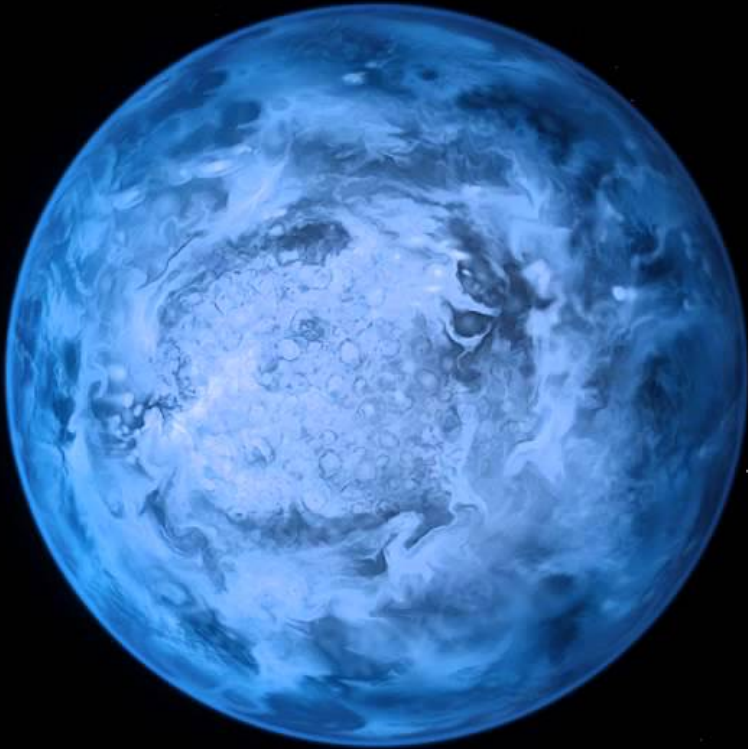


A JWST MIRI Emission Spectrum of the Benchmark Hot Jupiter HD 189733b

Julie Inglis, Heather Knutson, Nikole
Lewis, Tiffany Kataria, and Natasha Batalha

In collaboration with Brian Kilpatrick (Program
PI), Ian Crossfield, Greg Henry, David Sing,
Kevin Stevenson, Hannah Wakeford, David
Grant, Rob Zelle, and Maura Lally





HD 189733 b

$T_{\text{eq}} = 1200 \text{ K}$
Mass = $1.1 M_{\text{Jup}}$
Radius = $1.1 R_{\text{Jup}}$



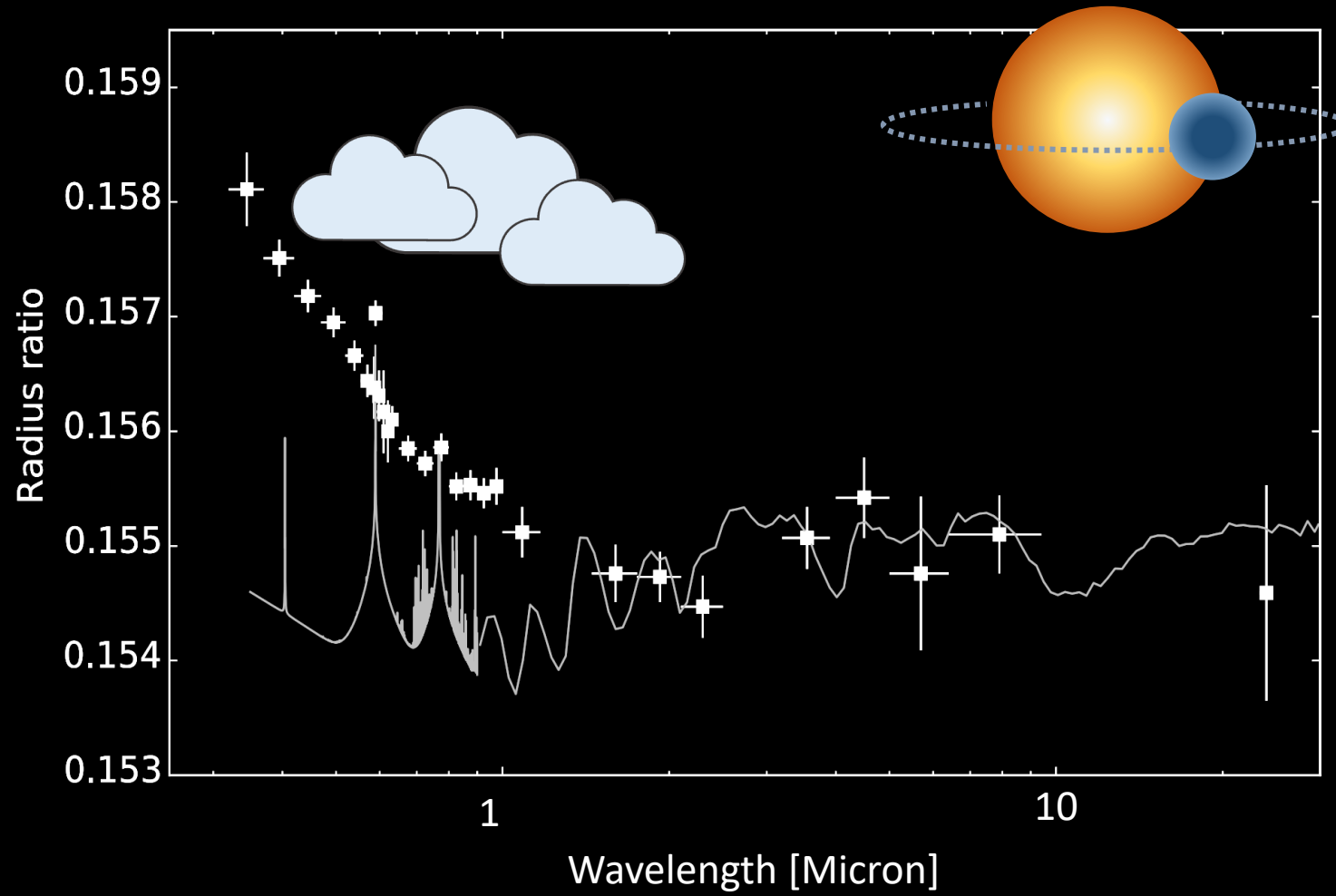
Jupiter

Image credit: ESO/M. Kornmesser

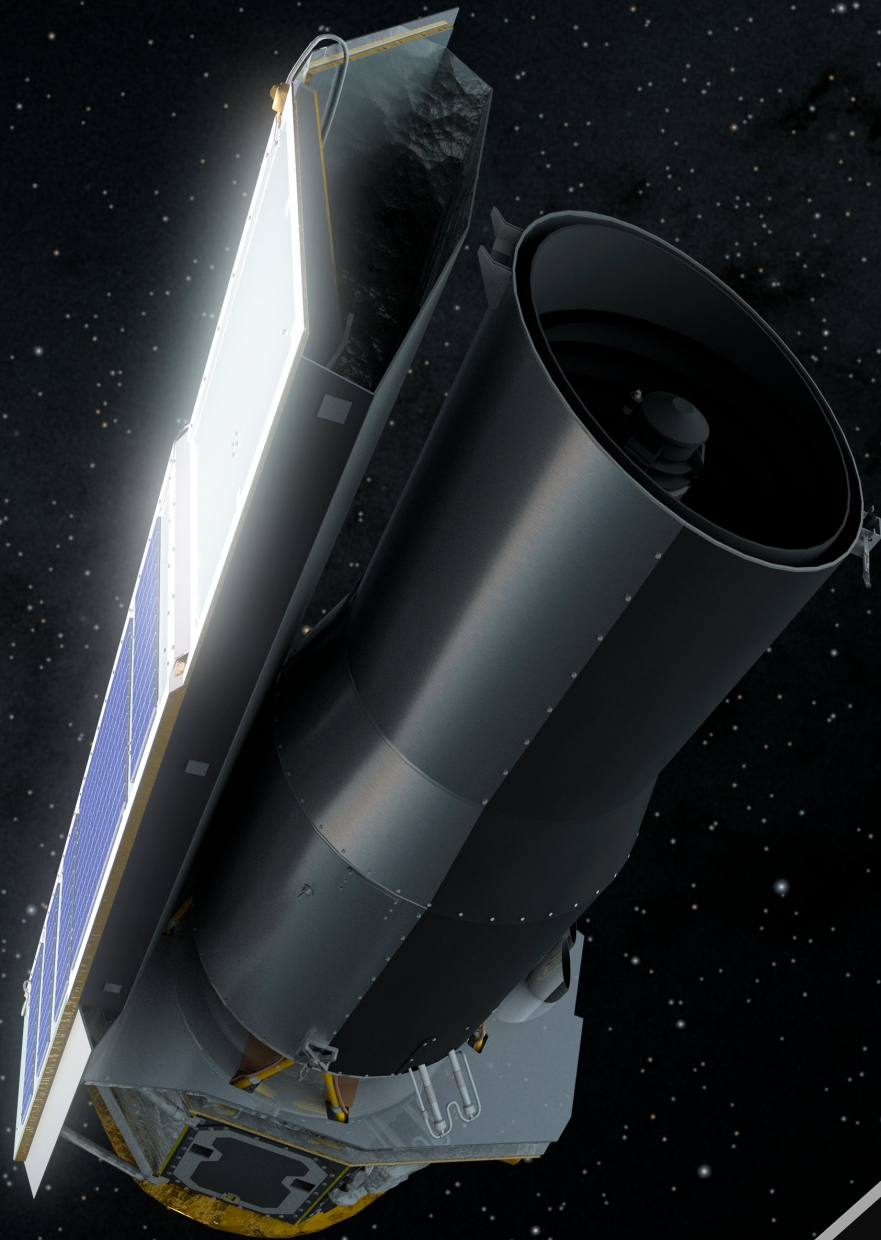


HST

Evidence for aerosols in transit



Plot from Madhusudhan+ 2016
Original data: Pont+ 2013



Spitzer

Global Temperature
NASA / JPL-Caltech /



THE NIGHTMARE WORLD OF
HD 189733 b
PRESENTS

RAINS OF TERROR

THIS FAR-OFF BLUE PLANET MAY LOOK LIKE A FRIENDLY HABITABLE WORLD, BUT DON'T BE DECEIVED!
WEATHER ON THIS WORLD IS DEADLY! THE PLANET'S COBBALT BLUE COLOR COMES FROM A
HAZY, BLOW-TORCHED ATMOSPHERE CONTAINING GASES LADDED WITH GLASS!
HOWLING WINDS SEND THE STORMING GASES SLIDING AT 3,400 MPH (2043) AROUND THE PLANET!
IT'S DEATH BY A MILLION CUTS ON THIS
SLASHER PLANET!

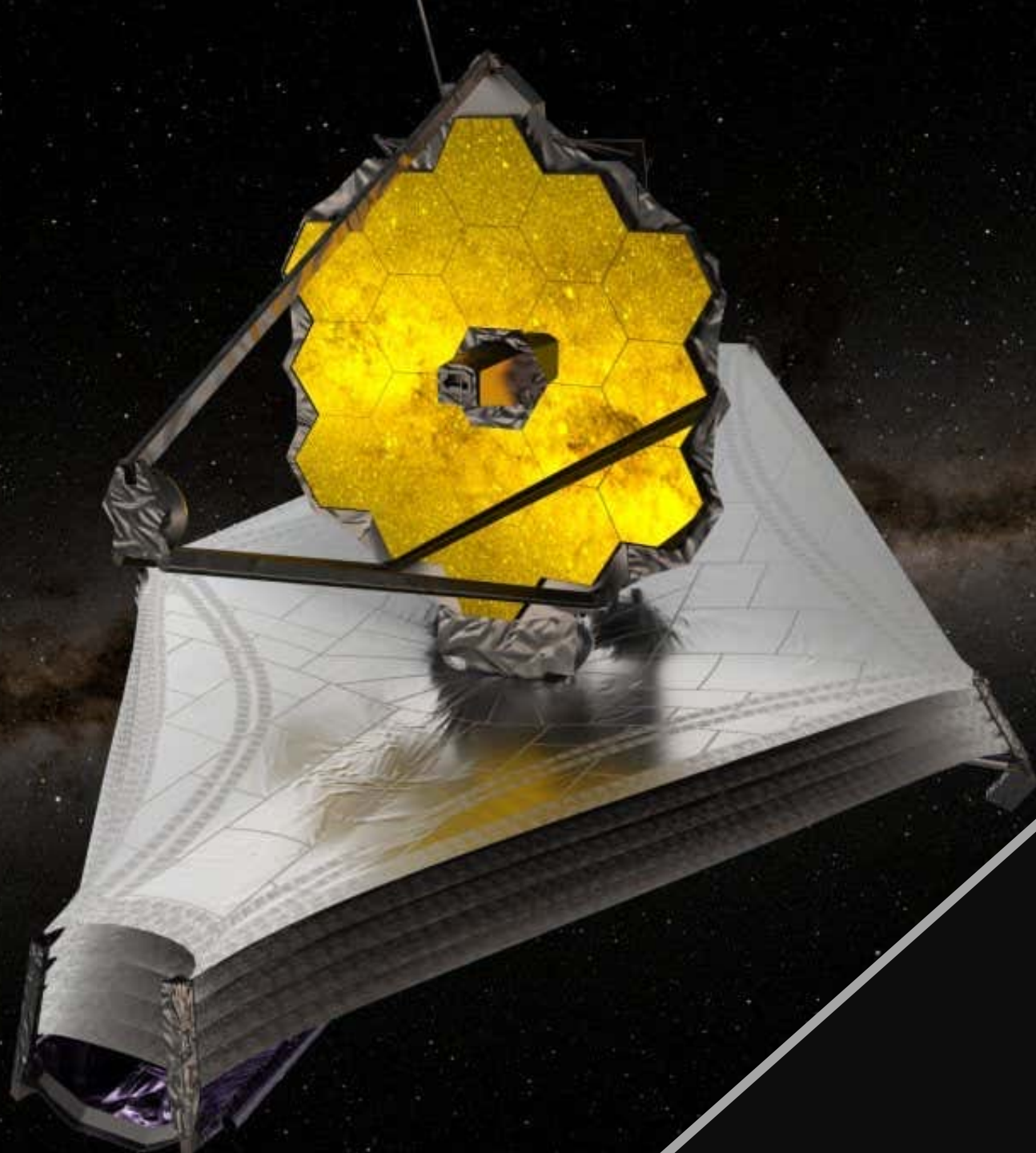
www.nasa.gov

GALAXY OF HORRORS
exoplanets.nasa.gov

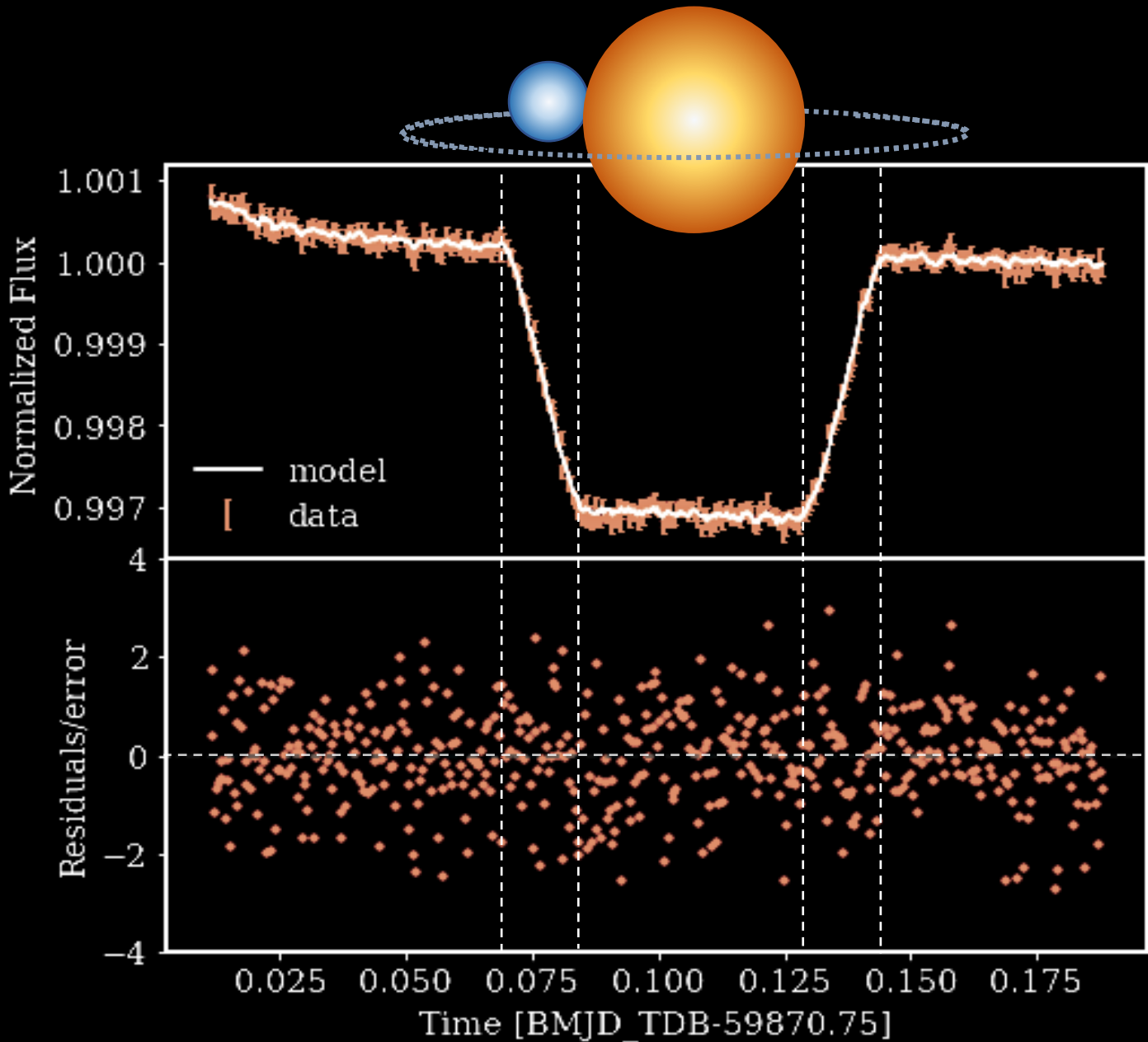
BASED ON REAL SCIENCE

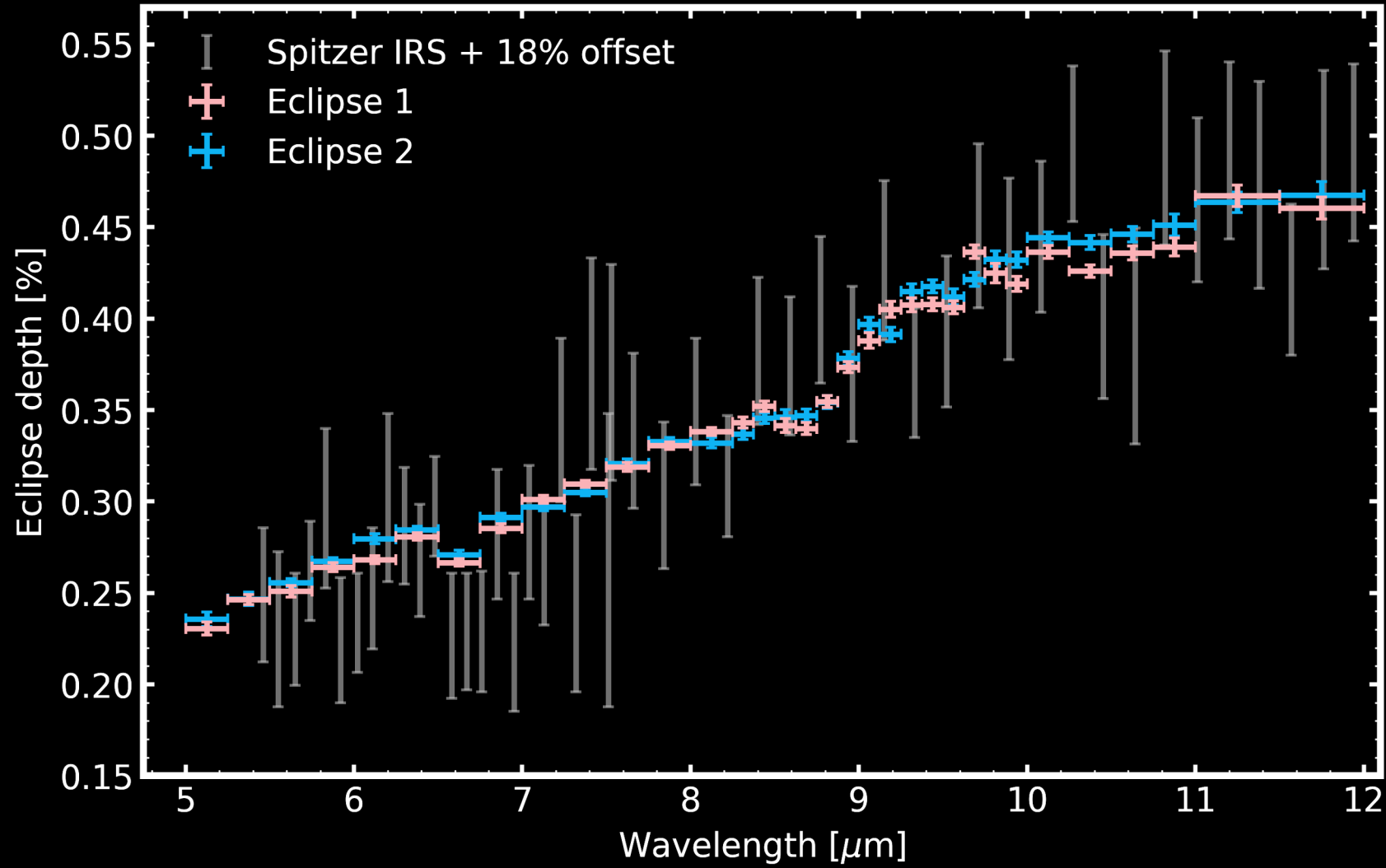
Keck
GAS GIANT
Discovered in 2005
Detected using radial velocity
A Haute-Provence Observatory discovery

Telescope • IRAC
ssc2007-09a

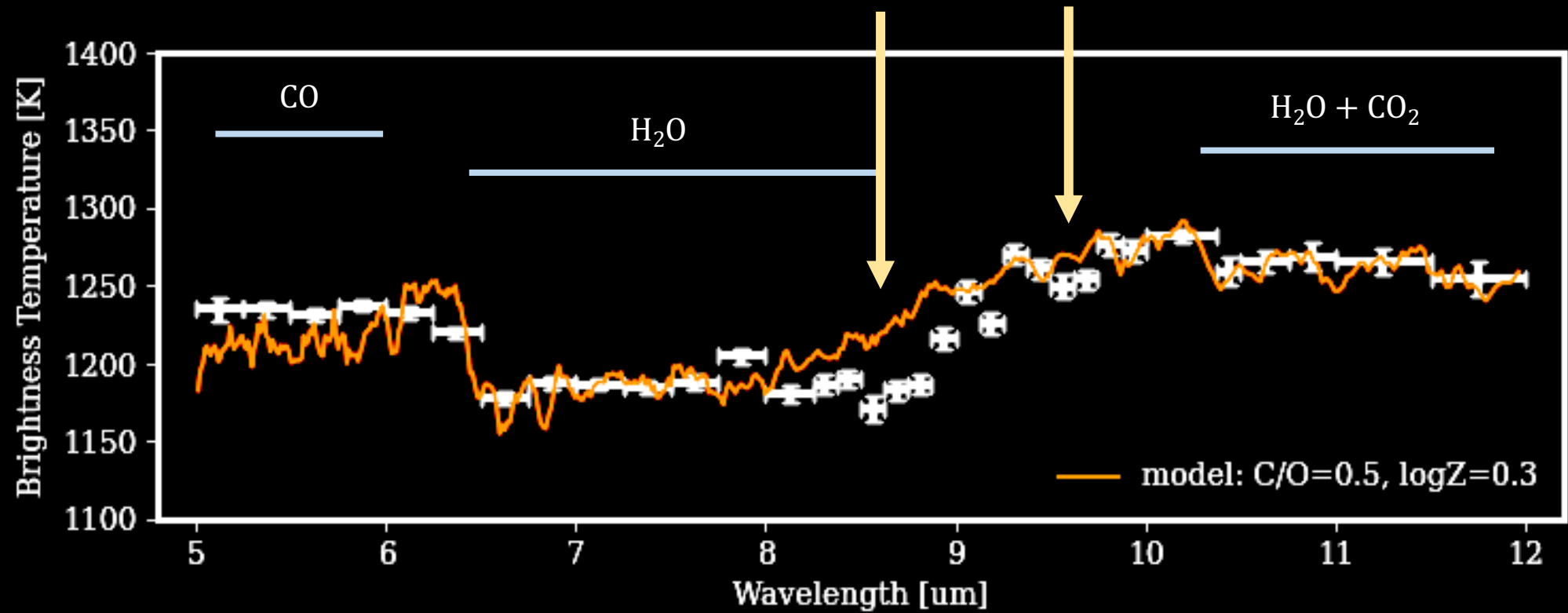


JWST

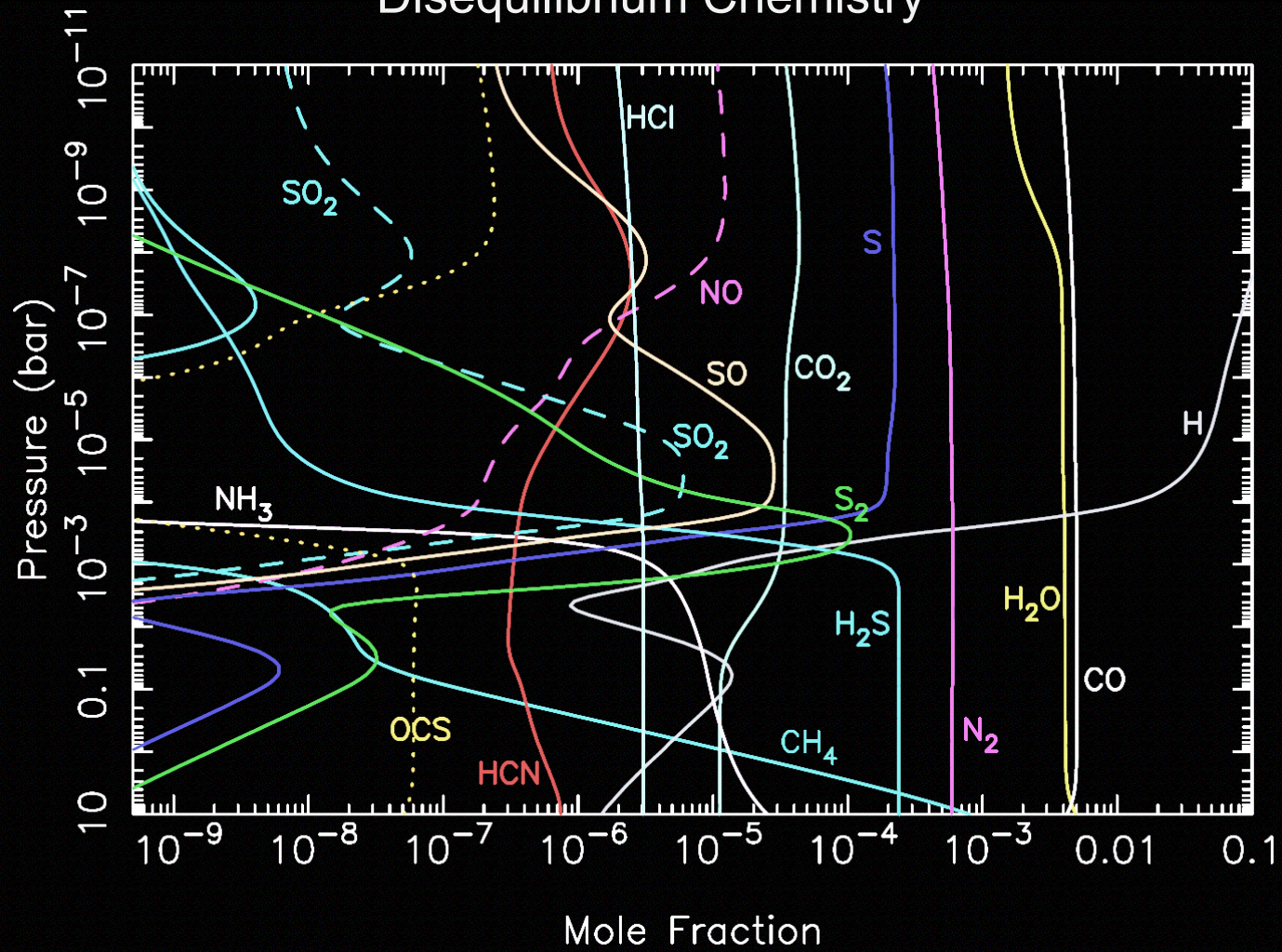




We see excess absorption from 8-9.5 microns



Disequilibrium Chemistry



Photochemical models by Julie Moses

Mystery absorber?

Gas Phase

Sulfur

H_2S
 SO_2
 OCS

Hydrocarbons

HCN
 C_2H_2
 C_2H_4
 C_2H_6

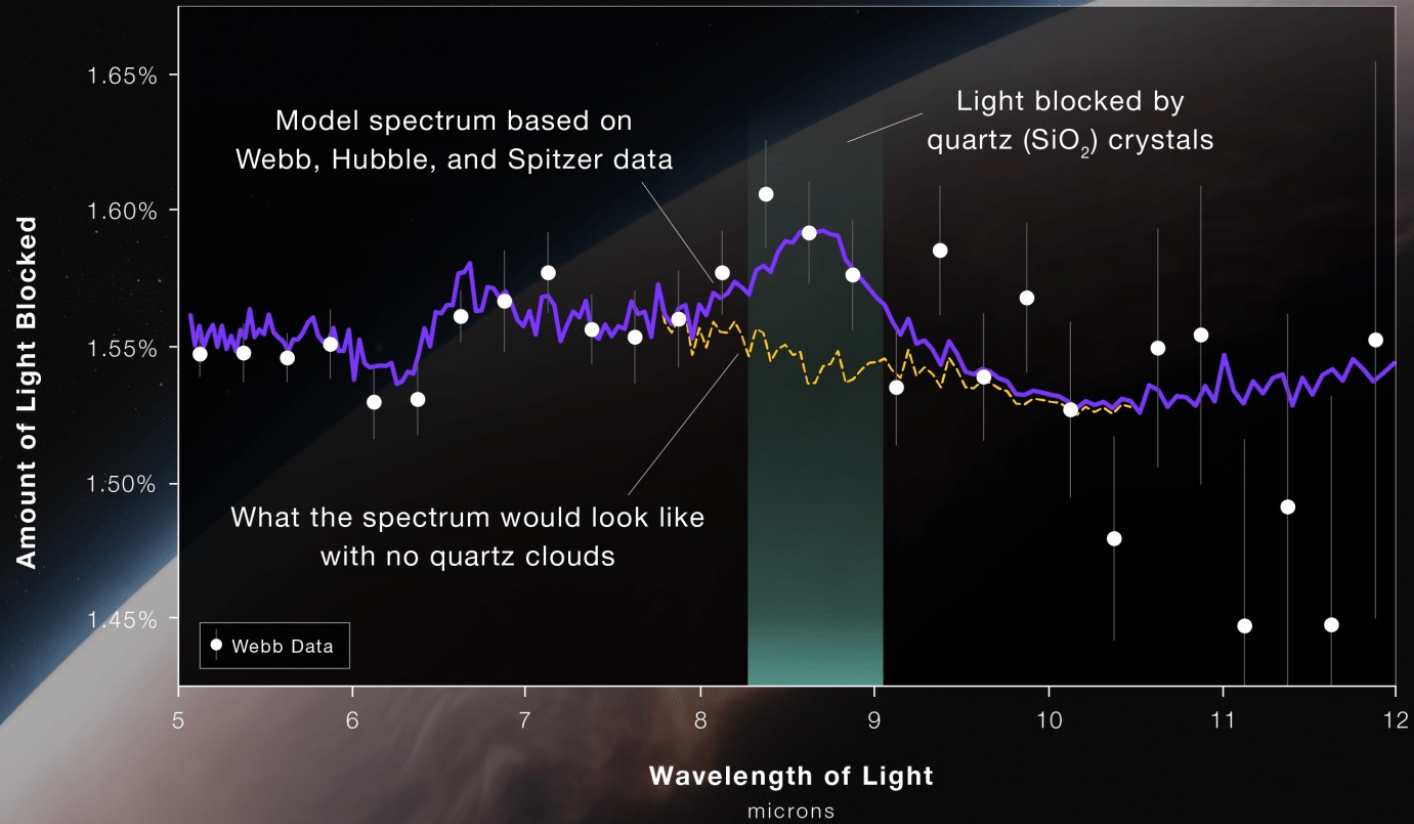
O_2
 H_3^+

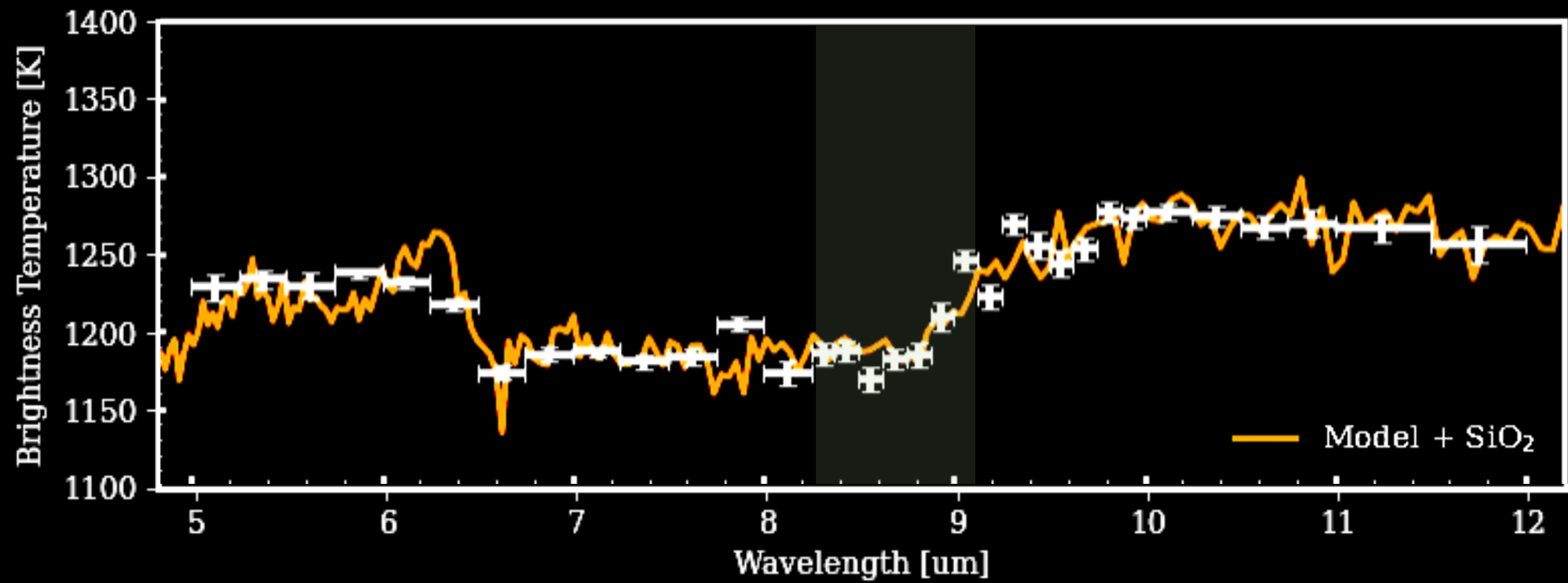
Low temperature

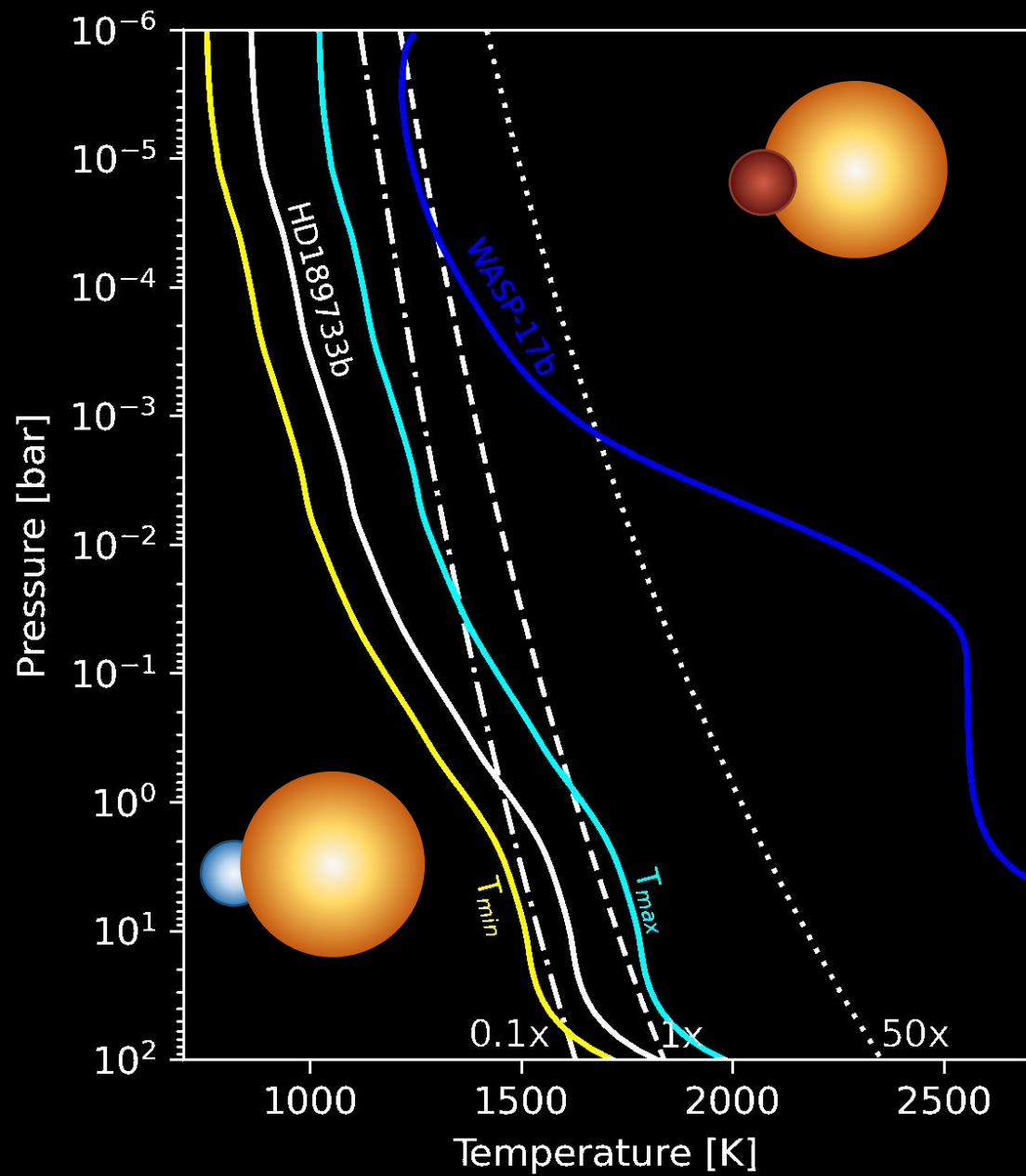
NH_3
 N_2O
 CH_4



COMPOSITION OF CLOUD PARTICLES







What's Next?

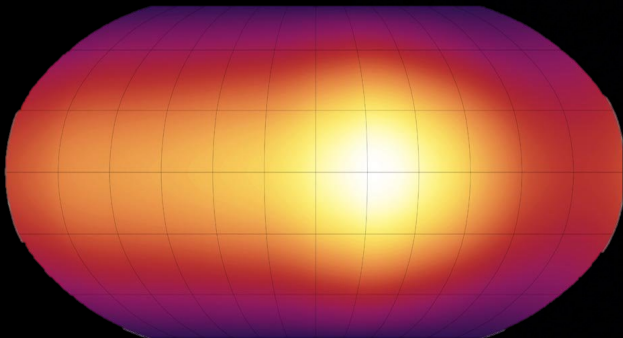
2.4 - 28 um coverage over 50 science hours!

Transit:

NIRCAM (GTO 1274, PI J. Lunine)
MIRI LRS (GO 2021, PI B. Kilpatrick)

Eclipse:

NIRCAM (GO 1633, PI D. Deming)
MIRI LRS (GO 2001, PI M. Min)
MIRI MRS (GO 163, PI D. Deming)



Eclipse map coming soon!
(See Maura Lally's talk at AAS)

