The sea ice is getting thinner

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Scientist take ice cores for determination of sea ice thickness. Credit: Florian Brier/Alfred Wegener Institute

Large areas of the Arctic sea-ice are only one metre thick this year, equating to an approximate 50 percent thinning as compared to the year 2001. These are the initial results from the latest Alfred-Wegener-Institute for Polar and Marine Research in the Helmholtz Association lead expedition to the North Polar Sea.

50 scientists have been on board the Research ship- Polarstern for two and a half months, their main aim; to carry out research on the sea-ice

areas in the central Arctic. Amongst other things, they have found out that not only the ocean currents are changing, but community structures in the Arctic are also altering. Autonomous measuring-buoys have been placed out, and they will contribute valuable data, also after the expedition is finished, to the study of the environmental changes occurring in this region.

“The ice cover in the North Polar Sea is dwindling, the ocean and the atmosphere are becoming steadily warmer, the ocean currents are changing” said chief scientist Dr Ursula Schauer, from the Alfred Wegener Institute for Polar and Marine Research part of the Helmholtz community, when commenting on the latest results from the current expedition. She is currently in the Arctic, underway with 50 Scientists from Germany, Russia, Finland, the Netherlands, Spain, the USA, Switzerland, Japan, France and China, where they are investigating ocean and sea-ice conditions.

“We are in the midst of phase of dramatic change in the Arctic, and the International Polar Year 2007/08 offers us a unique opportunity to study this dwindling ocean in collaboration with international researchers” said Schauer. Oceanographers on board the research ship Polarstern are investigating the composition and circulation of the water masses, physical characteristics of sea-ice and transport of biological and geochemical components in ice and seawater. Sea-ice ecosystems in the seawater and on the ocean floor will also be a focus of investigations. Scientists will take sediments from the ocean floor in order to reconstruct the climatic history of the surrounding continents.

Oceanographic measuring buoys were set out in all regions of the Arctic ocean for the first time during this International Polar Year. They are able to drift freely in the Arctic Ocean whilst collecting data on currents, temperature, and salt content of the seawater. The buoys will continuously collect data over and send them back to the scientists via

satellite. In addition, the deployment of a new titanium measuring system which allows contamination free sample collection of trace elements for the first time due to its high effectiveness. These studies will take place within the context of different research projects, all taking place during the International Polar Year: SPACE (Synoptic Pan-Arctic Climate and Environment Study), iAOOS (Integrated Arctic Ocean Observing System) and GEOTRACES (Trace Elements in the Arctic). At the same time, a large component of the work is supported by the European Union Program DAMOCLES (Developing Arctic Modelling and Observing Capabilities for Long-term Environment Studies). Further information on this project can be found on the German contribution to the International Polar Year website (www.polarjahr.de).

Changes in Sea-Ice

The thickness of the arctic sea-ice has decreased since 1979, and at the moment measures about a metre in diameter in the central Arctic Basin. In addition, oceanographers have found a particularly high concentration of melt-water in the ocean and a large number of melt-ponds. These data, collected from on board the Polarstern, and also from helicopter flights allow the scientists to better interpret their satellite images. Sea-Ice biologists from the Institute of Polar Ecology at the University of Kiel are studying the animals and plants living in and beneath the ice. They are using the opportunity to investigate the threatened ecosystem. According to the newest models, the Arctic could be ice free in less than 50 years in case of further warming. This may cause the extinction of many organisms that are adapted to this habitat.

Ocean Currents

The Arctic Ocean currents are an important part of global ocean circulation. Warm water masses flowing in from the Atlantic are

changed in the Arctic through water cooling and ice formation, and sink to great depths. Constant monitoring by the Alfred-Wegener-Institute for Polar and Marine Research over the last ten years have recorded significant changes, and have demonstrated a warming of the incoming current from the Atlantic Ocean. During this expedition, the propagation of these warming events along each of the currents in the North Polar Sea will be investigated.

The large rivers of Siberia and North America transport huge amounts of freshwater to the Arctic. The freshwater appears to function as an insulating layer, controling the warmth transfer between the ocean, the ice and the atmosphere.

The study area stretches from the shelf areas of the Barents Sea, the Kara Sea and the Laptev Sea, across Nansen and Amundsen bays right up to Makarow Bay.

Between Norway and Siberia and up to the Canadian Bay the scientists have taken temperature, salinity, and current measurements at more than 100 places. First results have shown that the temperatures of the influx of water from the Atlantic are lower as compared to previous years. The temperatures and salinity levels in the Arctic deep sea are also slowly changing. The changes are small here, but the areas go down to great depths, and enormous water volumes are therefore involved. In order to follow the circulation patterns in winter, oceanographic measuring buoys will be attached to ice floes, and continuous measurements will be taken whilst they float along with the ice. The measurements will be relayed back via satellite.

In addition to the ocean currents and sea-ice, zooplankton, sediment samples from the sea floor as well as trace elements will be taken. Zooplankton are at the base of the food chain for many marine creatures, and are therefore an important indicator for the health of the

ecosystem. The deposits found on the ocean floor of the North Polar Sea read like a diary of the history of climate change for the surrounding continents. Through sediment cores, the scientists may be able to unlock the key to the glaciation of northern Siberia.

In addition, the members of the expedition will be able to measure trace elements from Siberian rivers and shelf areas, that through polar drift are being pushed towards the Atlantic.

Source: Alfred Wegener Institute for Polar and Marine Research