

Beaufort Sea Mesoscale Meteorology Modeling Study: Sea Breeze Simulation

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The Beaufort Sea and its adjacent continental areas are prominent geographical features which are largely covered by sea ice on a seasonal basis over the ocean and bounded by the Brooks Range in the south on land. This complex geographical environment offers unique challenges for mesoscale meteorology modeling. Further oil development in this area requires improved understanding of the surface wind field, a crucial parameter for assessing and predicting dispersal and movement of oil spills. As thus a study has been established to investigate the mesoscale features of the surface wind field throughout this region, specifically in relation to the sea breeze and topographic effects. In this study, we focus on the sea breeze effect. Based on the analysis of observed surface winds at the weather stations along the Beaufort coast, as well as model simulations with the weather research and forecast model (WRF), we found that the sea breeze along the Beaufort Sea coast is of different from the temperate latitude. Due to the stable Arctic boundary layer (inversion), which is unfavorable for the vertical convection, the offshore flow aloft occurs at relatively low level. In addition, due to continuous solar radiation, the sea breeze along the Beaufort coast is not followed by the land breeze. However the sea breeze's strength and horizontal extent demonstrate a diurnal variation. The wind direction shows clockwise turning from 12:00 AKST to 00:00 AKST. Sea breeze could be a dominant factor causing the wind variation along the Beaufort Sea coast.