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On assessment of the relationship between changes of sea ice extent and climate in the Arctic

Genrikh Alekseev, Natalia Glok, and Alexander Smirnov
Arctic and Antarctic Research Institute, St.-Petersburg, Russian Federation (alexgv@aari.ru)

An increase of surface air temperature (SAT) in the marine Arctic (a part of the Arctic covered with sea ice in winter) shows a good relationship with reduction of sea ice extent (SIE) in summer. For instance, a strong correlation (a coefficient equal to -0.93) was found between the summer SAT in the marine Arctic and satellite-derived 1980-2014 September sea ice index (the average of sea ice extent in the Arctic since 1978, in millions of sq. km). Based on this finding anomalies of Arctic September SIE were reconstructed from the beginning of twentieth century using linear regression relationship. This reconstructed SIE shows a substantial decrease in the 1930-40s with a minimum occurring in 1936, which, however, is only a half of the decline in 2012. An impact of the inflow of warm and salty Atlantic water on winter SIE was evaluated as an example for the Barents Sea. This evaluation reveals a coherent spatial pattern of the Atlantic water spreading, presented by surface salinity distribution, and the position of sea-ice edge, and significant correlation between the inflow of the Atlantic water and maximal SIE.