



Lead Author e-mail: [erko.jakobson@ut.ee](mailto:erko.jakobson@ut.ee)

**Title:** *Teleconnections between climate variability in the Arctic region and northern Europe*

**Erko Jakobson**<sup>1,2</sup>, Jaak Jaagus<sup>3</sup>

<sup>1</sup>*Tartu Observatory, 61602 Tõravere, Estonia*

<sup>2</sup>*Department of Physics, University of Tartu, 50090 Tartu, Estonia*

<sup>3</sup>*Department of Geography, University of Tartu, 50090 Tartu, Estonia*

Climate change is faster and more severe in the Arctic than in the rest of the world. Changes in the Arctic may be related to climate changes in northern Europe and may partly explain them. Usually, the climate analyses are focusing on certain regions, without evaluation of influences from neighbouring regions. Still, it is known that at adjoin regions weather and climate is strongly related to each other. We used NCEP-CFSR reanalysis monthly mean values for 1979 – 2009 of temperature and specific humidity vertical profiles up to 300 hPa, sea level pressure, precipitable water and ice concentration, also NAO and AO monthly means from NOAA-CPC database. Previous studies are based mostly on the analysis of surface measurements. But the latest studies for the Arctic elucidate that climatic changes in the upper troposphere are even higher than near surface. Our results do not support them. Largest statistically significant trends in temperature and specific humidity were at 2 m and 1000 hPa, above that height trend strengths and also areas with significant trends decreased. Trends for 10 years (2000 – 2009) amplified more in temperature with even +0.5 °C/Year above Chukchi Sea and -0.5 °C/Year above Greenland and Alaska, but still, trends decreased with height. Locally, there was high positive correlation between temperature, specific humidity and precipitable water. Ice concentration had high negative correlation with temperature and specific humidity. For teleconnection patterns, a testing point (TP) was selected in southern Estonia (58N, 26E). TP has high mutual correlations ( $R > +0.5$ ) between temperature, specific humidity and precipitable water with the whole studied region (north of 55N) in spring and autumn. The correlations are slightly smaller in summer. In winter, contrary, TP has significant correlations only with Europe. Temperature, specific humidity and precipitable water in TP had significantly correlated with air pressure in spring and autumn in Siberia ( $R < -0.5$ ), in winter between Europe and Greenland ( $R < -0.5$ ) and in summer in Moscow region ( $R > +0.5$ ). To verify the influence of AO and NAO indices, partial correlation analysis were used. Still, apply of controlling factor did not changed the correlation patterns much, indicating that AO and NAO do not control considerably of the teleconnection patterns.