

Planet

One third of sea rising is due to melting of high altitude glaciers

A new study quantifies with unprecedented accuracy this consequence of global warming (Stéphane Foucart)

The reduction of the ice caps in Antarctica and Greenland is one of the major causes of rising sea. The melting of glaciers set in altitude is not less important. International work led by Alex Gardner (Clark University, Maine and Michigan University) and published on Friday, May 17, by "Science" indicate that the reduction of glaciers in northern Canada, Alaska, Patagonia or the Himalayas, contributed to a third of the rise in sea level between 2003 and 2009. This represents the equivalent of an annual influx of 260 billion tons of ice in the seas of the world, as much as what was poured by Greenland and Antarctica together. Translated into ocean rising, the figure is less impressive: these tens of billion tons correspond to 0.72 mm, on the 2.5 mm rise a year observed during the studied period. This work should help to better understand the processes involved in sea level rising - one of the major manifestations of warming. And thus to be able to anticipate it.

"To achieve these results, we compared data from two satellites, one measuring the thickness of glaciers by altimetry, the other evaluating changes in their mass over time", says glaciologist Etienne Berthier, researcher (CNRS), at the Laboratory for Space Studies in Geophysics and Oceanography (Legos) and co-author of this work. *"In general, previous estimates were based on ground observations of a sample of glaciers and results were then extrapolated to the totality of about 200 000 listed glaciers, adds the researcher. But geographically very close glaciers may behave very differently. In the Alps, for example, the Sarenne glacier thins three to four times faster than that of Argentière".* The extrapolations from a small number of glaciers therefore induce large uncertainties. These are now largely solved. *"Knowing precisely, during a given period, the contribution of one of the factors to sea level rising will allow us to better assess, by deduction, the importance of the other factors in this phenomenon",* says Anny Cazenave, researcher (CNES) at Legos and professor at the College de France.

Estimates revised upwards

Today, the expansion of the deep ocean as a result of current warming is, for example, poorly evaluated. But it also contributes actively to sea level rise. Just as the inputs of inland waters in the ocean, also difficult to quantify. Determining the true contribution to each parameter (glacier melting, ocean expansion, ice caps reduction, etc.) should allow refining forecast of the marine level increase by 2100. This forecast is the one of the most uncertain. In its latest report, the Intergovernmental Panel on Climate Change (IPCC) projected a global average rise of 20 cm to 60 cm by the end of the century. This estimate should be revised upwards in the next report of the expert panel, but uncertainties still remain important.

As significant as natural fluctuations that affect variations in the ocean rise. Between 2003 and 2009, it has been 2.5 mm per year, while the average since the beginning of satellite measurements in January 1993, is 3.2 mm per year ... But between early 2011 and early 2013, the rising abruptly increased to about 1 cm per year!

"For now, it is catching up a small drop in sea level observed around April 2011, on the occasion of the last La Niña", says Cazenave. This periodic phenomenon - antagonist of the famous El Niño - is indeed not only responsible for a temporary drop in global average temperature: *"It changes the water transfers between continents and oceans",* explains the researcher. An additional piece to a complicated puzzle.

A contraction of 13% on Everest since 1960

In some regions, the melting of altitude glaciers threatens the sustainability of water in several large rivers feeding large population centers. This is one of the main concerns raised by the work conducted by Sudeep Thakuris (University of Milan, Italy), presented at the conference of the American Geophysical Union, held in Cancún (Mexico) from 14 to 17 May.

According to this work, the glaciers of the Everest massif lost about 13% of their surface area since 1960, their front having lost 180 m on average. This withdrawal would be even more marked for small glaciers, less than 1 km² area, with an average loss of 43% of their surface in five decades.

"Himalayan glaciers are considered as the water tower of Asia, summarizes M.Thakuri. In fact, they store water and supply rivers during the dry season, people rely on them for agriculture, drinking water and power generation."