A Measure of How Far Behind We Are + Anecdotes from Recent Rambles

by strannikov

I did expend the electricity and toner to print one copy of pages five to forty-one of the IPCC AR6 Working Group I Summary for Policymakers released Monday, 9 August 2021: which motivated the following calculations.

Math has never been my strong suit, so basic math posed the limit of complication here. Most of the calculations consisted of converting units of measurement as defined by results from Google searches.

To give an initial idea of what I found before I explain how I arrived at my conclusion (I do heartily invite any and all with actual math aptitude to compensate for my miscalculations): it would take a fleet of almost two thousand (2 000, or about 1 820 as well as I could determine) commercial supertankers to move one gigaton of harvested Antarctic ice. (In a previous essay I posed ice harvesting or “ice mining” in Antarctica as an opportunity both for distributing fresh water to arid locales and drought-stricken lakes and reservoirs and for very modestly helping to reduce sea level rises courtesy of melting Antarctic ice shelves and glaciers.)

From c. 1995 through 2010, Antarctica's Thwaites Glacier is said to have lost up to fifty-two gigatons of melt run-off annually, so about one gigaton a week. One gigaton is one billion metric tons, and one metric ton equals 2204.6 pounds. This begins to give an idea of the enormous size and mass of just the Thwaites Glacier, which still

exists as of August 2021, though probably with at least five hundred and twenty fewer gigatons of ice mass than in August 2011.

A metric ton is only about thirty-five pounds short of a long ton, a long ton being equal to 2240 pounds. A long ton is an important unit to keep in mind, since the hold volume and capacity of any commercial supertanker is measured in long tons (when not measured in dead weight tons).

A large commercial supertanker can hold about five hundred fifty thousand dead weight tons, which for purposes of my calculation are the equivalent of long tons: but if I err at all, let us opt for one dead weight ton being the rough equivalent of only one metric ton.

Admittedly, my calculations may have begun to stray already, since I've not taken time or expended effort to learn the difference in volume and/or weight of a ton of ice compared to its mass in terms of melted ice.

Since it would take a fleet of at least hundreds of commercial supertankers (presumably, newly built or outfitted specifically for carrying either freshwater ice or freshwater itself) to move a single gigaton of Antarctic ice, there seems no way on Earth to appreciably forestall sea level rises by shipping Antarctic ice in frozen or liquid form to other parts of the planet. (Energy/fuel, technical, and crew requirements for operating such a massive fleet or fleets would likely prove prohibitive themselves, as would the work of harvesting and loading ice or water into the fleets' holds.) Nor does any science seem presently to exist that could say anything about the efficacy of transporting ice or water from the south polar region to any other stricken part of the planet to alleviate aridity or drought conditions, other than provision of only ephemeral and interim relief.

This informal exercise is intended only to begin to suggest the enormity of what the IPCC has begun to tell us about what the decades, centuries, and millennia directly and immediately ahead stand to bring our—and our planet's—way.

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In the course of other recent internet ramblings, I had occasion to consult the Wikipedia entry for the 2004 science fiction thriller The

Day After Tomorrow (a film I have never seen). Here is a two-paragraph excerpt from the Wikipedia entry on its “real-world” reception:

“Stefan Rahmstorf of the Potsdam Institute for Climate Impact Research, an expert on thermohaline circulation and its effect on climate, said after a talk with scriptwriter Jeffrey Nachmanoff at the film's Berlin preview:

‘Clearly this is a disaster movie and not a scientific documentary, [and] the film makers have taken a lot of artistic license. But the film presents an opportunity to explain that some of the basic background is right: humans are indeed increasingly changing the climate and this is quite a dangerous experiment, including some risk of abrupt and unforeseen changes ... Luckily it is extremely unlikely that we will see major ocean circulation changes in the next couple of decades (italics mine) . . . at least most scientists think this will only become a more serious risk towards the end of the century. And the consequences would certainly not be as dramatic as the “superstorm” depicted in the movie. Nevertheless, a major change in ocean circulation is a risk with serious and partly unpredictable consequences, which we should avoid . . . .'”

Rahmstorf's comments are dated in the Wikipedia footnotes as 11 October 2004. However significantly, the Potsdam Institute for Climate Impact Research contributed data and/or data analysis for a report released Thursday, 5 August 2021, concerning the Atlantic Meridional Overturning Circulation (AMOC, aka the Atlantic Gulf Stream), less than twenty years after Rahmstorf's movie review.

The science journal Nature Climate Change published this abstract titled “Observation-based early-warning signals for a collapse of the Atlantic Meridional Overturning Circulation” on 5 August 2021 (author: Niklas Boers):

“The Atlantic Meridional Overturning Circulation (AMOC), a major ocean current system transporting warm surface waters toward the northern Atlantic, has been suggested to exhibit two distinct modes of operation. A collapse from the currently attained strong to the weak mode would have severe impacts on the global

climate system and further multi-stable Earth system components. Observations and recently suggested fingerprints of AMOC variability indicate a gradual weakening during the last decades, but estimates of the critical transition point remain uncertain. Here, a robust and general early-warning indicator for forthcoming critical transitions is introduced. Significant early-warning signals are found in eight independent AMOC indices, based on observational sea-surface temperature and salinity data from across the Atlantic Ocean basin. These results reveal spatially consistent empirical evidence that, in the course of the last century, the AMOC may have evolved from relatively stable conditions to a point close to a critical transition."

—and as Reuters scribe Nina Chestney helped explain with interview quotes from Boers in a piece published the same day, after questioning whether AMOC weakening was due to changes in circulation or to a loss of dynamic stability:

"'The loss of dynamical stability would imply that the AMOC has approached its critical threshold, beyond which a substantial and in practice likely irreversible transition to the weak mode could occur,' said Niklas Boers at the Potsdam Institute for Climate Impact Research and author of the study. 'The findings support the assessment that the AMOC decline is not just a fluctuation (in circulation) or a linear response to increasing temperatures but likely means the approaching of a critical threshold beyond which the circulation system could collapse,' Boers said."

Note again the optimism of Stefan Rahmstorf's comments from October 2004: "it is extremely unlikely that we will see major ocean circulation changes in the next couple of decades" (id est, not before October 2024 at the very earliest). Note again also that the recent analysis comes from his colleagues at the Potsdam Institute for Climate Impact Research. (The data and their PICIR analysis are already subject to dispute, always a proper response to published reports of data and their analysis.)

I begin to conclude by citing paragraph C. 3. 4 from page 36 of the IPCC's AR6 Working Group I Summary for Policymakers release

(italics relating to the epistemic spectrum are a feature of the document as published): “The Atlantic Meridional Overturning Circulation is very likely to weaken over the 21st century for all emission scenarios. While there is high confidence in the 21st century decline, there is only low confidence in the magnitude of the trend. There is medium confidence that there will not be an abrupt collapse before 2100. If such a collapse were to occur, it would very likely cause abrupt shifts in regional weather patterns and water cycle, such as a southward shift in the tropical rain belt, weakening of the African and Asian monsoons and strengthening of Southern Hemisphere monsoons, and drying in Europe.”

I have not learned whether PICIR researchers Boers or Rahmstorf contributed to the IPCC report, but it might be significant that the IPCC did not draw upon the data analysis published 5 August 2021, since the IPCC document review covered only work published prior to calendar year 2021.

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Oh, and a footnote/afterthought, also courtesy of Wikipedia: seventeen of the twenty largest wildfires in California history have occurred in just the past twenty years—eight of the ten largest wildfires in California history have occurred in just the past five years.

—and I post the following link here on 16 Aug 21 only because I did not come across it until after posting the preceding essay:

Video: Antarctic Ice Mass Loss 2002-2020 — Climate Change: Vital Signs of the Planet (nasa.gov)

(This link features its own embedded link to a comparable survey of Greenland ice mass loss over the same period.) Some of the ice mass loss depicted in West Antarctica (the Thwaites Glacier and Pine Island Glacier region) apparently is attributable (again, at least in part) directly to geothermal venting from a volcano underneath

the Antarctic ice sheets, though this hardly qualifies as much of a consolation.