Scientists Report Unprecedented Changes in Earth’s Rotation

Description

Every day, the Earth takes a little longer to complete its rotation. Although the change is only measured in fractions of a millisecond, the forces behind it are enormous. A recent study indicates that the current rate at which our days are lengthening is unprecedented in 3.6 million years of geological history.

Researchers found that the melting of polar ice sheets and glaciers due to climate change is causing water, previously stored at high latitudes, to flow into the oceans and spread towards the equator. This movement shifts mass away from the poles, slowing the planet's rotation, much like a figure skater slows when extending their arms.

Previous studies had already noted unusual effects of climate change on Earth's spin. The team from the University of Vienna and ETH Zurich revisited geological data and determined that today’s rate of change has not been matched in the past. To analyse millions of years, they examined fossilised remains of marine organisms, which record ancient sea levels. This helped them calculate changes in the Earth’s rotation.

Currently, the rate of climate-driven day lengthening is 1.33 milliseconds per century. While this may seem small, it signifies a massive redistribution of mass: about 1,000 gigatonnes moving from the poles to the oceans. The energy involved in this shift is comparable to a magnitude 9.0 earthquake.

Looking ahead, if high emissions continue, climate change will likely become the primary force affecting day length by the end of the century, surpassing even the Moon’s gravitational influence. The consequences, though subtle, could impact technologies like GPS navigation and reflect broader changes in the Earth’s ecosystem. The team plans to explore other factors influencing the planet's mass distribution, such as groundwater depletion.

Vocabulary List:

1. **rotation** /roʊˈteɪʃən/ (noun): turning of an object around its center
2. **unprecedented** /ʌnˈprɛsɪdəntɪd/ (adjective): never seen or happening before in history
3. **latitudes** /ˈlætɪˌtudz/ (noun): distance north or south from the equator
4. **redistribution** /ˌriːdɪstrɪˈbjuːʃən/ (noun): movement of something to different places
5. **gigatonnes** /ˈgɪgəˌtʌnz/ (noun): a unit equal to one billion metric tons
6. **gravitational** /ˌgrævɪˈteɪʃənəl/ (adjective): connected to the force that pulls objects together

Comprehension Questions

Multiple Choice

1. How long does it currently take for the Earth to complete its rotation?

   Option: 24 hours
   Option: 23 hours 59 minutes
   Option: Fraction of a millisecond
   Option: 23 hours 56 minutes

2. What is causing the increase in the length of days on Earth?

   Option: Volcanic activity
   Option: Melting of polar ice sheets
   Option: Tectonic shifts
   Option: Solar flares

3. What is the current rate of climate-driven day lengthening?

   Option: 1 millisecond per century
   Option: 1.33 milliseconds per century
   Option: 0.5 milliseconds per century
   Option: 2 milliseconds per century

4. Which institutions conducted the research on Earth's rotation?

   Option: NASA and NOAA
   Option: University of Vienna and ETH Zurich
   Option: MIT and Stanford
   Option: Harvard and Yale

5. What is the approximate amount of mass moving from the poles to the oceans?

   Option: 500 gigatonnes
   Option: 1,000 gigatonnes
   Option: 2,000 gigatonnes
   Option: 750 gigatonnes

6. By the end of the century, what will likely surpass the Moon's gravitational influence?

   Option: Solar radiation
   Option: Climate change
   Option: Tidal patterns
   Option: Atmospheric pressure

True-False

7. The change in Earth's rotation is measured in seconds.

8. Melting glaciers are contributing to the slowdown of Earth's rotation.

9. The current rate of day lengthening has occurred multiple times in the last 3.6 million years.

10. Fossilised remains of marine organisms helped researchers study ancient sea levels.

11. High emissions are expected to decrease the influence of climate change on day length.

12. The energy shift from polar ice to oceans is equivalent to a magnitude 9.0 earthquake.

Gap-Fill

13. The Earth takes a little longer to complete its rotation each day, with changes measured in _____ milliseconds.

14. The current rate at which our days are lengthening has not been matched in _____ million years.

15. The movement of water to the oceans slows the planet's rotation like a figure skater who _____ their arms.

16. The team plans to explore other factors influencing the planet's mass distribution, such as groundwater _____ .

17. The consequences of changing day length could impact technologies like _____ navigation.

18. Climate change is likely to become the primary force affecting day length by the end of the

_____ .

Answer

Multiple Choice: 1. Fraction of a millisecond 2. Melting of polar ice sheets 3. 1.33 milliseconds per century 4. University of Vienna and ETH Zurich 5. 1,000 gigatonnes 6. Climate change
True-False: 7. False 8. True 9. False 10. True 11. False 12. True
Gap-Fill: 13. fractions of a 14. 3.6 15. extends 16. depletion 17. GPS 18. century

Vocabulary quizzes

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

1. What phenomenon describes the circular movement of an object around its center?
   Option: Revolution
   Option: Rotation
   Option: Translation
   Option: Orbital path

2. Which term describes something that has never happened before?
   Option: Familiar
   Option: Routine
   Option: Common
   Option: Unprecedented

3. What is the term for the process of distributing something again or differently?
   Option: Allocation
   Option: Redistribution
   Option: Consolidation
   Option: Segregation

4. What unit of measurement is commonly used to quantify large amounts of carbon emissions?
   Option: Kilograms
   Option: Tonnes
   Option: Gigatonnes
   Option: Pounds

5. What type of force attracts two bodies toward each other in physics?

Option: Electromagnetic
Option: Frictional
Option: Gravitational
Option: Nuclear

6. What term refers to the layer of gases surrounding a planet?

Option: Lithosphere
Option: Hydrosphere
Option: Atmosphere
Option: Biosphere

7. What is the name of NASA's spacecraft that performed a close approach to a celestial body?

Option: Orbiter
Option: Probe
Option: Flyby
Option: Lander

8. What is the process of adjusting instruments to ensure accurate results called?

Option: Tuning
Option: Calibrating
Option: Testing
Option: Validating

9. What instrument is used to measure magnetic fields?

Option: Spectrometer
Option: Magnetometer
Option: Barometer
Option: Seismograph

10. What is the basic unit of biological classification?

Option: Genus
Option: Family
Option: Order
Option: Species

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

11. Certain blooms of phytoplankton can produce _____ substances that are harmful to marine life.

12. This fish species has a _____ appearance that sets it apart from others.

13. Some _____ volcanic eruptions have shaped the landscape we see today.

14. The river's _____ contribute to the local ecosystem's health.

15. Regular _____ of ocean temperatures helps scientists understand climate change.

16. _____ life plays a crucial role in nutrient cycling in various ecosystems.

17. Research on the ancient sediment provides new _____ into historical climate patterns.

18. The _____ activity in this region creates fertile soil for agriculture.

19. The species is classified under the _____ Asteraceae.

20. Some toxins produced by certain algae can have _____ effects on marine mammals.

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

21. Phytoplankton are microscopic organisms that perform photosynthesis in aquatic ecosystems.
22. The distribution of species affects biodiversity in ecosystems.
23. Space exploration has provided insights into the origins of our solar system.
24. Climate change is impacting weather patterns around the world.
25. Sediments can provide valuable information about past environmental conditions.
26. Living organisms are constantly interacting with their environment to survive.
27. Monitoring air quality is essential for public health and safety.
28. Catastrophic events, such as tsunamis, can have devastating effects on coastal communities.
29. The annual carbon emissions are measured in gigatonnes to understand their impact on climate change.

30. Genetic studies help us understand the evolutionary relationships between species.

Answer

Multiple Choice: 1. Rotation 2. Unprecedented 3. Redistribution 4. Gigatonnes 5. Gravitational 6. Atmosphere 7. Flyby 8. Calibrating 9. Magnetometer 10. Species
Gap-Fill: 11. toxic 12. distinct 13. ancient 14. outflows 15. monitoring 16. Microbial 17. insights 18. volcanic 19. genus 20. fatal
Matching sentence: 1. phytoplankton 2. distribution 3. exploration 4. climate 5. sediments 6. interacting 7. monitoring 8. catastrophic 9. gigatonnes 10. genetic

CATEGORY

1. Sci/Tech - LEVEL4

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4. esl news
5. Level 4
6. unprecedented

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