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AUTONOMOUS INVESTIGATIONS OF MARGINAL ICE ZONE PROCESSES- CHANGING FEEDBACKS AND OBSERVATIONAL CHALLENGES

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The observed reduction of Arctic summertime sea ice extent and expansion of the marginal ice zone (MIZ) has profound impacts on the balance of processes controlling sea ice evolution, including the introduction of several positive feedback mechanisms that may act to accelerate melting. Examples of such feedbacks include increased upper ocean warming through absorption of solar radiation, elevated internal wave energy and mixing that may entrain heat stored in subsurface water masses (e.g. the relatively warm Pacific Summer (PSW) and Atlantic (AW) waters) and elevated surface wave energy that acts to deform and fracture sea ice. These processes grow in importance with increasing open water extent.

Investigations of MIZ dynamics must resolve the short spatial and temporal scales associated with the processes that govern the exchange of momentum, heat and freshwater near the atmosphere-ice-ocean interface while also achieving the spatial scope and temporal persistence required to characterize how the balance of processes shifts as a function of evolving open water fraction and open water fetch to the south. The recent Office of Naval Research (ONR) Marginal Ice Zone program provides an example of how autonomous platforms can be applied to provide high-resolution measurements that extend from open water, through the MIZ and deep into ice-covered regions while providing persistence to quantify evolution over an entire summertime melt season. This talk will provide an overview of the strategy developed by the ONR MIZ team and highlight early results from the 2014 field program.