ESA's Madrid-Area Exoplanets Science Meeting



# PLATO in a nutshell

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October 4th, 2022

Artist's impression © OHB System AG

#### **ESA'S NEW AND FUTURE EXOPLANET MISSIONS**



#### Cheops

First step characterisation of known Earthto-Neptune size exoplanets



### Webb

Detailed characterisation of exoplanet atmospheres through transit studies and direct imaging





#### Plato

Studying terrestrial planets in orbits up to the habitable zone of Sun-like stars, and characterising these stars



**·**eesa

#### Ariel

Performing a chemical census of a large and diverse sample of exoplanets by analysing their atmospheres







# **PLATO: Objectives**



Determination of bulk properties of hundreds of exoplanets, including terrestrial planets in the habitable zone of Sun-like stars

- Required planet properties accuracies:
  - radius: 3%
  - mass: 10%
  - age: 10%

for an Earth-size planet orbiting a G0 dwarf star with V < 10

Architecture, formation, evolution of planetary systems, and correlation with stellar parameters

- Planet evolution with age
- Our Solar System in context

Internal structure of stars, their evolutionary state, detailed characterization Additional planetary science

- Exo-moons,
- Planets around evolved stars...



## **PLATO:** Objectives



Known Rp and Mp and Rp < 2 RE



04/10/2022

Updated from Rauer et al. (2014)





Known Rp and Mp and Rp < 2 RE



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Updated from Rauer et al. (2014)



# The PLATO Programme



#### PLATO combines 2 segments:

- Space segment
  - 26 telescopes: very high precision photometry (<50 ppm in 1 hour).
  - Long pointings on the same field for >2 years
  - Monitoring of  $\sim$  140.000 stars per pointing with a FoV  $\sim\!2100$  sqdeg.
- Ground segment
  - Radial velocity monitoring of the candidates identified from their light curves.





# The PLATO Programme: Tools







# PLATO: Observing strategy



- 4 years nominal operations
  - Possible extension to  $\geq 6$  years
  - Consumables for up to 8.5 years

### $\rightarrow$ For nominal science mission:

- 2 long pointings lasting 2 years each

### $\rightarrow$ Possible alternative scenario:

- 1 long pointing for 3 years
- 1 year step-and-stare



Nascimbeni et al. 2022

Final strategy to be decided 2 years before launch



# PLATO: Observing strategy



- 4 years nominal operations
  - Possible extension to  $\geq 6$  years
  - Consumables for up to 8.5 years
- → If the mission operations are extended:
  - 2 long pointings lasting 3 or 4 years each

### $\rightarrow$ Possible alternative scenario:

- 1 long pointing for 3 years
- 1 long pointing for 2 years
- 1 year step-and-stare



Nascimbeni et al. 2022

Selection of the first long pointing sky field by June 2023

04/10/2022



# **PLATO** Mission status



- Spacecraft development is progressing well
  - S/C CDR in 2023
- Several instrument flight units already finished
  - 2 Telescope Optical Units
  - 2 Focal Plane Assemblies
  - 1 Front end electronics unit
  - $\rightarrow$ The remaining units being manufactured at good pace
- Flight-like Engineering Model successfully tested at SRON and IAS
- Nominal launch Q4 2026 on Ariane 6 to L2



## **PLATO** Mission status







PLATO Payload Module STM



### PLATO Mission status: EM Camera



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### PLATO Mission status: EM Camera



Optimal focus temperature determination at SRON: T =-77.6 C

y [mm]

0

-50

x [mm]

50

0

esa





- Spanish contribution to HW development:
  - Focal Plane Assemblies of the 26 telescopes: INTA, CAB (LIDAX)
  - Optical verification in termal vacuum (TestHouse) of 10 complete telescopes: INTA/LINES
  - Onboard computers (2 MEU  $\rightarrow$  12 DPUs): IAA (TASE)
  - Power supply units of the DPUs (PSUs): IAC (CRISA)
- Data processing algorithms for the PLATO Data Center
- Contribution to the preparation of the scientific programme









04/10/2022

ENTRO

INTA



Spanish contribution to PLATO: MEU







**Engineering model** 







## Spanish contribution to PLATO: TestHouse









# Spanish contribution to PLATO: PSM/PDC



- PDC (PLATO Data Center)
  - WP375000 (IAC, Roy Alonso). "L1 corrections from known transits"
  - WP374310 (UGR, J.C. Suárez). "End-Product Guarantee"
  - WP385100 (CAB, E. Solano). "Compliance with VO standards"
  - WP385200 (CAB, E. Solano). "VO Services developments"
- PSM (PLATO Science Management)
  - WP122200 (IAC, C. Allende). "Fundamental parameters, chemical abundances"
  - WP122300 (IAA, A. Claret) . "Determination of limb-darkening"
  - WP121130 (UGR, J.C. Suárez). "Theoretical oscillation frequencies"
  - WP128300 (UV, A. Moya). "Lightcurve preparation for asteroseismology"
  - WP112510(IAC, H. Deeg). "Circumbinary planet detection"
  - WP143100 (IAC, R. Alonso): "Photometric follow-up"
  - WP115500 (CAB, D. Barrado): "Non-transiting planets via REBs"
  - WP145200 (IAC, R. Alonso):" Secondary eclipse, phase variation spectroscopy"
  - WP141100 (IEC-UB, I. Ribas): "Target distribution requirements"

