

Formation and Transportation of High-Salinity Water Produced in Polynyas South of the St. Lawrence Island

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Abstract The authors studied variations of temperature and salinity in seawater under sea ice using hydrologic data collected from polynyas south of the St. Lawrence Island during March of 2008 and 2009. The results indicate that the high-salinity water found during the cruises of 2008 and 2009 was due to the formation of polynyas. The salinity observed in 2008 was higher than that in 2009 as a result of higher salt production in 2008. The spatial distributions of high-salinity cores differed between the two cruises. In March 2008, a southeastward flow was formed under the persistent northerly wind in the observation region, which transported the high-salinity water produced by the polynyas to the southeast. The similar flow, however, did not exist in March 2009 because the northerly wind over the study area was interrupted by a southerly wind. Accordingly, the polynyas and the high-salinity water produced by them existed for a short time. As a result, the high-salinity water in 2009 did not spread very far, and stayed within the polynyas. In addition, during the 2009 cruise, two stages of observations in the polynyas showed the core of high-salinity water was shifted to the southwest of the St. Lawrence Island. This result suggested that a southwestward flow might have existed in the area at the onset of the northerly wind, which was consistent with the alongshore and/or offshore flows caused by the northerly wind.

Key words polynya; high-salinity water; ice production; salt production

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