Geophysical Research Abstracts
Vol. 14, EGU2012-3468, 2012
EGU General Assembly 2012
© Author(s) 2012

Observed forcing [U+2010] feedback processes between Annular-like atmospheric circulation and sea ice -a Maximum Covariance Analysis

Q. Wu (1) and X. Zhang (2)

(1) School of Atmospheric Sciences, Nanjing University, China (qigangwu@nju.edu.cn), (2) International Arctic Research Center, University of Alaska Fairbanks (xdz@iarc.uaf.edu)

A lagged maximum covariance analysis (MCA) is applied to investigate linear covariability between monthly sea ice concentration and geopotential height at 500 hPa (Z500) in the both Northern and Southern Hemisphere. We have detected a dominant forcing role that atmospheric circulation plays in sea ice cover changes throughout the year, but a seasonality of sea ice concentration impact on the Annular-like atmospheric circulation. In the Northern Hemisphere, a wintertime atmospheric signal resembling the negatively polarized Arctic/North Atlantic Oscillation (AO/NAO) is significantly correlated with persistently reduced sea ice concentration anomalies in the North Atlantic and Pacific sides of Arctic Shelf seas up to the preceding summer. In the Southern Hemisphere, statistically significant covariances are also found between austral springtime Z500 and prior sea ice concentration anomalies up to four months earlier. The MCA pattern is characterized by an Antarctic Dipole (ADP)-like pattern in sea ice concentration and a positively polarized Antarctic Oscillation (AAO) in Z500. The above leading time of sea ice concentration anomalies provides an implication for skillful predictability of Northern (Southern) Hemisphere wintertime (springtime) atmospheric variability.

The link between the above Annular-like atmosphere response and the sea ice up to four months earlier seems to stem from the remarkable persistence of sea ice anomalies. Such persistence can be explained by dynamic and thermodynamic processes. The Annular-like atmospheric signal is hemispheric in extent and primarily equivalent-barotropic through the troposphere. The feedback of sea ice concentration anomalies on the Annular-like atmospheric circulation involves the diabatic heating due to the air–sea heat exchanges and transient eddy flux changes.