

# Climate change, rising sea level, and what it means for the Hudson Bay coast

Sadly, there are many examples of how climate change is already impacting our planet. Rising ocean levels, often called sea level, is one such example. Exactly how rising sea levels will affect you will depend on where you are.

## How is sea level impacted by climate change?

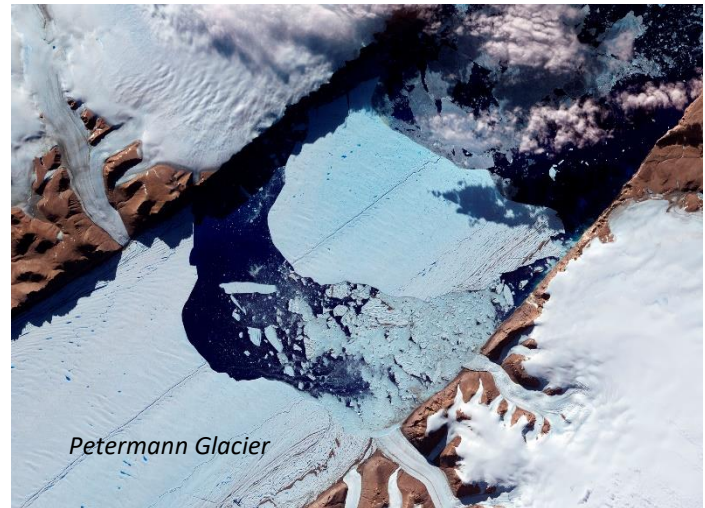
Rising global temperatures lead to sea level rise in two major ways: melting ice and thermal expansion.

### Melting Ice

About 10% of land on Earth is covered by glacial ice, and that ice stores a lot of water. As temperatures have risen, these glaciers have started to break and melt. About two thirds of the sea level rise we have experienced has come from melting glaciers.

### Thermal Expansion

Simply put, warm water takes up more space than cold water. This means that, as the greenhouse effect warms the oceans, the water expands to a greater volume and takes up more space. This phenomenon is responsible for one third of the sea level rise seen to date.

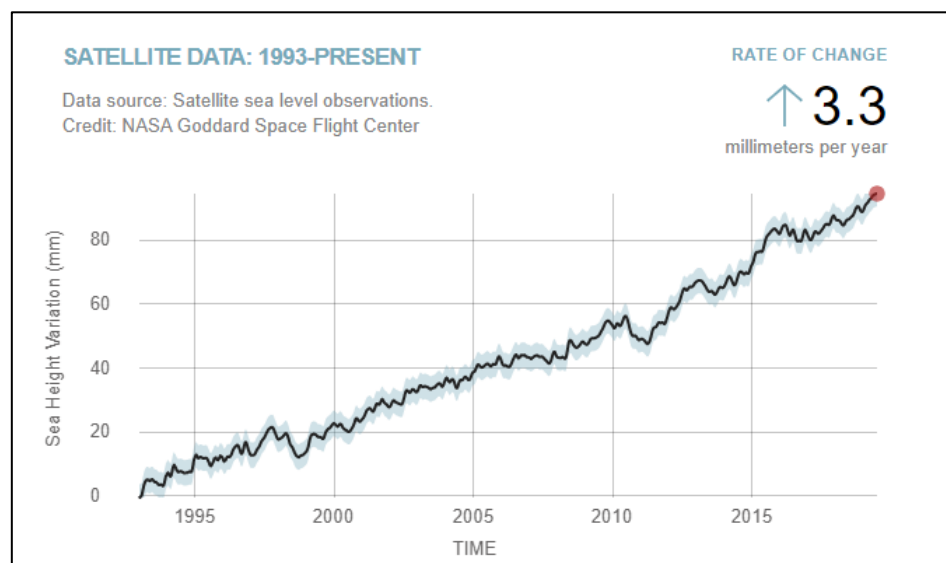


This NASA image from July 2012 shows a large chunk of ice that has broken from the Petermann Glacier in Greenland.  
<https://earthobservatory.nasa.gov/images/78648/closeup-of-the-ice-island-from-petermann-glacier>

## What is happening with global sea level?

For the last 2,000 years or so, global sea level stayed relatively constant. It wasn't until the late 1800s, when humans started burning coal and other fossil fuels at increasingly higher rates, that sea level started to rise. Today, sea level is 13 to 20 centimeters (5 to 8 inches) higher than it was in 1900.

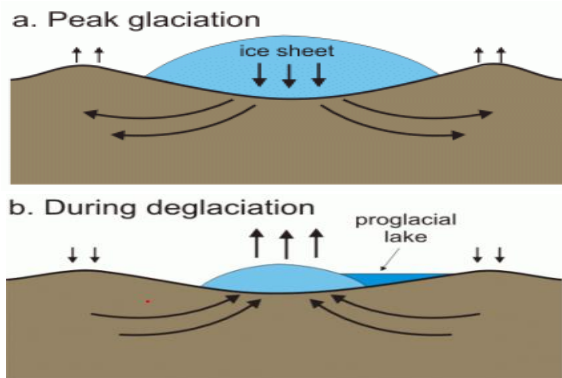
Not only is sea level increasing, but the rate at which it's increasing has become faster. Before 1990, the rate of sea level rise was about 1.5 millimeters per year. By the year 2000, that rate had increased to 3.2 millimeters per year. As of June, 2019, NASA has calculated the rate of sea level rise to be 3.3 millimeters per year.



Graph of sea level change since 1993 as tracked by satellites. As of June, 2019, the rate of change is 3.3 millimeters per year. Source: [climate.nasa.gov](https://climate.nasa.gov)

## Sea level on the Hudson and James Bay Coast

The surface of the Earth is not the same everywhere, and neither is the surface of the ocean. As such, different places will experience sea level rise differently, with some locations seeing more rising than the global average and some seeing less. Presently, the Hudson and James Bay coasts are seeing a decrease in sea level due to a process called “isostatic rebound”.

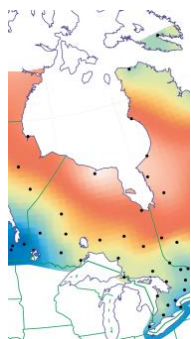


During the last ice age, most of what we now consider Canada was covered by a massive sheet of ice. The ice was so heavy that it squeezed the land beneath it, as illustrated in the drawing to the left.

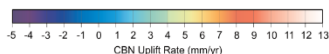
As the ice began to melt, and the weight of the glacier disappeared, the land underneath began to rise up, or rebound, back to its original shape. This is the process we call isostatic rebound, and it’s still occurring in Ontario today.

*The weight of an ice sheet squeezes the ground beneath it. When the ice melts, the ground slowly rebounds. Images from <http://www.antarcticglaciers.org/glaciers-and-climate/sea-level-rise-2/recovering-from-an-ice-age/>*

Currently, the land on the Hudson Bay coast is rising at a rate between 8 and 13 millimeters per year (or, to put it another way, 80 centimeters to 1.3 meters in about 100 years). You can see evidence of the land that was gained because of rebound when you fly near the Bay as beach ridges of high ground where the shoreline of the Bay was years ago.

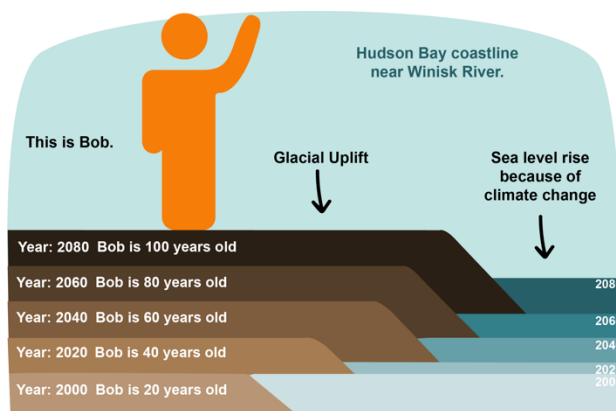


*The land in Ontario is rising due to rebound following the past glaciation. The rate of land uplift on the Hudson Bay coast is between 8 and 13 millimeters per year, depending on location. Map from Henton et. al. *Crustal Motion and Deformation Monitoring of the Canadian Landmass*. *Geomatica* 60(2):173-191 (2006).*



*Shrub covered ridges of beach sand running parallel to the shore of Hudson Bay seen as white ice in the background. The raised beaches mark the location of the former bay shoreline. The valley of the Severn River is visible in the foreground underneath the plane. Photo taken March 21, 2012.*

This rise from rebound of 80cm to 1.3m far exceeds the current average rise in sea level of 33 centimeters in 100 years and likely will exceed even the most extreme projections of a global increase in sea levels of 1m by the year 2100. Sea level rise is expected to impact coastal communities all over the world. The water level of Hudson and James Bay coasts, however, is not expected to rise because of the effect of glacial rebound. In fact, the sea level along the bays has been and will continue to decrease.



**For further information on sea level rise and rebound, check these out:**

<https://ocean.si.edu/through-time/ancient-seas/sea-level-rise>

<https://www.ontariobeneathourfeet.com/sea-level-rise-james-hudson-bay>

<http://pubs.aina.ucalgary.ca/arctic/Arctic62-4-458.pdf>

UPDATED: APRIL 2020

2/2