

Ocean Expansion: Steric vs. Eustatic

Most objects tend to expand when they are heated. An example would be the alcohol in a thermometer. Sea water in the ocean would expand in the same way. Its expansion is becoming more observable now, and in the future, its expansion will cause the sea levels to rise.

There are two factors that lead to sea level rising: Steric change and eustatic change. **Steric change** means that the ocean is expanding due to expansion of water molecules. This is one of the major contributors to sea level change. It occurs at places with higher temperatures and/or greater pressure. The increase in volume causes a decrease in density. This would later inhibit the thermohaline circulation, which transports oxygen and nutrients and regulates the global climate (*See the "World Ocean Circulation" module for more information.*)

Eustatic change is the expansion of the ocean due to the addition of water. The extra amount of water released into the ocean body is due to melting ice sheets and glaciers. Warmer temperatures accelerates the melting, adding more water into ocean the than previous decades. The major contributors of the additional water are from the Greenland Ice Sheet and the Antarctic Ice Sheet.

In the 20th century, sea levels were rising at a rate of 1.0-2.0mm/year. About 0.5 ± 0.2 mm is caused by steric change, the remaining by eustatic change. In the 21st century, scientists expect an average rate of rising to be 5 ± 4 mm/year. This is at least twice that of the last century. Greenland may suffer from a total loss of ice sheet in the next century. This could result in a 7m rise in the world's sea level. Many coastal area will be inundated by then.

Sources:

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