Some climate impacts happening faster than anticipated

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A report released today at the annual meeting of the American Geophysical Union provides new insights on the potential for abrupt climate change and the effects it could have on the United States, identifying key concerns that include faster-than-expected loss of sea ice, rising sea levels and a possibly permanent state of drought in the American Southwest.

The analysis is one of 21 of its type developed by a number of academic and government agency researchers for the U.S. Climate Change Science Program. The work incorporates the latest scientific data more than any previous reports, experts say, including the 2007 Intergovernmental Panel on Climate Change.

While concluding that some projections of the impact of climate change have actually been too conservative – as in the case of glacier and ice sheets that are moving and decaying faster than predicted – others may not pose as immediate a threat as some scenarios had projected, such as the rapid releases of methane or dramatic shifts in the ocean current patterns that help keep Europe warm.

"We simulate the future changes with our climate models, but those models have not always incorporated some of our latest data and observations," said Peter Clark, a professor of geosciences at Oregon State University and a lead author on the report. "We now have data on glaciers moving faster, ice shelves collapsing and other climate trends emerging that allow us to improve the accuracy of some of our future

projections."

Some of the changes that now appear both more immediate and more certain, the report concludes, are rapid changes at the edges of the Greenland and West Antarctic ice sheets, loss of sea ice that exceeds projections by earlier models, and hydroclimatic changes over North America and the global subtropics that will likely intensify and persist due to future greenhouse warming.

"Our report finds that drying is likely to extend poleward into the American West, increasing the likelihood of severe and persistent drought there in the future," Clark said. "If the models are accurate, it appears this has already begun. The possibility that the Southwest may be entering a permanent drought state is not yet widely appreciated."

Climate change, experts say, has happened repeatedly in Earth's history and is generally believed to be very slow and take place over hundreds or thousands of years. However, at times in the past, climate has also changed surprisingly quickly, on the order of decades.

"Abrupt climate change presents potential risks for society that are poorly understood," researchers wrote in the report.

This study, in particular, looked at four mechanisms for abrupt climate change that have taken place prehistorically, and evaluated the level of risks they pose today. These mechanisms are rapid changes in glaciers, ice sheets and sea level; widespread changes to the hydrologic cycle; abrupt changes in the "Atlantic Meridional Overturning Circulation," or AMOC, an ocean current pattern; and rapid release to the atmosphere of methane trapped in permafrost or on continental margins.

Considering those mechanisms, the report concluded:

-- Recent rapid changes at the edges of the Greenland and West Antarctic ice sheets show acceleration of flow and thinning, with the speed of some glaciers more than doubling. These "changes in ice dynamics can occur far more rapidly than previously suspected," the report said, and are not reflected in current climate models.

-- Inclusion of these changes in models will cause sea level rises that "substantially exceed" levels now projected for the end of this century, which are about two feet – but data are still inadequate to specify an exact level of rise.

-- Subtropical areas around the world, including the American West, are likely to become more arid in the future due to global warming, with an increasing likelihood of severe and persistent drought. These are "among the greatest natural hazards facing the United States and the globe today," the report stated, and if models are correct, this has already begun.

-- The strength of "AMOC" ocean circulation patterns that help give Europe a much warmer climate than it would otherwise have may weaken by about 25-30 percent during this century due to greenhouse gas increases, but will probably not collapse altogether – although that possibility cannot be entirely excluded.

-- Climate change will accelerate the emissions of methane, a potent greenhouse gas, from both hydrate sources and wetlands, and they quite likely will double within a century – but a dramatic, potentially catastrophic release is very unlikely.

The "overarching" recommendation of the report is the need for committed and sustained monitoring of these climatic forces that could trigger abrupt climate change, the researchers concluded.

Better observing systems are needed, better forecasting of droughts should be developed, a more comprehensive understanding of the AMOC system is needed, and monitoring of methane levels should be maintained, among other needs.

Source: Oregon State University

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