Dynamics of branches of the Bering Strait inflow in the Chukchi Sea during the Holocene

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The Bering Strait inflow (BSI) is an important element of the Arctic Ocean circulation system and a major control on the distribution of sea ice and primary production in the western Arctic Ocean. The BSI splits into three branches, i.e., the Alaskan Coastal Current (ACC) flowing northeastward, the branch flowing northward, and the branch flowing northwestward along the Herald Canyon and turning eastward (tentatively called "Herald Canyon Current" and "HCC" here). Holocene mineral proxy records from the northern and northeastern Chukchi Sea showed that the BSI was intensified during the middle Holocene but the timing of maxima was different between ACC and HCC areas (Yamamoto et al., 2017 Climate of the Past).

Mooring observations at Bering Strait and Pt. Barrow in the recent decade indicated that the position and intensity of the Aleutian Low (AL) are key factors controlling the volume transport of the BSI and its branches (Danielson et al., 2014, Progress in Oceanography; Brugler et al., 2014; Progress in Oceanography). The total volume transport of the BSI through Bering Strait increases on decadal timescale by increase in the atmospheric pressure over the Aleutian Basin by the eastward migration or the weakening of the AL (Danielson et al., 2014). The volume transport of the ACC at Pt. Barrow decreases when the easterly winds are strong in summer by the stronger Beaufort High and summer AL (Brugler et al., 2014).

Based on mineral proxy data (Yamamoto et al., 2017), we reconstructed the intensity of the total BSI and its branches. The reconstruction showed millennial-scale variation in the relative intensity of the ACC and HCC, showing the intensification of the HCC relative to the ACC around 8.7, 7.7, 6.9, 5.6-5.0, and 2.8-2.0 ka, which were associated with decrease in total volume transport of the BSI. The association of branch intensities with total BSI intensity is consistent with the results of decadal observation mentioned above. The relative intensification of HCC to ACC is attributed to the stronger AL in these periods.

Studies of Mt. Logan ice core (Fisher et al., 2008 Holocene) and Jellybean Lake sediments (Anderson et al., 2005 Quaternary Research) indicated millennial-scale variations in wind direction, which is sensitive to the position and intensity of the AL. However, there records are not consistent with the

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records of the BSI from a viewpoint of the AL behavior on a decadal timescale. The influence of the position and intensity of the AL on the BSI on centennial and millennial timescales is probably not identical to that on annual and decadal timescales.