JWST Reveals Alien Weather, Exposes Exoplanet Bias

Description

The James Webb Space Telescope (JWST) has provided a unique weather report for a planet located 690 light-years away. The forecast for WASP-94A b, a tidally locked gas giant, reveals cloudy mornings of vaporized rock, clear evenings, and strong winds that can move sand-like particles before they evaporate under constant daylight.

WASP-94A b has a mass slightly less than half that of Jupiter but is more than 70% wider. With an average temperature above 1,500 Kelvin, one side of the planet remains in perpetual daylight, while the other is shrouded in permanent night. This creates a significant temperature difference, causing the evening limb to be around 450 Kelvin hotter than the morning limb. This leads to distinct atmospheric conditions on each side.

The JWST discovered that the morning atmosphere consists of thick clouds made of vaporized magnesium silicate, while the evening skies are clear. Powerful winds move these magnesium silicate clouds from the cool night side to the hot day side, where they evaporate before reaching the evening limb.

The findings suggest that the weather on WASP-94A b is constantly changing, resembling a sandstorm in the sky. This has broader implications for how astronomers study exoplanets. Traditionally, data averaged from the whole planet led to errors in estimating chemical compositions. The JWST's methods can now differentiate between the morning and evening atmospheres, revealing more accurate insights.

Mukhurjee's team intends to use this advanced technique on more planets, including one with an unusual orbit, which could provide new insights into varied weather systems. The research underscores the complexity of exoplanets, highlighting that what appears as a single point of light may actually be two distinct atmospheres.

Comprehension Questions

Multiple Choice

1. How far is the planet WASP-94A b located from Earth?
   - Option: 690 light-years
   - Option: 500 light-years
   - Option: 1000 light-years
   - Option: 750 light-years

2. What type of planet is WASP-94A b?

Option: Terrestrial
Option: Gas giant
Option: Ice giant
Option: Rocky planet

3. What is the average temperature of WASP-94A b?

Option: 1,000 Kelvin
Option: 1,200 Kelvin
Option: 1,500 Kelvin
Option: 2,000 Kelvin

4. What are the morning skies of WASP-94A b primarily composed of?

Option: Vaporized magnesium silicate
Option: Hydrogen gas
Option: Water vapor
Option: Carbon dioxide

5. What is a significant feature of WASP-94A b's atmosphere during the evening?

Option: Thick clouds
Option: Clear skies
Option: Acid rain
Option: Heavy snow

6. What role do powerful winds play in WASP-94A b's atmosphere?

Option: They create storms
Option: They move magnesium silicate clouds
Option: They decrease temperature
Option: They prevent evaporation

True-False

7. WASP-94A b remains in perpetual night on one side.

8. The temperature difference between the morning and evening sides of WASP-94A b is negligible.

9. The James Webb Space Telescope has improved the study of exoplanets.

10. WASP-94A b is larger than Jupiter.

11. The morning atmosphere of WASP-94A b is made up of clear skies.

12. Research on WASP-94A b indicates it may have two distinct atmospheres.

Gap-Fill

13. WASP-94A b is located _____ light-years away.

14. The average temperature of WASP-94A b exceeds _____ Kelvin.

15. The morning atmosphere of WASP-94A b consists of _____ clouds.

16. Clear skies are primarily observed during the _____ of WASP-94A b.

17. Powerful winds on WASP-94A b move magnesium silicate clouds from the cool night side to the _____ day side.

18. The research suggests that WASP-94A b's weather is constantly _____ .

Answer

Multiple Choice: 1. 690 light-years 2. Gas giant 3. 1,500 Kelvin 4. Vaporized magnesium silicate 5. Clear skies 6. They move magnesium silicate clouds
True-False: 7. True 8. False 9. True 10. False 11. False 12. True
Gap-Fill: 13. 690 14. 1,500 15. thick 16. evening 17. hot 18. changing

CATEGORY

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