

# The rise in sea level has never been so fast for 3000 years

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For the first time, there is a study which tracks the history of the rise in sea levels over most of the last 3000 years. And the result confirms, yet again, the reality of the current change in climate : the present rise in sea levels is the fastest of the period, while global temperatures are getting warmer and warmer.

While the average surface temperature of the planet clearly broke all records in the year 2015, the rise in sea levels has been accelerating since the industrial revolution. Between 1900 and 2000, researchers estimate that our planet's oceans and seas gained about 14cm because of the effect of melting ice, especially in the Arctic (North Pole), for which studies have been published in the reports of the Proceedings of the National Academy of Sciences of the USA (PNAS).

To get this historical reading of the rise in sea level, the researchers studied proxy data such as the geological strata of sediment, coral and other sources which indicate the range in sea level. Though they don't have the accuracy of modern tide-gauges, whose statistics have been studied since 1800, and nothing like the accuracy of satellite data from the beginning of the 1990's they are still relevant. In total, they have worked on more than 1300 geological indicators coming from 24 regions in the world.

' There have been some prior studies about sea levels in ancient times, but we are the first group to produce some ongoing global archives of ancient sea levels', declared the co-author of the study Ben Horton of Rutgers University, in an email sent to Mashable.com. ' We have sites in the northern and southern hemispheres and we are including proxy data recordings from salt marshes, mangrove swamps, coral, biological and archeological indicators ', he added.

The first indicat of this study is that the rise in sea level recorded over the 20th century is the fastest for at least 800 years and perhaps for more than 2,700 years. The past century is 'extraordinary' so significant has the rise in water level been. The sea level has increased by 14cm, having remained quite stable and by not being much over or under 10cm of the established average for the 2,000 years preceding the 20th century.

This is a historical variation of the sea level according to the study. The black line is the average projection, the dark grey area corresponds to an interval in reliability of 67%, the light grey 95%. © Robert Kopp.

The study confirms the link between ongoing climate change and the observed rise in sea level. Without the increase of 1°C in the temperature registered in the 20th century,

the rising sea level would have been two times less in extent (about 7 cm) and could have been reversed by as much as 3cm.

## Ocean levels are rising more quickly

And the rate of increase is getting faster : from the beginning of the 90's, the rise has been about 30cm per century (and 3.27mm per year even, since 2003), because polar ice sheets and ice-caps are now melting at an accelerated rate.

'There is no doubt that the the fastest rise has been in the 20th century ', affirms Bob Kopp, teacher of Earth and Planetary Sciences at Rutgers and leading author of the study. ' This is induced by the growth of temperatures during the 20th century, itself driven by the use of fossil fuels.'

Another indicator of the study, Robert Kopp explains, is that the 20th century is not the only phase where temperatures and sea levels have varied. Thus between the years 1000 and 1400, the sea level decreased by about 8 cm while global temperatures decreased by about 0.2°C. Notably, the explanation for this is a known natural phenomenon: a body contracts or expands according to its temperature.

What will ocean levels be at the end of the century ?

If greenhouse gas emissions don't decrease, and this is the most likely scenario, the rise in sea levels should be between 52 and 131 cm. And even if countries succeeded in respecting the agreement reached during the COP21 in Paris at the end of 2015 limiting global warming to 2 °C, the rise would still be between 24 to 61 cm, significant today for coastlines which have been massively urbanised.

But there remains an unknown that escapes scientists and is not integrated into their projections. It is the response from the Antarctic and Arctic ice caps in the second half of the 21st century. A study from February 2015 shows that if the ice-caps from the east of the Arctic were to melt, as has already been happening, this could lead to a rise in sea levels of ...17metres !