

Climate scientists' global warning

By Chris Mooney

6:09 AM Saturday Mar 26, 2016

Study suggests the impact of global warming will be quicker and more catastrophic than envisioned, writes Chris Mooney.



If the scientists' study is right, sights like that in Lake Argentina, where chunks of ice broke off the Perito Moreno Glacier this month, could become more common. Photo / AP

An influential group of scientists led by James Hansen, the former Nasa scientist often credited with having drawn the first major attention to climate change in 1988 congressional testimony, has published a dire climate study that suggests the impact of global warming will be quicker and more catastrophic than generally envisioned.

The research invokes collapsing ice sheets, violent megastorms and even the hurling of boulders by giant waves in its quest to suggest that even 2C of global warming above pre-industrial levels would be far too much. Hansen has called it the most important work he has ever done.

The sweeping paper, 52 pages in length and with 19 authors, draws on evidence from ancient climate change or "paleo-climatology", as well as climate experiments using computer models and some modern observations. Calling it a "paper" really isn't quite right - it's actually a synthesis of a wide range of old and new evidence.

"I think almost everybody who's really familiar with both paleo and modern is now very concerned that we are approaching, if we have not passed, the points at which we have locked in really big changes for young people and future generations," Hansen said.

The research, appearing on Wednesday in the open-access journal Atmospheric Chemistry and Physics, has had a long and controversial path to life, having first appeared as a "discussion paper" in the same journal, subject to live, online peer review - a novel but increasingly influential form of scientific publishing. Hansen first told the press about the research last year, before this process was completed, leading to criticism from some journalists and also fellow scientists that he might be jumping the gun.

What ensued was a high-profile debate, both because of the dramatic claims and Hansen's formidable reputation. And his numerous co-authors, including Greenland and Antarctic ice experts and a leader of

the United Nations' Intergovernmental Panel on Climate Change, were nothing to be sniffed at.

After record downloads for the study and an intense public review process, a revised version of the paper has now been accepted, according to both Hansen and Barbara Ferreira, media and communications manager for the European Geophysical Union, which publishes Atmospheric Chemistry and Physics. Indeed, the article is now freely readable on the Atmospheric Chemistry and Physics website.

The paper, according to Ferreira, was subject to "major revisions in terms of organisation, title and conclusions". Those came in response to criticisms that can all be read publicly at the journal's website. The paper also now has two additional authors.

Most notably, perhaps, the editorial process led to the removal of the use of the phrase "highly dangerous", in the paper's title, to describe warming the planet by 2C above pre-industrial levels.

The original paper's title was Ice melt, sea level rise and superstorms: evidence from paleoclimate data, climate modelling, and modern observations that 2C global warming is highly dangerous. The final title is Ice melt, sea level rise and superstorms: evidence from paleoclimate data, climate modelling, and modern observations that 2C global warming could be dangerous. But nonetheless, Hansen's climate catastrophe scenario now takes its place in the official scientific literature relatively intact. So let's rehearse that scenario, again, for the record.

Hansen and his colleagues think that major melting of Greenland and Antarctica can not only happen quite fast - leading to as much as several metres of sea-level rise in the space of a century, depending on how quickly melt rates double - but that this melting will have dramatic climate change consequences, beyond merely raising sea levels.

That's because, they postulate, melting will cause a "stratification" of the polar oceans. What this means is that it will trap a pool of cold, fresh meltwater atop the ocean surface, with a warmer ocean layer beneath.

We have actually seen a possible hint of this with the anomalously cold "blob" of ocean water off the southern coast of Greenland, which some have attributed to Greenland's melting.

Indeed, shortly before the new paper's publication, the National Oceanic and Atmospheric Administration released new recent data on the globe's temperature that certainly bears a resemblance to what Hansen is talking about. For not only was the globe at a record warmth overall over the last three months, but it also showed anomalous cool patches in regions that Hansen suspects are being caused by ice melt - below Greenland, and also off the tip of the Antarctic peninsula.

"My interpretation is that this is the beginning," Hansen says of these cool patches in curious parts of the global ocean. "And it's one or two decades sooner than in our model."

However, when it comes to both the melt rates for Greenland and Antarctica, and also these cool ocean patches, we have a very limited time span of observations. It is far from clear, yet, that Hansen's interpretation of them will prevail, and the new study also suggests closely observing these areas in coming years.

Stratification, the key idea in the new paper, means that warm ocean water would potentially reach the base of ice sheets that sit below sea level, melting them from below (and causing more ice melt and thus, stratification). It also means, in Hansen's paper, a slowdown or even eventual shutdown of the overturning circulation in the Atlantic ocean, due to too much freshening in the North Atlantic off and around Greenland, and also a weakening of another overturning circulation in the Southern Ocean.

This, in turn, causes cooling in the North Atlantic region, even as global warming creates a warmer

equatorial region. This growing north-south temperature differential, in the study, drives more intense mid-latitude cyclones, or storms. The study suggests such storms may kick up gigantic oceanic waves, which may even be capable of feats such as hurling boulders in some locations, not unlike the huge rocks seen on the Bahamian island of Eleuthera, which I visited with Hansen and his co-author, geologist Paul Hearty, in November.

These rocks play a key role in the new paper, just as they did in the original study draft.

Indeed, long before the current paper, Hearty had documented, in peer reviewed publications, that Eleuthera's rocks appear to have come from the ocean and to have been lifted high up on to a coastal ridge. This appears to have happened during a past warm period, the Eemian, around 120,000 years ago, when the planet was only slightly warmer than today but seas were far higher - but the idea is that something like it could happen again.

The paper contains many ideas and departures, but the key one is its suggestion of the possibility of greater sea-level rise in this century than forecast by the UN's Intergovernmental Panel on Climate Change.

"The models that were run for the IPCC report did not include ice melt," Hansen said in a press conference regarding the paper on Tuesday. "And we also conclude that most models, ours included, have excessive small-scale mixing, and that tends to limit the effect of this freshwater lens on the ocean surface from melting of Greenland and Antarctica."

There is a great deal at stake. Hansen has cited the paper in court proceedings in a case playing out in Oregon, where a series of young plaintiffs, including his granddaughter Sophie, are suing the United States for violating their constitutional rights by allowing fossil fuel burning. While scientists will have to digest the new version of the paper, when the initial draft paper was released, at the website of Atmospheric Chemistry and Physics Discussions, it prompted both scientific praise and also major scepticism.

David Archer, a geoscientist at the University of Chicago and a reviewer for the first round of the paper, called it "another Hansen masterwork of scholarly synthesis, modelling virtuosity, and insight, with profound implications".

But Peter Thorne, another official reviewer and a climate researcher with the National University of Ireland Maynooth, wrote that "it is far from certain that the results contended shall match what will happen in the real world".

Thorne also expressed his "personal discomfort at the paper being openly and actively publicised before the discussion period is complete."

Michael Mann, a Penn State university climate scientist familiar with the original study, commented, "Near as I can tell, the issues that caused me concern originally still remain in the revised manuscript.

"Namely, the projected amounts of meltwater seem unphysically large, and the ocean component of their model doesn't resolve key wind-driven current systems (eg the Gulf Stream) which help transport heat poleward. That makes northern hemisphere temperatures in their study too sensitive to changes in the Atlantic meridional overturning ocean circulation," the scientific name for the ocean circulation in the Atlantic that, the study suggests, could shut down.

However, another Penn State researcher, glaciologist Richard Alley, said by email that "though this is one paper, it usefully reminds us that large and rapid changes are possible, and it raises important research questions as to what those changes might mean if they were to occur.

"But, the paper does not include enough ice-sheet physics to tell us how much, how rapidly is how

likely."

- Bloomberg

- Washington Post