

Higher Water Temperatures and Reduced Ice Cover In the Arctic Ocean

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Over the past six weeks, scientists aboard the [research](#) vessel "Polarstern" of the Alfred Wegener Institute for Polar and Marine Research have been investigating changes in ocean temperature and sea ice cover in the area of Fram Strait between Spitsbergen and Greenland. In this area significant exchange of water masses between the Arctic Ocean and the Atlantic Ocean takes place. **The ongoing process of global warming throughout the past years has also altered conditions in Fram Strait and the North Polar Sea.**

Recordings of temperature measurements in Fram Strait at various water depths indicate a rise in temperature since 1990 in the West Spitsbergen Current, which carries warm Atlantic Ocean water into the Arctic Ocean. The recent measurements by oceanographers aboard "Polarstern" point towards a further warming tendency. Compared to the previous year, temperatures recorded in the upper 500 metres of ocean current were up to 0.6 °C higher this year. The rise in temperature was detectable to a water depth of 2000 metres, representing an exceptionally strong signal by ocean standards. Consequently, the influx of warmer water causes a change in sea ice cover. Satellite images have documented a clear recession of sea ice edges in the Fram Strait region and in the Barents Sea over the last three years.

Climate processes are not only affected by the horizontal extent of sea ice, but also by its thickness. In order to determine ice thickness, the sea ice research group of the Alfred Wegener Institute has, over the past years, developed an airborne ice thickness sensor. It is towed by

helicopter approximately 30 metres above ground and can cover up to 100 kilometres distance within one hour. This method allows construction of a representative picture of sea ice thickness. The thickness sensor is validated by flying the helicopter over a series of drilled ice holes (of known depth) arrayed along a transect line. In this way the precision of the sensor can be confirmed.

An exceptional type of comparison between measurements was carried out on Wednesday off the East Greenland coast, where "Polarstern" met the British research icebreaker "James Clark Ross": for the very first time in the history of sea ice research, sea ice topography was measured simultaneously from above and below. For this purpose, a British autonomous underwater vehicle (AUV) scanned the underside of the sea ice using sonar, while the sea ice physicists of the Alfred Wegener Institute evaluated the ice surface as well as its thickness from above, using the helicopter-towed ice thickness sensor.

These activities served as preparation for the calibration of the satellite "CryoSat". Starting in March 2005, "CryoSat" will measure sea ice thickness continually from a height of 700 kilometres in both polar regions. The quantification of sea ice thickness and its changes are of great importance in international climate research. Sea ice has a key role in climate systems and is considered a sensitive indicator of climate fluctuations. "CryoSat" will be used to investigate whether regional changes occur in all polar regions as a consequence of global warming.

Presently, "Polarstern" is on her 20th Arctic expedition. Since July 16th, scientists of the Alfred Wegener Institute for Polar and Marine Research have been working as part of an international team carrying out atmospheric chemical measurements, gathering data from the ocean and sea ice and collecting rock samples from the sea floor. On Sunday, "Polarstern" will reach Tromsø.

Source: Alfred-Wegener-Institut

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