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Waves through a continuous ice cover: ice breakup and wave attenuation

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Polar ice covers play a relevant role in the energy exchange between atmosphere and ocean, influencing the global climate. Sea ice in the Arctic and Antarctic is characterised by two distinctive regions: the pack ice, which is a white desert of compact ice; and the Marginal Ice Zone (MIZ), which is the outskirts of the sea ice cover and it is formed by ice floes of different sizes. Waves from the open ocean penetrate the MIZ and can eventually reach the pack ice, contributing to their dynamics. In this regard, waves can break the ice, herd floes, and overwash them to accelerate their melting. Generally speaking, the interaction of waves and ice produces a substantial attenuation of the incident wave field. However, the physics of this interaction and waves-in-ice is still obscure.
In order to investigate the differences between the two types of cover, a series of experimental tests are performed in the SIWI (Sea-Ice Wave Interaction) facility. Both a continuous and a broken cover are tested under the action of monochromatic waves with different periods and amplitudes. Transmitted waves are recorded and subsequently compared with incident ones to evaluate the differences in wave attenuation.
Results show a linear trend of wave transmission for the continuous cover, depending only from the wave period, while the broken one is also dependent by the incident amplitude.