SCIENCE NEWS
OUR SOLAR SYSTEM

Our Roly-poly Earth

The last four years have seen an increase in Earth's midsection.

by Maggie McKee

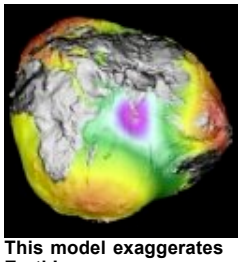
It's a familiar phenomenon to anyone who's tried to lose weight: As soon as one area starts to trim down, another balloons up. A similar shifting of mass happens with Earth, which is slightly wider around the middle than it is tall. For the last 10,000 years or so, the planet has been slowly tightening its belt, its mass traveling toward the poles. But in the last four years, researchers have noticed an abrupt turnaround — Earth is gaining back its spare tire, and the culprit appears to be climate change.

Before 1997, Earth was getting taller while its equator was shrinking. *NASA / GSFC*

Since 1997, Earth's equator has been bulging while the globe gets slightly shorter. *NASA / GSFC*

"We're not measuring Earth's radius itself," says Benjamin Chao, a geophysicist at NASA's Goddard Space Flight Center and one of the chroniclers of this shift. "We're measuring the effects of its changing gravity field." For 25 years, researchers have tracked the movement of satellites by shooting laser beams at them from Earth. Because the pull of gravity is directly related to the amount of mass, maps of the planet's mass distribution can be made by recording subtle changes in satellites' positions.

Decades of data gathering showed a steadily decreasing waistline — known as postglacial rebound — which scientists attribute to a springiness in Earth's mantle. Ice from the last Ice Age had pressed down on the poles like a vise, causing the planet's middle to expand. When it melted about 10,000 years ago, Earth began to spring back, transferring its mass from the equator toward the poles.



This model exaggerates Earth's uneven mass distribution. *GFZ-Potsdam*

"It's still rebounding today," says Chao. "We're still seeing the northern part of Europe and Canada rising. But in the last few years, the trend is reversing. Something else is causing Earth to become more oblate…. It was a very big surprise."

In a paper published in the current issue of *Science*, Chao and colleague Christopher Cox discuss the possible triggers of the reshuffling of Earth's mass. Atmospheric events and melting polar ice are both dismissed (a shelf of ice 30 miles long, 6 miles wide, and 3 miles thick would have to have melted in the last five years to account for the extra girth, which is ten times more ice than what's estimated to have actually melted). That leaves the oceans as the most likely suspect, with changing currents the conduit for the movements of mass. And changes in the ocean mean one thing to those in the know — something is afoot with the world's climate.

"What we're seeing is definitely climate variations," says Chao. In fact, the gravitational field changes began "at the time of the strongest El Niño event this century," write scientists in an accompanying article. Models suggest this recurring but irregular cycle of shifts in ocean and atmospheric conditions could move water to the tropics, which might account for the equatorial bulge. "Whether this is a natural, regular thing that will come back later or a one-time thing we don't know," says Chao, who doesn't rule out global warming as a cause.

But lest you worry about Earth bursting its seams, Chao reassures, "We're talking about very small effects. It's not like Earth's gravity is going to change overnight." Earth is about 1/300th wider than it is tall, but it has only added about one part in 100 million to its belly in each of the last four years.

Such small changes attest to the sensitivity of the satellite data, which is due to get even finer now with a pair of satellites launched in March called GRACE (Gravity Recovery and Climate Experiment). These will bounce radio beams between them and produce even more subtle maps of Earth's gravity field.

The GRACE mission is designed to study Earth's gravity field.
NASA

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