Links of wintertime climate variability in Eurasia to ocean temperature anomalies in the preceding seasons

*Pawel Schlichtholz[1]

1. Institute of Oceanology of the Polish Academy of Sciences- Centre for Polar Studies KNOW, Sopot, Poland

Several recent studies indicate that wintertime extreme weather events and climate variability over Eurasia are related to anomalies of sea ice cover in the Barents Sea region even though casual mechanisms behind this relation remain uncertain. Here we will first review our previous investigations of this problem, based on a regression analysis between oceanic observations and atmospheric (NCEP/NCAR) reanalysis for the period 1982-2006, which show that: (i) a large fraction (70% of the variance explained) of the total sea ice cover variability in the Barents and Greenland Seas in winter is related to Atlantic water temperature (AWT) anomalies at the entrance to the Barents Sea in the preceding summer, (ii) these local AWT anomalies are representative of, at least, a regional mode of subsurface ocean temperature anomalies which reemerge on the surface in the following autumn-to-winter season, (iii) these anomalies affect not only the sea ice cover but, consequently, also the local atmospheric conditions up to the tropopause level in the Barents Sea region, (iv) they influence also the large-scale atmospheric circulation in the Northern Hemisphere extratropics by perturbing the storm tracks. The large-scale surface air temperature anomalies related to warm AWT anomalies form a kind of the “warm Arctic-cold Eurasia” pattern with a negative lobe in the latitude band of a significant reduction of the upper-tropospheric storm track activity and lower-tropospheric poleward transient eddy heat flux. This pattern is uncorrelated with the corresponding anomalies related to the North Atlantic Oscillation, which increases the potential for seasonal prediction of wintertime climate variability in middle latitudes based on summer AWT anomalies. Finally, we will present some preliminary results on the robustness of the proposed scenario based on a statistical analysis of links between wintertime surface atmospheric variability in Eurasia (data from the ERA-Interim reanalysis) to the sea surface temperature in the Barents Sea and North Atlantic during preceding seasons in whole era of satellite observations (1979-2016).

