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A laboratory experiment assessing the effect of sea ice on wave dumping

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Wave-ice interaction is a critical factor in the dynamics of the marginal ice zone (MIZ), the region between open ocean and an expanse of ice floes of varying size and shape. This interaction works both ways: while waves cause the fractures of ice floes, the presence of ice floes affects waves through scattering and various dissipative processes. In order to assess the latter, a laboratory experiment has been carried out in the coastal directional basin at Plymouth University. Sea ice has been simulated with two deformable plates: 1mX1m plastic sheet with variable thickness of polypropylene, which holds the same density ($\sim$0.9 g/cm3) of ice, and PVC Forex, which hold the same mechanical property of ice. Experiments have been conducted using monochromatic as well as random wave fields with different steepness and wavelengths (both shorter and larger than the floe). The wave field has been monitored before and after the simulated ice floe with a number of wave probes deployed along the basin, including a 6-probe array to track directional properties. On the whole, results show a substantial scattering and dissipation of the wave field, which appears to be dependent on the amount of overwash on the ice floe.