



Advancing the Search for Exoplanets

Avital Keeley

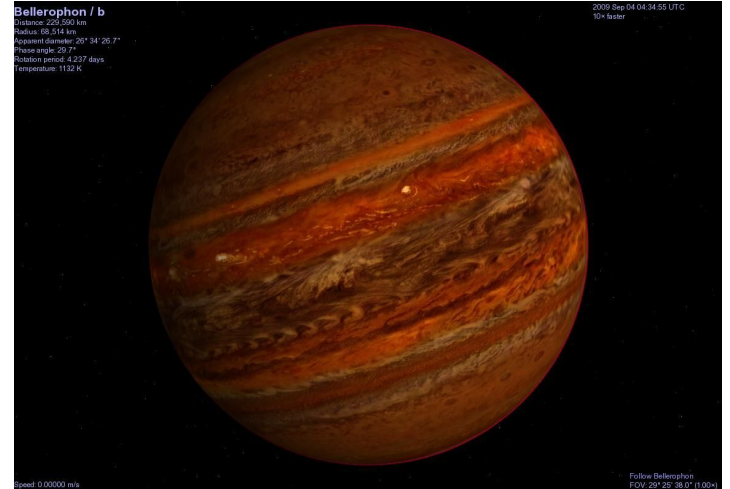
Dr. Max Millar-Blanchaer

Skyler Palatnick



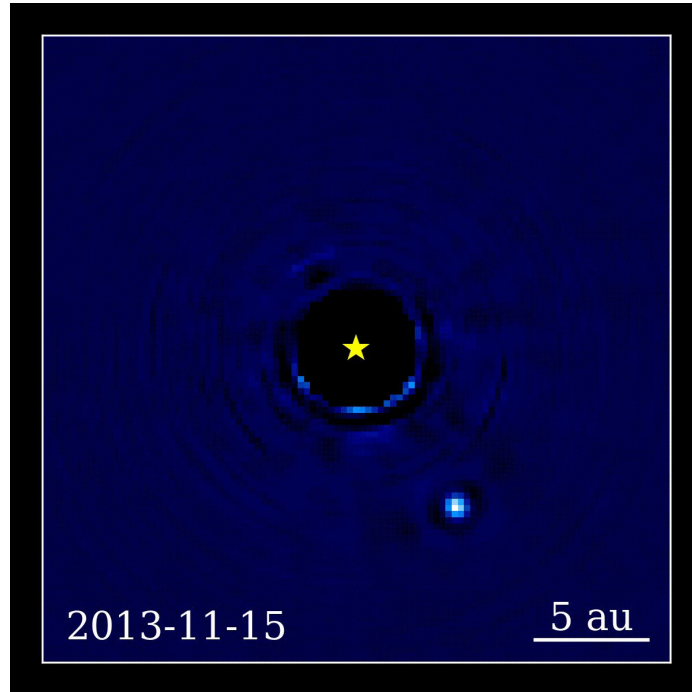
Overview

- Introduce exoplanets
- Explain direct imaging & tools
- Look at code comparing mass sensitivity of instruments



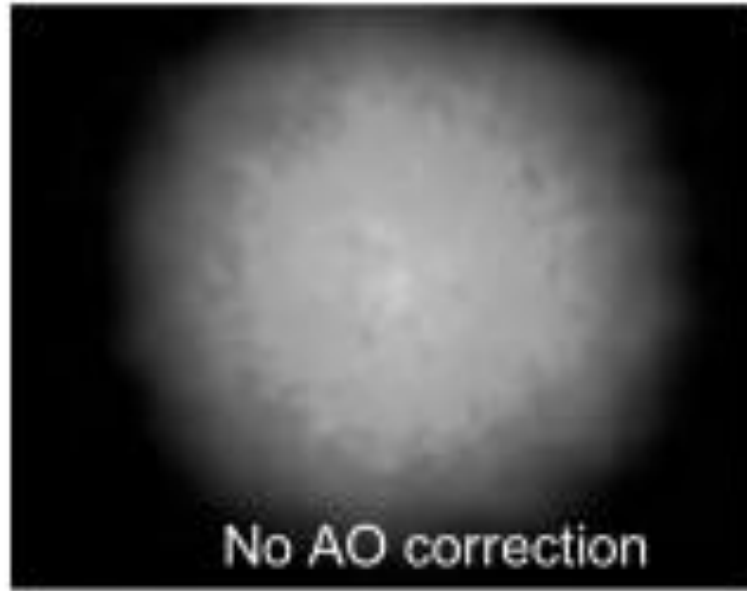
<https://www.pinterest.jp/ideas/>

What is an Exoplanet?



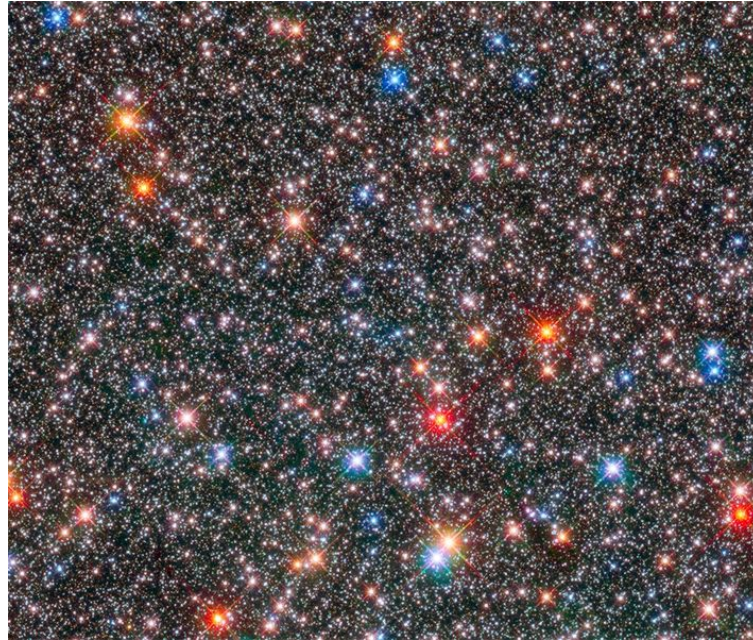
<https://jasonwang.space/orbits.html>

Direct Imaging Process



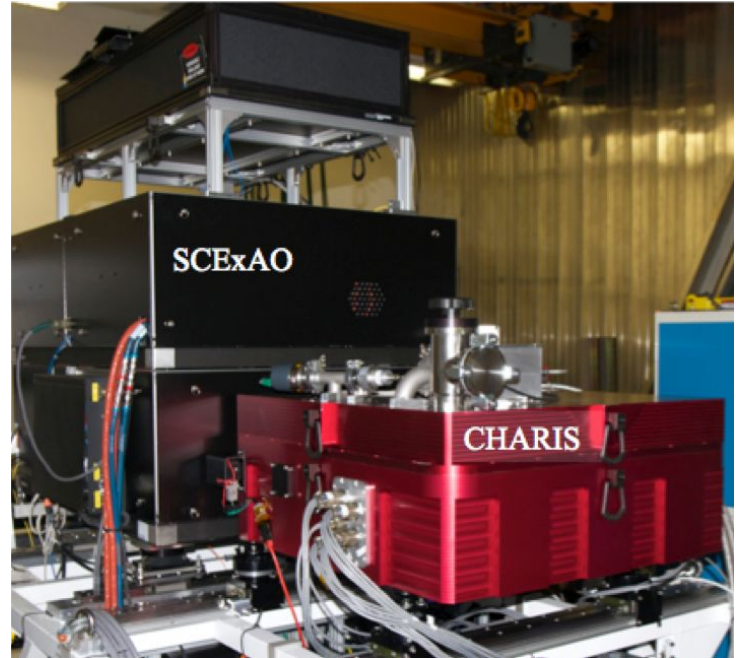
Currie et al. 2022

The Importance of Direct Imaging Technology



<https://www.inverse.com/article/40937-hubble-image-star-swarms-holds-milky-way-clues>

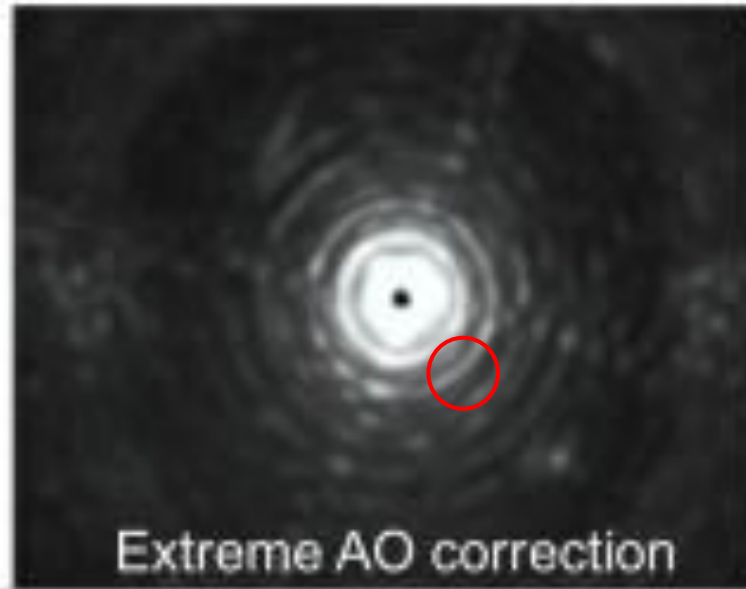
The Path of Starlight



<https://www.nao.ac.jp/en/research/telescope/subaru.html>

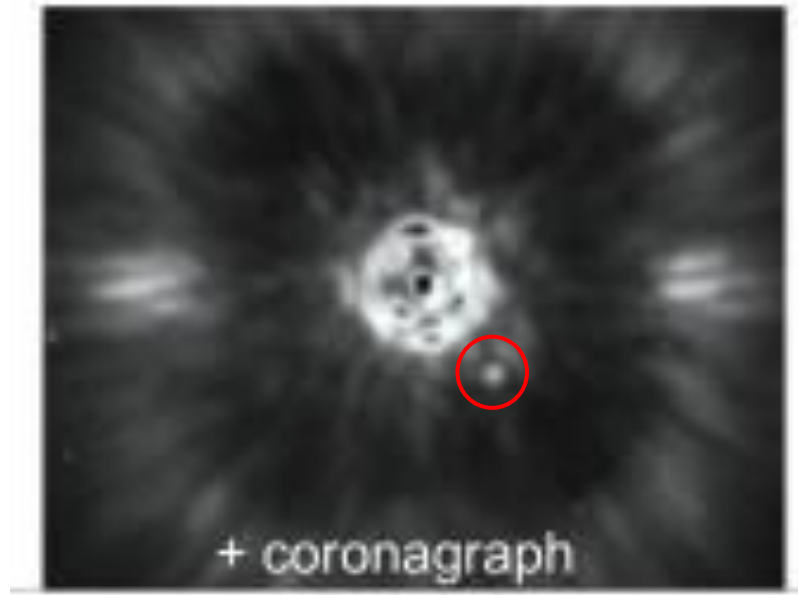
<https://subarutelescope.org/en/results/2020/12/10/2918.html>

Direct Imaging Process



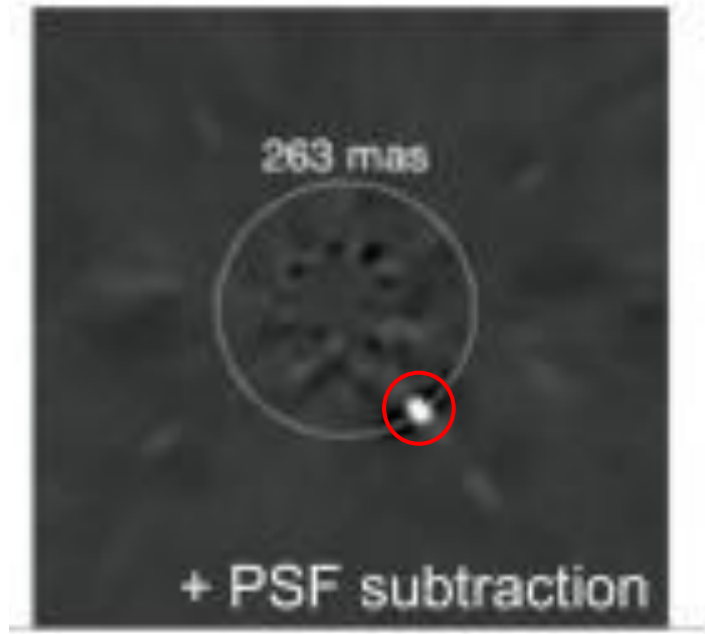
Currie et al. 2022

Direct Imaging Process



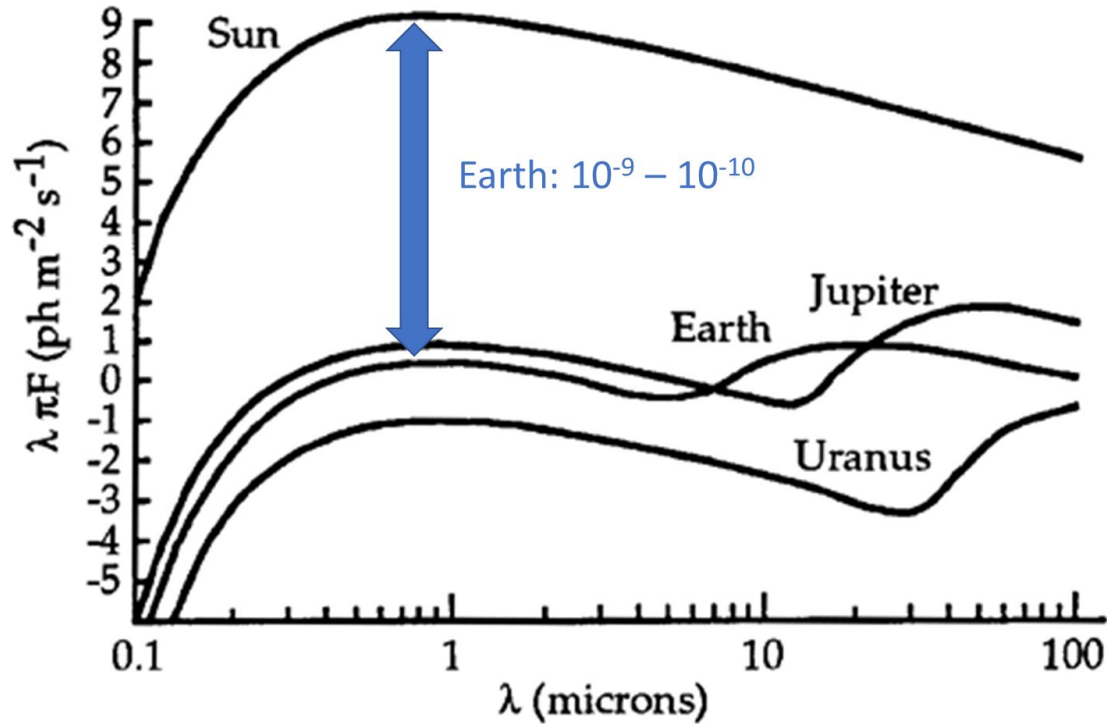
Currie et al. 2022

Direct Imaging Process

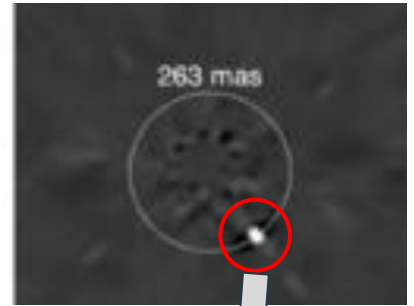
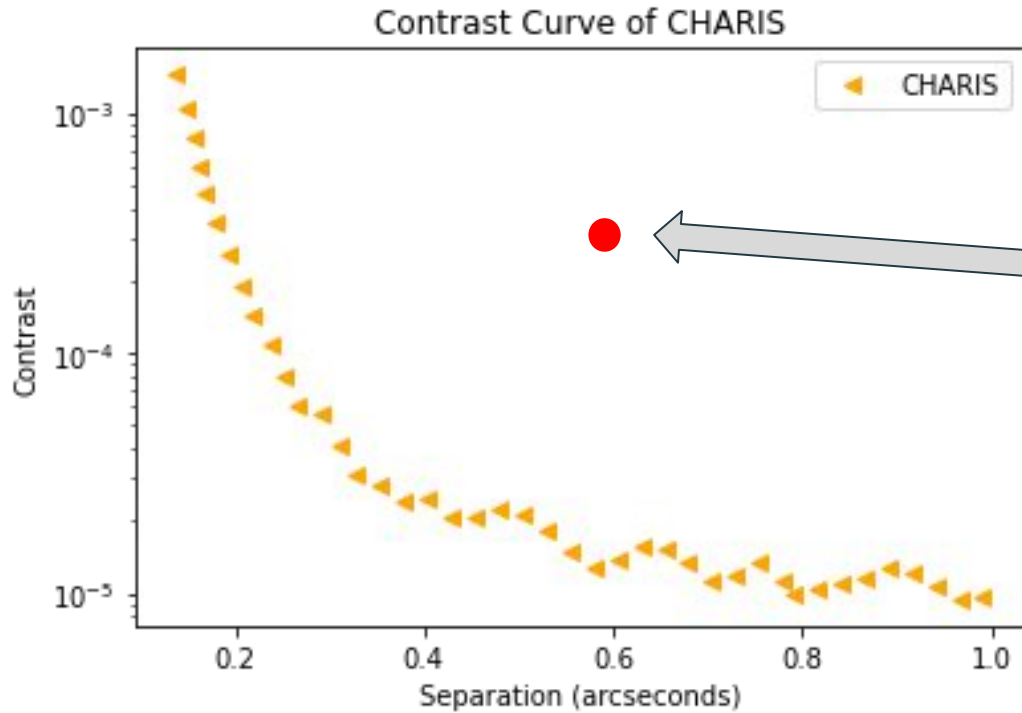


Currie et al. 2022

Current Limitations

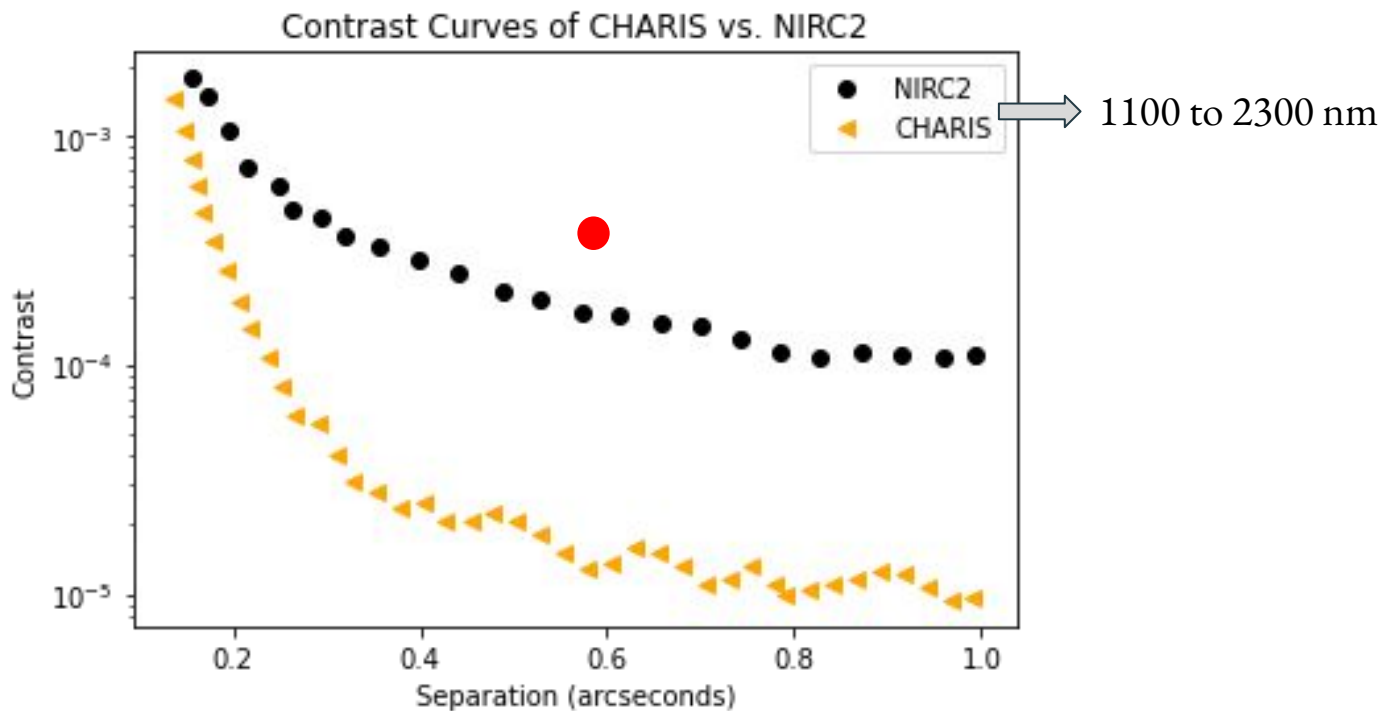


What Are Contrast Curves?

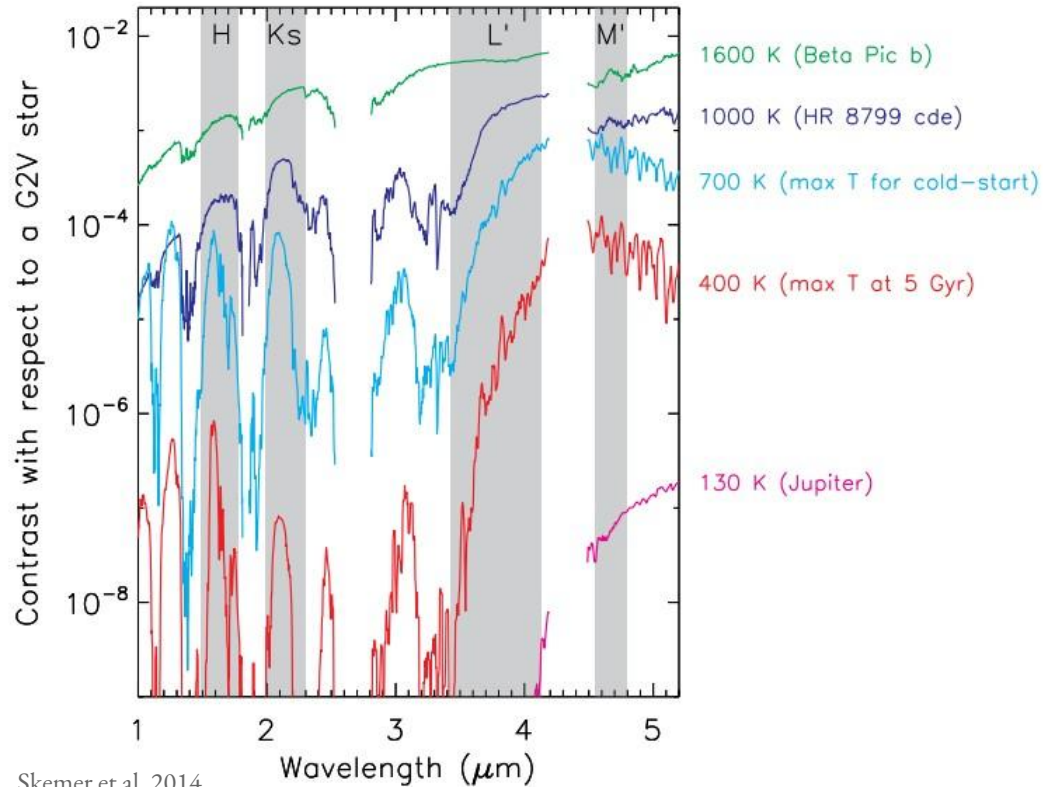


Currie et al. 2022

Determining the Best Instrument from Overlapping Wavelength Capabilities

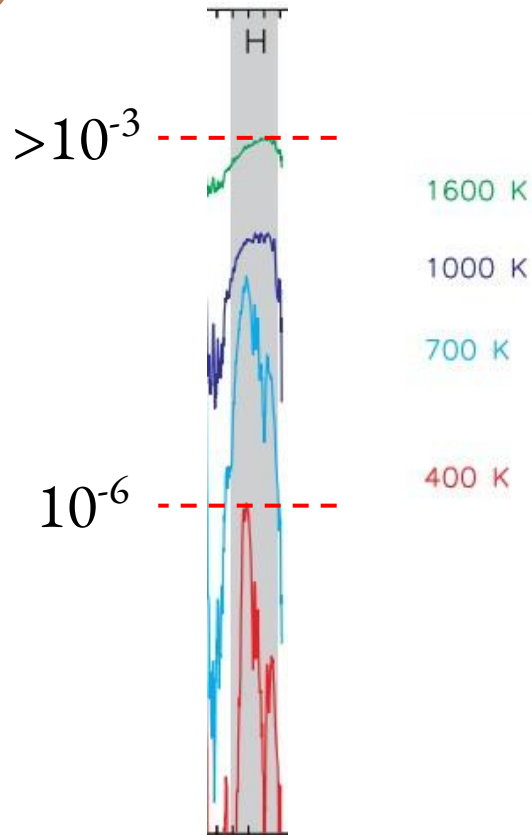


Ages Determine the Best Wavelength for Imaging

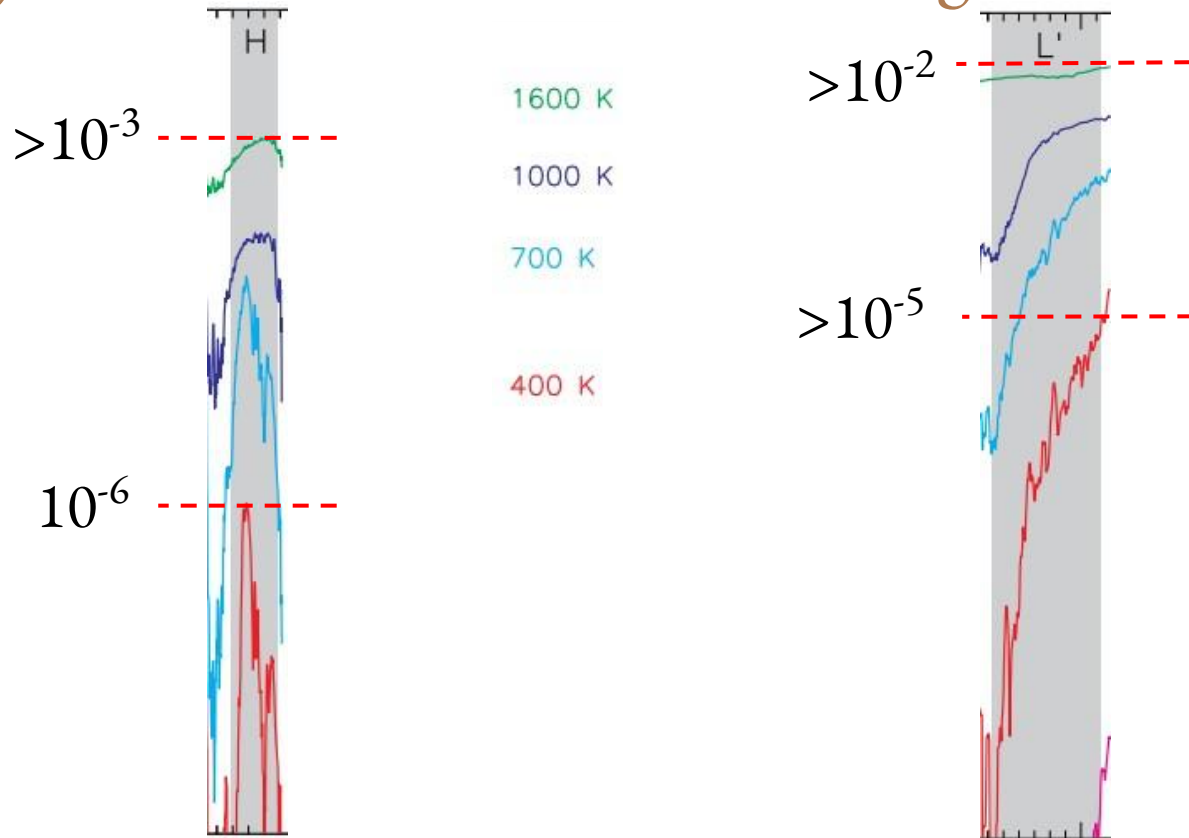


Skemer et al. 2014

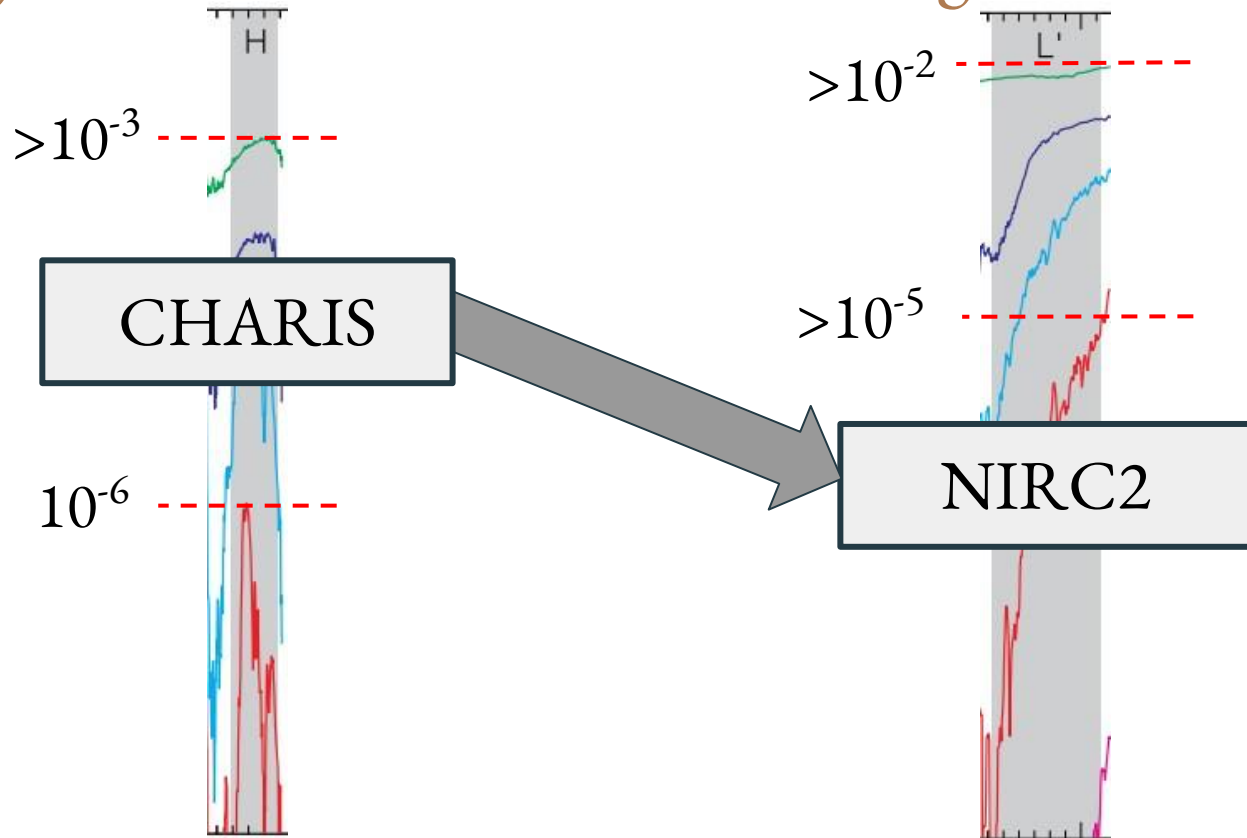
Ages Determine the Best Wavelength for Imaging



Ages Determine the Best Wavelength for Imaging



Ages Determine the Best Wavelength for Imaging



Goal of My Code

Age + stellar magnitude + distance

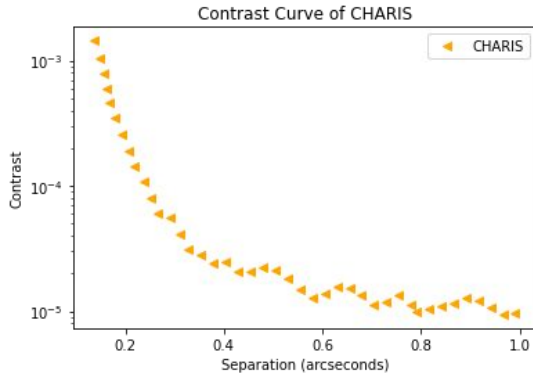
```
graph TD; A[Age + stellar magnitude + distance] --> B[My code]; B --> C([Planet mass]);
```

The diagram is a vertical flowchart. At the top is a yellow rectangular box containing the text 'Age + stellar magnitude + distance'. A large yellow arrow points downwards from this box to a smaller yellow rectangular box containing the text 'My code'. Another large yellow arrow points downwards from the 'My code' box to a grey oval containing the text 'Planet mass'.

My code

Planet mass

Goal of My Code

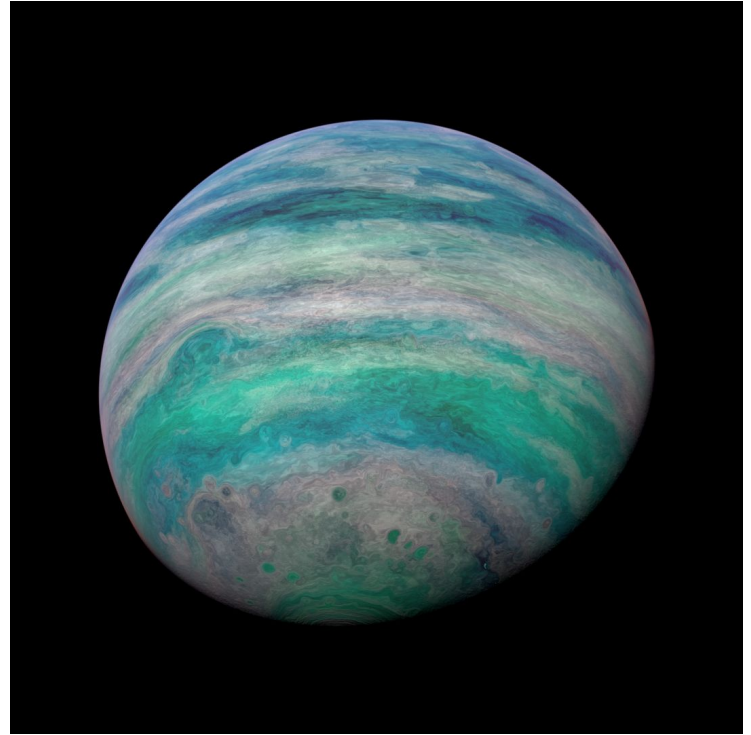


Instrument
contrast +
separation &
evolutionary
models

User
inputs

Predicted mass
vs. separation
plot

Evolutionary Models

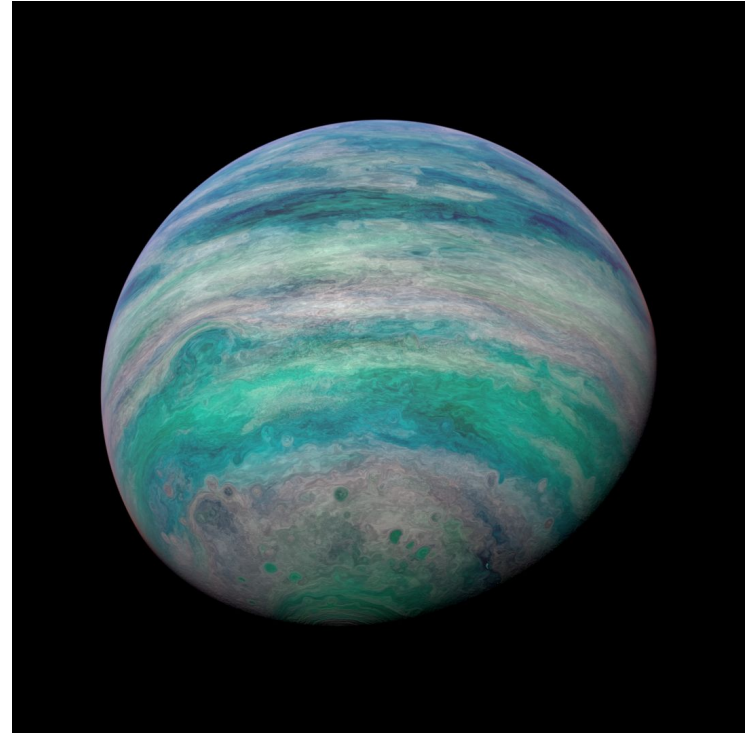


<https://www.turbosquid.com/3d-models/exoplanet-alien-planet-gas-3d-1221998>

Evolutionary Models



<https://scitechdaily.com/rocky-earth-sized-exoplanet-is-missing-an-atmosphere-video/>



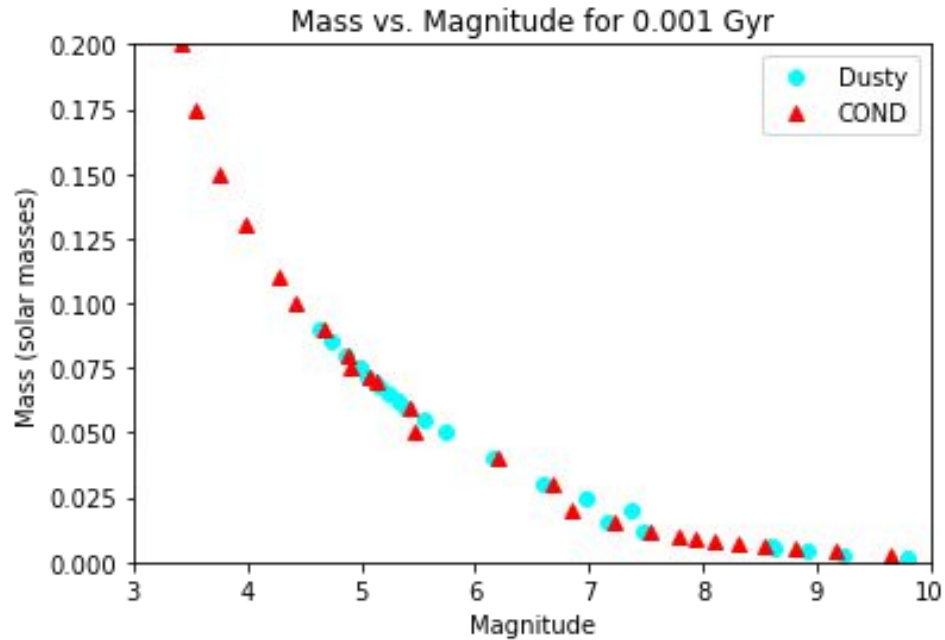
<https://www.turbosquid.com/3d-models/exoplanet-alien-planet-gas-3d-1221998>

COND

vs.

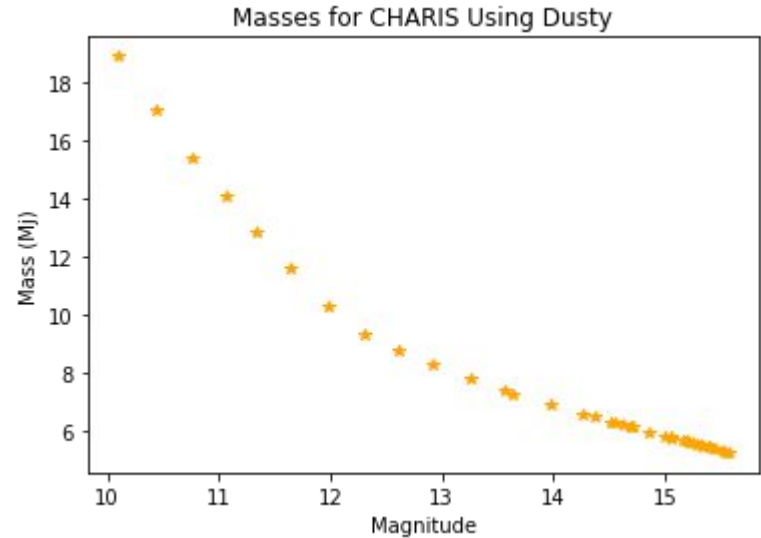
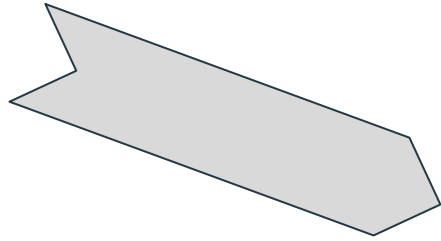
Dusty

Age: 0.001 Gyr



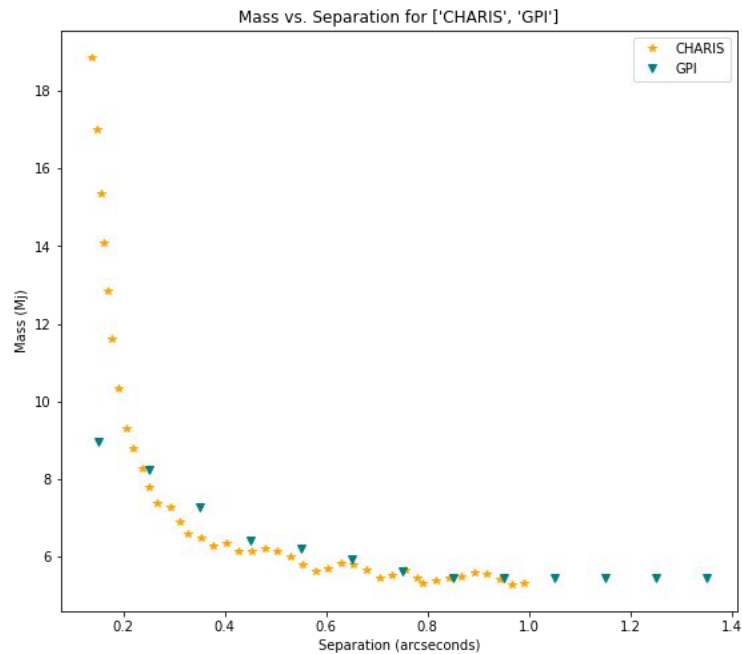
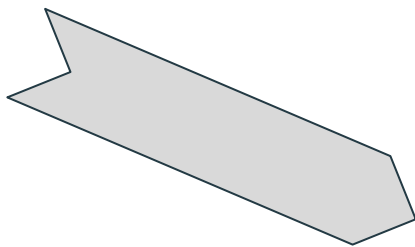
Function by Function

Find_masses (instrument, model, inputs)

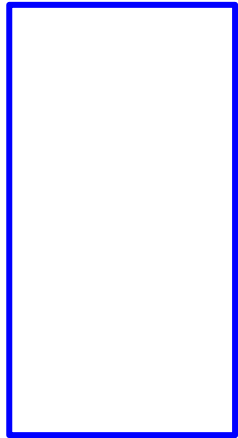


Function by Function

Compare_instruments ([instruments], model, inputs)

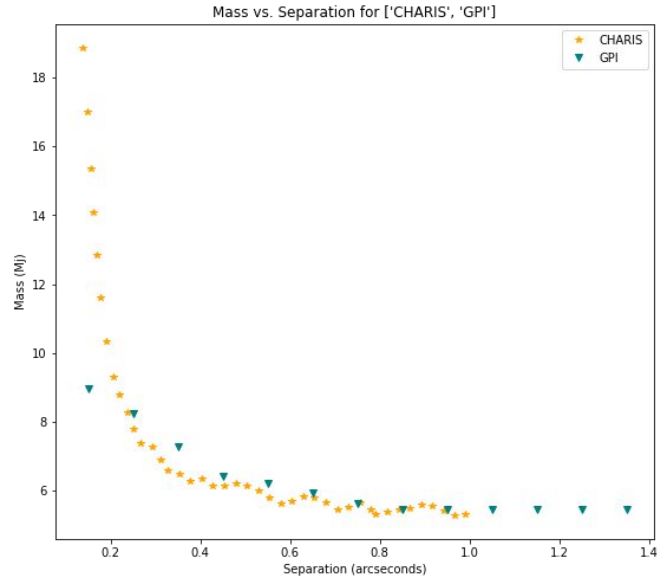
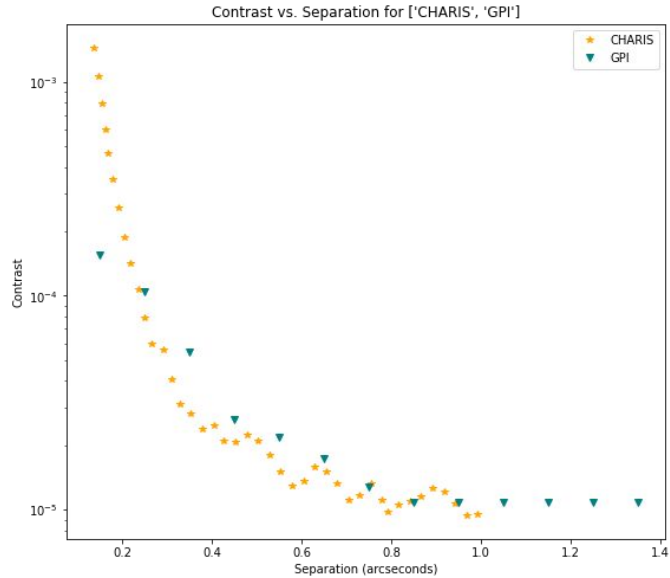


Function by Function



Instrument_picker

Final Plots



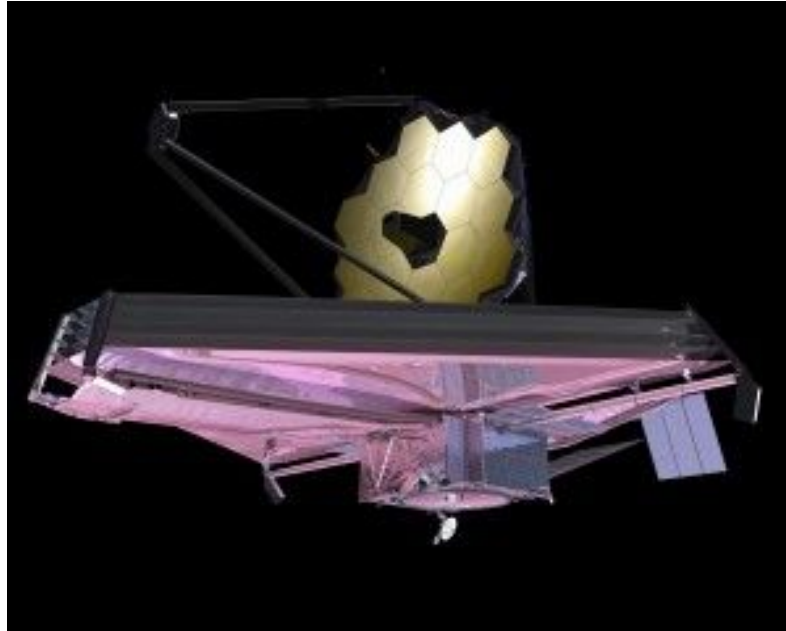
Model: Dusty

Stellar magnitude: 9

Age (Gyr): 0.05

Distance (parsecs): 100

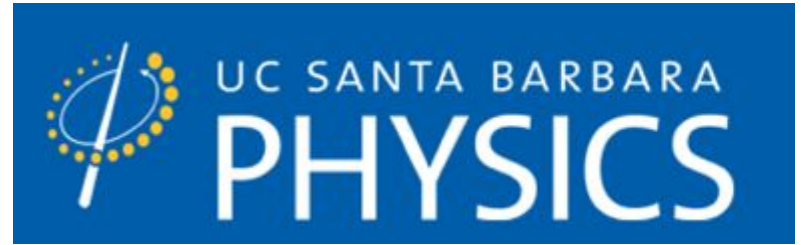
Next Steps



<https://museumplanetarium.org/event/mission-overview-james-webb-space-telescope/>

Acknowledgments

- National Science Foundation - Funding
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