

# Increasing levels of carbon dioxide in Arctic coastal seas

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Iréne Wählström has investigated two of the coastal seas off Siberia, the Laptev Sea and the East Siberian Sea, in a ship-borne expedition, and -- in the case of the Laptev Sea -- by mathematical modelling. Credit: Photo: University of Gothenburg

The Arctic coastal seas absorb the greenhouse gas carbon dioxide to an ever-decreasing extent. This leads to an increase in the level in the atmosphere and an increase in the rate of warming in the Arctic. This is the conclusion from research carried out at the University of Gothenburg, Sweden.

Most scientists consider that changes to the Earth's climate are caused by increasing amounts of greenhouse gases released by humans from, for example, the combustion of fossil fuels. [Carbon dioxide](#) plays a major role in this process.

## **The oceans absorb carbon dioxide**

Approximately half of the emission of carbon dioxide from human combustion of fossil fuels was absorbed by the oceans up until 1994. As the amount of carbon dioxide in the oceans rises, however, their capacity to absorb the gas falls, and it remains in the [atmosphere](#).

"The greenhouse gases raise the temperature of the [Earth](#) and this increase is particularly noticeable in the Arctic. It is even more pronounced in Siberia and its coastal seas," says Iréne Wåhlström, researcher in marine chemistry.

The increase in temperature has an impact on the environment in the Arctic – the cover of sea ice is lower, for example, and the supply of water from rivers increases, the permafrost thaws and the rate of coastal erosion increases.

"One consequence is that organic matter that has been stored in soil is carried to the seas, where it is partially broken down to carbon dioxide," says Iréne Wåhlström.

## **Climate change affects the carbon dioxide system**

Iréne Wåhlström has investigated two of the coastal seas off [Siberia](#), the Laptev Sea and the East Siberian Sea, in a ship-borne expedition, and – in the case of the Laptev Sea – by mathematical modelling.

The East Siberian Sea has a western part and an eastern part, into which water flows from the Pacific [Ocean](#).

"The level of marine photosynthesis is high in these waters during the summer, and carbon dioxide is consumed. This leads to the level in the sea being lower than in the air, and the sea absorbs carbon dioxide from the air," says Iréne Wåhlström.

The western East Siberian Sea receives also a major contribution from rivers, both directly from the land and from the neighbouring Laptev Sea.

"The river water contains high levels of organic matter, which is partially broken down to carbon dioxide in the sea. This leads to the level in the sea being higher than in the air, and thus carbon dioxide flows from the sea into the air, accelerating [climate](#) change."

The Laptev Sea had an excess of carbon dioxide during the late summer of 2008 that was of the same order of magnitude as the western East Siberian Sea, probably caused by the breakdown of organic matter from the land.

The results suggest that the Laptev Sea has changed from being a sink for atmospheric carbon dioxide to become a source of carbon dioxide during the late summer. This will probably be reinforced by a higher air temperature, particularly if parts of the large reservoir of stored organic matter in the Arctic tundra thaw and are carried to the sea. This will further increase the rate of temperature rise of the Earth.

Provided by University of Gothenburg

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