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Episodic warming of near-bottom waters under the Arctic sea ice on the central Laptev Sea shelf: observations, explanations, and implications

Markus Janout (1), Jens Hölemann (1), Bennet Juhls (2), Thomas Krumpen (1), Benjamin Rabe (1), Dorothea Bauch (2), Carolyn Wegner (2), Heidi Kassens (2), and Leonid Timokhov (3)

(1) Alfred-Wegener-Institute Helmholtz Center for Polar and Marine Research, Bremerhaven, Germany (markus.janout@awi.de), (2) GEOMAR Helmholtz Center for Ocean Research, Kiel, Germany, (3) Arctic and Antarctic Research Institute, St. Petersburg, Russia

A multi-year mooring record (2007-2014) and satellite imagery highlight the strong temperature variability and unique hydrographic nature of the Laptev Sea shelf. This Arctic shelf is the beginning of teh transpolar drift system and a key region for river discharge and sea ice formation and export, and includes submarine permafrost and methane deposits, which emphasizes the need to understand the thermal variability near the seafloor. Recent years were characterized by early ice retreat and a warming near-shore environment. However, warming was not observed on the deeper shelf until year-round under-ice measurements recorded unprecedented warm near-bottom waters of +0.6°C in winter 2012/2013, just after the Arctic sea ice extent featured a record minimum. In the Laptev Sea, early ice retreat in 2012 combined with Lena River heat and solar radiation produced anomalously warm summer surface waters, which were vertically mixed, trapped in the pycnocline, and subsequently transferred toward the bottom until the water column cooled when brine rejection eroded stratification. This presentation highlights the strong temperature variability and the dominant oceanographic processes in the Laptev Sea, as well as the role of the Lena River as a source for heat and bio-optical properties such as colored dissolved organic matter. Finally, we discuss how continuing changes in sea ice conditions may affect the thermal environment and hence the Laptev Sea ecosystem.