Geophysical Research Abstracts
Vol. 13, EGU2011-6500, 2011
EGU General Assembly 2011

Greenland Sea sea ice variability over 1979-2007 and its link to the surface atmosphere

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Mean winter Arctic sea ice concentration based on passive microwave observations for the period 1979-2007 are analyzed to examine the variability of the western Nordic Seas marginal ice zone (MIZ). A principal component analysis performed on this regional domain shows that the interannual variability is dominated by a mode which captures more than 70% of the total variance and shows only moderate correlation with the leading mode of global Northern Hemisphere sea ice variability. This mode appears to be related to a pattern of sea-level pressure (SLP) anomaly centered on the MIZ with large scale signature resembling the characteristic pattern of the North Atlantic Oscillation (NAO) as defined by, e.g., Hurrell et al. (2003). Still this leading mode of SIC variability shows a weak correlation with the NAO index. Composite SIC fields based on distinct NAO patterns for the positive and negative phase of the NAO, as retrieved from the weather regime analysis by Cassou et al. (2004) indeed suggest a preferential response of the Greenland Sea SIC variability to negative NAO-like patterns of SLP driving enhanced sea ice cover in the Greenland Sea. The SLP pattern is consistent with a response of the sea ice margin to the strength of the northerly winds along eastern Greenland. A weak pattern of surface air temperature anomalies also emerges in the central Greenland Sea which occurs, at least partly, as a response of the surface atmosphere to sea ice concentrations changes.