

Worst Case Climate Risk

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How could world access to newer better information on new IEEE technologies be a matter of urgency, of life and death importance to us all?

When Kumar asked us to organize a new book, to connect the real science, climatology, engineering and economics to address the worst risks coming to us from climate change, even we did not realize how much we had to learn by putting the pieces together, even in the study of climate risks themselves. We did not realize just how serious and near-term the biggest threats actually are. We did not yet know how many critical pieces need to be connected together in ways they have never been connected before, both to understand and reduce the threats.

In August, 2021, Metta Spencer (https://en.wikipedia.org/wiki/Metta_Spencer), a leader of Canadian futurist groups, asked what we really know from the very most solid science about the risk that climate change might actually become serious enough to endanger the existence of the human species. The key challenge was to bring together people who had never put the relevant pieces together to assess how bad the risk might be. This discussion, at <https://www.youtube.com/watch?v=SMp9a0PwL3o>, was a great eye-opener to us. But it was only just an opening.

Part IV of this book will begin with new work solidly proving the large risks due to methane emissions and changes on ocean currents, established in the work of Wadhams. But our personal motivation here is driven more by a much larger risk, which has yet to be fully proven, which cries out for more and deeper R&D, but which now seems convincing enough that we feel we are part of a struggle for our very lives (or at least our childrens' lives).

We now know that the most important mass extinctions of life on earth in past history were caused by outgassing of H₂S (a poison twice as potent per ppm as hydrogen cyanide) from the oceans. The H₂S was mainly produced by a type of microbe which has different names in different scientific communities, but resulted from two conditions in deep ocean waters: (1) low oxygen; and (2) a high concentration of certain nitrates, such as phosphates, which need to be studied in greater depth.

We are now much more worried than we were at the start of this project, in part because of what Ward and Werbos learned from Wadhams about changes in ocean currents (in the youtube video!), but in part because of new information about mass extinctions in the past and data on nutrient flows in the ocean today:

(a) Cui, Y., Kump, L.R. and Ridgwell, A., 2013. Initial assessment of the carbon emission rate and climatic consequences during the end-Permian mass extinction. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 389, pp.128-136. (Use "advanced search", the "hamburger" three lines at scholar.google.com, to see this and other important papers by Kump. See also the explanation in chapter 12 of <https://www.amazon.com/New-History-Life-Discoveries-Evolution-ebook/dp/B00OZM4AN2/>, the best integrated history of life on earth now available.)

(b) <https://www.aoml.noaa.gov/ocd/ocdweb/nutrients.html>

THE GEOGRAPHIC DISTRIBUTION OF the danger levels of relevant nutrients happens to coincide exactly with the source of the Humboldt current, which is also a place where the thickness of oxygen containing deep water is shrinking rapidly (e.g. see the map from NOAA at verbos.com/Atacama.pdf). Next most dangerous is the "Arctic tongue" at the origins of Gulf Stream currents.

The "coincidence" of locations seems strange at first, but it is not surprising that regions of the ocean which contain more oxygen also contain more of our kind of life, which can digest nutrients and excrete them to the ocean bottoms.

Again, more research is needed to pin down exactly where the risks may be, and to answer the many obvious questions, but such research should be one of highest priorities in climate policy all over the world. When Guterres and Kerry both proposed a new climate security office under the UN Security Council, we strongly hoped that such an office could be created, and managed under the highest standards of review and integrity (and funding) ever seen in the example of NSF.