

メキシコ湾流の水温分布変化とバレンツ海の海氷減少の因果関係について Influence of the Gulf Stream on the Barents Sea ice retreat and Eurasian coldness

佐藤 和敏^{1*}; 猪上 淳²; 渡部 雅浩³
SATO, Kazutoshi^{1*}; INOUE, Jun²; WATANABE, Masahiro³

¹ 総合研究大学院大学, ² 国立極地研究所, ³ 東京大学大気海洋研究所

¹The Graduate University for Advanced Studies, ²National Institute of Polar Research, ³Atmosphere and Ocean Research Institute, University of Tokyo

Abnormal winter sea-ice retreat over the Barents Sea has been considered as a leading clue to the recent midlatitude severe winters. Barents Sea is considered as a hot spot for the rapid Arctic climate change due to the intense air-sea interaction induced by the sea-ice decrease; however, the underlying mechanisms remain uncertain, in particular causal relation of sea-ice retreat and atmospheric forcing and response. To understand this causality, we selected typical cases, defined as averaged warm and averaged cold years of December using the NCEP Climate Forecast System Reanalysis (CFSR). The composite analysis, revealed that anticyclonic anomaly is obvious over the northwestern Eurasia. The western Barents Sea and Sbarvard locates at the strong pressure gradient zone, prevailing southerly winds. Over the Barents Sea, the difference in daily mean air temperature between warm and cold winters is more than 10°C, suggesting that warm advection prevails during warm years. Therefore, during warm years, decrease in sea-ice cover is induced by southerly warm advection. The positive anomalies of precipitation from the southeast of Greenland to Barents Sea and negative anomalies of them from Nordic Sea to western Eurasia means the poleward shift of cyclone tracks, suggesting that the moisture transport is also changed poleward. Because the cyclones tend to shift poleward in less sea ice year over the Barents Sea, it is natural that the snow depth over the sea ice near the Fram Strait shows a positive anomaly during warm winters. Here we show that the poleward shift of sea surface temperature over the Gulf Stream, where is situated upstream from the Barents Sea, modifies the horizontal distribution of tropospheric condensational heating resulted from change in convection over the warm current, likely acting as a bridge to the Barents Sea by forcing planetary waves. This remote atmospheric response modifies cyclone tracks poleward, resulting in anomalous warm advection over the Barents Sea sector.

キーワード: メキシコ湾流, 北極, バレンツ海, ユーラシアの寒冷化
Keywords: Gulf Stream, Arctic, Barents Sea, Eurasian coldness