

Antarctic bulge could flood Washington DC

* 19:00 05 February 2009 by David Robson

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Rather than spreading out evenly across all the oceans, water from melted Antarctic ice sheets will gather around North America and the Indian Ocean. That's bad news for the US East Coast, which could bear the brunt of one of these oceanic bulges.

Many previous models of the rising sea levels due to climate change assumed that water from melted ice sheets and glaciers would simply run into the oceans and fill them uniformly. These models predict a 5-metre rise in sea levels if the West Antarctic ice sheet melts, but fail to acknowledge three important factors.

First, Jerry Mitrovica and colleagues from the University of Toronto in Canada considered the gravitational attraction of the Antarctic ice sheets on the surrounding water, which pulls it towards the South Pole. As the ice sheet melts, this bulge of water dissipates into surrounding oceans along with the meltwater. So while the sea level near Antarctica will fall, sea levels away from the South Pole will rise.

Once the ice melts, the release of pressure could also cause the Antarctic continent to rise by 100 metres. And as the weight of the ice pressing down on the continental shelf is released, the rock will spring back, displacing seawater that will also spread across the oceans.

Redistributing this mass of water could even change the axis of the Earth's spin. The team estimates that the South Pole will shift by 500 metres towards the west of Antarctica, and the North Pole will shift in the opposite direction. Since the spin of the Earth creates bulges of oceanic water in the regions between the equator and the poles, these bulges will also shift slightly with the changing axis.

Washington awash

The upshot is that the North American continent and the Indian Ocean will experience the greatest changes in sea level - adding 1 or 2 metres to the current estimates. Washington DC sits squarely in this area, meaning it could face a 6.3-metre sea level rise in total. California will also be in the target zone.

"Policy-makers must realise that the effects could be greater or smaller in different areas," says team member Natalya Gomez. The team have so far only considered one ice sheet, so the effects of other ice sheets across the world could also have a similar impact, she says.

However, these models assume that all the West Antarctic sea ice will melt, but Peter Convey from the British Antarctic Survey in Cambridge points out this may not necessarily be the case. "It would be dangerously easy to get people to focus on the 6-metre figure, but it just might not happen like that," he says.

Jonathan Gregory from the University of Reading in the UK, who is part of the Intergovernmental Panel on Climate Change, however, thinks the work should be helpful once this has been reliably evaluated.

Journal reference: Science: DOI: [10.1126/science.1166510](https://doi.org/10.1126/science.1166510)