

Investigations of Spatial and Temporal Variability of Ocean and Ice Conditions In and Near the Marginal Ice Zone

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Project Summary

Recent years have seen extreme changes in the Arctic. Particularly striking are changes within the Pacific sector of the Arctic Ocean, and especially in the seas north of the Alaskan coast. These areas have experienced record warming, reduced sea ice extent, and loss of ice in areas that had been ice-covered throughout human memory. Changes are particularly large in the marginal ice zones (MIZ); areas where the "ice-albedo feedback" driven by solar warming is highest, ice melt is extensive, and where human and marine mammal activity is greatest.

Despite the significance of the MIZ, basic parameters such as sea surface temperature (SST), sea surface salinity (SSS), and a range of sea ice characteristics are still insufficiently understood in these areas, and especially so during the summer melt period. The project described here, identified collectively as the "Marginal Ice Zone Ocean and Ice Observations and Processes EXperiment" (MIZOPEX), will address these information gaps through a targeted, intensive observing campaign that exploits unique capabilities of multiple classes of UAS (NASA Ikhana, Insitu ScanEagles, and a microUAS) combined with in-situ sensing and satellite observations. The Artemis SlimSAR is one of several payloads to be flown on the NASA Ikhana UAS. Specific research areas to be addressed using MIZOPEX data are relationships between ocean skin and subsurface temperatures and how these evolve over time in an Arctic environment during summer; variability in sea ice conditions such as thickness, age, and albedo within the MIZ; interactions of SST, salinity and ice conditions during the melt cycle; and validation of satellite-derived SST and ice concentration fields provided by AVHRR, MODIS, AMSR-E and the NPP/JPSS VIIRS.

MIZOPEX consists of a data collection phase and a data analysis and archival phase, with flight operations planned for summer 2013 over the Beaufort Sea, north of the Alaskan coast. In the course of addressing the science tasks, MIZOPEX will demonstrate the operational capabilities of UAS when deployed in a difficult environment and tasked with challenging mission profiles. The project will provide new insights into the steps necessary to operate multiple UAS, including multiple classes of UAS and multiple UAS of the same class, in and near the U.S. National Air Space (NAS). The effort will contribute to NASA's Earth science goals by making measurements that are directly relevant to improving Earth system models, by improving our understanding of fundamental phenomena, and by characterizing change in key components of the Earth system.