of exoplanets down to earth size in habitable zone
- Planets + host star
- Bright, nearby stars: exquisite knowledge of host stars + planet characterisation
- Unique database for complementary science: legacy

Techniques:

- photometric transits
- asteroseismology
- ground based spectroscopy



strong european expertise

Targets and sky coverage:

- 50% of the whole sky
- 85,000 bright cool stars, noise $< 3.4 \cdot 10^{-5}$ in 1 hr
- 3,000 very bright and nearby cool stars ($m_v < 8$)
- 1,000,000 cool stars, noise $< 8.0 \cdot 10^{-5}$ in 1 hr ($m_v < 13$)

detect & characterise
earth-like planets

detect earth-like
planets

PLATO Science preparatory Management

- We need the best possible tools, algorithms, models, catalogues, observational support etc available for PLATO.
- This requires support from the science community for PLATO preparation and analysis after launch.
- Current major activity: Production of ESA “Yellow Book”, used in down selection

PSPM Tasks

- Develop and specify state-of-the-art tools and algorithms for planet detection, parameter determination and asteroseismology of stars.
- Prepare the selection of the target fields and make available a high quality input catalogue.
- Organise the community for followup observing campaigns (confirmation, characterisation and, maybe, preparation)
- Prepare the community for exploitation of PLATO data
- After launch: analyze PLATO data, update tools and methods, assist the community in PLATO analysis.

PLATO Science Preparation

Major work themes

- **Science Coordination:** overall PSP coordination coordinate community
- **Exoplanet Science:** transit detection, planet parameters
- **Followup Coordination:** organisation of ground based observations.
- **Stellar Science:** Stellar physics, oscillation modes, stellar evolution models
- **Target/Field Characterisation:** PLATO input catalogue, prepare field selection
- **End-to-End Simulator:** PLATO data simulator
- **Additional Science:** prepare for additional science program

PSPM consists of.....

- More than 120 scientists from 15 countries leading various work packages
- Each coordinator will lead a small team of participating scientists

Much of the European exoplanet community is involved at some level.

Find out more information about the PSPM and, in particular, how you can contribute:

<http://www.oact.inaf.it/plato/PPLC/Home.html>

- Information about the PLATO Mission
- Up-to-date work breakdown structure
- Short description of every work package
- Name of work package coordinators and contact information

The PLATO legacy

- a huge sample of characterized planets with known mass, radius and age, including terrestrial planets in the HZ of solar-like stars
- Large numbers of planets surrounding stars bright enough for detailed follow-up
 - **pioneers true comparative planetology and taxonomy of planet systems**

A huge complementary science program:

- 1,000,000 of high-precision photometric stellar lightcurves
- 20,000 of these stars will allow for astroseismic characterization
- in synergy with Gaia: mass, age, rotation, distance, luminosity, radius
 - **a breakthrough in stellar physics** (e.g. stellar structure and evolution, internal mixing processes, stellar rotation, ages of globular clusters, young open clusters)