



The phase shift of the Labrador Current on interannual-to-decadal scales

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The transport of the Labrador Current has substantial interannual-to-decadal variability that may significantly impact the ocean climate and marine ecosystem off Atlantic Canada and Northeast United States. Nevertheless the alongshore coherence of the Labrador Current on the interannual-to-decadal scales has been a long standing question. Here we have used satellite altimetry data to study interannual-to-decadal variability of the unit-depth surface Labrador Current in the past two decades, in the context of the subpolar gyre of the North Atlantic. The surface Labrador Current transport is positively and negatively correlated with the winter North Atlantic Oscillation (NAO) index (with the transport lagging by about one year) in the north (the Labrador and northeastern Newfoundland Slope) and in the south (the Scotian Slope), respectively. The transport over the Labrador and northeastern Newfoundland Slope is negatively correlated with that over the Scotian Slope, suggesting two distinct regimes. In addition, the surface Labrador Current transport declines over the Labrador Slope and northeastern Newfoundland Slope and increases over the Scotian Slope. The subpolar surface gyre shows notable quasi-decadal oscillations that are significantly correlated with the winter NAO index. The gyre has also been weakening in the past two decades, which is likely to be part of multi-decadal variability.