Source: truthout.org by Dahr Jamail

Earth's Ice Loss "Is a Nuclear Explosion of Geologic Change"

Dahr Jamail is a superb journalist

Much of the frozen water portion of the Earth, otherwise known as the cryosphere, is melting. This is not news: It's been happening for decades. What is news is that the long-term melting trends in the Arctic, Antarctica, and with most land-based glaciers are accelerating, often at shocking rates, largely due to human-caused climate change.

Antarctica is melting three times as fast as it was just 10 years ago, alarming scientists. A study earlier this year showed 3 trillion tons of ice had disappeared since 1992. That is the equivalent of enough water to cover the entire state of Texas with 13 feet of water, and raise global sea levels a third of an inch.

"From 1992 to 2011, Antarctica lost nearly 84 billion tons of ice a year (76 billion metric tons)," read the AP story on the study. "From 2012 to 2017, the melt rate increased to more than 241 billion tons a year (219 billion metric tons)."

“I think we should be worried,” one of the study’s 88 co-authors, University of California, Irvine’s Isabella Velicogna, told AP. “Things are happening. They are happening faster than we expected.”

In fact, the polar ice caps have melted faster in the last 25 years than they have in the last 10,000 years.

In the Arctic, the Greenland Ice Sheet is losing an average of 270 billion tons of ice each year, and the strongest sea ice in the region broke up for the first time on record this summer.

All of this melting is causing sea level rise to accelerate.

For glaciers that exist outside of the Polar Regions, the situation is even worse.

“You can count on all alpine glaciers in the world to be gone by 2100,” Dan Fagre, US Geological Survey (USGS) research ecologist and director of the USGS Climate Change in Mountain Ecosystems Project, told Truthout.

Truthout spoke with experts like Fagre, as well as others with expertise in the Antarctic and Arctic, who shared an often-grim prognosis of what lies in store for the cryosphere.

Greenland

Ruth Mottram is a climate scientist at the Danish Meteorological Institute who has been studying Greenland for the last 11 years, and the Arctic for the last 15. Mottram is also one of the scientists behind the Polar Portal – a Danish web portal that gives near real-time data on the Arctic, including sea ice and Greenland ice sheet processes.

She explained to Truthout that melting in Greenland can vary significantly from year to year and is highly dependent upon weather conditions any given year.

“However, since the turn of the millennium there has been a series of summers where there have been increasingly large amounts of melt and runoff into the ocean,” Mottram explained.

She studies the surface mass budget, which is the balance between income — snowfall — and the outgoing melt and runoff. Mottram and her colleagues sum these up daily on the Polar Portal, as well as over the entire year, which in turn gives them an idea of the “health” of the ice sheet.

Her data is alarming.

“Of the top 10 lowest surface mass budget years,” Mottram said of this data, “only 2 occurred before the year 2000.”

She explained that on top of this, the ice sheet can also lose mass by calving (ice breaking off a glacier at its terminus) from glaciers and basal melting.

“Yet, both of these processes also have to be balanced by snowfall and what we see in the last two years is that the total budget, as opposed to the surface-only budget, has been roughly neutral – around 0,” she added.

However, Mottram also pointed out how the ice sheet has lost 200 – 300 gigatonnes (one gigatonne is about 1 cubic kilometer) of ice every year from 2003-2011. This means that the

two aforementioned neutral and relatively lower melting years, as she put it, “do not nearly reverse the mass losses of the last decades.”

Greenland Ice Sheet meltwater is influencing the circulation of the Atlantic Meridional Overturning Circulation (AMOC), a massive oceanic conveyor belt current that moves huge amounts of warm water from the tropics northward, and from the Atlantic up toward the Arctic. The AMOC plays a critical role in creating the mild climate of the UK and other parts of Western Europe.

“There is also some evidence that Arctic climate change in general is influencing mid-latitude weather patterns – leading to the kind of persistent and extreme weather that leads to, for example, the heatwave we had in northern Europe this year,” Mottram explained. “The idea is that the warming of the Arctic – which has been more rapid than in other parts of the planet – has led to a smaller difference in temperature between pole and tropics, which then leads to a more wavy jet-stream.”

While Mottram believes longer observations are needed on this topic, some studies have pointed out how the wavier jet-stream is intensifying extreme weather events like hurricanes, as well as altering global climate patterns.

Meanwhile, the increasing melt of the Greenland Ice Sheet is directly linked to the increase in calving and iceberg production at outlet glaciers.

“These can pose hazards to shipping and fisheries,” Mottram added. “But they also allow the ice sheet to contribute water to the ocean faster than just by melting.”

She and her colleagues also note the number of storms tracking up the east coast of Greenland of late, which have brought a lot of snow and rain to eastern Greenland and seem to be penetrating higher up into the Arctic – possibly due to the lower sea ice extent there.

“The winds associated with these storms can bring quite high temperatures to east and northeast Greenland, and this year we twice saw very unusual warm periods – associated with Foehn winds (similar to the Chinook in north America) – that also opened up the pack ice around the coast of Greenland,” Mottram explained. She also pointed out the role this could have played in the way in which the aforementioned “last ice area” of sea ice recently began to move away from the coast and break up.

This led to the north coast of Greenland briefly becoming navigable over the summer. The Polarstern and Oden – two research ships from Germany and Sweden respectively – were able to access areas of the Arctic to do research much more easily than had been expected. The same is true of the Venta Maersk – the Danish “ice class” container ship that was the first to traverse the northern sea route this summer.

“It’s not to say it’s easy to sail in the Arctic right now, quite not,” Mottram said. “But the time is coming soon!”

Michael MacCracken, the chief scientist for climate change programs at the Climate Institute in Washington, DC, told Truthout that the loss of land ice, such as the loss of mass from the Greenland Ice Sheet, clearly raises sea level globally.

“This threatens low-lying coastal areas and island nations, and additionally, the rise in sea level can lift up glacial ice streams around Antarctica,” he said. “This then allows ocean waters better access to the ice streams, warming them and making calving more likely, ultimately contributing to further sea level rise.”

Antarctica

NASA emeritus scientist Robert Bindschadler, who worked for 35 years as a glaciologist at NASA Goddard Space Flight Center, previously told Truthout that the world may see three to four meters of sea level rise by the year 2200.

Bindschadler has led 18 field expeditions to Antarctica, published more than 130 scientific papers, and advised the US Congress and a former vice president on the stability of ice sheets and ice shelves. His current primary concern about what is happening in the Antarctic is linked to the fact that many of the glaciers there exist within deep valleys, as remote sensing has proven as of late.

“These deep valleys matter because they mean the glacier is sitting in a trough so deep that were you to remove the ice, it is below sea level,” Bindschadler told Truthout. “The damage the ocean can do only extends to the point where the glacier retreats onto the land. But the fact that these big outlet glaciers in Antarctica are sitting in a valley whose floor is below sea level means they can never escape the impact the oceans have on them.”

In other words, these land-based glaciers are now at risk of being melted from below by warming seawater that could flow into the valleys within which the glaciers are located.

He pointed out another worrisome fact about these valleys: Many of their depths may increase the further they get from the ocean.

“So, the ocean has greater impact on them the more they melt, which means the potential for fast and continual retreat of these outlet glaciers is probably more widespread than we appreciated four years ago,” Bindschadler added.

Bindschadler is concerned that these valleys – in which so many of the major glaciers exist – could be the next major factor in how glacial ice is rapidly released into the oceans, causing sea levels to rise further.

Alpine Glaciers

Fagre, who is the lead investigator in the USGS Benchmark Glacier Program and has been working in Glacier National Park since 1991, is concerned about how mountain snowpack has been shrinking in Glacier National Park, like in so many other places, over the last half century.

In Glacier National Park, the snow is on the ground an average of 30 days less than it used to be.

“Since the planet is warming up, more of the precipitation in Glacier is now falling as rain instead of snow,” Fagre told Truthout. Since they’re less likely to be covered in snow, glaciers are more directly exposed to the sun, which obviously hastens their melting.

In 1850, Glacier National Park, before it was designated a national park, contained 150 glaciers, covering around 100 square kilometers. Today, only between 14 and 15 square kilometers of ice coverage remain, an 85 percent loss. Instead of 150 glaciers, there are now only 26. Even this alarming tally of ice loss is a conservative estimate, as measuring area doesn’t account for thinning.

Fagre and his team started monitoring the mass balance of Glacier National Park’s Sperry Glacier in 2005.

“Our program mirrors what the others are seeing in Alaska and the Cascades,” he said. Aside from a couple of years where the glacier accumulated more ice, the glacier lost mass consistently, “as is true for almost every mountain glacier in the world for which we have mass balance information.”

“Our trajectory has well exceeded previous worst-case projections for many of our glaciers,” said Fagre, and added that the Blackfoot and Jackson Glaciers in the park had melted faster than the predictions by a full decade.

“What we’ve found since then is that they continue to go, and at unsustainable rates,” he said.

“This is an explosion, a nuclear explosion of geologic change,” Fagre said of the global impacts from climate change, particularly in the cryosphere. “This is unusual. It is incredibly rapid and exceeds the ability for normal adaptation. We’ve shoved it into overdrive and taken our hands off the wheel.”

Conclusion

Kevin Lister, an associate with the Climate Institute in Washington, DC, co-authored a paper with MacCracken for the UN that addressed the crisis in the Arctic, among other climate change-related issues.

Lister and MacCracken’s paper showed that the natural rate of carbon sequestration is so slow as to not be measurable. This doesn’t bode well for the possibility of halting climate change: The researchers say that carbon sequestration will be incapable of bringing atmospheric CO2 down to safe levels even in the hypothetical circumstance of a zero-carbon economy emerging.

Their paper also shows that while carbon sequestration and mitigation measures must continue to be pursued, “the likelihood is that that they will be unable to bring [atmospheric] CO2 down fast enough.”

Lister believes that climate change “is fundamentally irreversible as there is strong evidence that the heating effects of the amplifying mechanisms are greater than that of increases in [atmospheric] CO2.”

Lister told Truthout that he and MacCracken have argued that dramatic solutions to the climate crisis “must be pursued with all urgency.”

“Should we fail to make a start, then the scale of intervention that we need and the risks associated with it will increase exponentially with any delay,” Lister said.