



Astronomers Measure Universe's Most Violent Wind for First Time

Description

For the first time, scientists have measured the incredible speed of hot gas erupting from the heart of M82, a galaxy that forms stars at a rate ten times faster than the Milky Way. This gas is moving at speeds exceeding 3 million kilometres per hour, capable of creating a massive outflow that extends tens of thousands of light-years into space.

This significant discovery arose from the XRISM spacecraft, a joint project by JAXA and NASA. The highly sensitive Resolve instrument onboard detected X-ray emissions from superheated iron in M82's core. These findings, published in *Nature* on March 25, address a question that has puzzled astronomers for decades: what drives the dramatic outflow seen from this nearby galaxy?

Starburst galaxies, like M82, are intriguing to researchers due to their intense activity. They consume gas reserves rapidly, creating powerful winds and enormous outflows. Understanding these phenomena is essential for grasping how galaxies evolve and how star formation operates within them.

The researchers measured the wind speed by observing how light changes when it's moving towards or away from them, known as the Doppler effect. The high-speed iron found was found to be ejecting in multiple directions, providing data that indicated an impressive wind velocity. The temperature of the gas matched predictions, reaching around 25 million degrees Celsius.

While previous theories suggested that shockwaves from supernovae and intense star formation heated surrounding gas, XRISM has confirmed that the outflow is strong enough to expel four solar masses of gas from the galaxy each year. However, it remains unclear what happens to an additional three solar masses, creating a mystery that future studies will aim to resolve.

Vocabulary List:

1. **outflow** //ˈaʊtfləʊ// (noun): a large movement of gas moving outward
2. **erupting** //ɪˈrʌptɪŋ// (verb): bursting out suddenly and with great force
3. **emissions** //ɪˈmɪʃənz// (noun): substances or energy sent out from something
4. **superheated** //ˌsu:pəˈhi:tɪd// (adjective): heated to a much higher temperature than normal
5. **velocity** //vəˈlɒsəti// (noun): how fast something moves in a direction
6. **expel** //ɪkˈspel// (verb): to force something out from a place

Comprehension Questions



Multiple Choice

1. What galaxy is discussed in the text?
 - Option: Andromeda
 - Option: Milky Way
 - Option: M82
 - Option: Whirlpool Galaxy
2. What is the speed of the hot gas erupting from M82?
 - Option: 1 million kilometres per hour
 - Option: 2 million kilometres per hour
 - Option: 3 million kilometres per hour
 - Option: 4 million kilometres per hour
3. Which spacecraft was involved in the discovery?
 - Option: Hubble Space Telescope
 - Option: Chandra X-ray Observatory
 - Option: XRISM spacecraft
 - Option: James Webb Space Telescope
4. Which instrument onboard XRISM detected X-ray emissions?
 - Option: Resolve
 - Option: Spectrometer
 - Option: Imager
 - Option: Analyzer
5. On what date were the findings published?
 - Option: March 25
 - Option: April 1
 - Option: February 15
 - Option: January 10
6. How many solar masses of gas does the outflow expel from the galaxy each year?
 - Option: Three
 - Option: Four
 - Option: Five
 - Option: Six



True-False

7. M82 forms stars at a rate ten times slower than the Milky Way.
8. The temperature of the gas in M82 is around 25 million degrees Celsius.
9. The Doppler effect is used to measure the wind speed.
10. XRISM is a project solely by NASA.
11. Previous theories suggested that supernovae shockwaves may influence surrounding gas.
12. M82 is not a starburst galaxy.

Gap-Fill

13. The gas in M82 is moving at speeds exceeding _____ million kilometres per hour.
14. The significant discovery was made using the XRISM _____ spacecraft.
15. X-ray emissions were detected from superheated _____ in M82's core.
16. The researchers believe that the outflow can expel _____ solar masses of gas from the galaxy each year.
17. The temperature of the gas reaches around _____ million degrees Celsius.
18. Understanding the outflow helps grasp how galaxies _____ and how star formation operates.

Answer

Multiple Choice: 1. M82 2. 3 million kilometres per hour 3. XRISM spacecraft 4. Resolve 5. March 25 6. Four

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

Gap-Fill: 13. 3 14. spacecraft 15. iron 16. four 17. 25 18. evolve



Vocabulary quizzes

Multiple Choice (Select the Correct answer for each question.)

1. What process describes the end of a species on Earth?
Option: Evolution
Option: Extinction
Option: Adaptation
Option: Migration
2. What type of processes in the body relate to metabolism?
Option: Mechanical
Option: Metabolic
Option: Chemical
Option: Physical
3. What term describes the path an object takes as it moves around another object in space?
Option: Rotation
Option: Orbit
Option: Revolution
Option: Transition
4. What are released pollutants into the atmosphere commonly referred to as?
Option: Outflows
Option: Emissions
Option: Discharges
Option: Exhausts
5. What word describes the ability to recover from difficult situations?
Option: Weakness
Option: Failure
Option: Resilience
Option: Fragility
6. What adjective describes someone who is skillful with their hands?
Option: Clumsy
Option: Awkward
Option: Dexterous
Option: Fumbling
7. What term means to force something out?



- Option: Inhale
- Option: Compel
- Option: Expel
- Option: Retain

8. What is the term for experiences that fully engage one's senses?

- Option: Dull
- Option: Boring
- Option: Immersive
- Option: Superficial

9. What term describes the action of providing energy for something?

- Option: Cooling
- Option: Fueling
- Option: Hindering
- Option: Stalling

10. What term relates to mental processes such as perception and memory?

- Option: Physical
- Option: Emotional
- Option: Social
- Option: Cognitive

Gap-Fill (Fill in the blanks with the correct word from the vocabulary list.)

11. The gas was heated until it became _____, reaching extreme temperatures.
12. The pilot executed a series of _____ to safely land the aircraft.
13. Before the rocket launch, the team initiated a _____ to ensure everything was ready.
14. Scientists study a _____ to understand the history of life on Earth.
15. Many people experience _____ before taking an important exam.
16. The _____ worked tirelessly to prepare the ship for its next voyage.
17. The _____ of water from the dam must be carefully regulated.
18. The caterpillar will _____ into a butterfly.



19. The organization established a _____ to define roles and responsibilities.
20. The woolly mammoth is an example of a species that is _____ today.

Matching Sentences (Match each definition to the correct word from the vocabulary list.)

21. The music album is a collection of various artists' best hits, making it a perfect compilation.
22. The community came together to mourn the loss of their beloved leader.
23. The car's mechanics are vital for ensuring it operates smoothly and efficiently.
24. Vaccination helps the body become immune to certain diseases.
25. The process of fueling the rocket required precision and timing.
26. The velocity of the spacecraft increased as it entered the gravitational field of the planet.
27. The volcano has been erupting for several days, spewing ash into the atmosphere.
28. Many individuals experience anxiety during stressful situations or major life changes.
29. Cognitive therapy is focused on changing unhelpful thought patterns.
30. The community showed incredible resilience in the face of disaster and rebuilt their homes.

Answer

Multiple Choice: 1. Extinction 2. Metabolic 3. Orbit 4. Emissions 5. Resilience 6. Dexterous 7. Expel 8. Immersive 9. Fueling 10. Cognitive

Gap-Fill: 11. superheated 12. maneuvers 13. countdown 14. fossil 15. anxiety 16. crew 17. outflow 18. transform 19. hierarchy 20. extinct

Matching sentence: 1. compilations 2. mourn 3. mechanics 4. immune 5. fueling 6. velocity 7. erupting 8. anxiety 9. cognitive 10. resilience

CATEGORY

- 1. Sci/Tech - LEVEL5

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