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Predictability of the Barents Sea ice in early winter: Remote effects of oceanic and atmospheric thermal conditions from the North Atlantic

Takuya Nakanowatari (1,2), Kazutoshi Sato (2,3), Jun Inoue (1,2,3)

(1) National Institute of Polar Research, Tachikawa, Japan (nakanow@jamstec.go.jp), (2) Research and Development Center for Global Change, JAMSTEC, Yokosuka, Japan, (3) The Graduate University for Advanced Studies, Tachikawa, Japan

Predictability of sea ice concentrations (SICs) in the Barents Sea in early winter (November-December) is studied using canonical correlation analysis with atmospheric and ocean anomalies from the NCEP Climate Forecast System Reanalysis (NCEP-CFSR) data. We find that the highest prediction skill for a single-predictor model is obtained from the 13-month lead subsurface temperature at 200-m depth (T200) and the in-phase meridional surface wind (Vsfc). T200 skillfully predicts SIC variability in 35% of the Barents Sea, mainly in the eastern side. The T200 for negative sea-ice anomalies exhibits warm anomalies in the subsurface ocean temperature downstream of the Norwegian Atlantic Slope Current (NwASC) on a decadal timescale. The diagnostic analysis of NCEP-CFSR data suggests that the subsurface temperature anomaly stored below the thermocline during summer re-emerges in late autumn by atmospheric cooling and affects the sea-ice. The subsurface temperature anomaly of the NwASC is advected from the North Atlantic subpolar gyre over about 3 years. Vsfc skillfully predicts SIC variability in 32% of the Barents Sea, mainly in the western side. The Vsfc for the negative sea-ice anomalies exhibits southerly wind anomalies. Vsfc is related to the large-scale atmospheric circulation patterns from the subtropical North Atlantic to the Eurasian continent. Our study suggests that both atmospheric and oceanic remote effects have a potential impact on the forecasting accuracy of SIC.