



Reduction of salinity and temperature observed in the Atlantic layer in the eastern Eurasian Basin of the Arctic Ocean in summer 2011

M. Korhonen (1,2), B. Rudels (1,2), U. Schauer (3), S. Pisarev (4), B. Rabe (3), and A Wisotzki (3)

(1) Finnish Meteorological Institute, Helsinki, Finland (meri.korhonen@fmi.fi), (2) University of Helsinki, Helsinki, Finland,
(3) Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany, (4) Shirshov Institute of Oceanology,
Moscow, Russia

The heat carried northward by the Atlantic water to the Arctic Ocean and the heat stored in the sub-surface warm Atlantic layer have since the end of 18th century been advanced as factors that could influence the ice cover and perhaps even create an ice free Arctic Ocean. This question has again been brought into focus in the last 20 years with the observations of several warm Atlantic water pulses entering and circulating along different loops in the Arctic Ocean. This interest has been further accentuated by the reduction of the minimum ice extent observed during the last 5 years. Fram Strait is the main passage for warm Atlantic water into the Arctic Ocean and the Fram Strait inflow branch follows the continental slope toward Laptev Sea. The properties of the Atlantic water core remain almost unaffected as far east as Severnaya Zemlya, where the second, cold Barents Sea inflow branch that enters the Arctic Ocean via St. Anna Trough leaves the upper part of the slope. North of the Laptev Sea considerable changes occur in the water column. The temperature and salinity of the Atlantic water core are reduced and strong indications of lateral mixing are present. The strength of these changes has varied throughout the years and on the ARKXXVI-3 expedition with RV Polarstern in 2011 a very strong reduction of especially the Atlantic layer salinity but also temperature was observed and the temperature and salinity maxima were displaced far from the continental slope compared with previous years. The cooling and freshening extended deep into the water column and heat loss and input of melt water from the surface are unlikely causes for the reduction. Here it is examined, if mixing between the two inflow branches can lead to the observed lowering of the salinity, and if also the possibility that the major part of the Fram Strait branch recirculates in the Nansen Basin and mainly the Barents Sea branch supplies the Atlantic layer beyond the Gakkel Ridge could also contribute to the reduction. This explains the lower temperatures and salinities of the “Arctic” Atlantic water as due to mixing with colder, less saline water, not because of a large heat loss to ice melt and atmosphere, and its two mode structure by the “Arctic” Atlantic water being supplied by two different sources returning from the Eurasian and Amerasian basin respectively.