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Robustness of the large-scale modes of variability of winter Arctic sea ice concentration

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The dominant mode of variability of Arctic winter sea ice concentration has previously been suggested to be represented by a double-dipole structure, with the loading pattern of the first empirical orthogonal mode having phase of one sign in the Sea of Okhotsk and Barents Sea and opposing sign in the Labrador and Bering Seas. In this study, we build on this previous work, examining the robustness of the primary modes of large-scale variability of the winter sea ice concentration in the Arctic based on the satellite data record. We find that the double-dipole structure does not emerge as a robust mode of variability: rather, the primary mode can be considered as a tripole, explaining significant variability only in the Sea of Okhotsk, Barents and Bering Seas. In contrast, the Labrador Sea emerges in isolation in the second empirical orthogonal mode. The relative magnitude of the poles of variability in the empirical orthogonal function loading patterns are sensitive to the detrending of the data; however, the isolation of the variability of the Labrador Sea ice remains a robust feature. We find that there is no significant interannual-scale co-variability amongst the sea ice areas of the four seas comprising the double-dipole after low-frequency variability has been removed.