



## **On the Nature of Wind-Forced Upwelling in Barrow Canyon**

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The inflow of Pacific-origin water into the Arctic Ocean is known to strongly influence both its physical properties and the ecosystem, especially during the last decade of rapid environmental change. A significant fraction of the northward transport through the Chukchi Sea is channeled into Barrow Canyon, making it a particularly important gateway for Pacific water entering the basin. Using mooring timeseries data from 2002–4 near the head of Barrow Canyon, the seasonal signals in the canyon as well as aspects of upwelling were investigated. On average, the flow was down-canyon during each month of the year except February, when the up-canyon winds were strongest. Most of the deep flow through the head of the canyon consisted of cold and dense Pacific-origin winter water, although Pacific-origin summer waters were present in early autumn. Over the two-year study period 54 upwelling events were identified: 33 advected denser water to the head of the canyon, while 21 upwelled lighter water due to the homogeneous temperature/salinity conditions during the cold season. The upwelling occurred when the Beaufort High was strong and the Aleutian Low was deep, consistent with findings from previous studies. While the majority of the upwelling events resulted in the reintroduction of Pacific winter water onto the Chukchi shelf, the few strongest events advected Atlantic water. There were more than twice as many upwelling events during the cold season compared to the warm season due to the seasonal strengthening of the winds. A statistically significant relationship was found between the wind forcing and the occurrence of upwelling, such that stronger storms tend to result in stronger upwelling. It was also demonstrated that upwelling typically corresponds to the occurrence of the Northeast Chukchi polynya.