# Reducing mooring line loads from wave energy

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- Excessive and violent platform motions in response to severe operational and survival storm conditions place considerable strain on the mooring system (lines and anchors) and, thus, on the platform's performance and survivability.
- Animals take advantage of their body shape and motion to produce an inverse vortex street, which in turn results in thrust production.
- A hydrofoil is used to reduce wave induced motions and therefore decrease the loads on the mooring system. The fundamental idea is that a suitably shaped and appropriately located hydrofoil will, for certain wave conditions, result in thrust generation and thus it will propel the floater against the waves. Such a (hydrofoil based) concept is of relatively low technology, low complexity and risk (e.g. minimum or even non-existing moving components for a rigidly fixed hydrofoil) but it provides, energy consumption free, thrust generation thereby reducing the strain to the anchors.


Figure 1: on the left, the model platform in the wave flume. At the top right, photograph of the model equipped with a hydrofoil. Below, on the tested hydrofoils and the, equivalent volume, sphere. At the bottom right, schematic of the mooring line arrangement used for all the tests.

# Results

The initial analysis of our preliminary results shows that for certain (wave) attack conditions the use of a hydrofoil has the potential to decrease surge loads without increasing the heave loads. This, is best illustrated in Figure 2, where a section of the time history of the forces in surge and heave is presented.

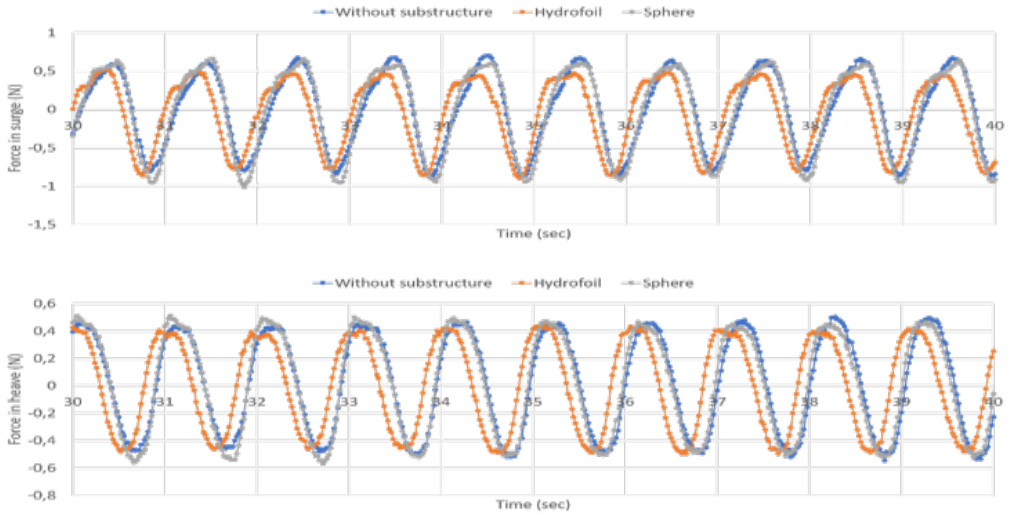


Figure 2: At the top and bottom, time histories of the surge and heave forces calculated from the acceleration measurements.

At the same time, visualising the flow behaviour in the experiments provided indications that reduction in surge accelerations and forces could be attributed to thrust being generated through the formation of an inverse vortex street, see Figure 3.

Figure 3: Flow visualisation indicating the formation of a Reversed von Karman streets.