

BRAVE NEW ARCTIC: THE UNTOLD STORY OF THE MELTING NORTH. By MARK C. SERREZE. Princeton, New Jersey: Princeton University Press, 2018. ISBN 9780691173993. 264 p., maps, b&w and colour illus., index, endnotes. Hardbound. US\$24.95.

For around a decade it has been a generally accepted scientific fact that the world's climate is changing, and that the cause is man-made carbon dioxide. These effects are magnified in the Arctic (so-called "Arctic amplification"), and steady reductions in the amount of sea ice have been one of the most visible results. In this sparsely populated region, this is a trend of concern not only for polar bears. Without its year-round ice cover, the reduced albedo of the Arctic Ocean has been blamed for changing weather systems throughout the Northern Hemisphere, resulting in more severe winters in the northern United States, earlier forest fires in Canada, and flooding in Europe. The eroding wave action resulting from the absence of sea ice has washed away coastal settlements in Alaska and the Canadian Arctic. The Arctic is at the front line of the global climate crisis.

What makes Mark Serreze's book interesting and different is that it does not merely document the changes we already know about, but tells the story of how the American scientific community came to the realization that Arctic climate change was real and man-made—and happening far quicker than models had predicted. Serreze himself admits to initially being skeptical that there was a link between CO₂ and Arctic warming, so the journey is also a personal one as the mounting evidence gradually persuades him to change his mind.

Climate models had long predicted that the consequence of increasing global CO₂ levels would be raised temperatures and reduced summer sea-ice cover, but for a long time this was simply not observed. Between 1979 and 2000 there were several years when new minima were observed, but these were followed by years in which the sea-ice extent returned to "normal" levels. Separating the anticipated downward trend from natural variability was surprisingly complicated.

For example, the eruption of Mount Pinatubo in the Philippines in June 1991 caused a drop in summer temperatures in the Canadian Arctic the following year, abruptly reversing several years of shrinking summer sea-ice extent and obscuring the expected CO₂-induced warming. It was not until 2003 that Serreze was finally convinced that a new trend had been established. This trend was confirmed beyond doubt in 2007, when there was a further dramatic drop in summer sea-ice cover. At a press conference the following year, Serreze said that he believed the Arctic cryosystem had probably now reached a tipping point and coined the term "death spiral" to describe the ever-shrinking summer sea-ice cover.

Another interesting example of the pitfalls to befall the scientific community as they tried to determine whether CO₂ levels were actually having an impact on the Arctic climate was what Serreze describes as a "mania" in the 1990s for invoking the Arctic Oscillation (AO), a large-scale atmospheric phenomenon, as a cause for observed changes. In fact, he claims that for a while the joke was that it was impossible to get a paper published or proposal funded unless it had a link to the AO. But ultimately the AO turned out to be a red herring as the underlying cause of Arctic climate change.

The difficulty of determining cause and effect in the Arctic climate was not merely a matter of science though. Perhaps the most remarkable part of the book is his detailed account of how political interference by the U.S. government of the day (the Republicans of the Bush administration) attempted to suppress data and harass and intimidate prominent scientists working in the field, on several occasions successfully shutting down or misdirecting the science programs they were employed on.

My main criticism of the book is that this story is viewed from a purely American perspective. Serreze rarely mentions contributions by non-U.S. scientists or the considerable international progress in unravelling the Arctic climate puzzle. He mentions that the major international Arctic climate research program, MOSAiC (Multidisciplinary drifting Observatory for the Study of Arctic Climate), which is billed as the "largest polar expedition in history" with over 600 participants from 17 countries (<https://www.mosaic-expedition.org/>), is much larger than the U.S. one, but then tantalizingly says nothing about its objectives. Perhaps the biggest future Arctic climate threat of all, the thawing of the vast reserves of frozen methane hydrates offshore Siberia (already observed to be bubbling to the surface), again receives barely a mention. So, one is left wondering how much of "the untold story of the melting north" from the book's title has actually been told.

Overall though, this is an enlightening and often fascinating read and well worth the money. In terms of technical level, since the book necessarily focuses on the subtleties of how the academic debate has evolved over the decades, it does require a good grasp of climate science on behalf of the reader. Despite its often chatty style, the book is perhaps better suited to students and practitioners than the layperson.

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