New study finds that the world's glaciers are melting at an accelerating rate

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A newly published scientific study, ("Community estimate of global glacier mass changes from 2000 to 2023," *Nature*, 19 February 2025), finds that the world's mountain glaciers are melting at a faster rate than ever recorded and that rate is accelerating. This will have many dire consequences both for humans and the environment as a whole.

Glaciers are large masses of ice, formed in colder regions, usually in mountains, where the accumulating winter snow does not completely melt away during summer. Over many years, snow builds up, gradually compacting and consolidating into ice. Eventually, the weight of the ice becomes such that it begins to "flow" downhill at a slow pace. The dynamic balance between snow accumulation during winter and melting during summer determines whether a glacier expands or contracts. Due to global warming, glaciers around the world have been contracting at an increasing rate.

The new data shows that the rate of melting is now (2012-2023) more than a third (36 percent plus or minus 10 percent) greater than that during the preceding period, 2000-2011. Since the beginning of the century, mountain glaciers have lost more than 6,500 billion metric tons of ice, 5 percent of the total.

There are currently a total of more than 200,000 mountain glaciers of varying sizes throughout the world.

They hold enough frozen water to raise sea levels world-wide by 32cm (13 inches), if totally melted. This would inundate many low-lying coastal areas, especially due to storm surge. That is not even counting the massive ice sheets covering Antarctica and Greenland, which currently hold 99 percent of fresh water ice on earth. Total melting of the Antarctic ice sheet alone would raise sea levels by another 60 meters (200 feet) and Greenland would add an additional 7.4 meters (24 feet). Combined, this would cause an incalculable catastrophe.

In addition, glacial runoff provides fresh water for millions of people around the world. The loss of this resource, if all the glaciers were to disappear, would cause massive economic and social disruptions and population migrations. Yet, this is the inevitable outcome if global warming is not halted and reversed.

The current study in *Nature* is the most comprehensive yet on this topic. It combines data from more than 230 regional estimates gathered by 35 internationally based research teams.

Until the advent of the industrial revolution, when the burning of fossil fuels began to increase massively, releasing greenhouse gases, fluctuations in glacial ice masses were subject to natural climate variation. In general, the loss of glacial ice due to warm weather melting was balanced by cold season snowfall and changes were relatively gradual. The rate of melting now being observed exceeds anything previously recorded since the end of the last ice age, roughly 11,500 years ago. Human civilization has developed and is adapted to this post-ice-age environment.

Since 2000, the annual rate of glacial melting has risen dramatically, from less than 100 gigatons to more than 500 gigatons.

To arrive at these numbers, the researchers used a variety of methods, from direct measurements on the ground to data from satellite imagery, the combination of which raises the level of confidence in the reliability of the result.

It was also found that glacial ice is far more vulnerable to climate change than the massive ice sheets of Greenland and Antarctica, due to the latter's larger mass and depth which result in a lower surface to volume ratio (i.e., less ice directly exposed to warm

air). This disparity is also reflected in the contrast between the total volumes of glacial ice loss from larger glaciers and the proportional losses relative to the sizes of individual glaciers between regions.

The greatest total volumes of glacial ice loss contributing to the global total were recorded in Alaska (22 percent), the Canadian Arctic (20 percent), peripheral glaciers in Greenland (13 percent) and the southern Andes (10 percent). However, the greatest relative losses (i.e., reductions in glacial size) occurred in regions with smaller glaciers, including Central Europe (-39 percent), the Caucasus (-35 percent), New Zealand (-29 percent), North Asia (-23 percent), and Western Canada and USA (-23 percent).

A separate report prepared by the United Nations agency UNESCO assesses the impact of melting glaciers on the world's population. It finds that the retreating glaciers threaten the food and water supplies of 2 billion people. The combination of the loss of glacial meltwater and diminished snowfall in mountainous regions due to global warming will adversely affect irrigated agriculture. Many of these areas are already experiencing food insecurity.

Regions significantly affected include East Africa, which has lost 80 percent of its glaciers in some places, and the Andes, where between a third and a half of glaciers have melted away since 1998.

The rapidly melting glaciers and diminishing and irregular rains are not only impacting poorer regions of the world. For example, the Colorado River basin has been in drought since 2000. Reduced rain and snowfall combined with higher temperatures have significantly lowered river levels, creating conditions in which various users of water resources, including urban areas, farmers and Native American nations are locked in seemingly irreconcilable conflict over the division of water allocations.

Another factor in the acceleration of glacial melting is the loss of the "albedo effect." White snow and ice reflect more sunlight and therefore absorb less heat than dark soil and rock. Therefore, as glaciers melt and retreat spatially, more of the darker underlying surface is exposed, creating a positive feedback (i.e., self-reinforcing) loop of more heat retained in the earth and even faster melting.

Historically, mountain glaciers and winter snowpack melt relatively more slowly, releasing water over an extended period as compared to runoff from rain, thereby creating a more steady, predictable supply of water for agriculture and human consumption than often more variable rainfall. However, global warming is upsetting that balance. Warmer global temperatures mean that there is less snowfall, and it melts more quickly. At the same time, growing seasons are lengthened but without a commensurate increase in the quantity and continuity of available water.

The study published in *Nature* projects that, at the current rate, half of the world's glacial mass will be lost by the end of the century.

Every year that greenhouse gas emissions are not reduced means that the rate of glacial melting will continue to accelerate. Since 1900, sea level worldwide has risen 20cm (8 inches) due to melting from all sources plus expansion of the volume of ocean water due to warming. Approximately half of that increase has occurred during the last 35 years.

The scientific and technical means exist to greatly reduce greenhouse gas emissions, the main cause of global warming and climate change. So do the necessary resources. However, under capitalism, these are employed for war and to increase the wealth of the corporate and financial oligarchy, a tiny fraction of the population. Unless the working class seizes political power and implements a rational, scientifically based program to reverse the current trend of climate deterioration, the future of human civilization is bleak.