

Abrupt climate shifts may move faster than thought

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The United States could suffer the effects of abrupt climate changes within decades—sooner than some previously thought--says a new government report. It contends that seas could rise rapidly if melting of polar ice continues to outrun recent projections, and that an ongoing drought in the U.S. west could be the start of permanent drying for the region. Commissioned by the U.S. Climate Change Science Program, the report was authored by experts from the U.S. Geological Survey, Columbia University's Lamont-Doherty Earth Observatory and other leading institutions. It was released at this week's meeting of the American Geophysical Union.

Many scientists are now raising the possibility that abrupt, catastrophic switches in natural systems may punctuate the steady rise in global temperatures now underway. However, the likelihood and timing of such "tipping points," where large systems move into radically new states, has been controversial. The new report synthesizes the latest published evidence on four specific threats for the 21st century. It uses studies not available to the Intergovernmental Panel on Climate Change (IPCC), whose widely cited 2007 report explored similar questions. "This is the most up to date, as it includes research that came out after IPCC assembled its data," said Edward Cook, a climatologist at Lamont-Doherty and a lead author of the new study.

The researchers say the IPCC's maximum estimate of two feet of sea level rise by 2100 may be exceeded, because new data shows that melting of polar ice sheets is accelerating. Among other things, there is

now good evidence that the Antarctic ice cap is losing overall mass. At the time of the IPCC report, scientists were uncertain whether collapses of ice shelves into the ocean off the western Antarctica were being offset by snow accumulation in the continent's interior. But one coauthor, remote-sensing specialist Eric Rignot of the Jet Propulsion Laboratory, told a press conference at the meeting: "There is a new consensus that Antarctica is losing mass." Seaward flow of ice from Greenland is also accelerating. However, projections of how far sea levels might rise are "highly uncertain," says the report, as researchers cannot say whether such losses will continue at the same rates.

In the interior United States, a widespread drought that began in the Southwest about 6 years ago could be the leading edge of a new climate regime for a wider region. Cook, who heads Lamont's Tree Ring Lab, says that periodic droughts over the past 1,000 years have been driven by natural cycles in air circulation, and that these cycles appear to be made more intense and persistent by warming. Among the new research cited is a 2007 Science paper by Lamont climate modeler Richard Seager, showing how changes in temperature over the Pacific have driven large-scale droughts across western North America. "We have no smoking gun saying that humans are causing the current changes. But the past is a cautionary tale," Cook told the press conference. "What this tells us is that the system has the ability to lock into periods of profound, long-lasting aridity. And there is the suggestion that these changes are related to warmer climate." Cook added: "If the system tips over, that would have catastrophic effects no human activities and populations over wide areas."

The panel said two other systemic changes seem less imminent, but are still of concern. Vast quantities of methane, a potent greenhouse gas, have long been locked up in ocean sediments, wetlands and permafrost. These could be destabilized by climate change, leading to blowouts of gas, and thus even more abrupt temperature shifts. The panel said

blowouts appear unlikely in the next 100 years—but that steady emissions could double, especially in the north, as land and water warm up. The panel also looked at the continuous circulation of the Atlantic Ocean, which sends warm water northward and cold water southward, controlling the climate of western Europe and beyond. Some scientists say this circulation could collapse if enough northern ice melts and dilutes the salty water. The panel found this scenario unlikely in the short term, but warned that the circulation's strength might decline 25% to 30% by 2100.

"Abrupt climate change presents potential risks for society that are poorly understood," the researchers write. [There is an] urgent need for committed and sustained monitoring of those components [that] are particularly vulnerable."

The report, Synthesis and Assessment Product 3.4: Abrupt Climate Change, is at: [www.climatechange.gov/Library ... 1-report/default.htm](http://www.climatechange.gov/Library...1-report/default.htm) .

Source: The Earth Institute at Columbia University

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