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**Groundwater pumping by humans has tilted Earth's axis – 19th June 2023**

## Level 4

Underground reservoirs affect Earth's balance. Geophysicist Ki-Weon Seo has discovered that we have extracted so much underground water that the tilt of Earth's axis has changed. This has caused the North Pole to move. It is drifting by more than four centimetres a year. Professor Seo calculated that we used more than two trillion tons of groundwater between 1993 and 2010. This caused Earth to wobble.

Groundwater affects Earth's gravity. Seo said: "Every mass moving around on the surface of the Earth can change the rotation axis." Scientists previously thought water-driven shifts were caused by melting glaciers. Seo was puzzled at how this alone could cause a tilt. He concluded that underground water was also a factor. Most groundwater we use is for irrigation. Another researcher said: "The very way the planet wobbles is impacted by our activities."

## Level 5

Scientists know the effect of underground reservoirs on maintaining Earth's balance. Geophysicist Ki-Weon Seo has discovered that humans have extracted so much groundwater from under our feet that the tilt of Earth's axis has changed. This shift has been big enough to relocate the North Pole. The mass of polar ice is drifting by more than four centimetres a year. Professor Seo calculated that we extracted more than two trillion tons of groundwater between 1993 and 2010. This caused Earth to wobble. Seo said the pumping of groundwater has caused sea levels to rise by 6.24 millimetres.

Professor Seo explained that groundwater affects gravity. He said: "Every mass moving around on the surface of the Earth can change the rotation axis." Scientists have recently found out how groundwater affects Earth's axis. They previously thought water-driven shifts were caused by melting glaciers. Seo was puzzled at how this could cause a tilt. He concluded that extracting underground water was also a factor. Much of the extraction of groundwater is due to irrigation. Another researcher said: "The very way the planet wobbles is impacted by our activities."

## Level 6

Perhaps it's only geophysicists who are aware of the importance of underground reservoirs on maintaining Earth's balance. Geophysicist Ki-Weon Seo from Seoul National University has discovered that humans have extracted so much groundwater from under our feet that they have changed the tilt of Earth's axis. This shift has been significant enough to physically relocate the geographic North Pole. The mass of polar ice is drifting by 4.36 centimetres a year. Professor Seo calculated that we extracted more than two trillion tons of groundwater between 1993 and 2010, causing Earth to wobble. Seo added that the pumping of groundwater has caused sea levels to rise by 6.24 millimetres.

Professor Seo explained how groundwater affects Earth's gravity. He said: "Every mass moving around on the surface of the Earth can change the rotation axis." Scientists have only recently discovered how groundwater can change Earth's axis. They previously believed water-driven shifts were caused by melting glaciers and ice caps. Seo and his colleagues were puzzled at how this could cause such a tilt. They concluded that the depletion of underground water was also a factor. Much of the extraction of groundwater is due to irrigation, especially in north-western India and western North America. Another researcher said: "The very way the planet wobbles is impacted by our activities."