

アラスカ沖バロー沿岸ポリニヤに関する観測・衛星・モデル融合研究

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A wind-driven, hybrid latent and sensible heat coastal polynya off Barrow, Alaska

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The nature of the Barrow Coastal Polynya (BCP), which forms episodically 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. We focus on oceanographic conditions such as water mass distribution and ocean current structure beneath the BCP. Two moorings were deployed off Barrow, Alaska in the northeastern Chukchi Sea from August 2009 to July 2010. For sea-ice season from December to May, a characteristic sequence of five events associated with the BCP has been identified (Figure 1); (1) dominant northeasterly wind parallel to the Barrow Canyon, with an offshore component off Barrow, (2) high sea-ice production, (3) upwelling of warm and saline Atlantic Water beneath the BCP, (4) strong up-canyon shear flow associated with displaced density surfaces due to the upwelling, and (5) sudden suppression of ice growth. A baroclinic current structure, established after the upwelling, caused enhanced vertical shear and corresponding vertical mixing. The mixing event and open water formation occurred simultaneously, once sea-ice production had stopped. Thus, mixing events accompanied by ocean heat flux from the upwelled warm water into the surface layer played an important role in formation/maintenance of the open water area (i.e., sensible heat polynya). The transition from a latent to a sensible heat polynya is well reproduced by a high-resolution pan-Arctic ice-ocean model. 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.

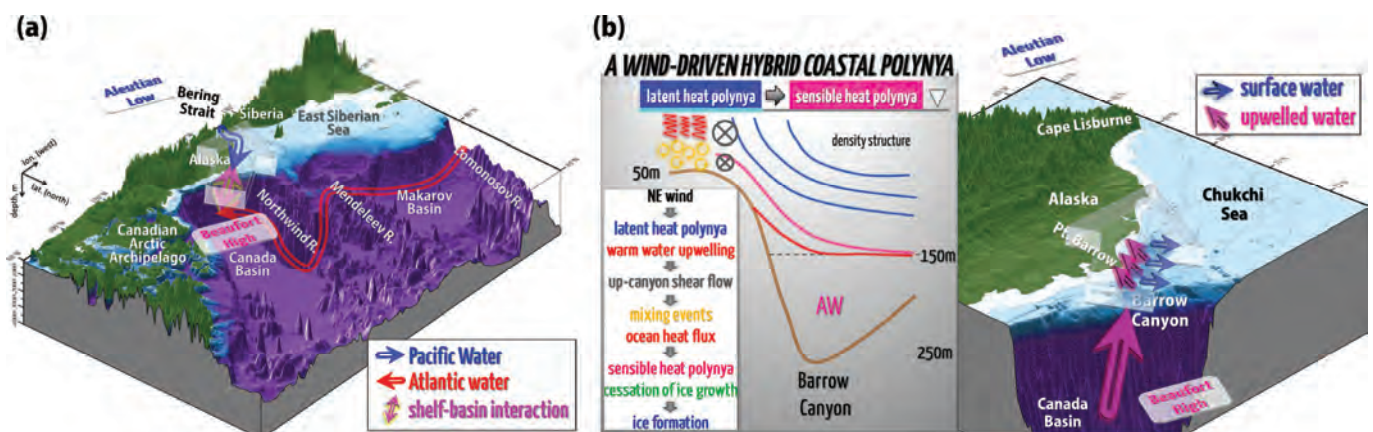


Figure 1

Schematics of "wind-driven hybrid latent and sensible heat polynya system" off Barrow. (a) Broad and (b) detailed views for the BCP system (Hirano *et al.*, 2016, in press).

References

Hirano D., Y. Fukamachi, E. Watanabe, K. I. Ohshima, K. Iwamoto, A. R. Mahoney, H. Eicken, D. Simizu, and T. Tamura, A wind-driven, hybrid latent and sensible heat coastal polynya off Barrow, Alaska, *Journal of Geophysical Research-Oceans*, **121**, doi:10.1002/2015JC011318, 2016 (in press).