



Scientists Measure Universe's Most Powerful Winds for First Time

Description

Scientists have for the first time measured the speed of hot gas erupting from the heart of the galaxy M82, which produces stars ten times faster than the Milky Way. This gas, moving over 3 million kilometres per hour, could drive a massive outflow of material stretching tens of thousands of light-years into space.

This discovery comes from the XRISM spacecraft, a collaboration between JAXA and NASA. Using its sensitive Resolve instrument, researchers captured X-ray emissions from superheated iron at the core of M82. The research, published on 25 March in Nature, addresses a long-standing question: what drives the powerful outflow observed in this galaxy?

M82 is a starburst galaxy, meaning it consumes gas rapidly, leading to extreme phenomena such as violent winds and colossal outflows. These processes are crucial for understanding galaxy evolution and star formation.

The measurement relied on the Doppler effect, where the movement of light sources shifts its spectrum. At M82's centre, outwards-moving iron broadens its spectral lines, revealing a wind velocity exceeding 2 million miles per hour. The gas temperature was found to be about 45 million degrees Fahrenheit (25 million degrees Celsius), generating substantial outward pressure that pushes gas into lower-pressure regions.

The data aligns with theories that shockwaves from supernovae heat surrounding gas, starting large-scale winds. The results confirm that the hot inner wind is strong enough to expel four solar masses of gas from the galaxy annually, but three solar masses remain unexplained. This opens new questions for future research on whether this gas escapes M82 or recycles back into it.

Vocabulary List:

1. **outflow** //ˈaʊt,fləʊ// (noun): movement of gas or material moving out
2. **superheated** //,su:pər'hi:tɪd// (adjective): heated to a very high temperature
3. **starburst** //ˈstɑː,bɜːst// (noun): a galaxy forming many new stars quickly
4. **spectrum** //ˈspektrəm// (noun): range of light or colors from an object
5. **velocity** //və'lesəti// (noun): the speed and direction of movement
6. **shockwaves** //ˈʃɑːk,weɪvz// (noun): powerful waves of pressure moving through material

Comprehension Questions



Multiple Choice

1. What was measured for the first time from the galaxy M82?
 - Option: The speed of hot gas
 - Option: The temperature of stars
 - Option: The composition of dark matter
 - Option: The distance to the galaxy
2. How fast is the hot gas from M82 moving?
 - Option: Over 1 million kilometres per hour
 - Option: Over 2 million kilometres per hour
 - Option: Over 3 million kilometres per hour
 - Option: Over 4 million kilometres per hour
3. What instrument on the XRISM spacecraft was used to capture data?
 - Option: Resolve
 - Option: Spectrum
 - Option: Observation
 - Option: Analysis
4. What type of galaxy is M82 classified as?
 - Option: Elliptical galaxy
 - Option: Spiral galaxy
 - Option: Starburst galaxy
 - Option: Irregular galaxy
5. The gas temperature in the center of M82 is approximately how many degrees Fahrenheit?
 - Option: 25 million
 - Option: 45 million
 - Option: 35 million
 - Option: 55 million
6. What drives the powerful outflow observed in M82 according to the researchers?
 - Option: Black holes
 - Option: Shockwaves from supernovae
 - Option: Dark energy
 - Option: Gravitational waves



True-False

7. The hot gas from M82 moves at a speed of over 1 million kilometres per hour.
8. The research was published on 25 March in the journal Nature.
9. M82 is consuming gas rapidly and is considered a starburst galaxy.
10. According to the measurement, gas from M82 can escape into lower-pressure regions.
11. Three solar masses of gas from M82 have been completely explained by the research.
12. The measurement was conducted using the Hubble Space Telescope.

Gap-Fill

13. Scientists have measured the speed of hot gas erupting from the heart of the galaxy M82, which can produce stars ten times faster than the _____.
14. The research was published on 25 March in _____.
15. This gas is moving over 3 million kilometres per hour, potentially driving a massive outflow of material stretching tens of thousands of _____ into space.
16. At M82's centre, outwards-moving iron broadens its spectral lines, revealing a wind velocity exceeding 2 million _____ per hour.
17. The gas temperature was found to be about 45 million degrees Fahrenheit (25 million degrees _____).
18. This opens new questions for future research on whether this gas escapes M82 or _____ back into it.



Answer

Multiple Choice: 1. The speed of hot gas 2. Over 3 million kilometres per hour 3. Resolve 4. Starburst galaxy
5. 45 million 6. Shockwaves from supernovae

True-False: 7. False 8. True 9. True 10. True 11. False 12. False

Gap-Fill: 13. Milky Way 14. Nature 15. light-years 16. miles 17. Celsius 18. recycles

CATEGORY

1. Sci/Tech - LEVEL4

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3. ESL learning
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5. Level 4
6. universe
7. violent wind

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