

BRIGHT STAR, FADING WORLD

Dusty Debris of a Dying Planet

Marc Hon, Avi Shporer, Saul Rappaport, Andrew Vanderburg
and the MIT TESS Science Office

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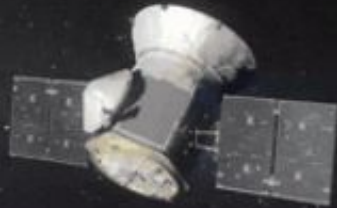
Email: mtyhon@mit.edu



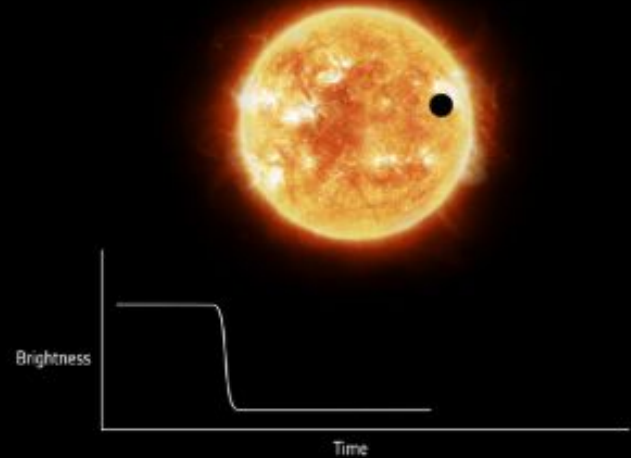
Massachusetts
Institute of
Technology

The Transiting Exoplanet Survey Satellite (TESS)

discovers planets crossing our line of sight

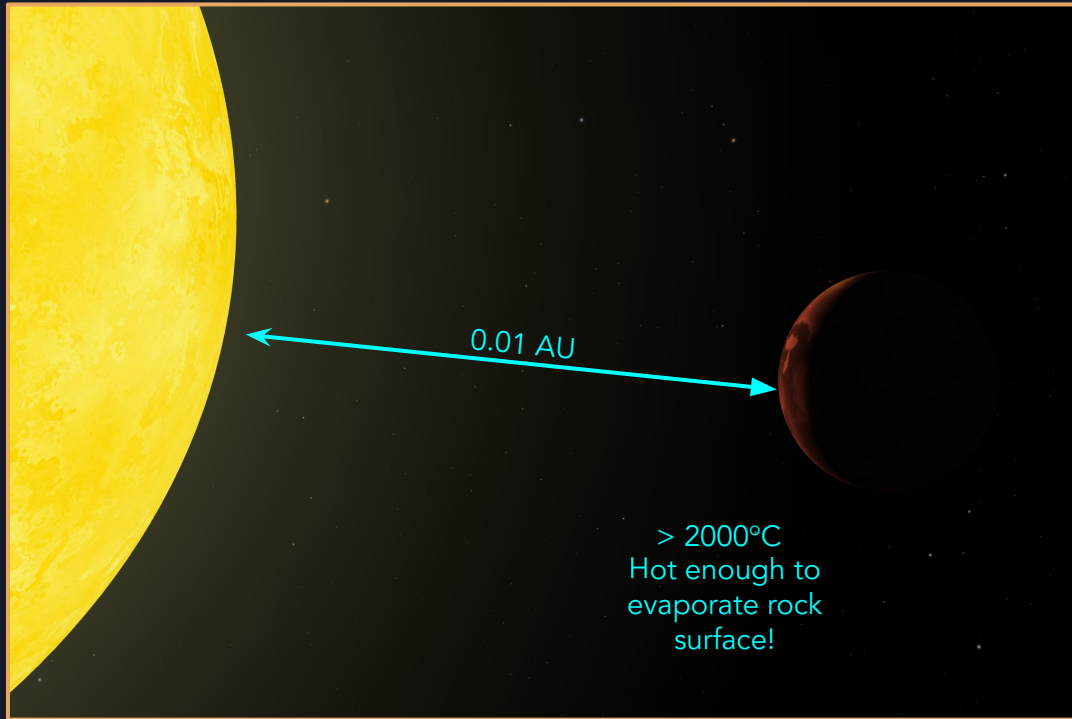


Credit: NASA Goddard Space Flight Center

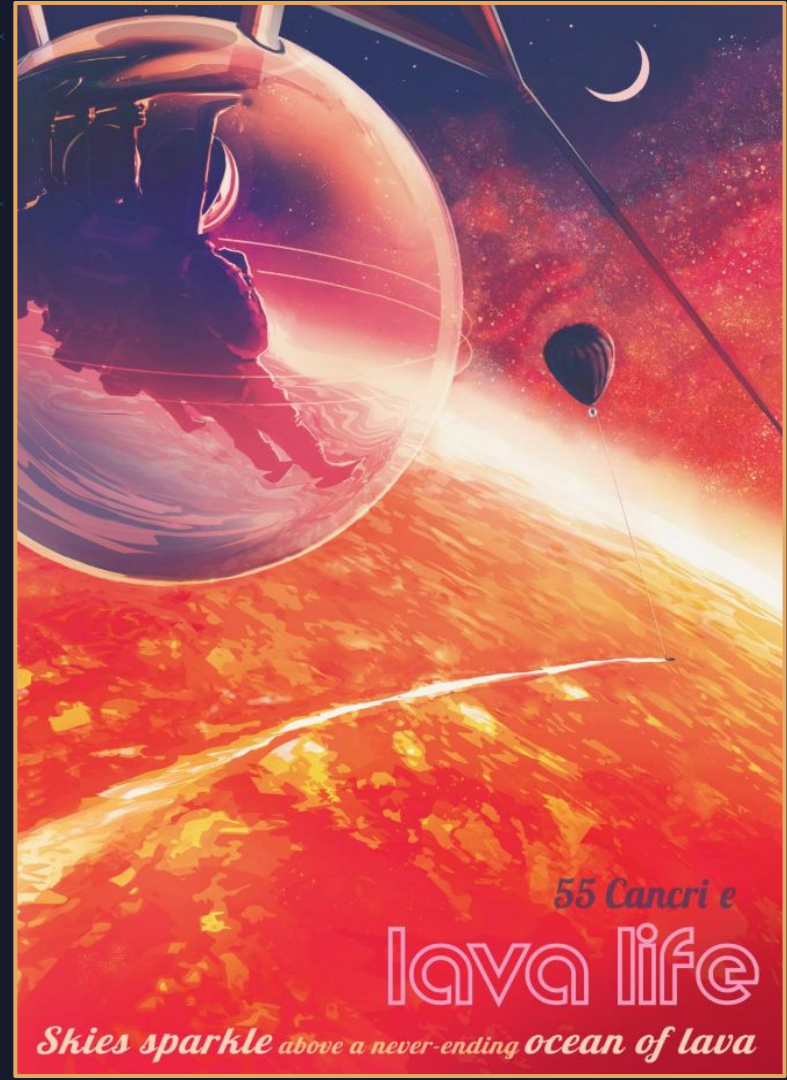


Credit: European Space Agency

These planets are lava worlds!



NASA Exoplanets



55 Cancri e
lava life
Skies sparkle above a never-ending ocean of lava



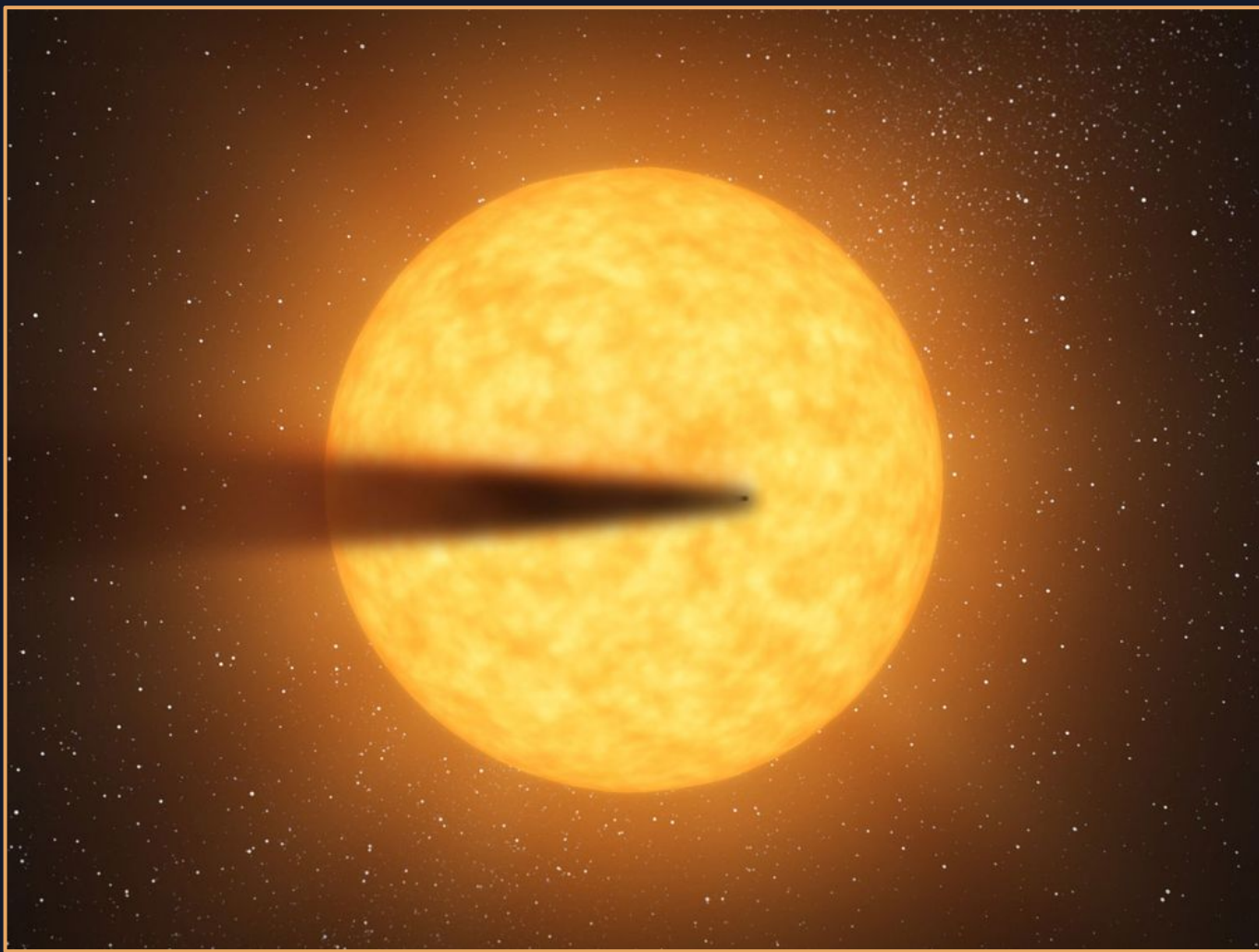
Larger, rocky planets may hold on to their atmospheres



Smaller planets have a tenuous hold on their atmospheres



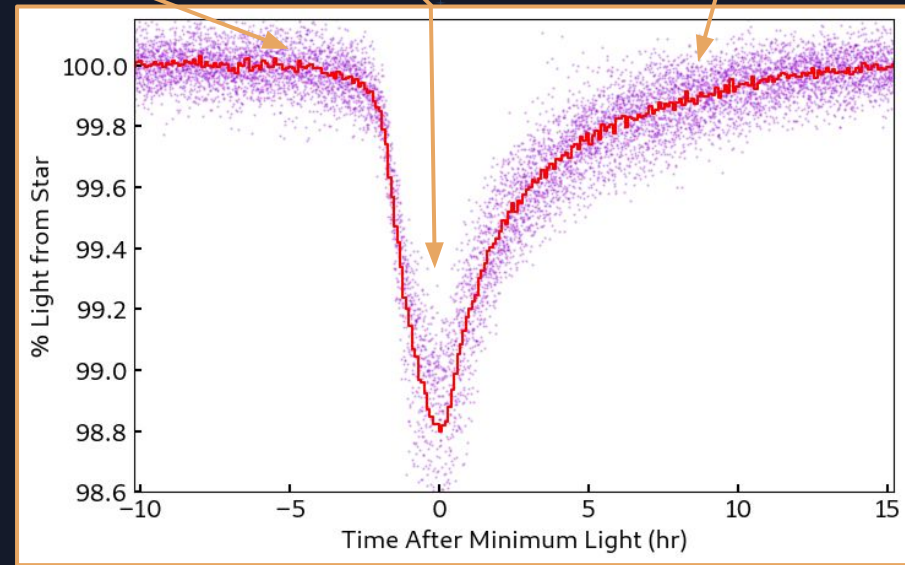
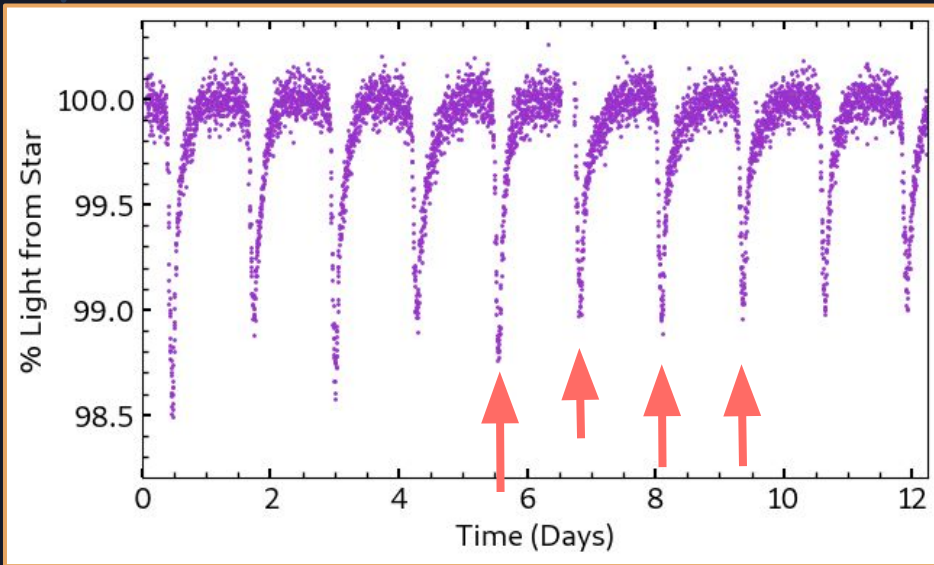
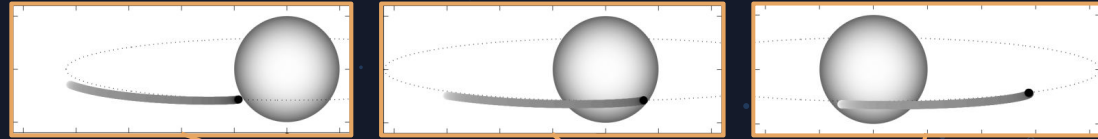
Escaped gas condenses and form comet-like dust tails

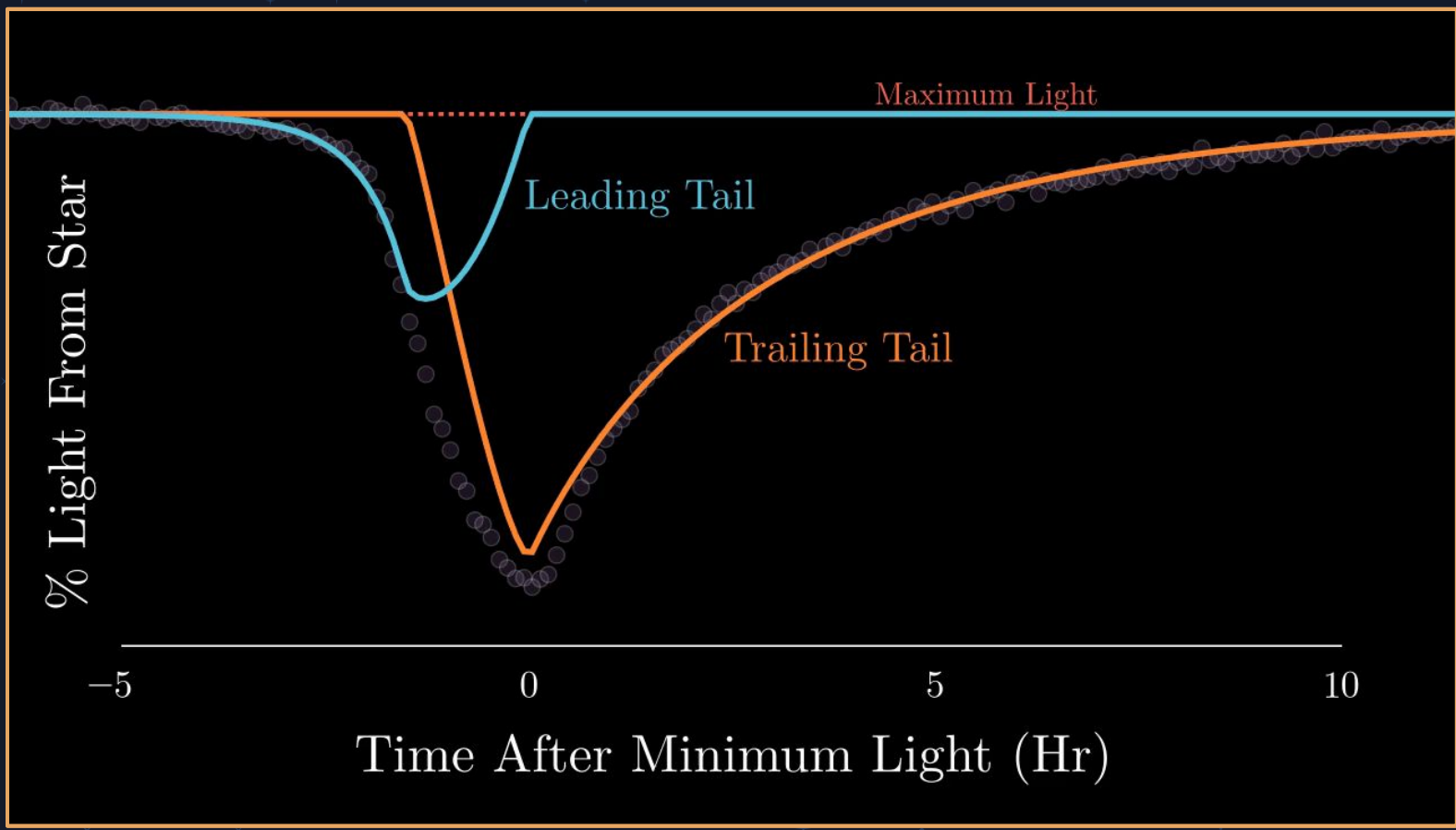


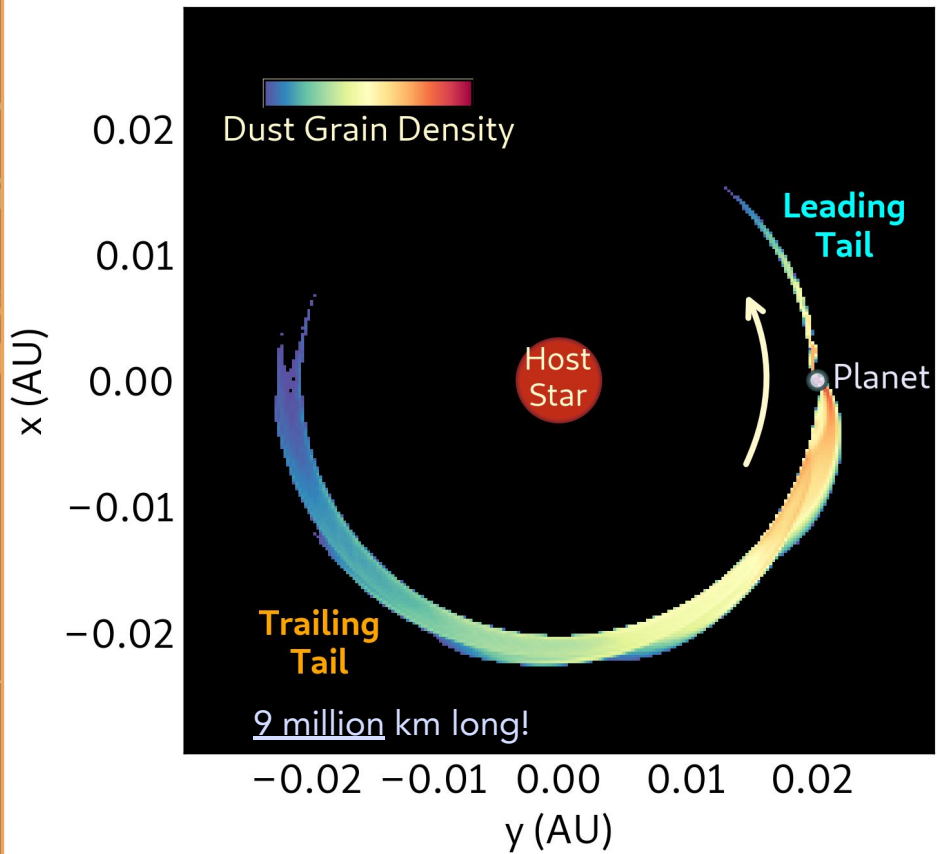
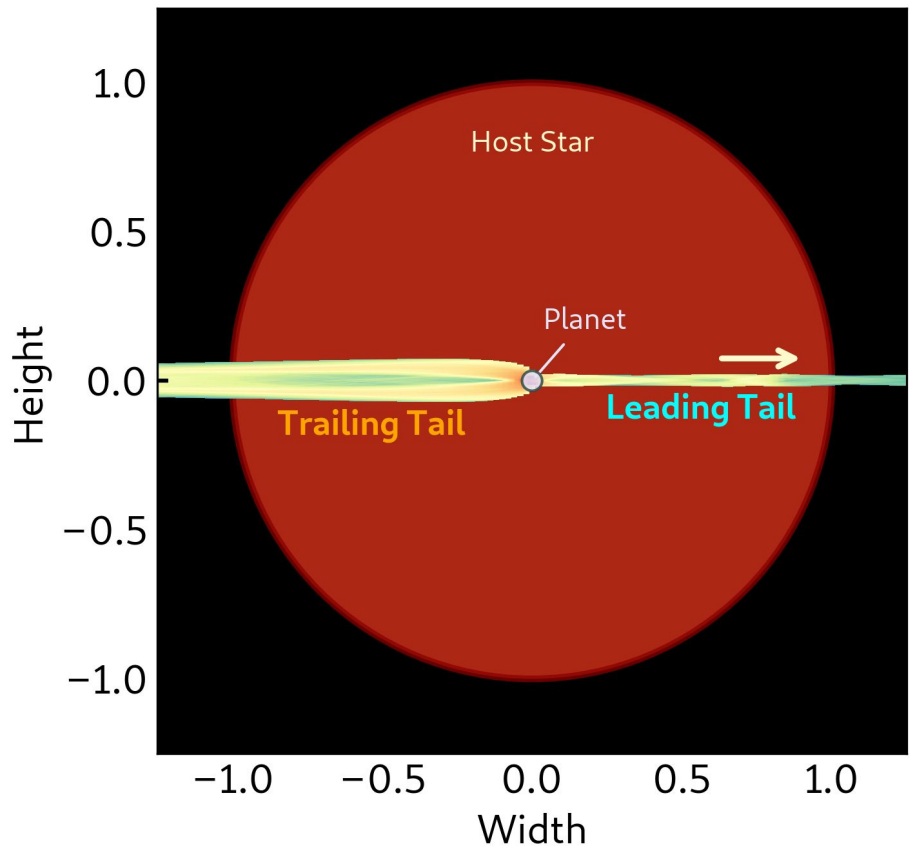
Planet Discovery: BD+05 4868 Ab

140 light years away

Brightness measurements:
Dimming every 30.5 hours

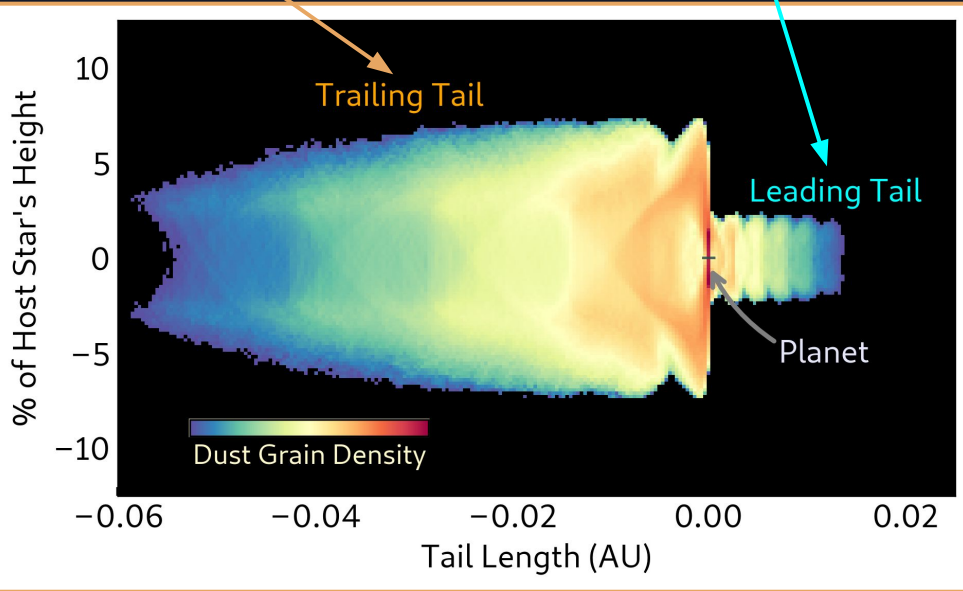






Smaller dust grains
(~1 micron)

Larger dust grains
(~10 microns)



The planet sheds the equivalent of

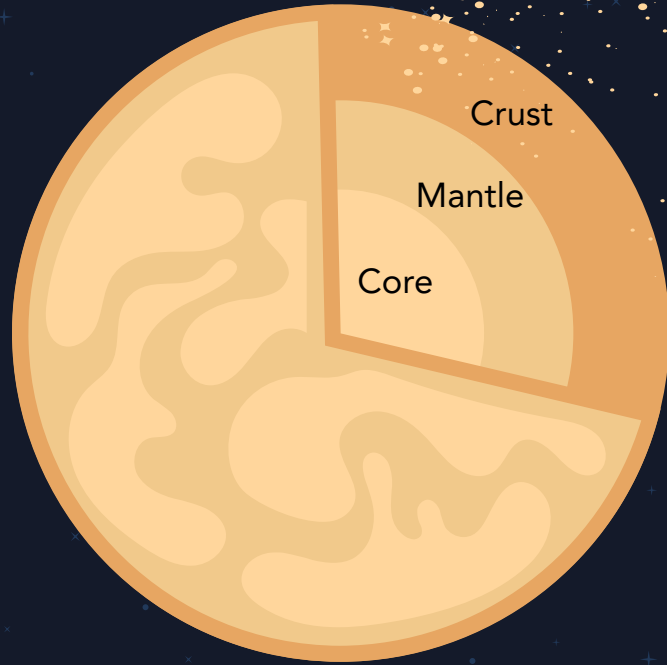
1 Moon every million
years



A planet like the Moon or Mercury will
completely disintegrate in the next:

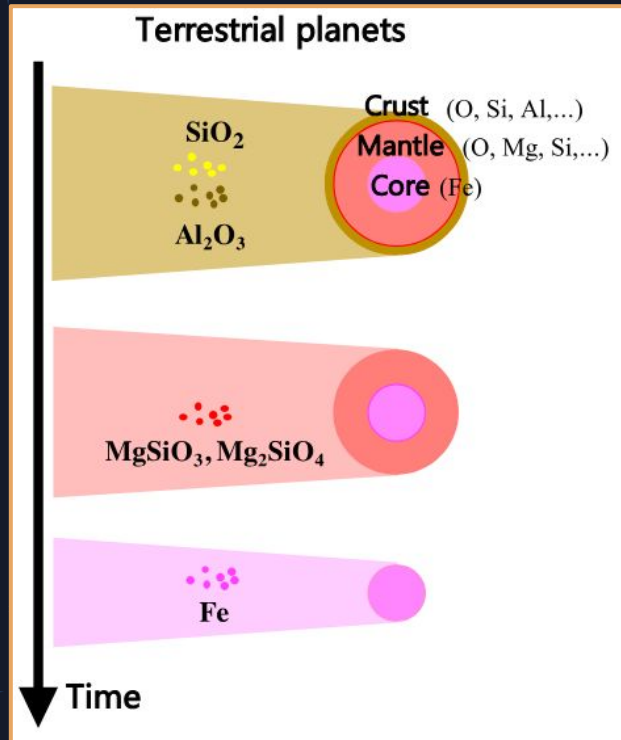
1-2 million years

Quartz? Olivine?
Pyroxene? Iron?

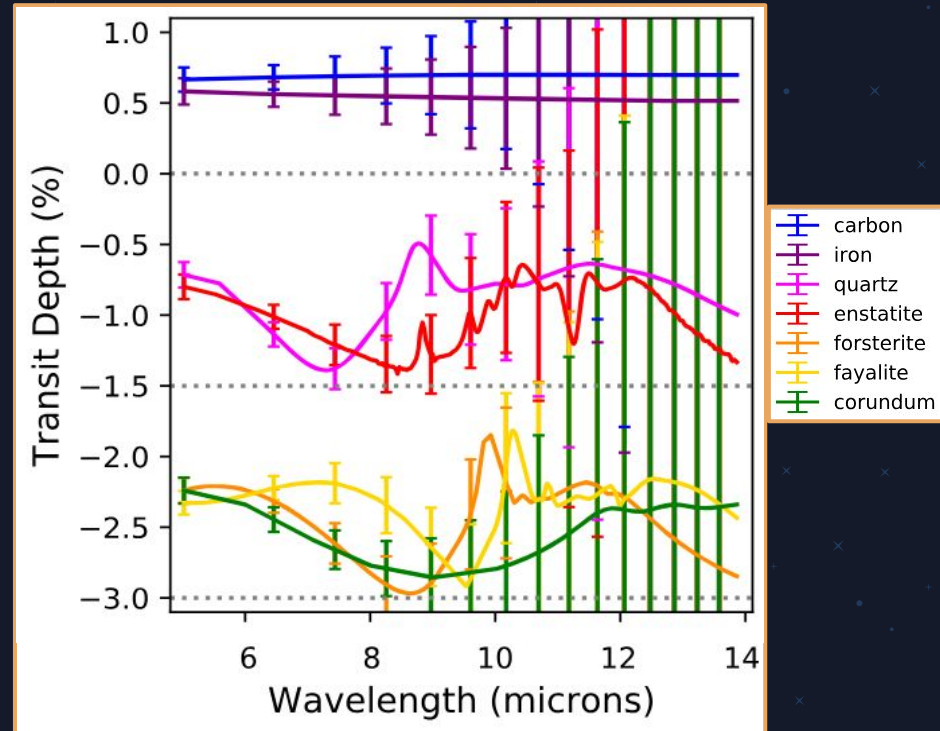


From the dust, we can directly measure the mineral content of a rocky planet outside our Solar System

BD+ 05 4868 Ab is an ideal target for transmission spectroscopy



Okuya+ (2020)



Adapted from Bodman+ (2018)

BD+05 4868 Ab is extreme

Relative to the three other known disintegrating planets, this discovery:

- Is the nearest known disintegrating planet
- Has the largest and longest dust tails (two tails).
- Shows the deepest transits from a copious mass loss rate

BD+05 4868 Ab is a prime target
for the geology of rocky planets
outside our Solar System

These slides:



Discovery paper:



Email: mtyhon@mit.edu