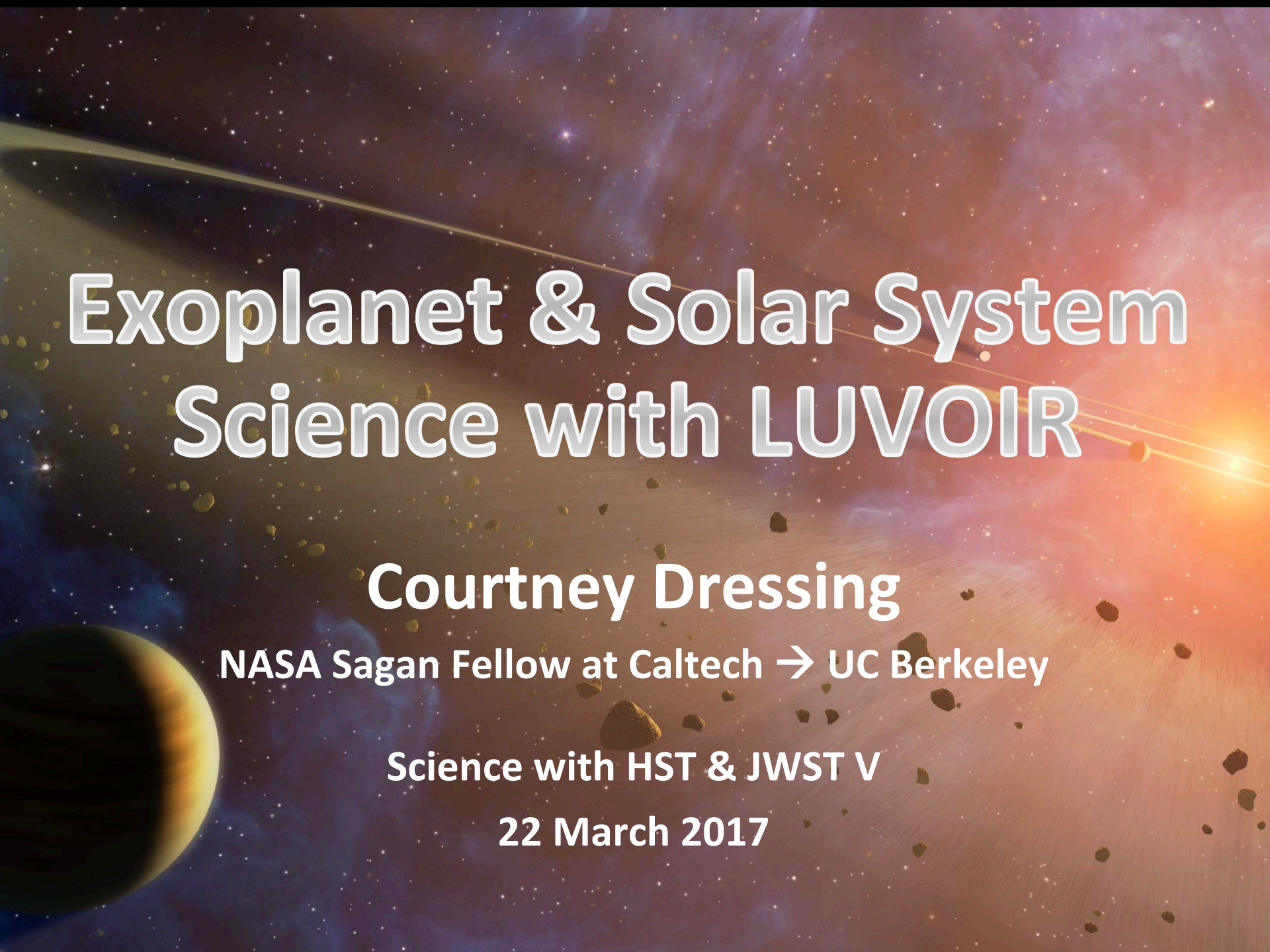


Exoplanet & Solar System Science with LUVOIR

Courtney Dressing

NASA Sagan Fellow at Caltech → UC Berkeley

Science with HST & JWST V

22 March 2017

LUVOIR will transport us to the outer solar system

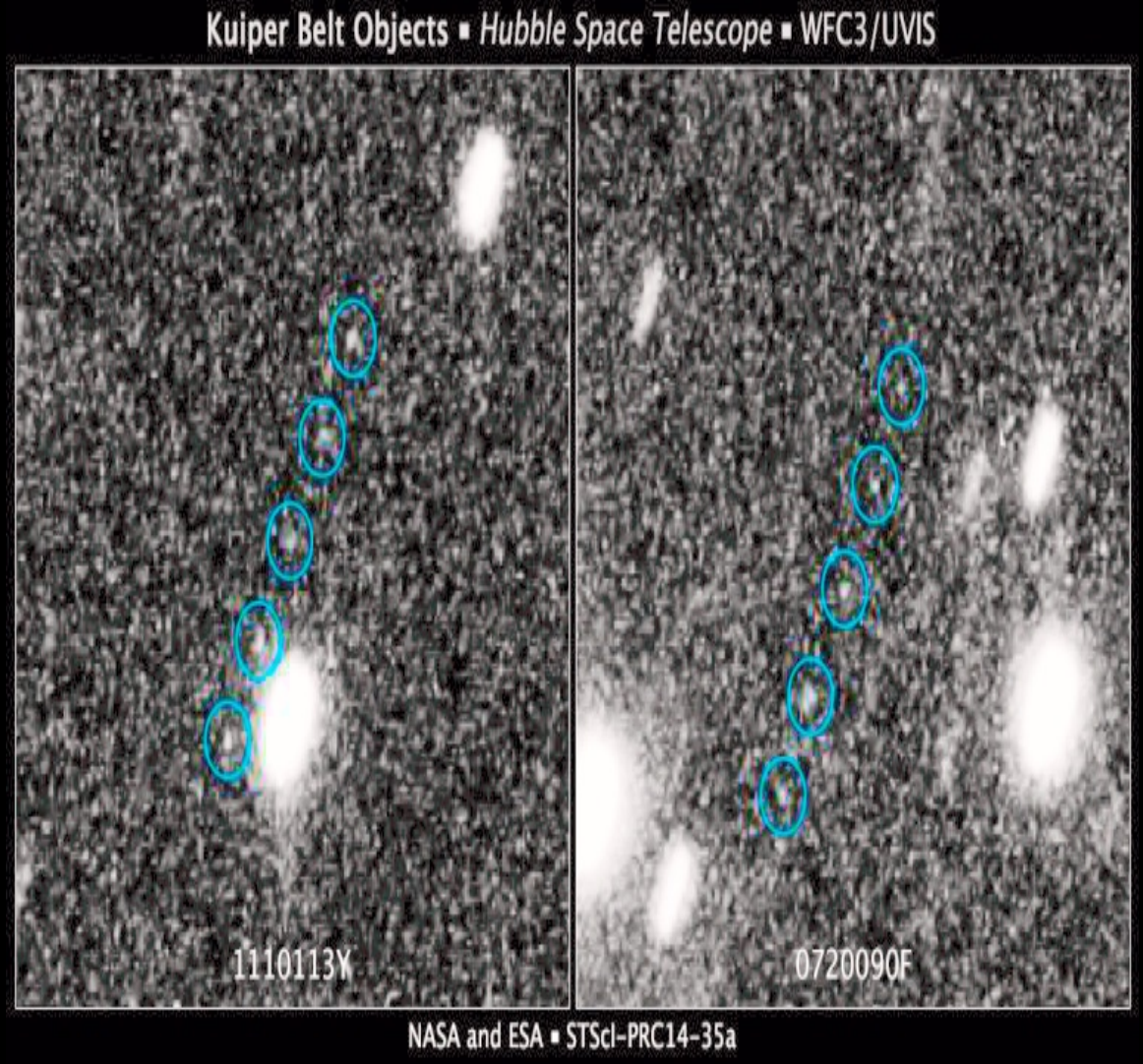
LUVOIR will resolve surface features on Pluto

Pluto with HST

LUVOIR will resolve surface features on Pluto

Pluto with LUVOIR

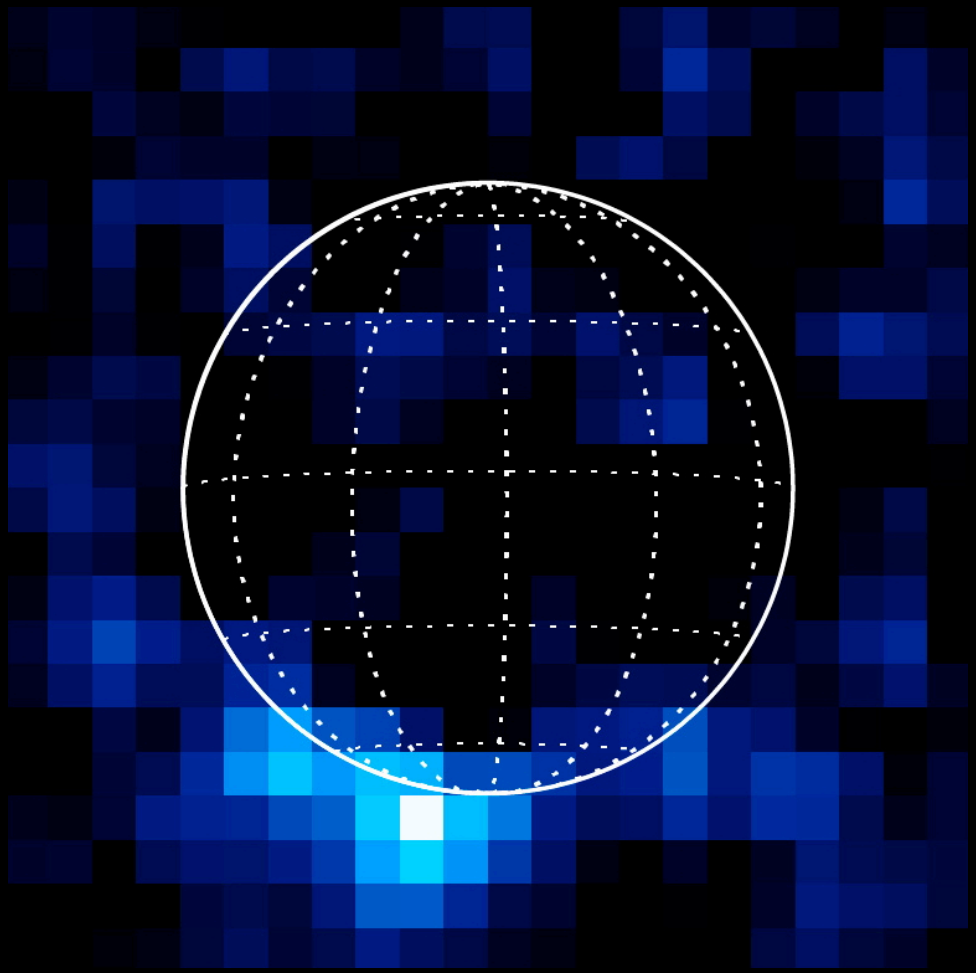
LUVOIR could detect new Kuiper Belt Objects



LUVOIR could image Planet 9

Simulated Image
(assumes distance of 500 AU)

LUVOIR will monitor plumes from icy moons



Europa with HST

Credit: Roth et al. (2014)

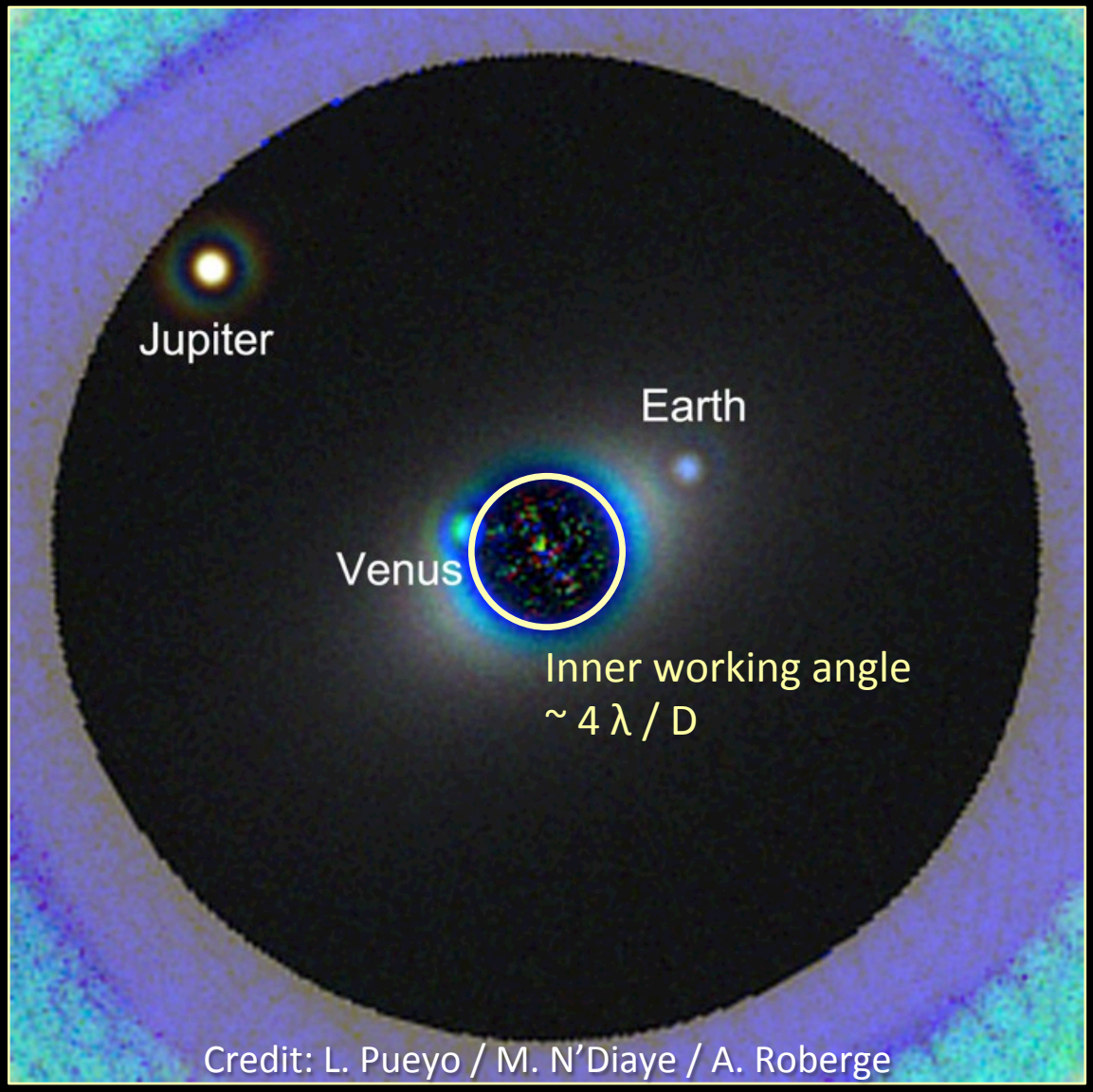
LUVOIR will monitor plumes from icy moons

Europa with LUVOIR

Credit: G. Ballester (LPL)

and expand the frontiers of exoplanet exploration

LUVOIR will image Earth-like planets



Solar System from 13 parsec with coronagraph and 12-m telescope

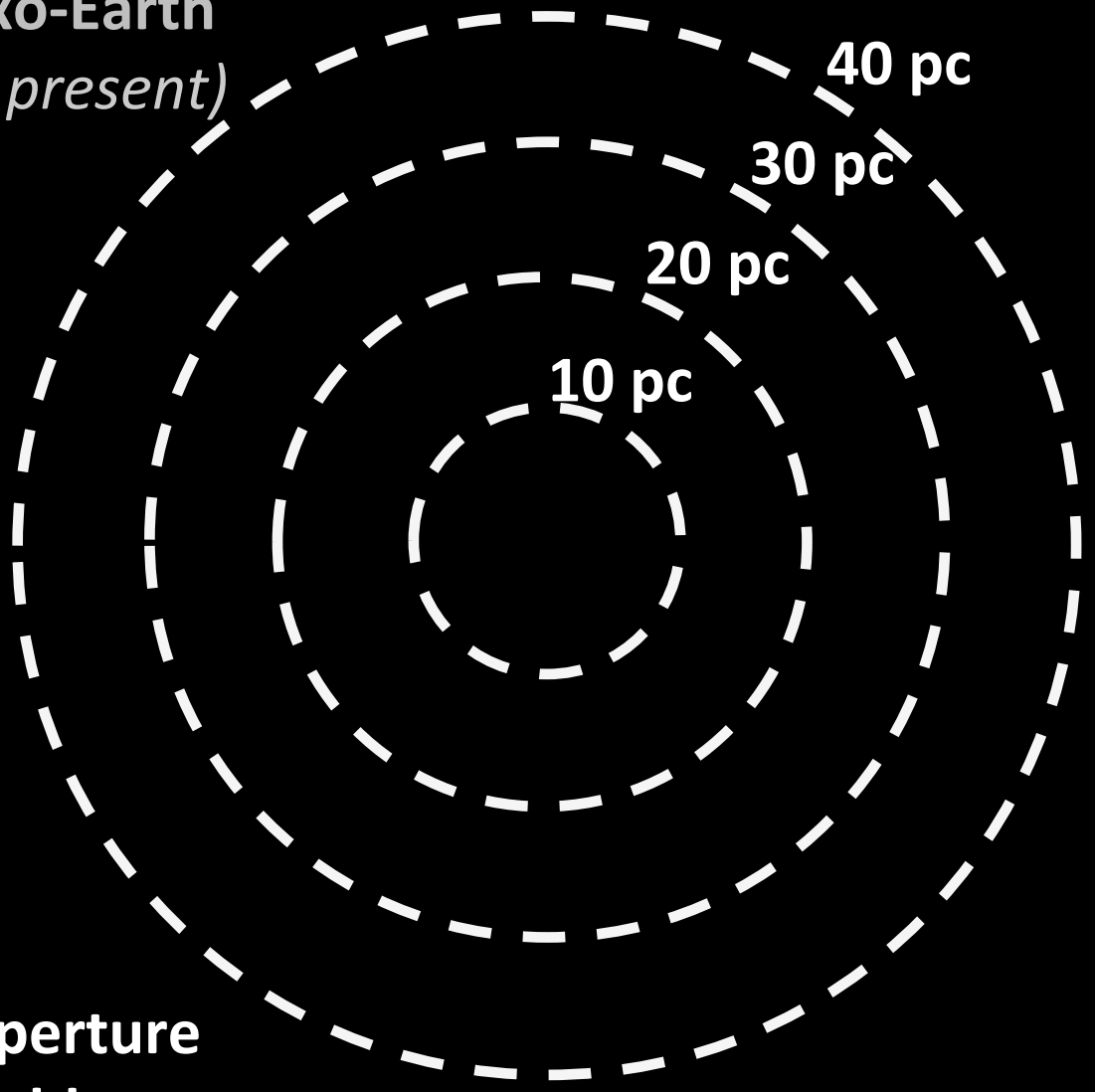
Bigger Telescopes Search More Habitable Zones

Chance of Exo-Earth Detection *(if present)*

80-100%

50-80%

20-50%



Telescope Aperture

Exo-Earth Yield

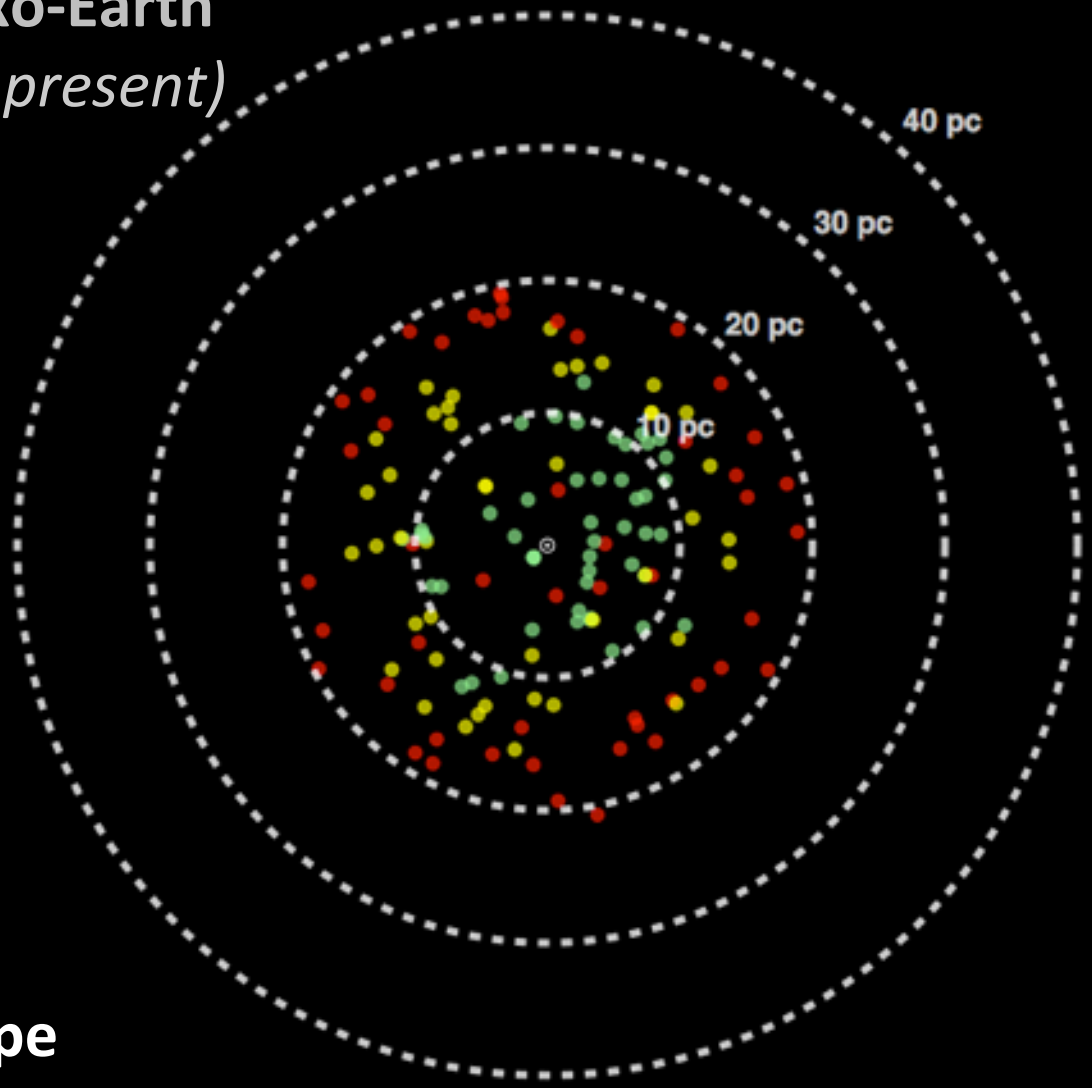
Bigger Telescopes Search More Habitable Zones

Chance of Exo-Earth Detection *(if present)*

80-100%

50-80%

20-50%



4-m Telescope

6 Exo-Earth Candidates

Stark et al. (2014)

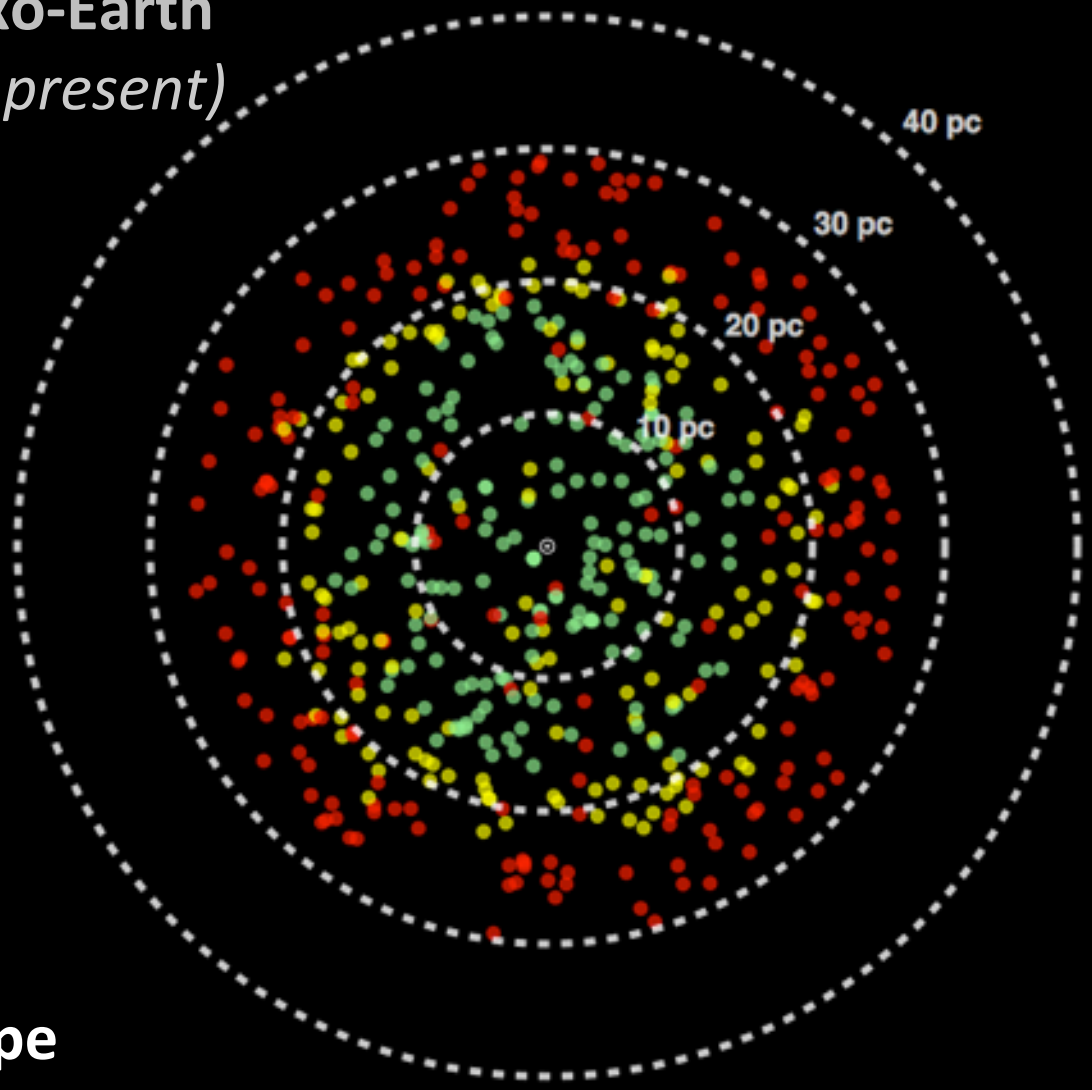
Bigger Telescopes Search More Habitable Zones

Chance of Exo-Earth Detection *(if present)*

80-100%

50-80%

20-50%



8-m Telescope

25 Exo-Earth Candidates

Stark et al. (2014)

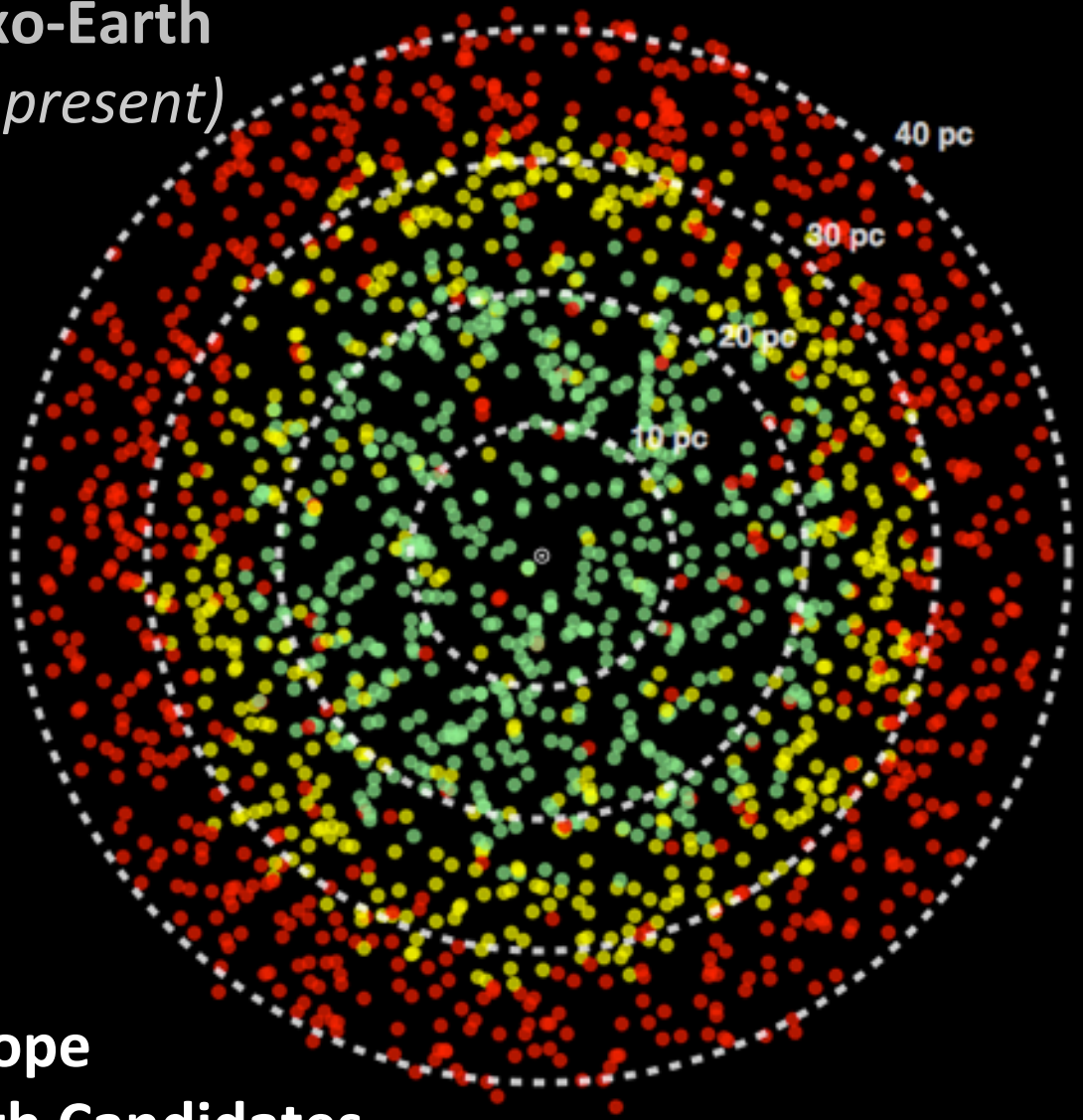
Bigger Telescopes Search More Habitable Zones

Chance of Exo-Earth Detection *(if present)*

80-100%

50-80%

20-50%

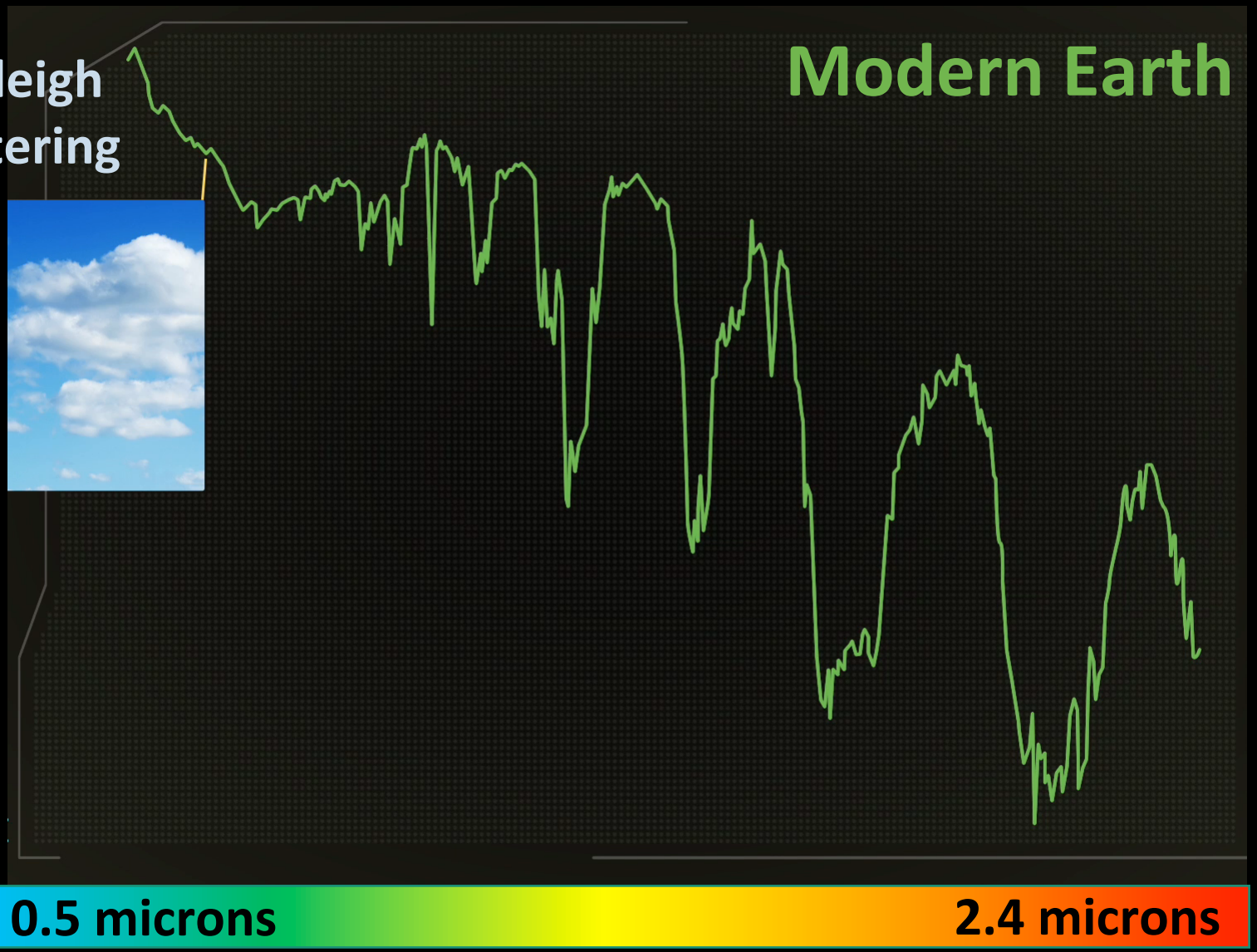


16-m Telescope

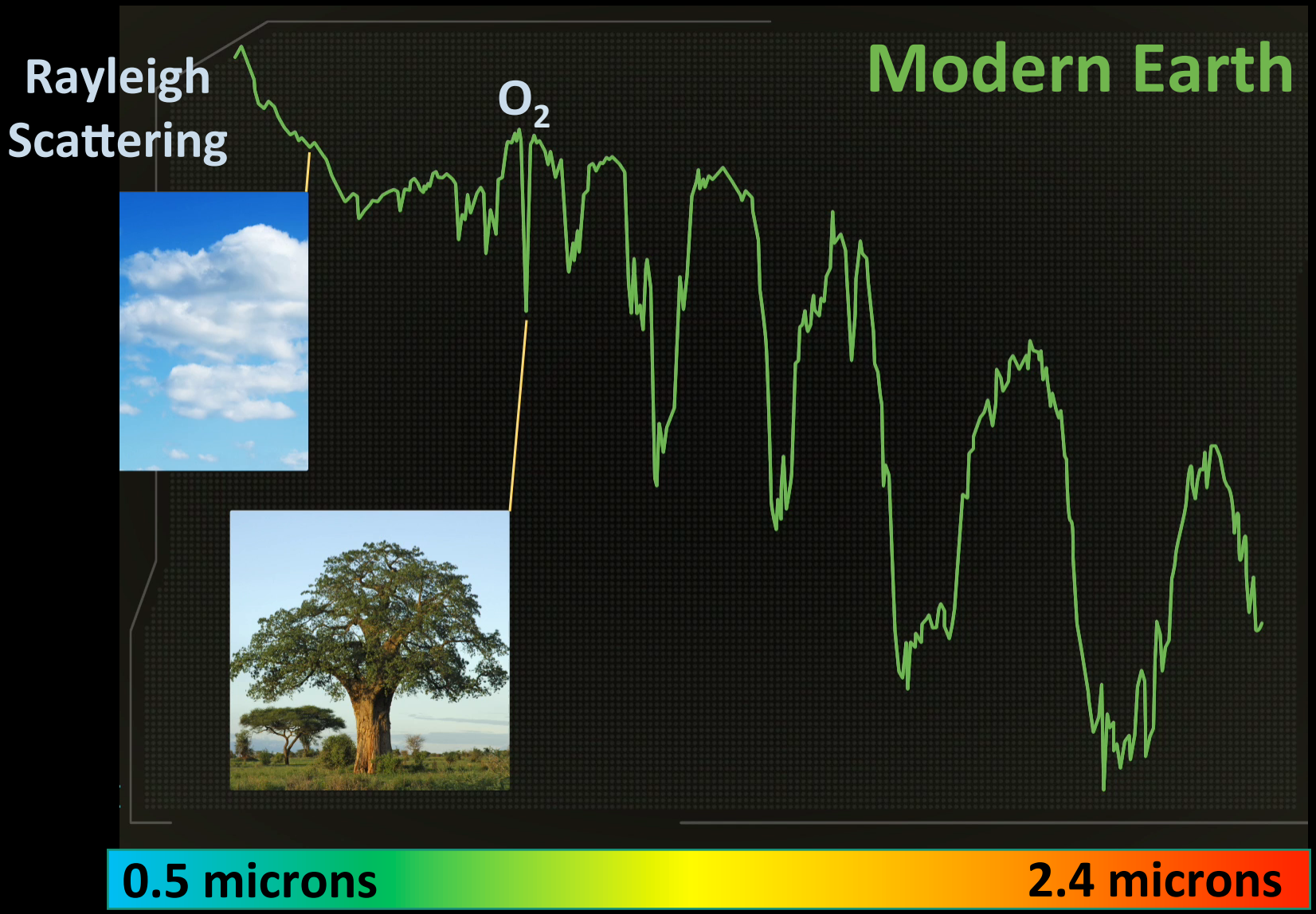
100 Exo-Earth Candidates

Stark et al. (2014)

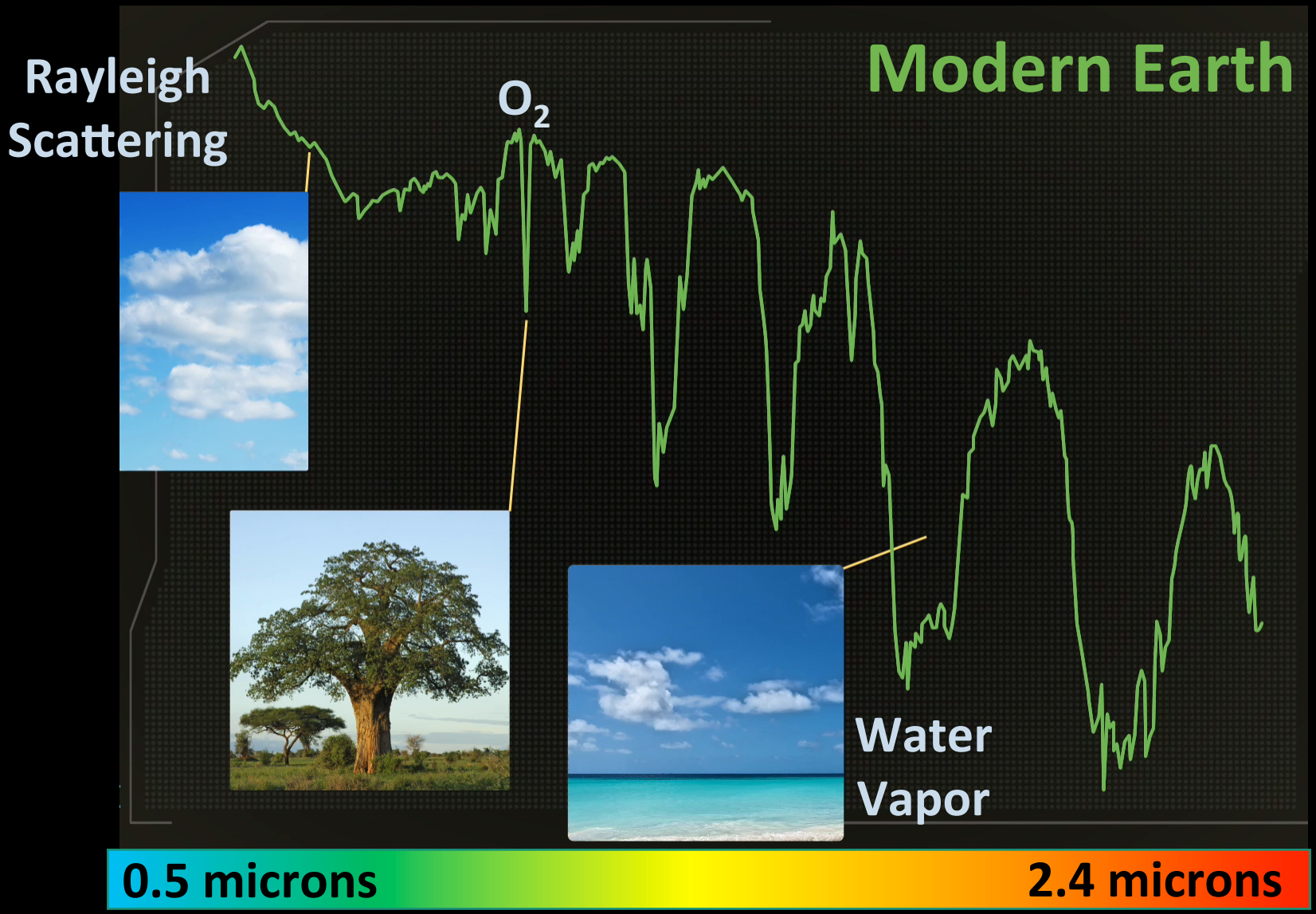
LUVOIR Spectra May Reveal Biosignatures



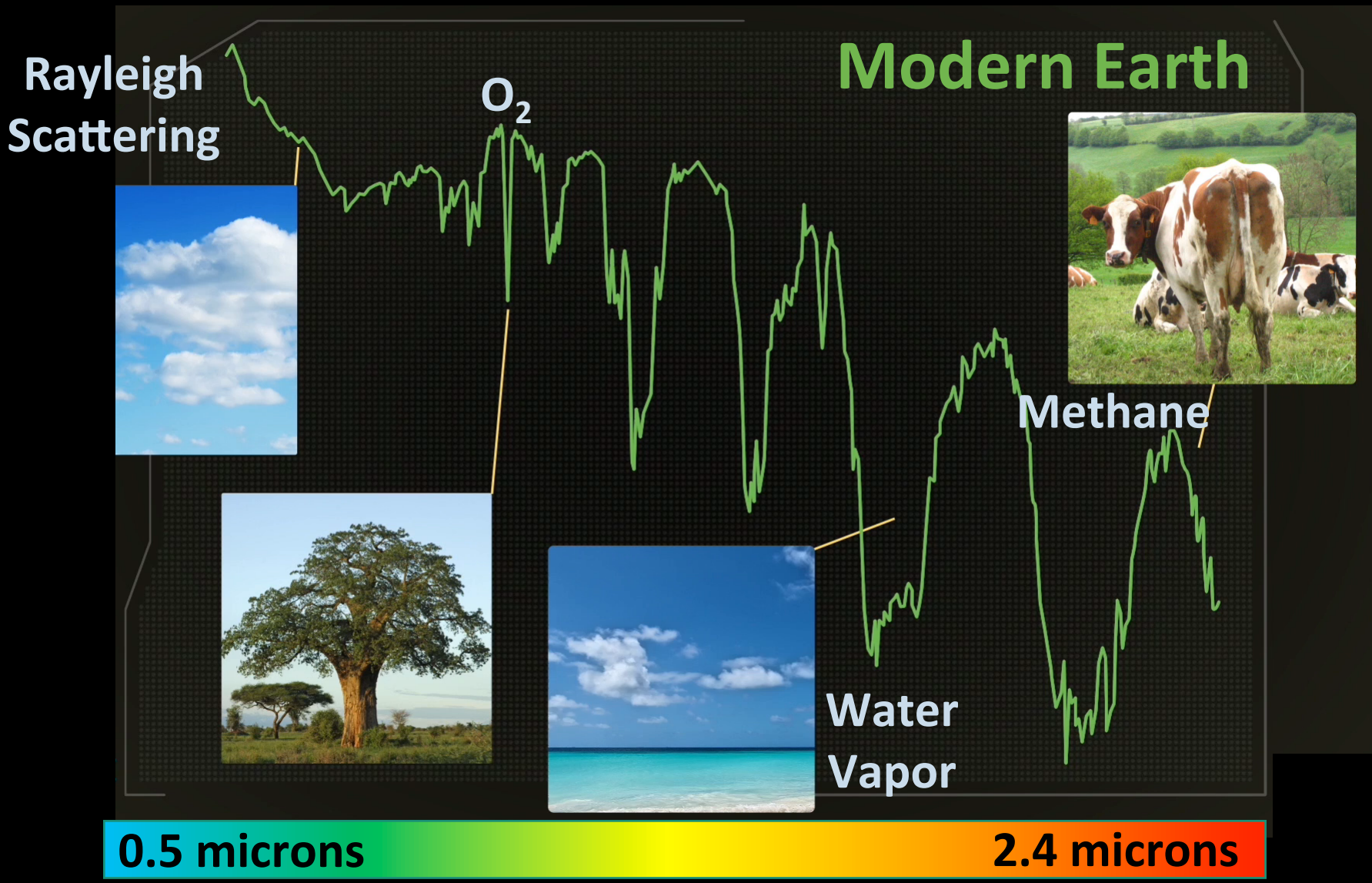
LUVOIR Spectra May Reveal Biosignatures



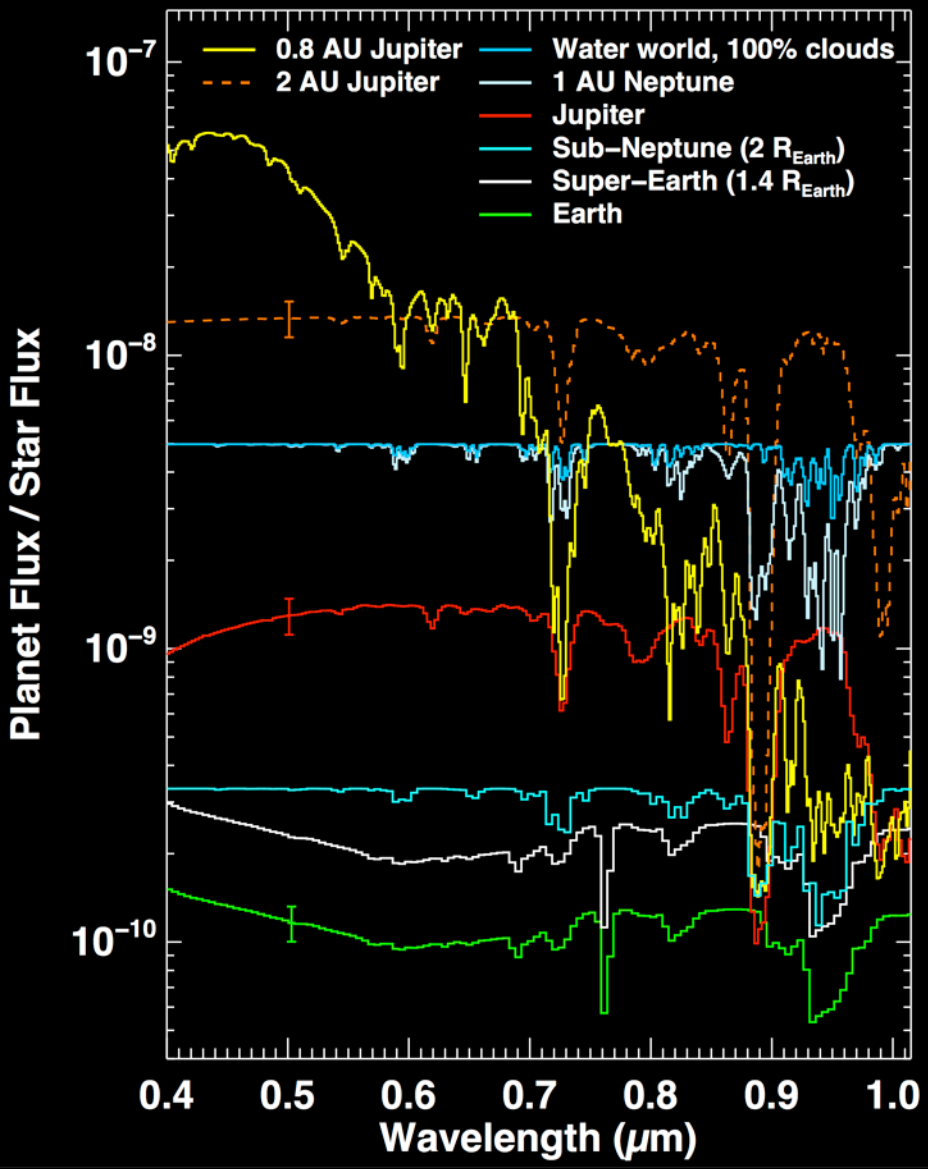
LUVOIR Spectra May Reveal Biosignatures

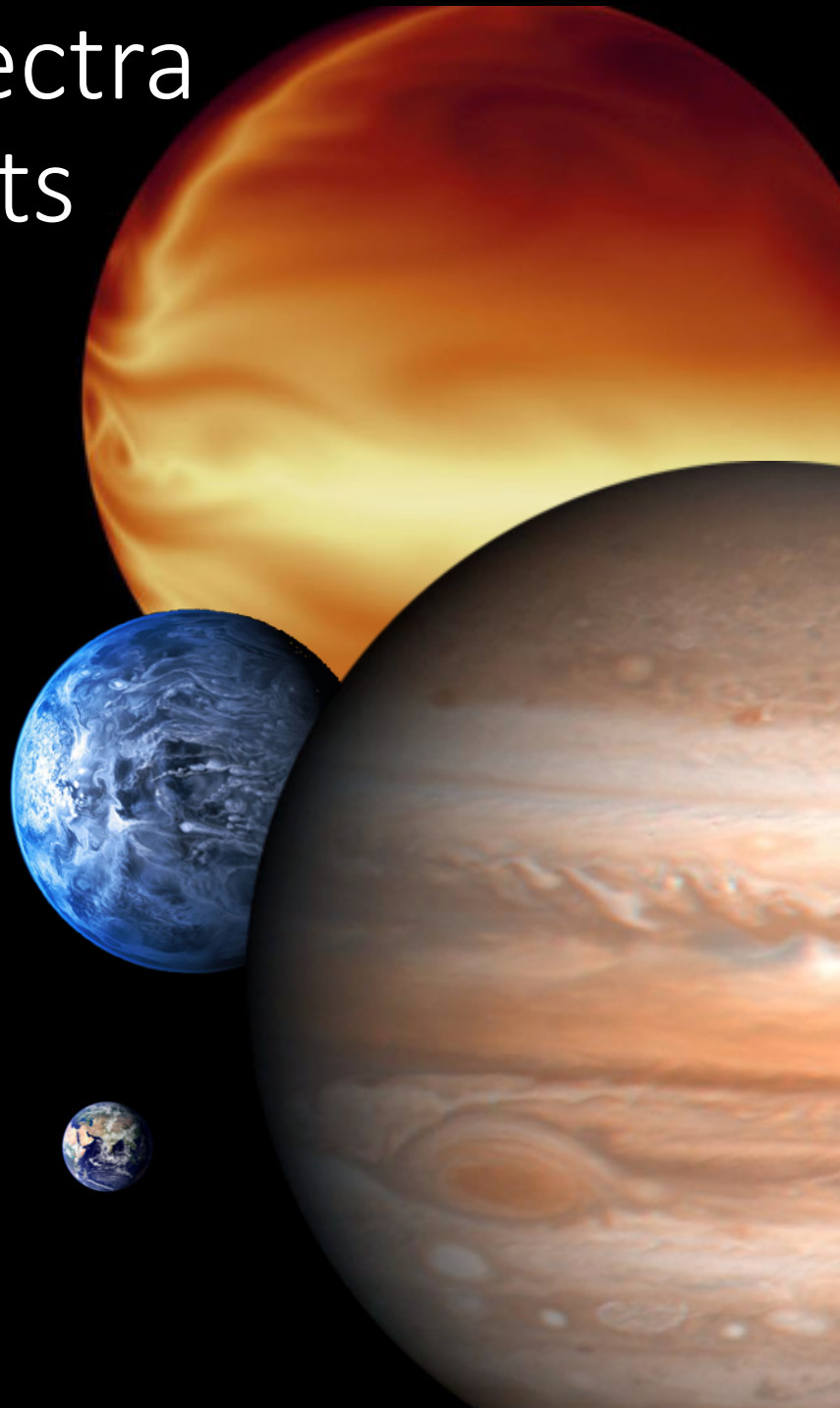


LUVOIR Spectra May Reveal Biosignatures



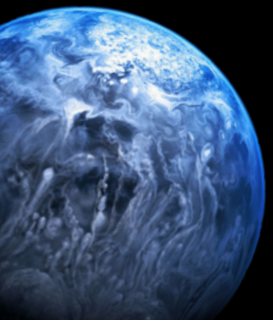
LUVOIR will obtain spectra of many diverse planets





Summary: LUVOIR will Revolutionize Planetary Science

- **Solar System**
  - Detailed views of the outer solar system
  - Real-time monitoring of dynamics
  - Multi-wavelength investigations
- **Exoplanets**
  - Detection & characterization of directly imaged planets
  - Atmospheric characterization of transiting planets
  - Constraints on the **frequency of habitable worlds**



How to Contribute to the LUVOIR Science Requirements

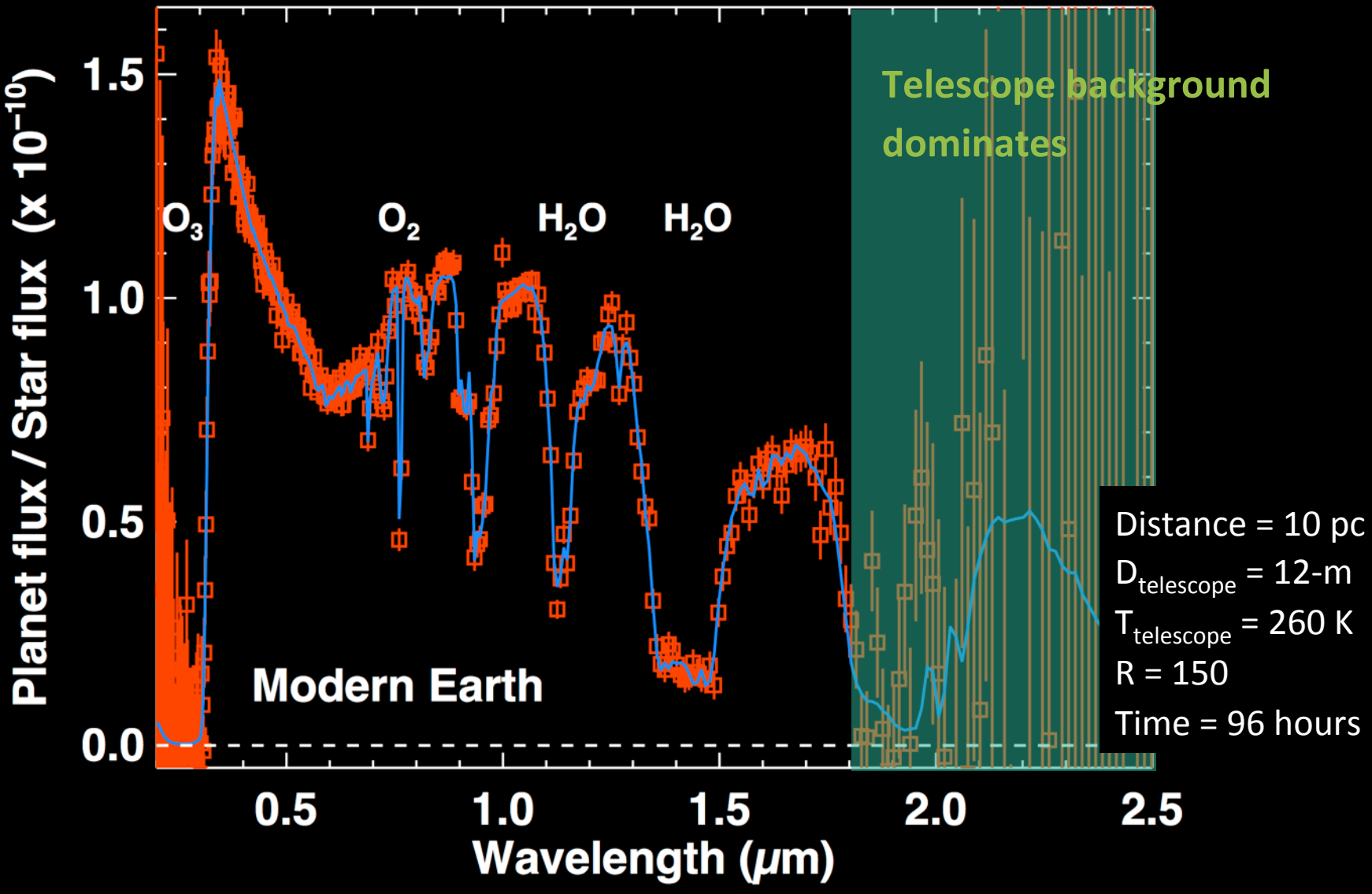
- For Cosmic Origins Science: John O'Meara (jomeara@smcvt.edu)
- For Solar System Science: Walt Harris (wharris@lpl.arizona.edu)
- For Exoplanet Science: Mark Marley (mark.s.marley@nasa.gov)

- Science Working Group website: https://asd.gsfc.nasa.gov/luvoir/wgs/

- Or just speak with Brad, Aki, Marc, Courtney, Jacob, or Daniela at this meeting

Additional Slides

LUVOIR will be warm



Distance = 10 pc

$D_{telescope}$ = 12-m

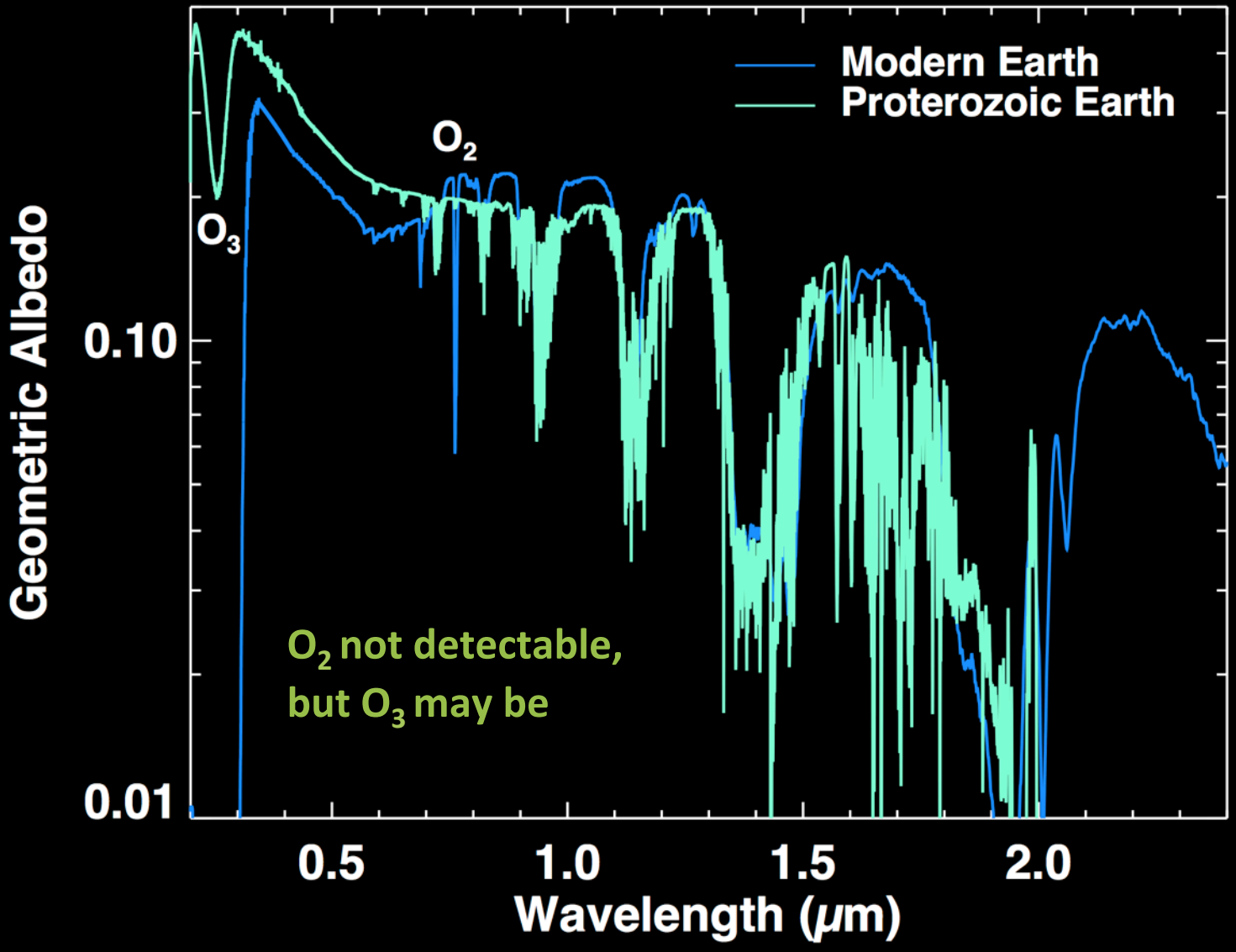
$T_{telescope}$ = 260 K

R = 150

Time = 96 hours

Credit: T. Robinson / G. Arney

Earth looked different in the past



Credit: G. Arney