

Friday, Jun 30, 2023

EPAPER TODAY'S PAPER

**TRENDING** [Play](#) [See UPSC](#) [Manipur](#) [UPSC](#) [Health](#) [Express](#)  
[Crossword](#) [offer](#) [Violence](#) [Special](#) [Specials](#) [et al.](#)  
[News](#) / [Explained](#) / [Explained Climate](#) / Groundwater extraction shifted the Earth's axis: What a new study says

# Groundwater extraction shifted the Earth's axis: What a new study says

The water sucked out from the ground for irrigation and meeting the world's freshwater demands, eventually, goes into the oceans, contributing to global sea level rise.

Written by [Alind Chauhan](#)

New Delhi | June 30, 2023 08:00 IST



A tubewell extracting groundwater in Rajasthan. (Photo: Rohit Jain Paras/ Express Archive)

Earth's axis of rotation, according to a new study, moving that humans pumped out around 2,150 gigatons of groundwater between 1993 and 2010, the study says that the planet's axis has drifted at the rate of 4.36 cm per year towards the east.

The study, 'Drift of Earth's Pole Confirms Groundwater Depletion as a Significant Contributor to Global Sea Level Rise 1993–2010', was published in the journal *Geophysical Research Letters*, earlier this month.

It was carried out by Ki-Weon Seo, Taewhan Jeon, Jae-Seung Kim, Kookhyoun Youm of the Seoul National University (South Korea), Dongryeol Ryu of the University of Melbourne (Australia), Jooyoung Eom of the Kyungpook National University (South Korea), Jianli Chen of the Hong Kong Polytechnic University (Hong Kong), Clark R Wilson of the University of Texas at Austin (USA).

### Assam Flood 2023: Why Is Assam Prone to Floods? | Explainer



Although the shift isn't significant enough to have real-life consequences, the study shows that humans have extracted so much water from the ground that it has impacted the planet's axis and contributed to **global sea level rise**.

### Earth's axis keeps shifting

Earth spins around an imaginary axis which passes through the north pole, its centre of mass and the south pole — just like a top spins around its spindle.

Scientists for years have known that the poles and the axis keep shifting naturally

## Best of Explained

---

[India and the US-China chips war](#)

[Groundwater extraction shifted the Earth's axis: What a new study says](#)

[How NRF aims to boost research in higher educational institutes](#)

[CLICK HERE FOR MORE](#)

For instance, rocks slowly circulating inside Earth's mantle causes the planet's mass to shift, leading to a change in the position of the rotational axis. Lead author of the latest research, Ki-Weon Seo, told *The Indian Express* that the shift of the axis, in fact, "varies about several metres in a year."

There are several other reasons responsible for polar motion like ocean currents and even hurricanes. But this phenomenon is also impacted by human activities. In 2016, a team of researchers demonstrated that climate-driven changes in water mass distribution, led by the melting of glaciers and ice in Greenland, can cause Earth's axis to drift. Five years later, another study said climate change was causing the rotational axis to shift more than usual since the 1990s.

### Findings of the new study

To carry out the study, Seo and his team took observational data spanning 17 years and a computer model to find out which factors affected the Earth's rotation of axis the most. Initially, the team wasn't able to match their prediction with the level of shift that scientists have observed in previous years.

---

### **Amitabh Sinha writes** | **Indian Ocean Dipole: What is it, how it can limit El Nino effects**

---

"I calculated variations of the spin axis using many kinds of data including atmospheric pressure, ocean bottom pressure, artificial reservoirs behind dams, polar ice, mountain glacier, wind, current and finally groundwater. The estimated spin axis variations didn't agree with the observation when excluding the groundwater effect. After including it, estimation agreed really well with

The study also noted that the **groundwater extraction from North America and northwestern India**, both located at the Earth's midlatitudes, had an outsized impact on the polar motion in comparison to the extraction taking place in poles or equators.

### Also Read | What is summer solstice and what causes it?

Seo explained: "Mass change on the equator or pole cannot affect change in the rotational pole. Rotational pole change is actually associated with the moment of inertia of the Earth, which is sensitive to midlatitude mass change."

### ALSO READ



**What is Cyclone Biparjoy and how was it named?**



**What made Cyclone Biparjoy unique, why its path was difficult to predict**



**PM Modi talks of Miyawaki forests in Mann ki Baat: What is this method, a...**



**Bonn climate meet takeaways: Old conflicts, some forward movement**

The water sucked out from the ground for irrigation and meeting the world's freshwater demands, eventually, goes into the oceans. Seo and his team confirmed that groundwater extraction is one of the major contributors to the **global sea level rise**. Their calculations matched with previous research, which estimated that groundwater extraction raised global sea levels by 6.24mm between 1993 and 2010.

First published on: 30-06-2023 at 08:00 IST

**TAGS:** Explained Climate Express Explained Groundwater

**Special UPSC Offer** 🙌 Preparing for UPSC and other competitive exams? We make your life simpler with Express UPSC Key.