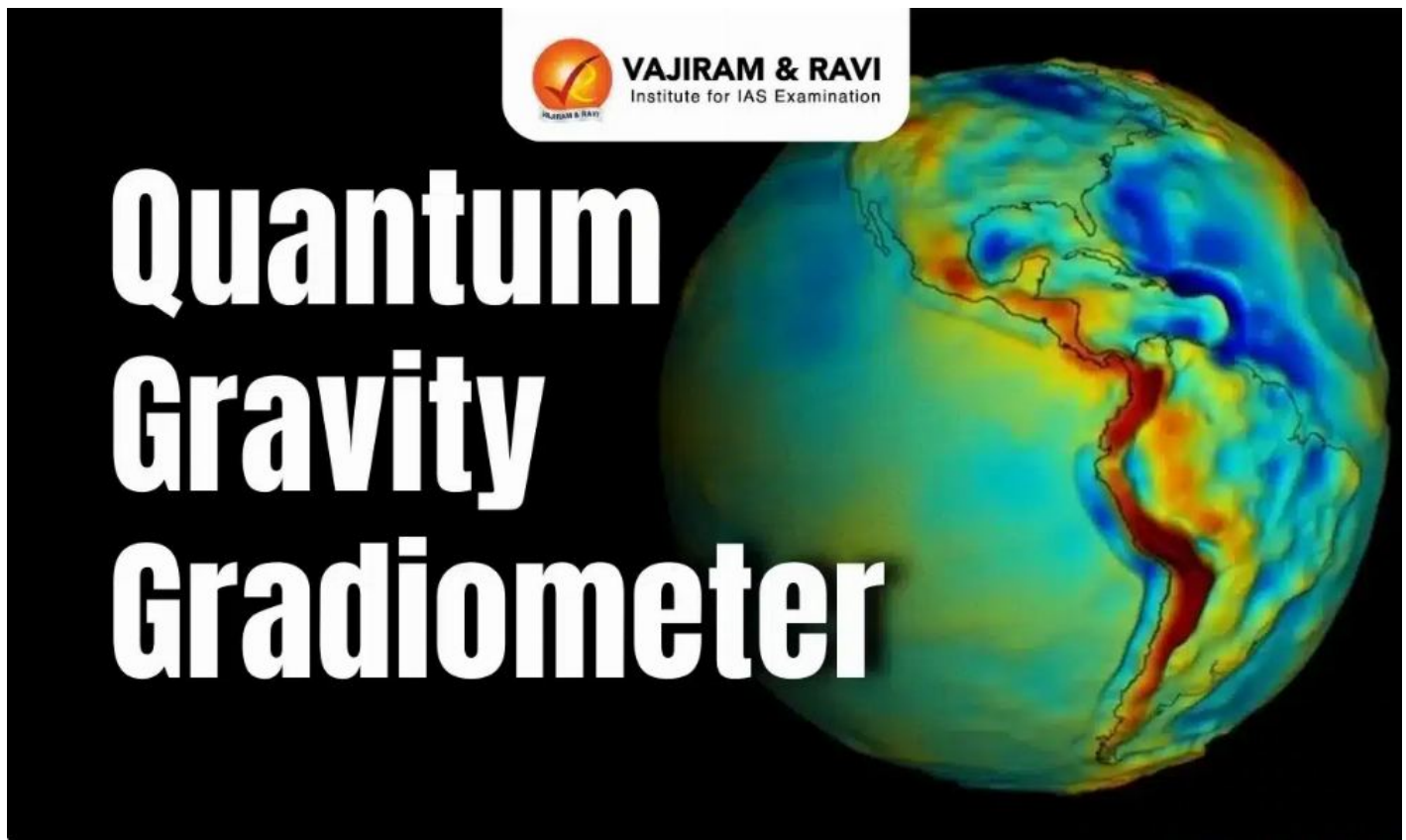


Quantum Gravity Gradiometer (QGG)

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Quantum Gravity Gradiometer (QGG) Latest News

NASA scientists have proposed an innovative use of cold atom-based quantum gravity gradiometers (QGGs) to measure how the Earth's mass distribution is changing, especially due to climate change.

About Quantum Gravity Gradiometer (QGG)

- **Quantum Gravity Gradiometer (QGG):** NASA scientists propose placing a **Quantum Gravity Gradiometer** onboard a satellite to detect **minute gravitational changes**.
 - In a **QGG**, atoms of a specific element are **cooled to near absolute zero** in a vacuum, transforming them into wave-like states.
 - **Lasers manipulate these atoms**, and the atoms undergo a **phase shift** directly related to the **gravitational force** acting upon them.
 - This setup can detect **differences in acceleration** as small as **10^{-15} m/s²** over a distance of just **1 meter**.

- This includes estimating the mass of large formations like the **Himalayas** and monitoring the movement of **water, ice, and geological materials** with extreme precision from **low Earth orbit**.
- **Gravitational force varies with mass distribution:** The **gravitational force** experienced at different points on the Earth's surface is **not uniform**; it depends on the **mass of nearby objects**.
 - For instance, gravitational force near a **mountain range** is stronger than in less dense regions, like cities or flat plains.
- **Gravity Gradiometer:** It is a **highly sensitive instrument** that measures how gravitational acceleration **changes from one place to another**.
 - For example, when a ball is dropped, the **acceleration due to gravity** can vary slightly depending on local mass differences.
 - These devices are used in **resource exploration**—like locating **hydrocarbon deposits**, as oil and gas are **less dense** than surrounding rock.

Source: SP

Source: <https://vajiramandravi.com/current-affairs/quantum-gravity-gradiometer/>

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