North Atlantic origin of interdecadal variability of the Warm Arctic and Cold Eurasia pattern

*Mi-Kyung Sung[1], Seon-Hwa Kim[2], Baek-Min Kim[2]

1. Ewha Womans University, 2. Korea Polar Research Institute

The Warm Arctic and Cold Eurasia (WACE) pattern and its intimate relation to the Barents/Kara Seas (B/K Sea) ice loss have been recognized recently. In the present study, a long-term spatio-temporal variability of the WACE pattern and its origin were examined using Twentieth Century Reanalysis (20CR) dataset for the period of 1901-2013. Since a coupled interaction between Ural blocking and Siberian High (SH) is crucial for accompanying cold anomaly over Eurasia under warm Arctic condition, recent Arctic sea ice loss and concomitant increase of Ural blocking have been blamed as plausible causes of recurrent cold winters over Eurasia. However, interdecadal variation in horizontal structure of the WACE pattern since long before the recent Arctic warming as identified in this study implies a possible influence of natural variability in current arctic warming and resultant severe cold winters. We found a wave train whose phase variation affects the horizontal structure of the WACE pattern originates from the North Atlantic. It is suggested that a slow variation in climatological mean atmospheric circulation over the North Atlantic, i.e. growth of the continental trough and oceanic ridge, leads to changes in mean baroclinicity and storm track as well. The resultant alteration in transient eddy vorticity flux which acts as Rossby wave source influences preferable phase of the wave train and relevant downstream circulation over the B/K Sea region. We tested Rossby wave response to altered North Atlantic storm track due to interdacadal variation in background states via simple stationary wave model experiments forced by idealized transient eddy vorticity flux to support proposed mechanism.

Keywords: Warm Arctic and Cold Eurasia pattern, North Atlantic , Ural blocking

