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On the intraseasonal and interseasonal relationships between the ice regimes of the Bering and Chukchi Seas

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Abstract. The study examines the intraseasonal and interseasonal coherence of sea ice regimes in the Bering and Chukchi Seas during the modern satellite observation period. The seasonal structure of statistical relationships between sea ice extent in the two seas was identified, and its associations with near-surface air temperature and sea surface temperature were assessed. The analysis used monthly sea ice extent series from the Sea Ice Index, Version 3, provided by the National Snow and Ice Data Center (NSIDC) for the 1979/80–2023/24 period, as well as 2-m air temperature data from the ERA5 reanalysis for the same period, and OSTIA sea surface temperature data for the northeastern Bering Sea shelf for 1982–2023. The methods included correlation analysis, comparison of monthly and phase-averaged characteristics with time lags, analysis of standardized anomalies, and partial correlation analysis. The results show that the Bering and Chukchi Seas are characterized by a stable intraseasonal coherence of sea ice processes, most pronounced during transitional periods of the ice season. A statistically significant relationship was identified between sea ice conditions in the Bering Sea during the ice decay phase and ice formation in the Chukchi Sea at the beginning of the following season. Sea surface temperature over the northeastern Bering Sea shelf explains part of this relationship, indicating the role of the preceding thermal state of the shelf waters. A seasonal asymmetry in the influence of temperature was revealed: in autumn and early winter, the sea ice coherence is more strongly associated with the air temperature over the Chukchi Sea, whereas in spring and summer it is more strongly associated with air temperature over the Bering Sea. The results suggest that spring–summer sea ice conditions in the Bering Sea may be considered a potential predictor of early-season ice formation in the Chukchi Sea.

Keywords:
ice cover, sea ice extent, Bering Sea, Chukchi Sea, sea surface temperature, near-surface air temperature

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