# ハイブリッド特性を有するバロー沿岸ポリニヤにおける海氷生産量の経年変動

平野大輔[1]、深町康[2]、渡邉英嗣[3]、岩本勉之[1,4]、Andrew Mahoney[5]、Hajo Eicken[5]、清水大輔[1]、大島慶一郎[2]、田村岳史[1]

[1] *極地研*

[2] *北大低温研*、[3] *JAMSTEC-IACE*、[4] *新潟大・理*、[5] *University of Alaska Fairbanks*

# Interannual variability of sea ice production in a hybrid latent and sensible heat coastal polynya off Barrow

Daisuke Hirano[1], Yasushi Fukamachi[2], Eiji Watanabe[3], Katsushi Iwamoto[1, 4], Andrew Mahoney[5], Hajo Eicken[5], Daisuke Simizu[1], Kay I. Ohshima[2], and Takeshi Tamura[1]

[1]*National Institute of Polar Research*

[2]*Institute of Low Temperature Science, Hokkaido University*, [3]*Japan Agency for Marine-Earth Science and Technology*

[4]*Faculty of Science, Niigata University*, [5]*Geophysical Institute, University of Alaska Fairbanks*

Nature of the Barrow Coastal Polynya (BCP) formed off the Alaska coast in winter is examined using mooring data, atmospheric re-analysis data, satellite-derived sea ice concentration and production data, and results from tracer experiments by pan-Arctic ice-ocean model. The BCP system undergoing the transition from a latent to a sensible heat polynya, occurs as follows (Figure 1); (1) dominant northeasterly wind (parallel to the Barrow Canyon with an offshore component off Barrow), associated with the SLP pattern composed of the Aleutian Low and Beaufort High, results in the warm water upwelling into the BCP region as well as the BCP formation by sea ice divergence, (2) baroclinic structure, established after the upwelling, gradually enhances the up-canyon shear flow, (3) enhanced vertical shear promotes vertical mixing accompanied by upward ocean heat flux from the upwelled warm water, and (4) the ocean heat transport to the surface mixed layer results in the transition to a sensible heat polynya and finally suppresses ice production in the BCP. Based on our findings, we propose that the BCP, previously considered to be a latent heat polynya, is a wind-driven hybrid latent and sensible heat polynya, with both features caused by the same northeasterly wind.

In this presentation, we also discuss interannual variability of sea ice production in the "wind-driven hybrid BCP" from 2002/03 to 2010/11 during AMSR-E operation period. Throughout the freeze-up season (November–May) during this period, 16–30% of the BCP ice production is estimated to be decreased due to ocean heat transport mainly from upwelling of warm Atlantic Water (AW). On 13 February 2004, the BCP ice production is suppressed by 75%. Results from the tracer experiments, visualizing AW upwelling from the mid-layer of the Canada Basin, demonstrate that the area of high tracer concentration at ocean surface well corresponds to that judged as open water area (i.e., sensible heat polynya) by open water mask of AMSR-E. Frequency and magnitude of the northeasterly are considered to be major factors of the interannual variability of sea ice production in the BCP.

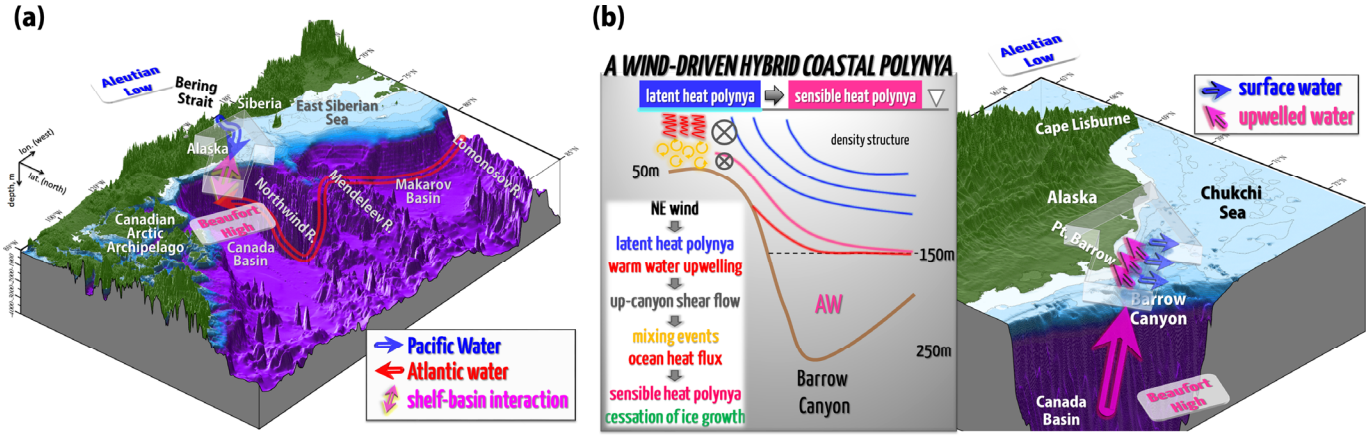


**Figure 1**

Schematics of "wind-driven hybrid latent and sensible heat polynya system" off Barrow. (a) Broad and (b) detailed views for the BCP system.