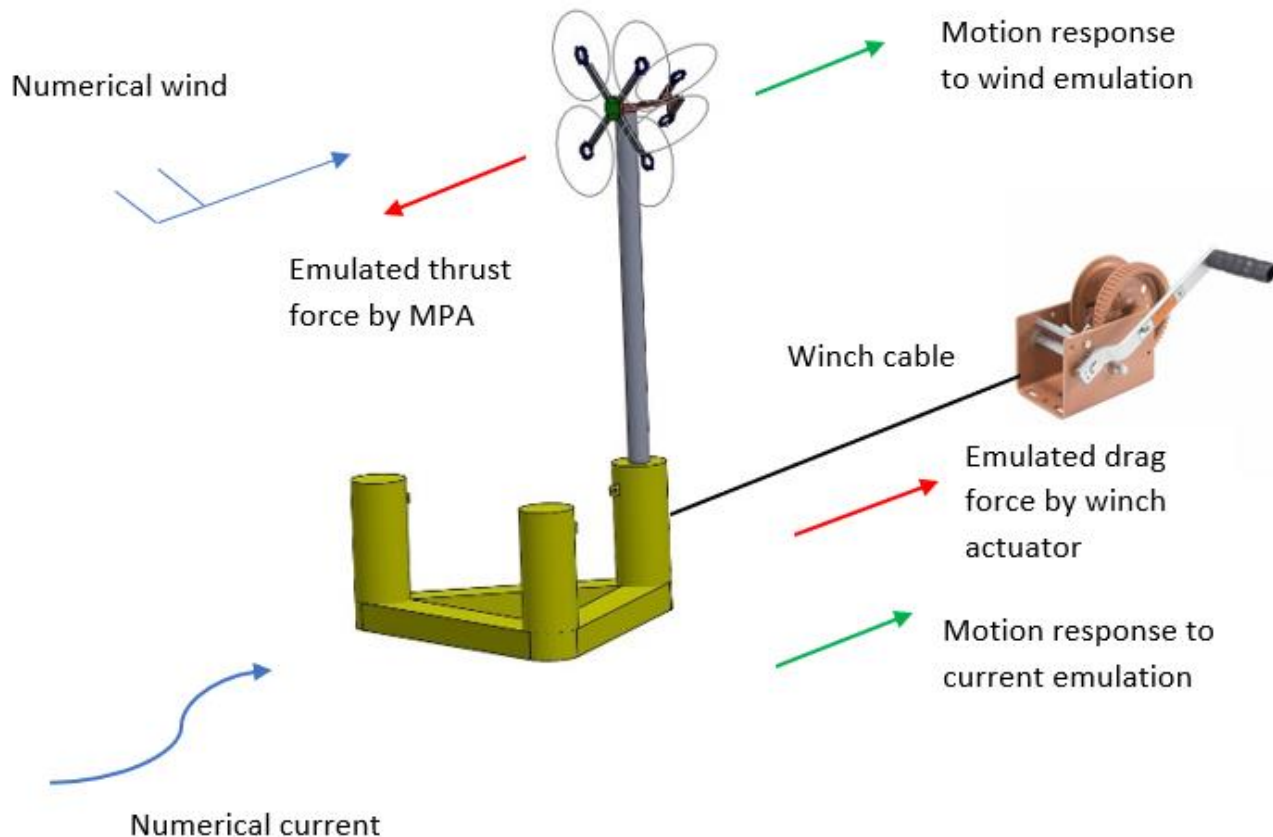




COMBINED CURRENT AND WIND SIMULATION FOR
FLOATING OFFSHORE WIND TURBINES

ALDERT OTTER

HYBRID TESTING?



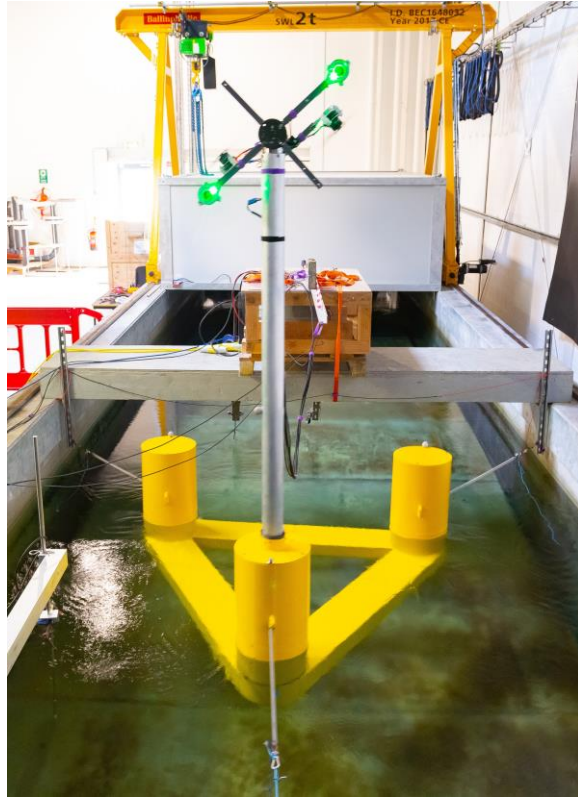
Classic equation of motion:

$$(m + a') \ddot{x}(t) + \int_{-\infty}^t K(t - \tau) \dot{x}(\tau) d\tau + cx(t) = F_{sum}(t)$$

Where $F_{sum} = F_{aero} + F_{hydro} + F_{mooring}$

And $F_{hydro} = F_{waves} + F_{current}$

MPA = Multi Propeller Actuator



Scale model & actuators

dSPACE



Real-time controller



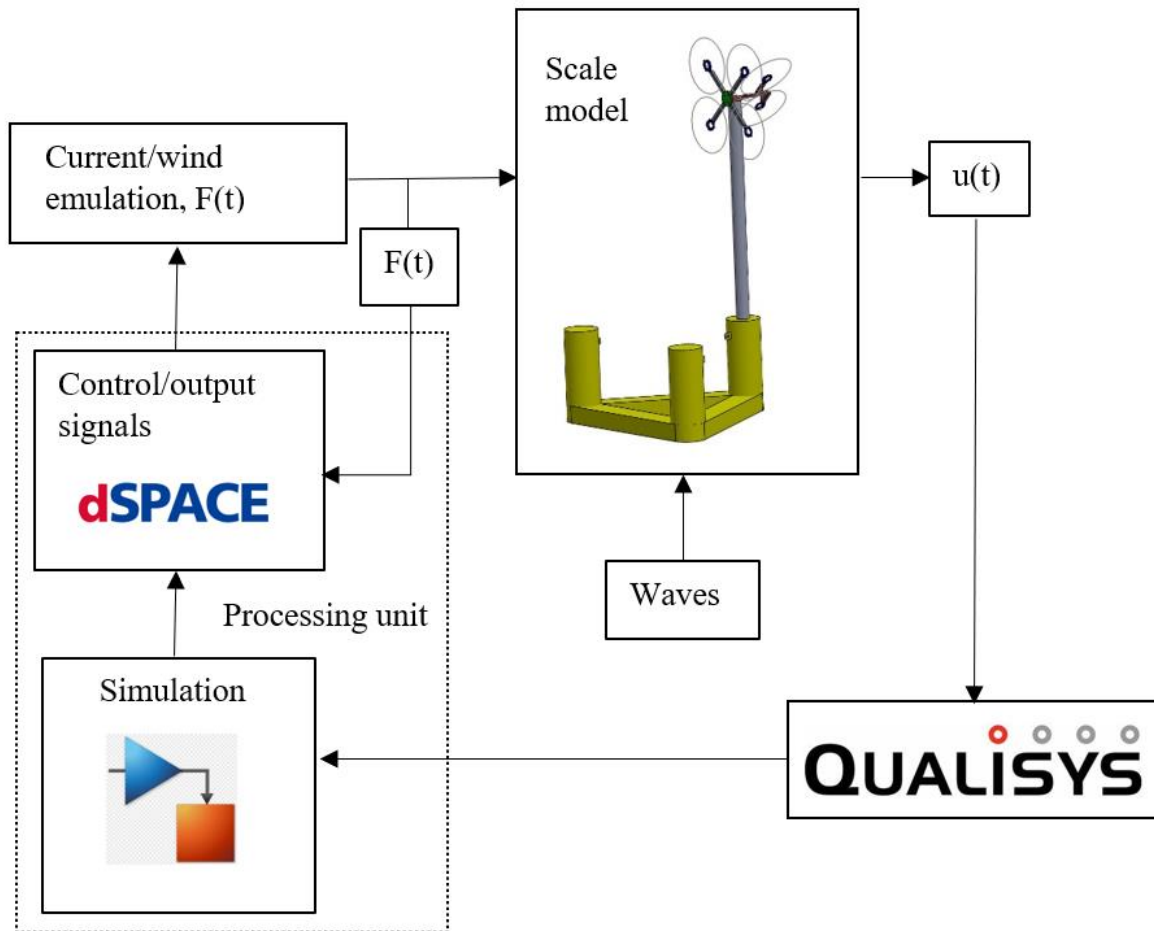
QUALISYS

FUTEK
ADVANCED SENSOR TECHNOLOGY, INC.

Feedback

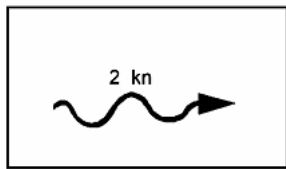
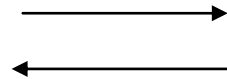
TECH REQUIREMENTS

SOFTWARE IN THE LOOP

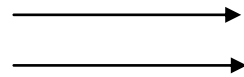


Wave-current interactions?

- Opposing current:
- Wave heights become larger
- Wave lengths become shorter

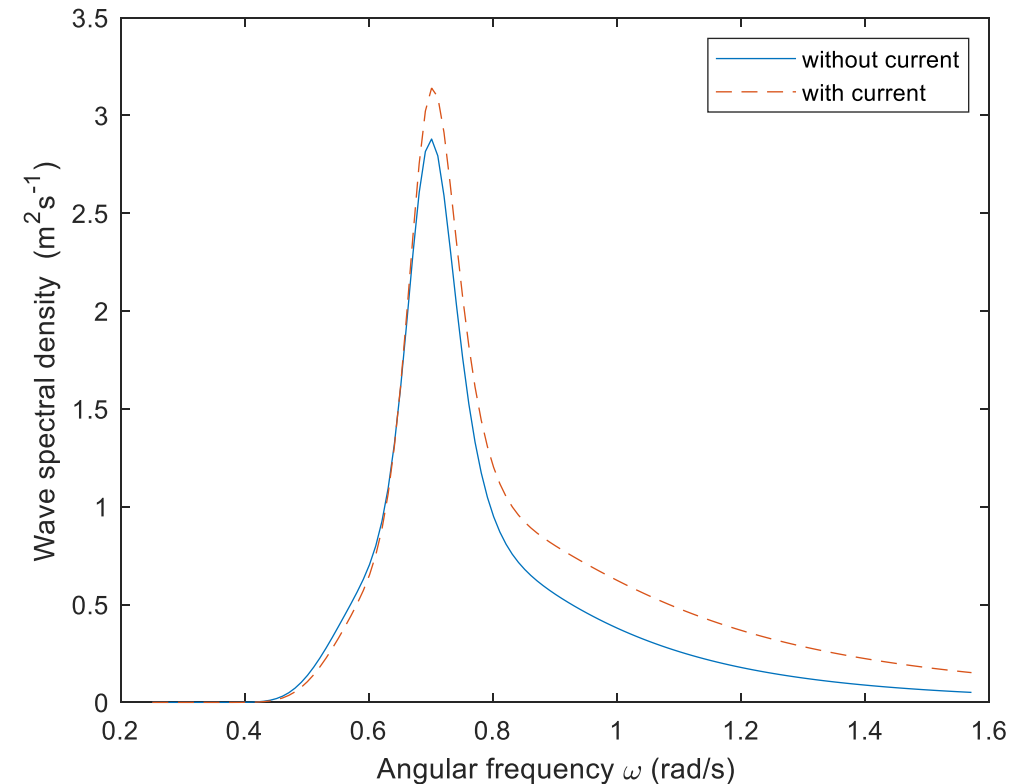


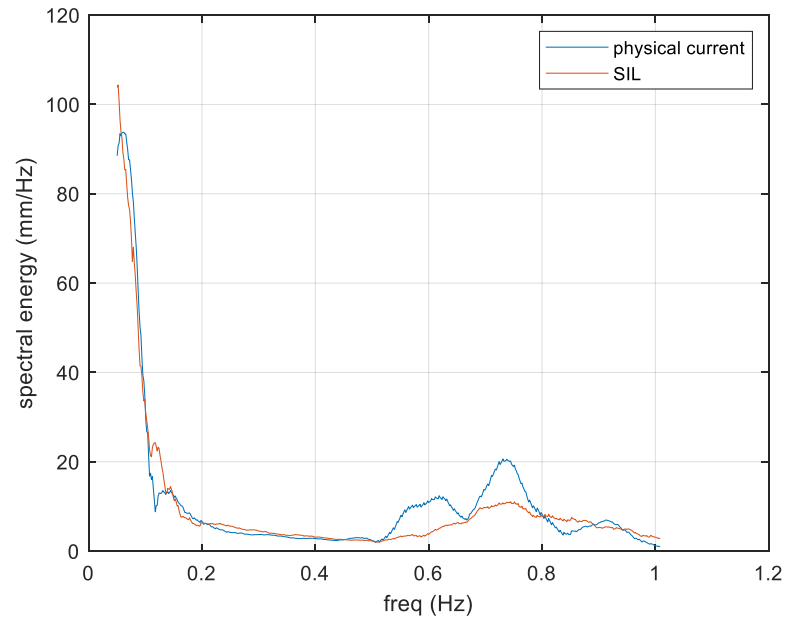
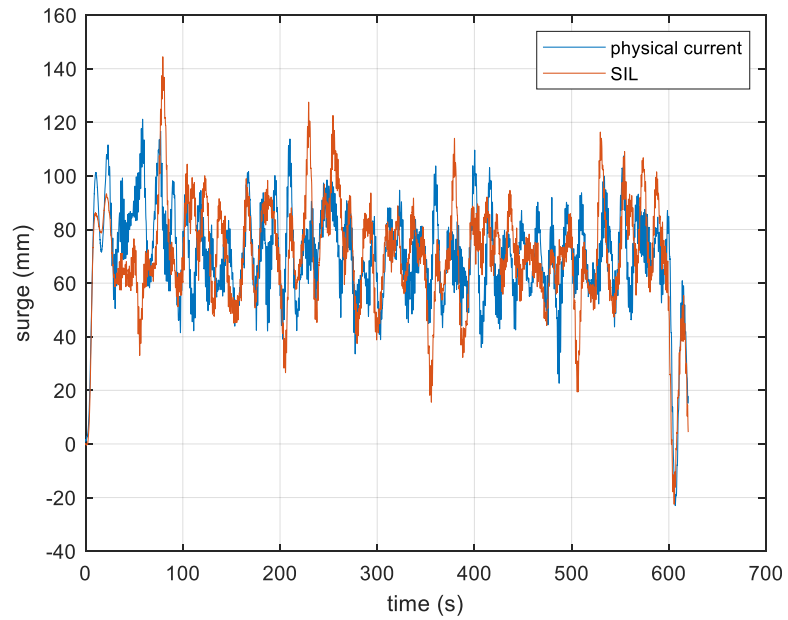
- Following current
- Wave heights become smaller
- Wave lengths become longer



Re-program the wave maker!
(change wave heights)

- Similar effect for wave spectra: spectral energy increases with opposing current and decreases with following current.

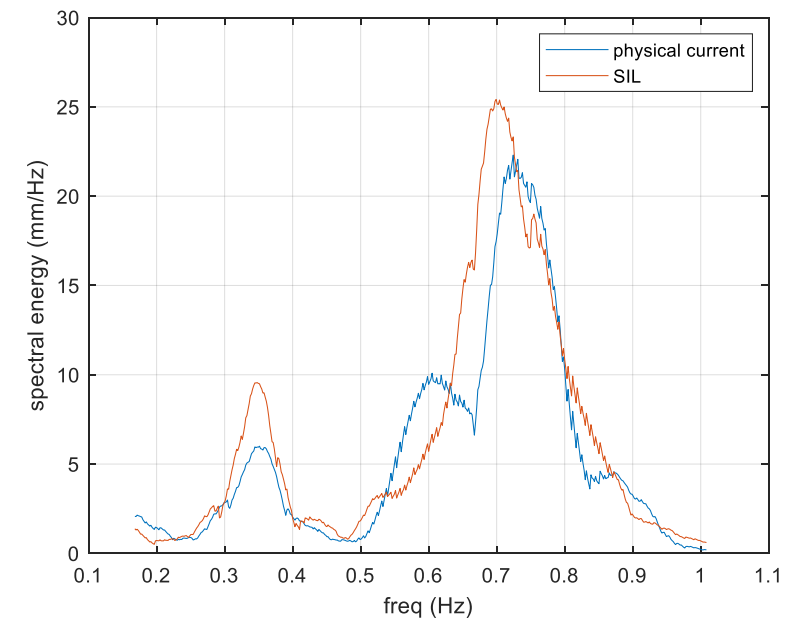
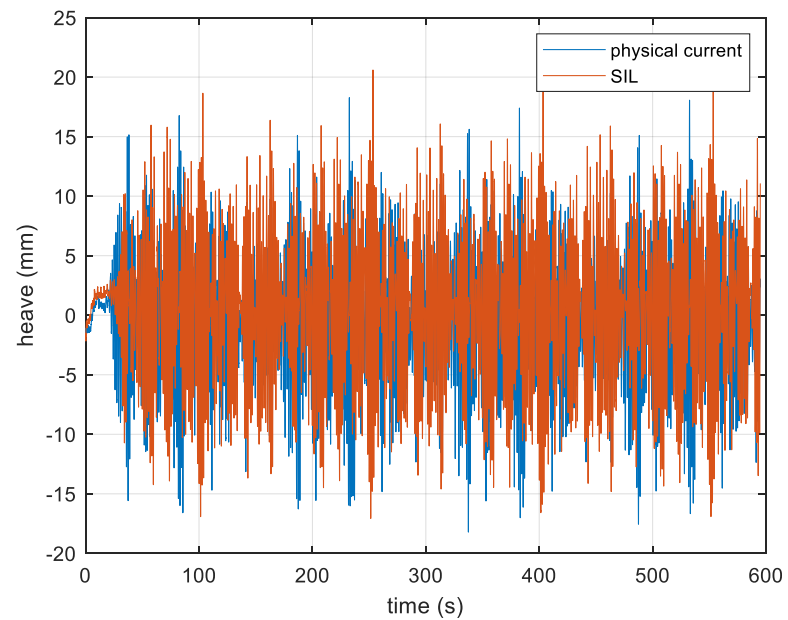




Some results:

Surge motion of the platform with combined loads

Average Relative Error: 0.11



Heave motion of the platform with combined loads

Average Relative Error: 0.14

THANK YOU!



Email: aldert.otter@ucc.ie