Slowing ocean current caused Earth to spin faster

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(PhysOrg.com) -- Most people probably didn't notice it, but back in 2009, the Earth spun around on its axis a tiny bit faster than usual, making for some slightly shorter days. It only happened for a couple of weeks and during that time, the days were only shortened by 0.1 milliseconds, but still, the whole idea seems a bit unsettling. This speed-up apparently came about due to ocean currents surrounding Antarctica suddenly slowing down for reasons that aren't wholly clear. Researchers from NASA's JPL, in conjunction with colleagues from the Institute of Earth Physics in France, spotted the phenomenon and after looking into it, have published their results in *Geophysical Research Letters*.

It's possible the team writes, that the slowed ocean currents came about

due to El Niño. They say that a slight drop in wind speeds that were moving in the same direction over the affected area of ocean were found two days before the ocean slowdown. They also explain that the spin speed of the Earth changes quite often due to variety of events, though normally it's changes in wind speed alone that account for most such changes. The Earth spin speed changes in response to such events, in this case moving faster, to conserve angular momentum. They team also points out that once the wind picked up again, so too did the current speed resulting in the axis spin returning to normal.

The researchers note that until now, such rapid changes between wind or ocean currents and changes in axis spin speed had never been seen. Normally gradual changes are found based on changes in prevailing wind patterns. The difference here appears to be the location of the wind changes, coming as they did over the Antarctic ice shelf which has a current that flows all the way around it. What's surprising is that such a small change in wind speed could cause an almost immediate change in ocean current speed to the extent that it was able to so quickly impact the Earth's rotation speed.

The researchers note that their observations could perhaps portend more to come as global warming causes changes to El Niño and other wind patterns and raises ocean temperatures causing unknown changes in currents and their speed.

More information: Detection of the Earth rotation response to a rapid fluctuation of Southern Ocean circulation in November 2009, *Geophysical Research Letters*, doi:10.1029/2011GL050671

Abstract
At seasonal and shorter periods the solid Earth and its overlying geophysical fluids form a closed dynamical system, which (except for tidal forcing) conserves its total angular momentum. While atmospheric

effects dominate changes in the Earth's rate of rotation and hence length-of-day (LOD) on these time scales, the addition of oceanic angular momentum (OAM) estimates has been shown to improve closure of the LOD budget in a statistical sense. Here we demonstrate, for the first time, the signature of a specific, sub-monthly ocean current fluctuation on the Earth's rotation rate, coinciding with recently-reported anomalies which developed in southeast Pacific surface temperature and bottom pressure fields during late 2009. Our results show that concurrent variations in the Antarctic Circumpolar Current (ACC), which saw a sharp drop and recovery in zonal transport during a two-week period in November, were strong enough to cause a detectable change in LOD following the removal of atmospheric angular momentum (AAM) computed from the Modern Era Retrospective Analysis for Research and Applications (MERRA) database. The strong OAM variations driving the LOD-AAM changes were diagnosed from ocean state estimates of the Consortium for Estimating the Circulation and Climate of the Ocean (ECCO) and involved roughly equal contributions from the current and pressure terms, with in situ confirmation for the latter provided by tide-corrected bottom pressure recorder data from the South Drake Passage site of the Antarctic Circumpolar Current Levels by Altimetry and Island Measurements (ACCLAIM) network.

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