

Ariel Mission Overview

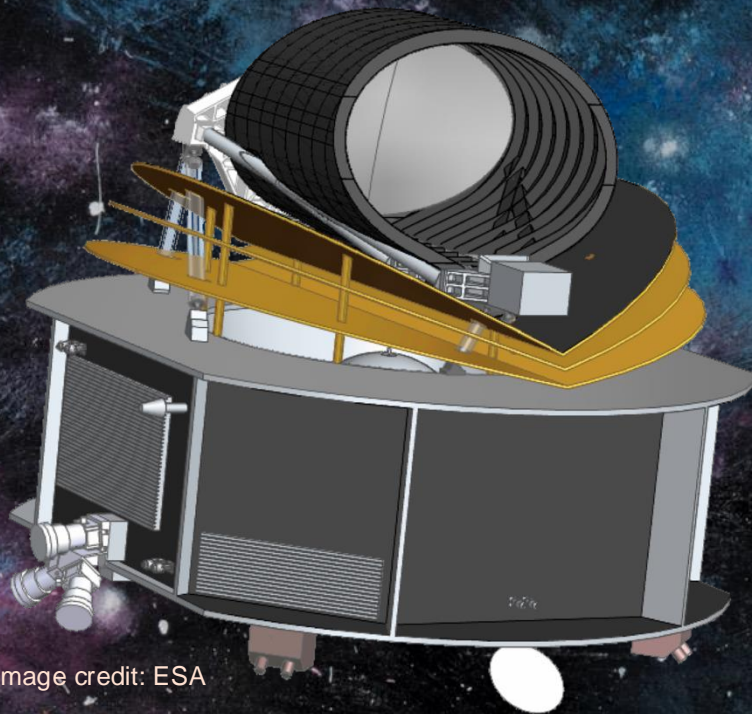


Image credit: ESA

Know Thy Star, Know Thy Planet 2025

Mark Swain

Jet Propulsion Laboratory, California Institute of Technology

© 2025 California Institute of Technology

Ariel Science Key Questions

What are planets made of?

How do planets form?

How do planets and their
atmospheres evolve?



Find out more about Ariel

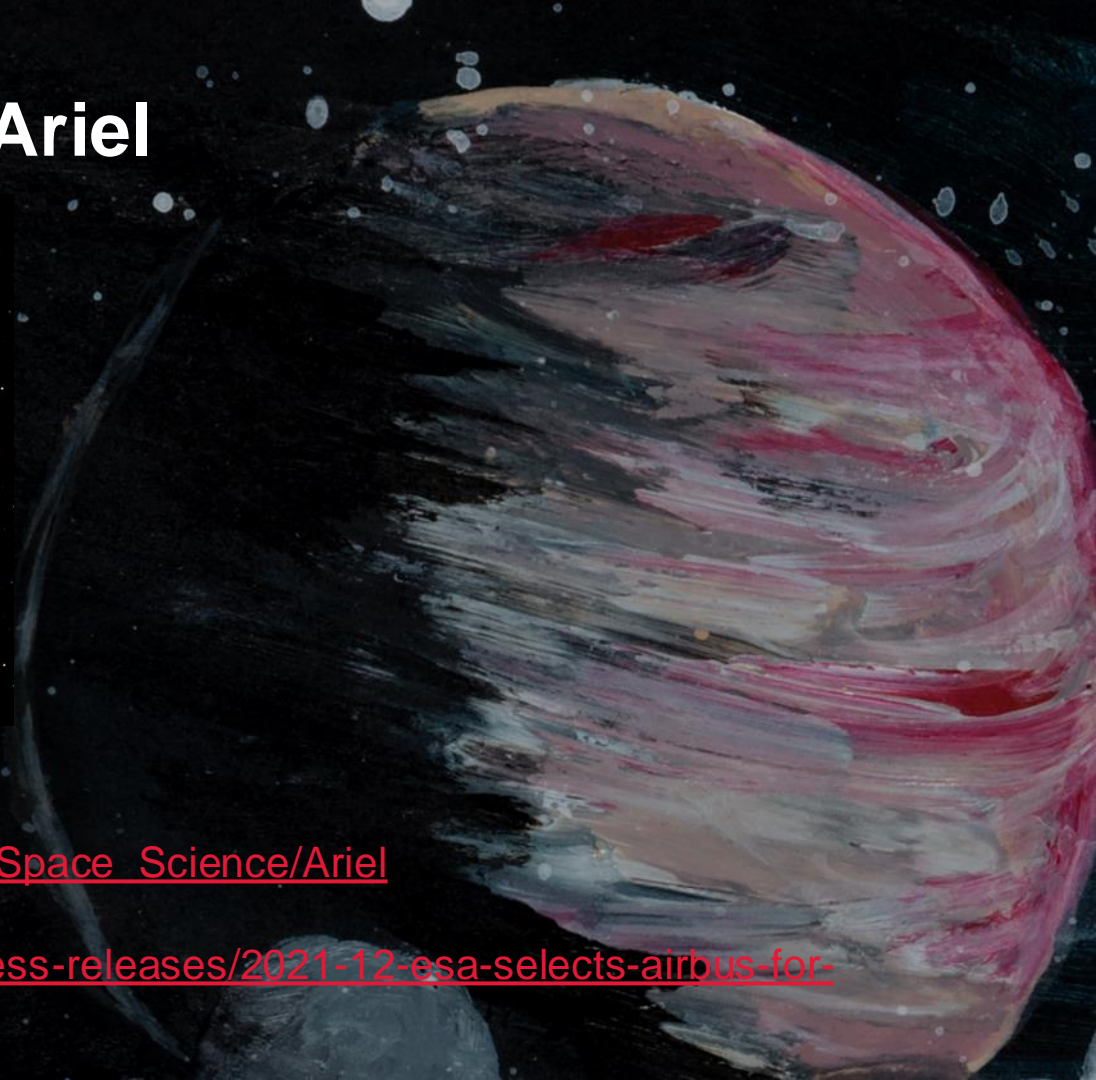


Image Credit: Airbus


<https://arielmision.space>

https://www.esa.int/Science_Exploration/Space_Science/Ariel

<https://www.airbus.com/en/newsroom/press-releases/2021-12-esa-selects-airbus-for-exoplanet-mission-ariel>



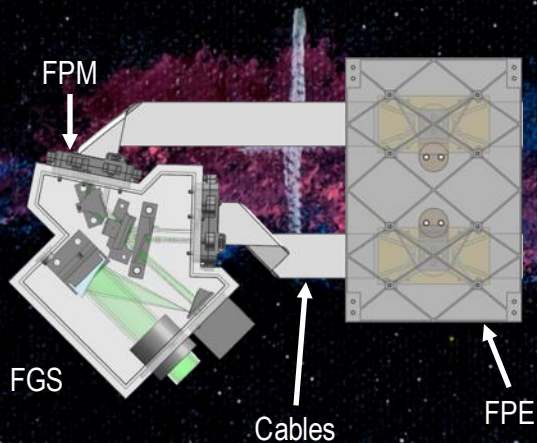
Ariel Mission Summary



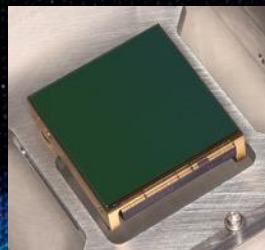
- ESA M4 mission, launching in 2029 to L2
- Prime mission duration: 4 years
- 0.5-7.8 μm simultaneous spectral coverage
- Objective is the statistical study of exoplanet atmospheres
- Science Payload implemented by 19 national partners
- Ariel PI: Giovanna Tinetti
- US participation through a NASA contribution
 - CASE Mission of Opportunity
 - US Ariel Science Center at IPAC

CASE Hardware Contribution

CASE is a subsystem of the ARIEL FGS



CASE reuses Euclid hardware designs



SWIR Detector
from Euclid



SIDEAR SCE electronics from
Euclid

CASE and the ARIEL Payload

- Off-axis 1.1 m x 0.7 m elliptical telescope
- ARIEL Infrared Spectrometer (AIRS): Resolution $\lambda/\Delta\lambda=30-200$), 1.98 – 7.8 μm
- Fine Guidance System (FGS)
 - Vis-Phot: 0.5 μm – 0.6 μm
 - FGS1: 0.6 μm – 0.8 μm
 - FGS2: 0.8 μm – 1.1 μm
 - NIR-Spec: 1.1 μm – 1.98 μm ($\lambda/\Delta\lambda\sim 20$)

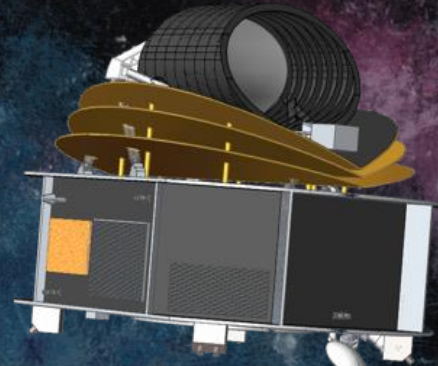


Image credit: ESA

CASE hardware

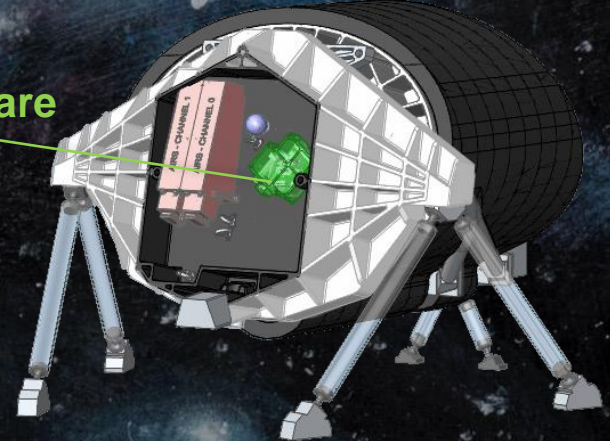
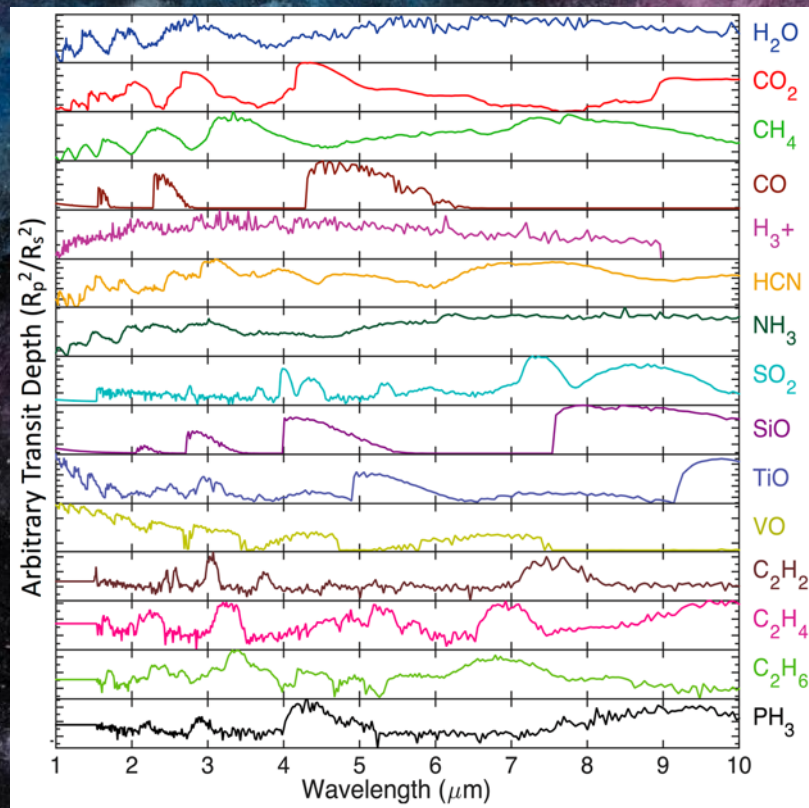
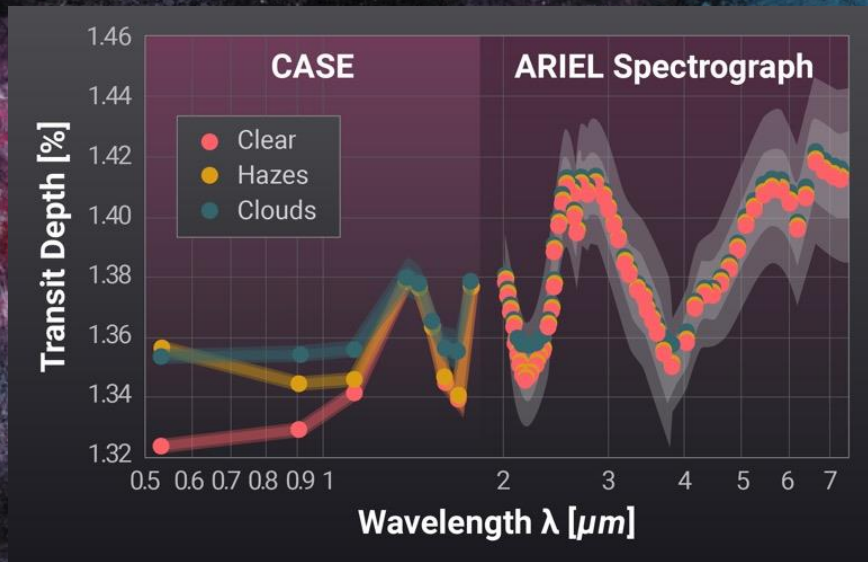


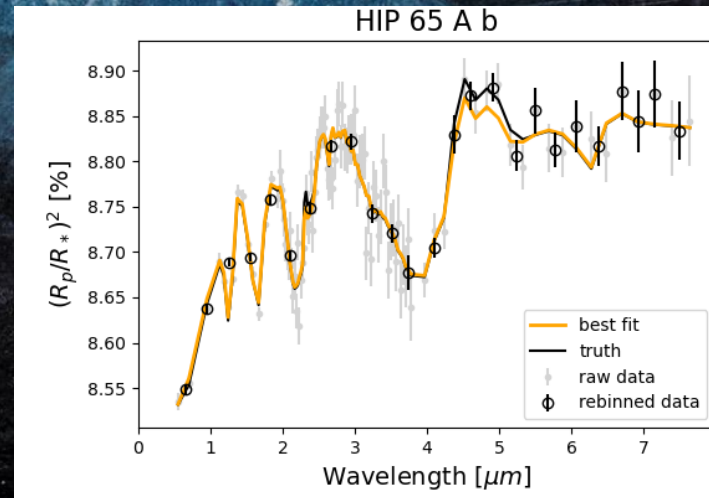
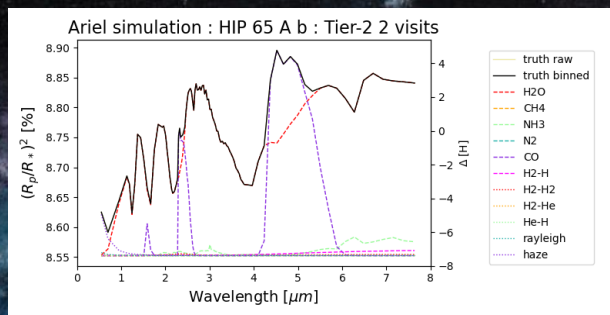
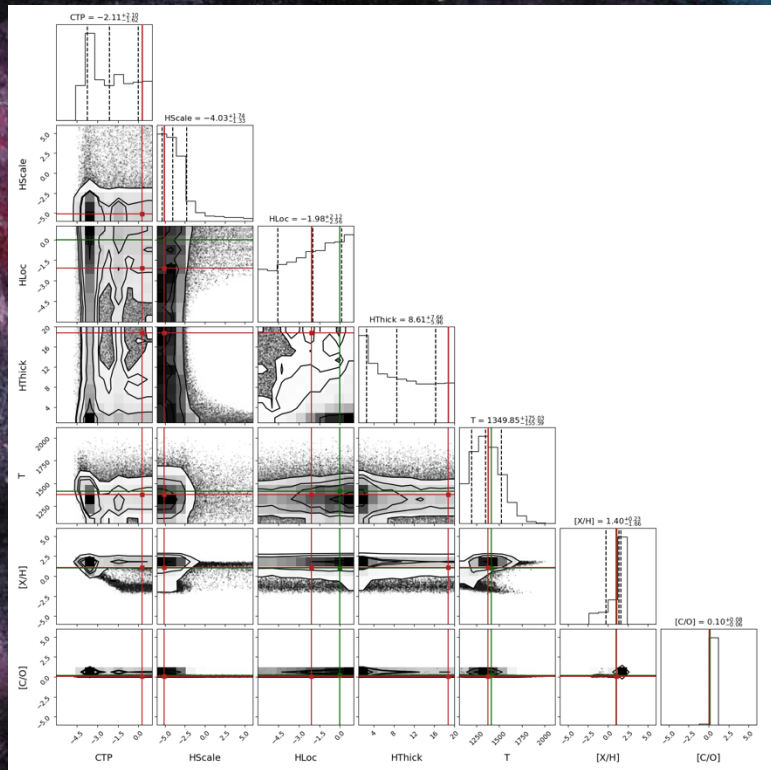
Image credit: Ariel Consortium

ARIEL will Detect Large Numbers of Atmospheric Gases



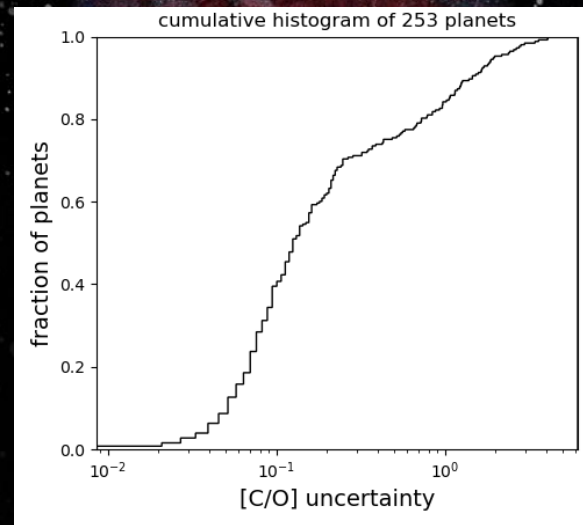
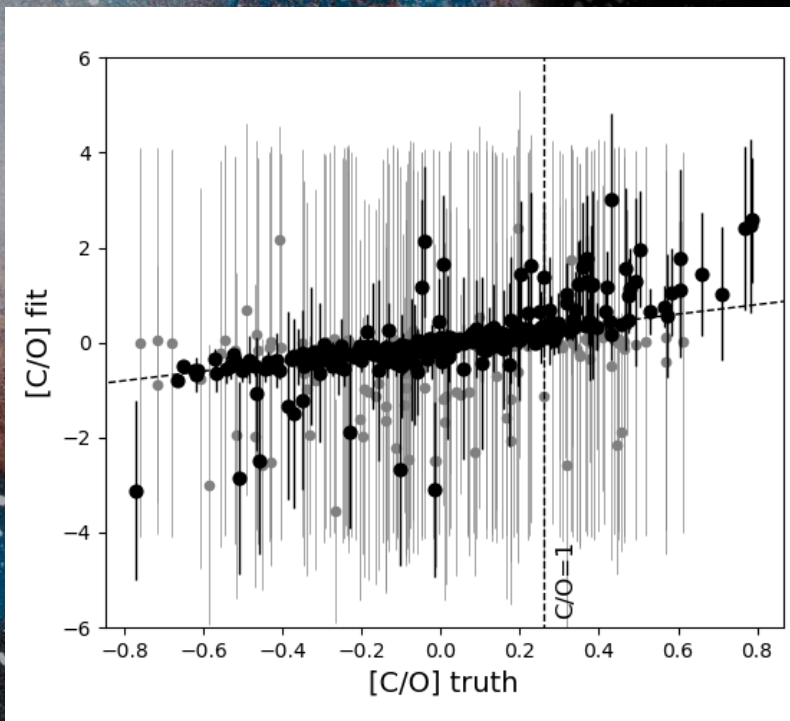
CASE team Ariel simulations

Tier 2 transit spectra



CASE team Ariel simulations

Tier 2 transit spectra



Median uncertainty is 0.1-0.2 dex

Ariel Preparation Activities

- Numerous Ariel Consortium activities spanning a variety of topics
- Exoplanet Watch
<https://exoplanets.nasa.gov/exoplanet-watch/how-to-contribute/checklist/>
- ExoClock <https://www.exoclock.space>
- Finding new planets
- Stellar characterization
<https://sites.google.com/inaf.it/arielstellarcatalogu>
- NASA proposal opportunity for Ariel preparation activities



Ariel 2029

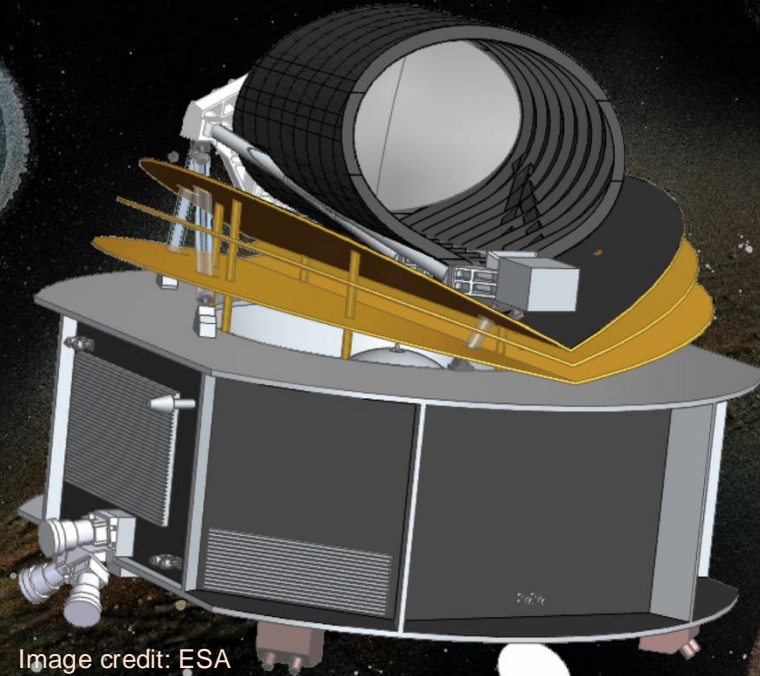


Image credit: ESA