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Physical measurements of breaking wave impact on a floating wave energy converter

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Marine energy converter must both efficiently extract energy in small to moderate seas and also successfully survive storms and potential collisions. Extreme loads on devices are therefore an important consideration in their design process. X-MED is a SuperGen UKCMER project and is a collaboration between the Universities of Manchester, Edinburgh and Plymouth and the Scottish Association for Marine Sciences. Its objective is to extend the knowledge of extreme loads due to waves, currents, flotsam and mammal impacts.
Plymouth Universities contribution to the X-MED project involves measuring the loading and response of a taut moored floating body due to steep and breaking wave impacts, in both long crested and directional sea states. These measurements are then to be reproduced in STAR-CCM+, a commercial volume of fluid CFD solver, so as to develop techniques to predict the wave loading on wave energy converters.
The measurements presented here were conducted in Plymouth Universities newly opened COAST laboratories 35m long, 15.5m wide and 3m deep ocean basin. A 0.5m diameter taut moored hemispherical buoy was used to represent a floating wave energy device or support structure. The changes in the buoys 6 degree of freedom motion and mooring loads are presented due to focused breaking wave impacts, with the breaking point of the wave changed relative to the buoy.