Internal Heating on a Migrating Giant Exoplanet with the Retired *Spitzer Space Telescope*

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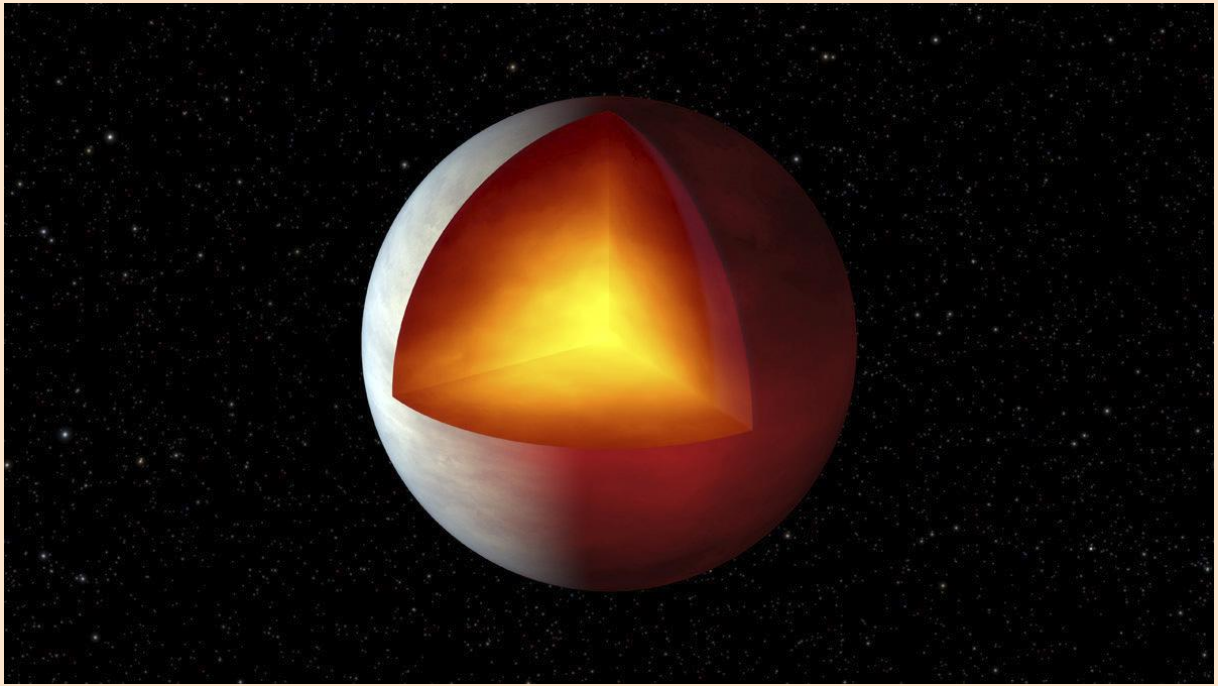
Evidence for Cryptic Heating of the Interior of XO-3b



Spitzer Space Telescope:

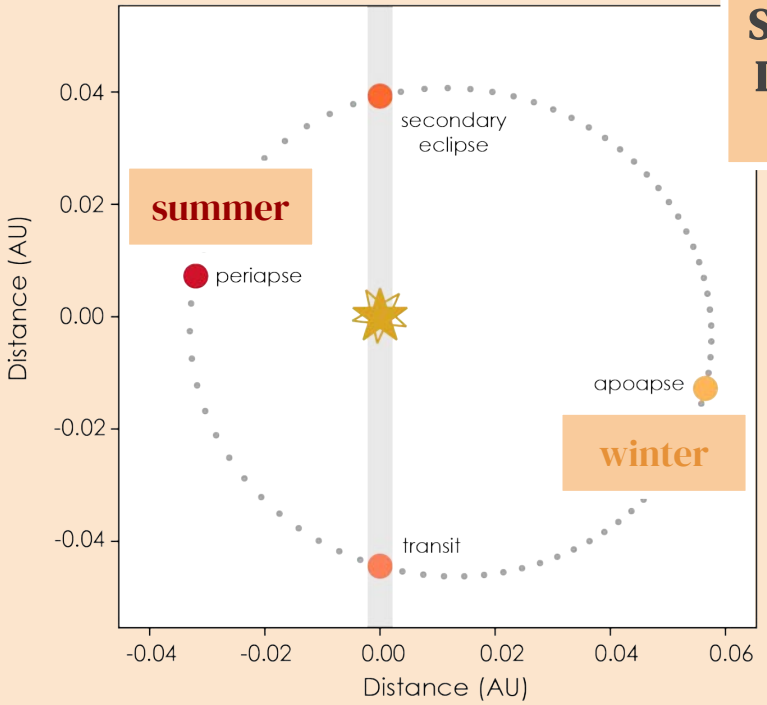
- Hints of extra heat embedded in the atmosphere of an exoplanet

Gaia Mission

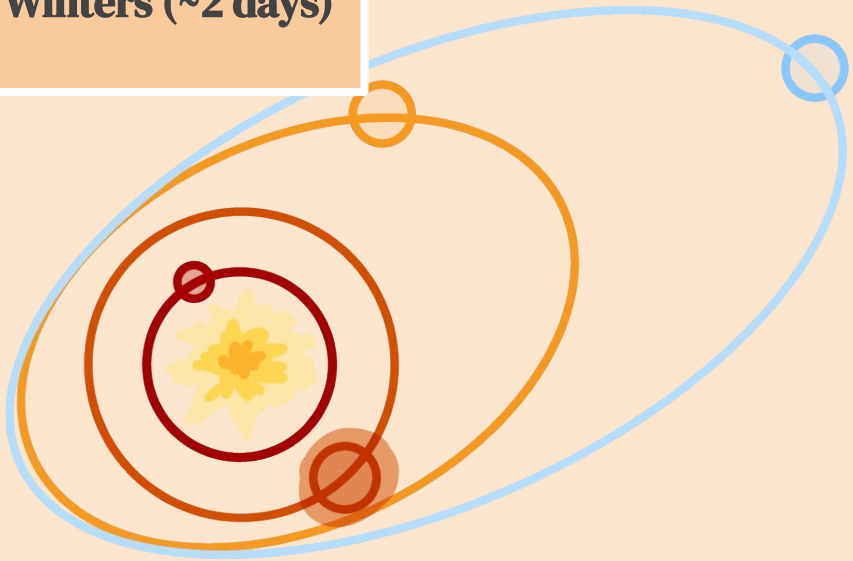
- Evidence of radius inflation on XO-3b

A Rare Example of a Planet Caught in Migration

Dang et al. (2022)

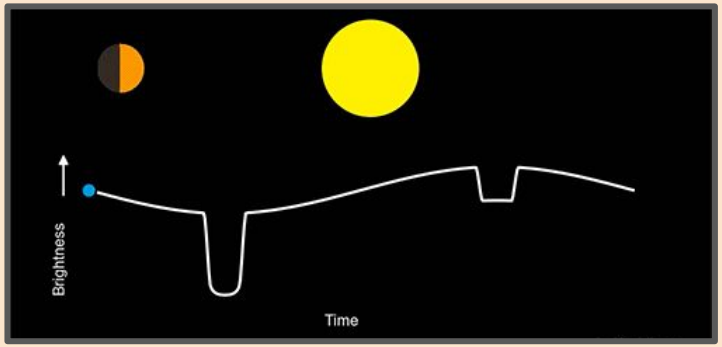


Shorter summers (~1 day)
Longer Winters (~2 days)

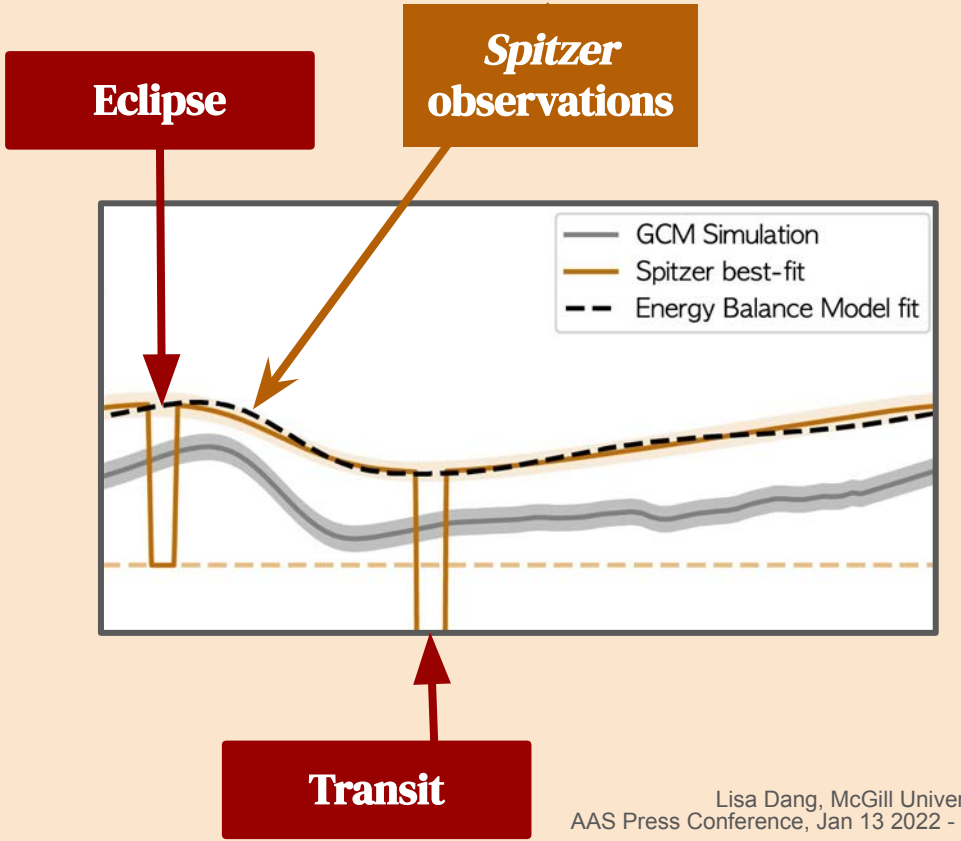


Climate of Exoplanets with Spitzer Phase Curves

Dang et al. (2022)



- Used the Spitzer Space Telescope to observe the planet complete a whole journey around its star which only took 3 days!
- we measured the temperature



It's not a heat wave, it's always hot!

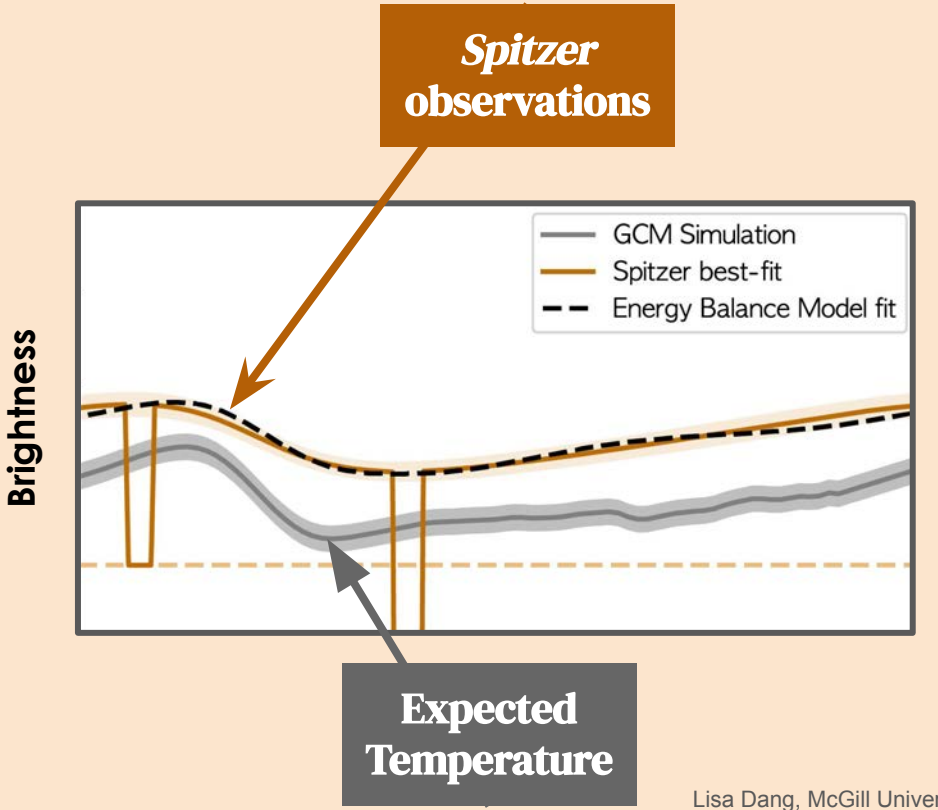
With the Retired Spitzer Space Telescope

What we did:

- We measured the temperature of XO-3b detected seasons on the planet!
- With Spitzer we were able to measure wind speeds of 1500 miles/hr!

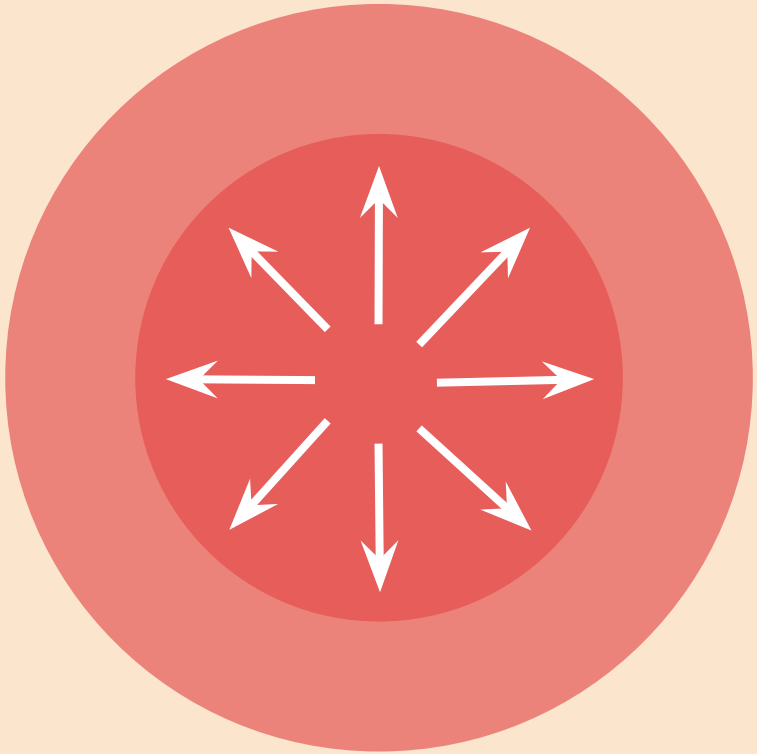
What we didn't expect:

- The excess heat isn't seasonal, it's hot all year long on XO-3b.



XO-3b : Puffer than Expected

Dang et al. 2022

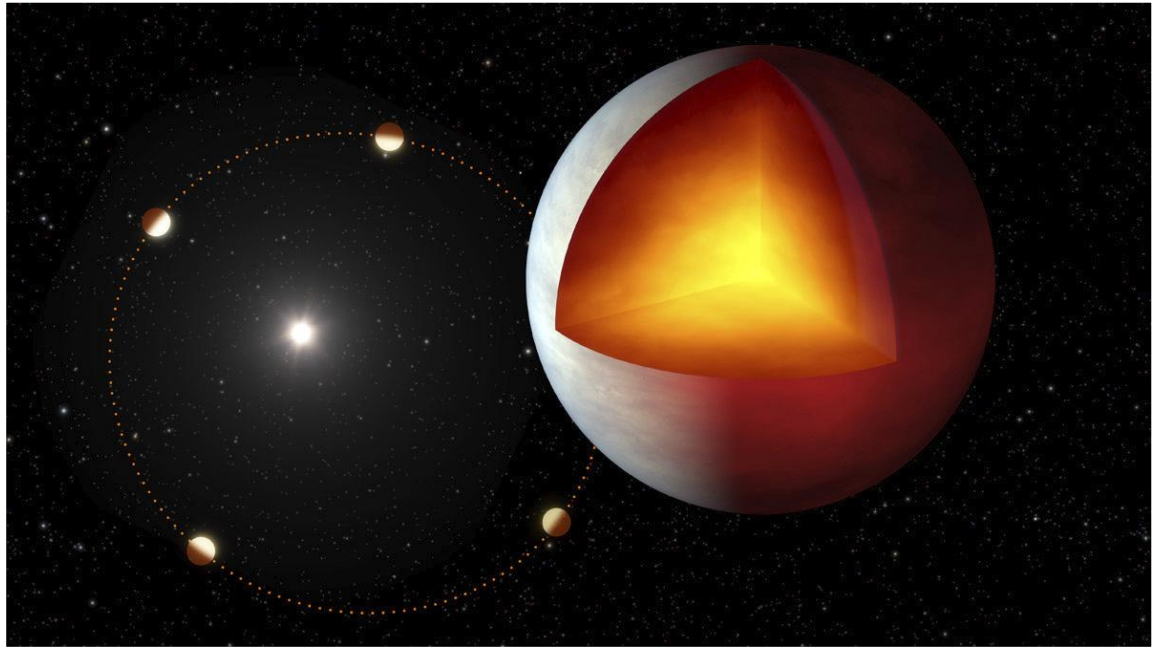


- Using Gaia observation, we find that the radius of XO-3b is puffer than expected ALSO suggesting an energetic interior
- The inflated radius suggest the planet is producing a LOT of its own heat

Tidal Heating
due to the eccentric orbit
eccentricity = 0.29

Nuclear Fusion
massive enough to be a Brown Dwarf?
Mass = 12 Jupiter mass

XO-3b: Unique Planetary Laboratory



Testing Emerging Ideas:

- Oddballs with peculiar characteristics are useful to test climate physics.
- Internal heating as a proxy to investigate the orbital evolution and understand how they form and evolve