バレンツ海における冬季の海氷面積の変動に対する海水温の影響

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Influence of ocean thermal condition on the wintertime sea ice extent variability in the Barents Sea

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The sea ice variability of the Barents Sea in early winter and its resultant atmospheric response is considered to be the triggers of downstream climate change such as Japan [Honda et al., 2009; Inoue et al., 2012]. In this study, we examined the ocean heat content, which is known to be a major factor for the sea ice extent variability [Arthun et al., 2012], based on the repeated hydrographic observations and Climate Forecast System Reanalysis (CFSR) data and explore the possibility for the long-term prediction of the sea ice extent variability in the Barents Sea. It is found that the sea ice extent in December is highly correlated with the ocean temperature of the North Atlantic Water in the sub-surface layer (50–200m), when the latter leads the former by about 2 years (Fig. 1). The CFSR data clearly show the slow advection of the anomalous ocean heat content from the North Atlantic to the Barents Sea along the subsurface layer. The variability of the sub-surface water temperature in the North Atlantic Water is mostly explained by the strength of the warm Norwegian Current along the Scandinavian Peninsula. Since the northward current is significantly correlated with the wind stress associated with the strength of the Icelandic Low, it is suggested that the ocean heat transport is mainly caused by the barotropically quick response of the gyre circulation. Thus, the usage of the sub-surface water temperature probably improves the prediction skill of the sea ice extent variability.
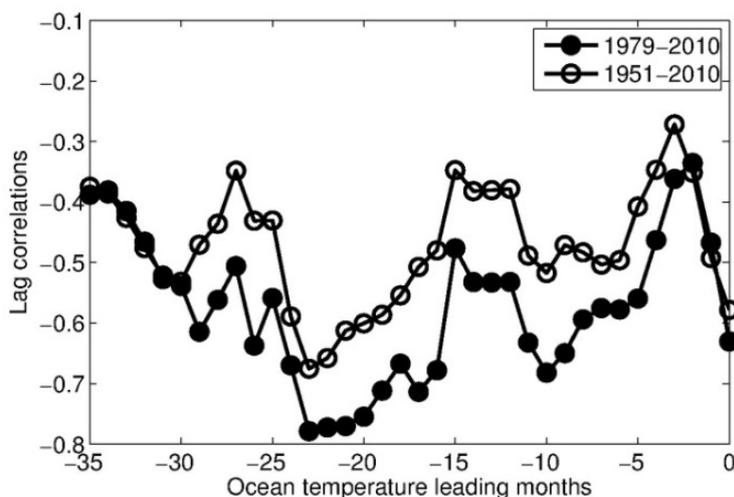

Figure 1.   Lagged correlation coefficients between the sea ice extent in the Barents Sea and the monthly subsurface ocean temperature along the Kola Section (70°–73°N, 33.5°E) from 1979 to 2010 (closed circles) and 1951 to 2010 (open circles).

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