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Università degli Studi di Napoli "Parthenope"

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Topic: Ocean-ice-atmosphere interactions

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ABSTRACT Subject :

Mapping and sampling supercooled water and platelet ice in McMurdo Sound

Abstract 30/01/2023 04:45:05

McMurdo Sound is characterised by year-round outflow of Ice Shelf Water (ISW) from the McMurdo/Ross Ice Shelf cavity, with much of the upper ocean significantly supercooled (i.e. colder than the local freezing point) through pressure relief. This supports the development of sub-ice platelet layers (SIPLs) – layers of individual ice discs that buoyantly accrete at the base of the sea ice. The layers may extend several metres into the upper ocean and are known to support the marine ecosystem by providing a quiescent and nutrient-rich habitat. Over the past two decades we have developed and deployed both in-situ and remote sensing capability to map the spatial distributions of snow, consolidated sea ice, sub-ice platelet layers, and supercooled water in McMurdo Sound. This integrated approach has revealed interdependencies between the physical components of the system and provides a foundation data series from which seasonal and interannual variability is beginning to emerge. The survey work has identified a persistent local plume of ISW, which extends north-north-westward from the front of the McMurdo Ice Shelf, running parallel to the Victoria Land Coast. The SIPL is present, and progressively thins, for ~100 km along this axis, while the supercooling in the frazil-laden upper ocean is thought to persist for approximately twice this distance. This work has recently been expanded to encompass the development of a bespoke, custom-engineered system which can quantitatively core the SIPL, without destroying its delicate structure. This new capability is now being used to investigate the connections between the physical environment of the SIPL and the extremely high concentrations of primary productivity within it. We will briefly introduce the system and describe results from its initial deployment.

