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Freshwater forcing modified the Labrador Current vigor and northwest Atlantic slope waters during the Little Ice Age and Medieval Climate Anomaly

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The Arctic witnessed unprecedented changes during the last millennium including the Little Ice Age (LIA) and Medieval Climate Anomaly (MCA) resulting in changes due to freshwater transport through Fram, Davis and Hudson straits into the Labrador Sea. A change in the freshwater supply is hypothesized to weaken/strengthen the Labrador Current vigor and perturbed the Atlantic meridional overturning circulation (AMOC). Understanding the impact of Labrador Current in providing freshwater to the North Atlantic is pivotal due to its role in modulating the AMOC. However, the extent to which the freshwater changed the Labrador Current vigor during the LIA and MCA is unknown due simply to the lack of high resolution and quantitative data. Moreover, studies suggested (e.g., Keigwin et al., 2003) no changes on the vast eastern Canadian continental margin shelf and slope waters during the LIA and MCA. Here we used two sediment cores from the eastern Canadian continental margin which were retrieved from the Labrador shelf and upper slope that are bathed by the Labrador Current to reconstruct changes during the LIA and MCA. The Labrador Current vigor was reconstructed using dynamic sediment proxy for the past 1,620 years. In addition, two sea-surface temperature proxies were also used to reconstruct the accompanied changes from the same samples. The data suggest that the Labrador Current was vigorous during the LIA due to increased freshwater delivery into the Labrador Sea. Further, the MCA and LIA cooled and warmed the slope waters but warmed and cooled the offshore Labrador Sea. We also report the Late Antique Little Ice Age cooling event nested within the poorly constrained Dark Ages Cold Period from the northwest Atlantic coinciding with the onset, establishment, and reorganization of many human settlements (Büntgen et al., 2016) including the collapse of Chinese Wei dynasty.

Büntgen, U et al. (2016) Nature Geoscience 9, 231-236
Keigwin, LD et al. (2003) Climate Dynamics 21, 53-62