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Climatic sea level variability along the Northwest Atlantic continental slope

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The Northwest Atlantic continental slope features the Labrador Sea, Orphan Basin, Newfoundland Basin and Laurentian Fan in the vicinity of the Gulf Stream/North Atlantic Current and along the pathway of the Deep Western Boundary Current. The regional characteristics of sea level and hydrographic variability are intimately related to the deep convection and subpolar gyre, and need to be better understood. In this study, temporal and spatial sea level variability in the Northwest Atlantic continental slope has been investigated based on a merged satellite altimetry dataset and a temperature and salinity climatology, in conjunction with ARGO observations. The altimetric results are compared with steric height calculated from the temperature and salinity climatology and from ARGO profile data. The annual cycle in the deep slope ocean can approximately be accounted for by the steric height variability, different from that near the coast (mainly driven by both buoyancy and wind forcing). The study shows significant interannual and decadal sea level variability and secular change, with prominent regional differences and varying linkages with large-scale atmospheric and oceanic variability. For example, the interannual sea level variability in the western Labrador Sea is primarily related to the wintertime deep convection due to regional cooling; whereas that over the Laurentian Fan and the Newfoundland Basin and along the Gulf Stream/North Atlantic Current pathway is likely associated with the offshore-onshore movement of the Gulf Stream/North Atlantic Current.