## SESSION: OCEAN 1-SEA ICE

**MARS Themes:**

Southern Ocean

**Title:**

Wind- and wave-driven free-drift dynamics in Antarctic Sea ice.


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**Abstract:**

Two ensembles of buoys, deployed in the marginal ice zone (MIZ) of the north-eastern Weddell Sea region of the Southern Ocean, are analysed to characterise the dynamics driving sea ice drift and deformation during the winter-growth and the spring-retreat seasons of 2019. The results show that although the two buoy arrays were deployed within the same region of ice-covered ocean, their trajectory patterns were vastly different. This indicates a varied response of sea ice in each season to the local winds and currents. Analyses of the winter data showed that the Antarctic Circumpolar Current modulated the drift near the sea ice edge. This led to a highly energetic and mobile ice cover, characterised by free-drift conditions. The resulting drift and deformation were primarily driven by large-scale atmospheric forcing, with negligible contributions due to the wind-forced inertial response. For this highly advective coupled ice-ocean system, ice drift and deformation linearly depended on atmospheric forcing. We also highlight the limits of commercial floating ice velocity profilers in this regime since they may bias the estimates of sea ice drift and the ice type detection. On the other hand, the spring drift was governed by the inertial response as increased air temperatures caused the ice cover to melt and break up, promoting a counterintuitively less wind-driven ice-ocean system that was more dominated by inertial oscillations. In fact, the deformation spectra indicate a strong de-coupling to large-scale atmospheric forcing. Further analyses, extended to include the deformation datasets from different regions around Antarctica, indicate that, for similar spatial scales, the magnitude of deformation vary between seasons, regions and the proximity to the sea ice edge and the coastline. This implies the need to develop rheology descriptions that are aware of the ice types in the different regions and seasons to better represent sea ice dynamics in the MIZ.


**Format:**

Poster


**Keywords:** (add ; between keywords)

Antarctic; sea ice; drift; autonomous devices