

Physical model tests on a floating offshore wind turbine

HYDRALAB+ SparBOFWEC project

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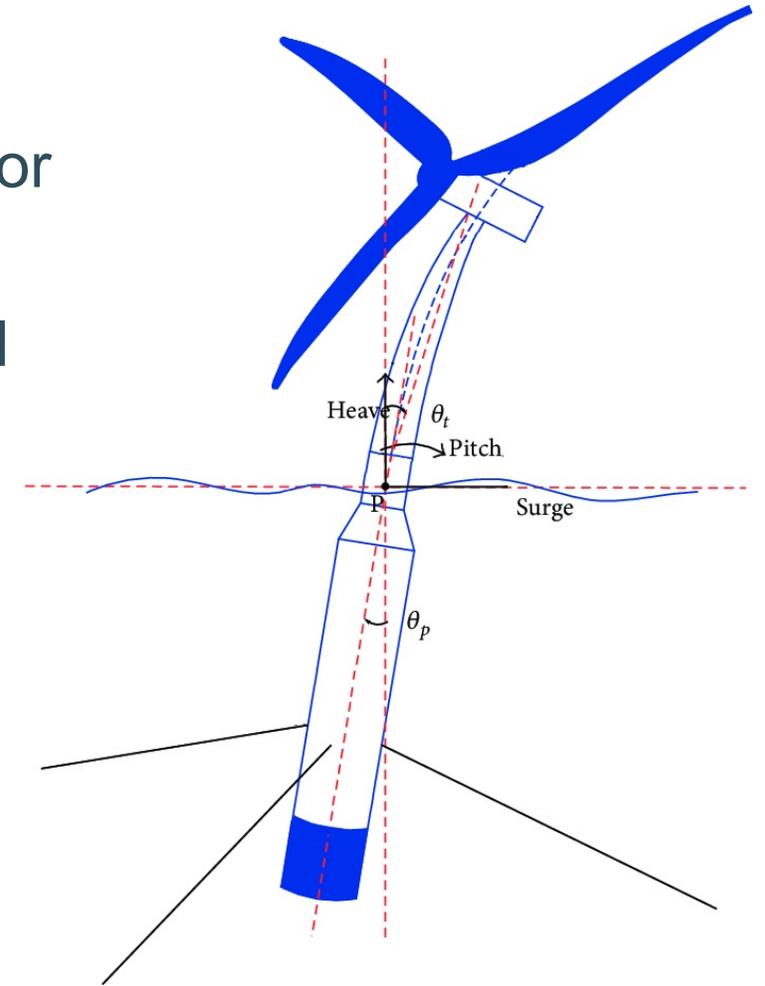


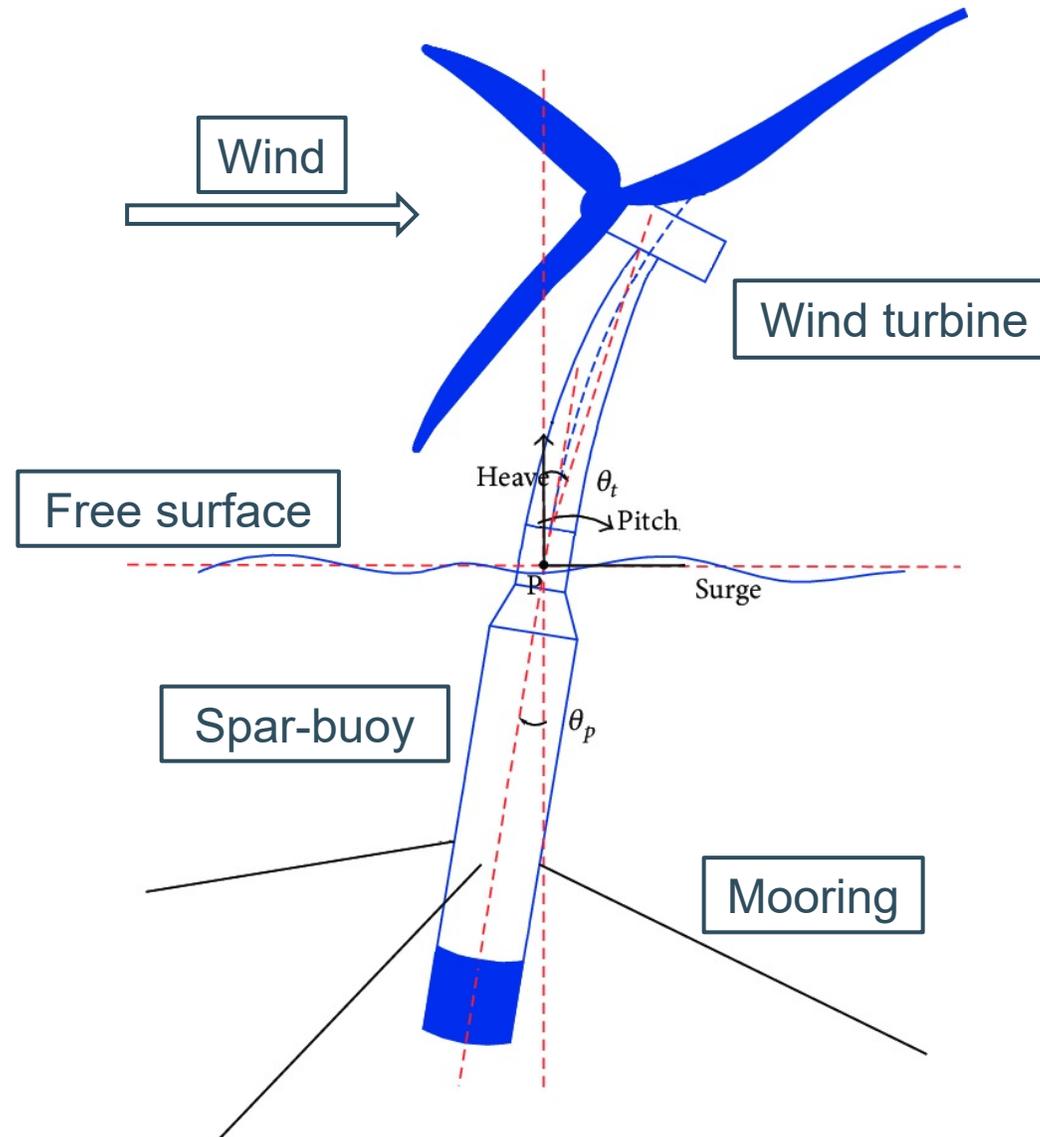
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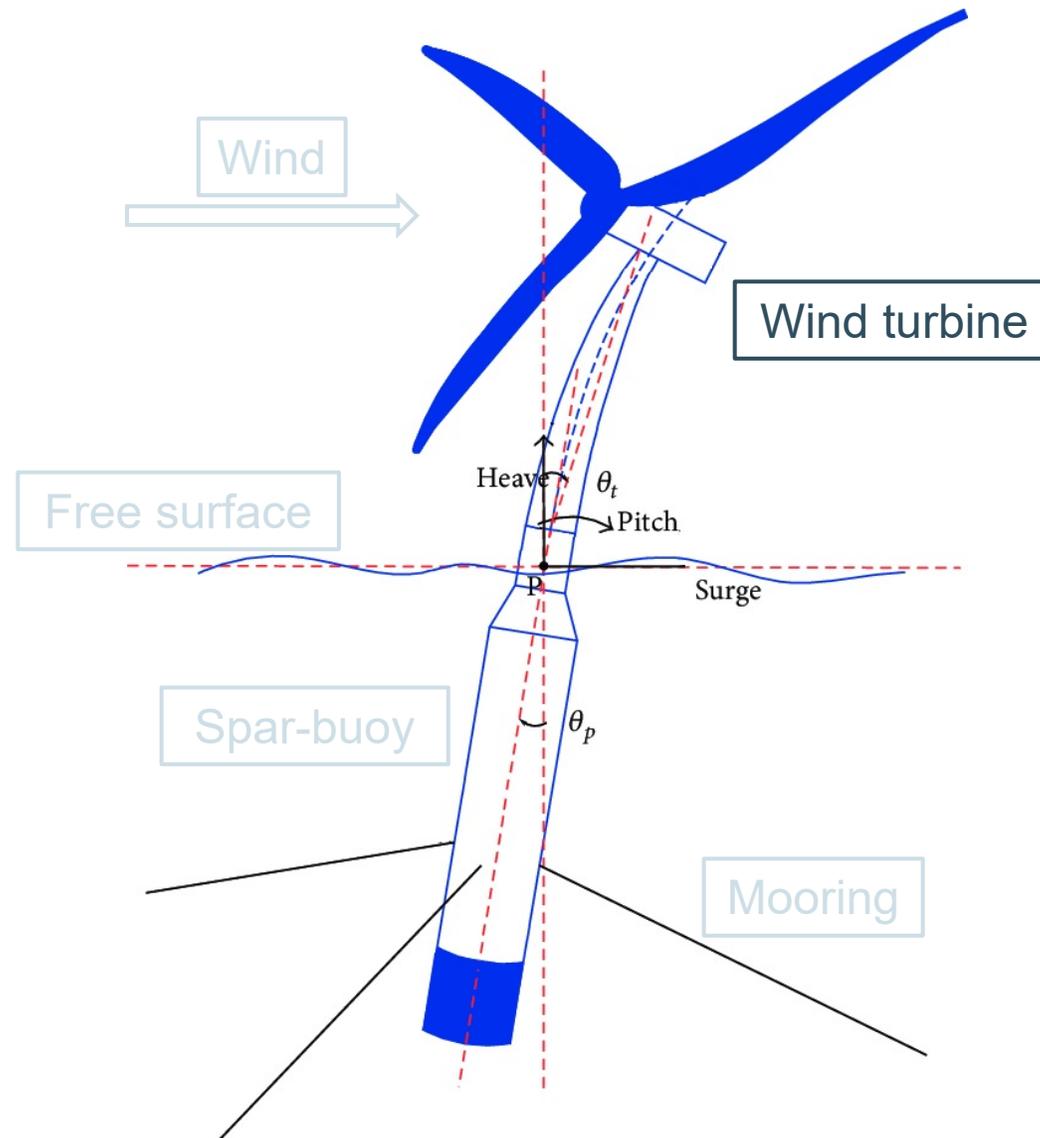


Motivation

- Overcome limitations posed by approximate systems for rotor motion
- Investigate coupling between pitch controlled rotor and floater motion
- Database for validation of numerical models



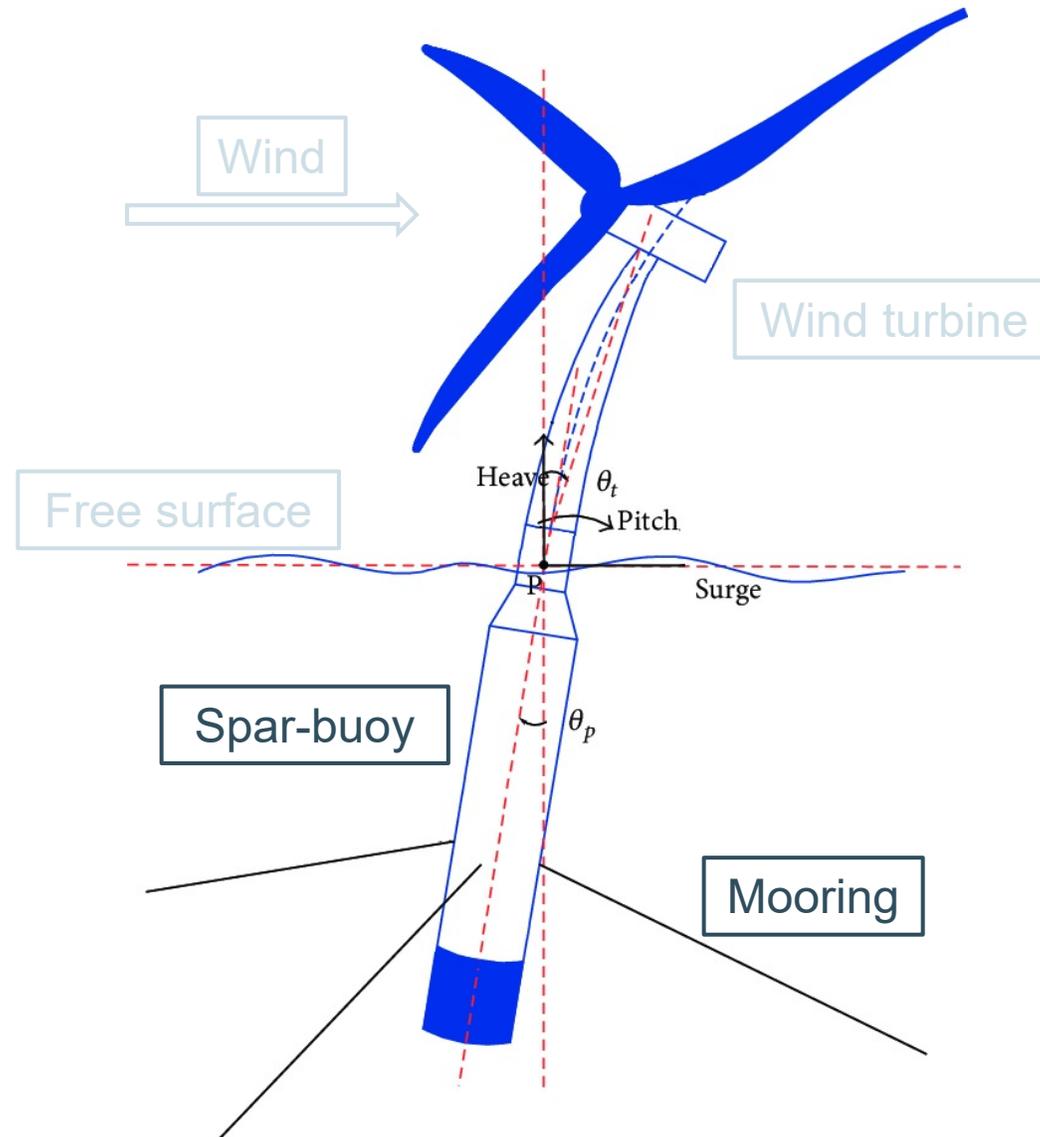




Wind turbine

- Downscaled (1/40) NREL 5MW wind turbine
- Geometrically upscaled PoliMi WT rotor for improved performance at low Reynolds numbers

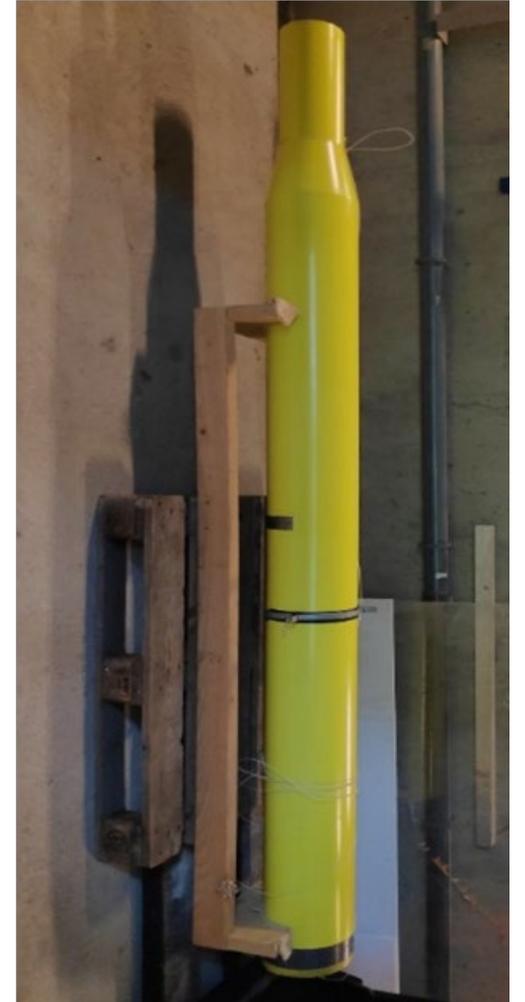
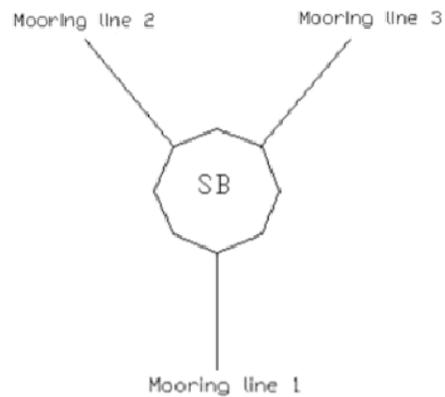


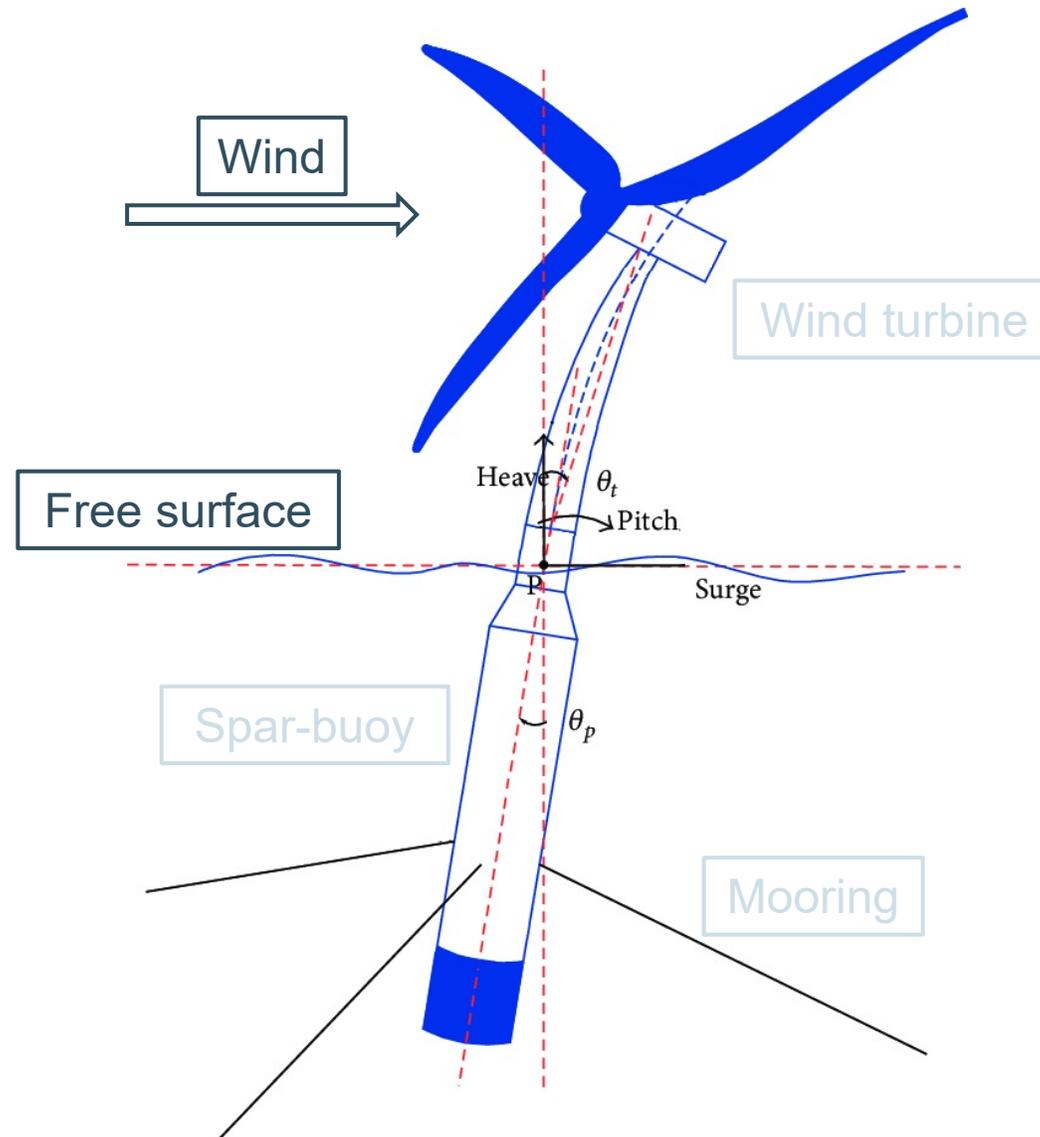


Floater

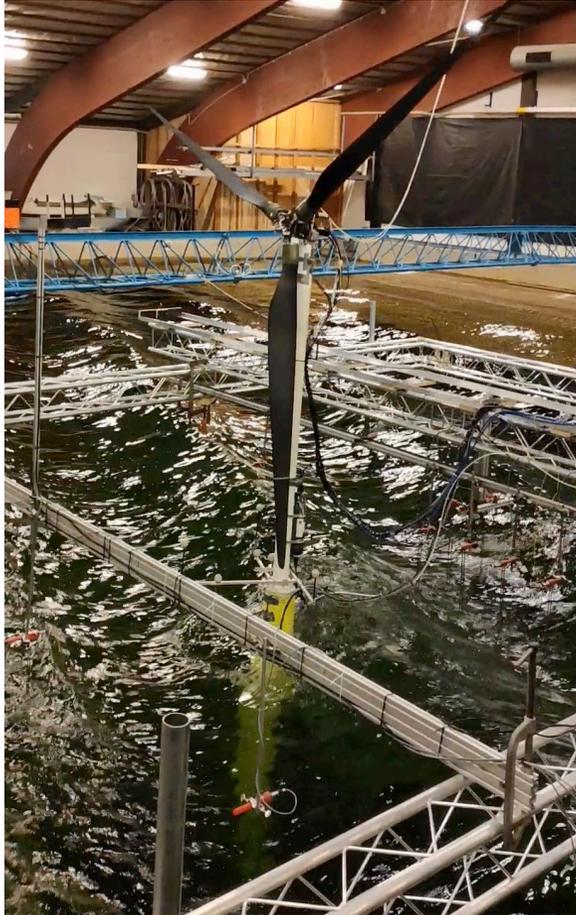
- Downscaled (1/40) OC3 Hywind spar buoy
- Crowfoot catenary mooring approximated by a series of springs

Wave generator

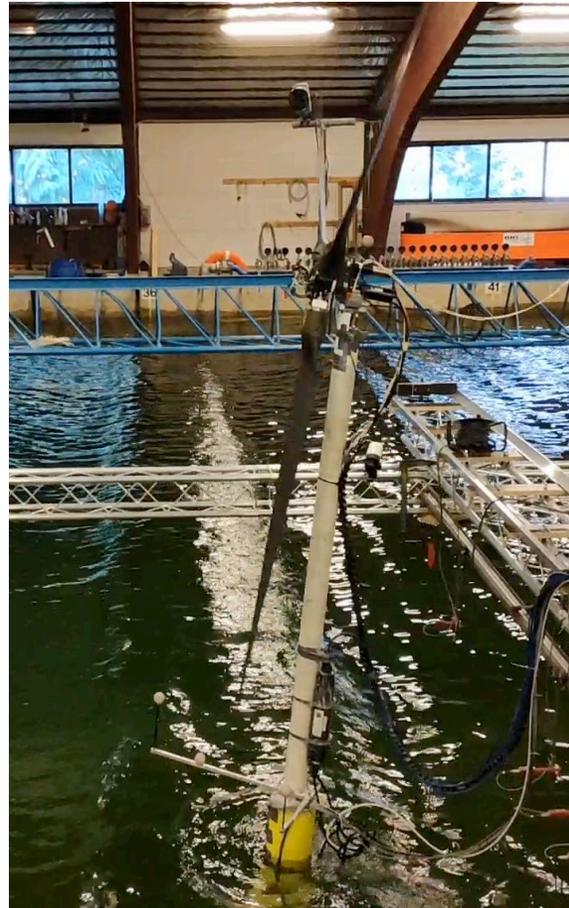




Wind and waves



**REGULAR WAVE
NO WIND**



**IRREGULAR WAVE
WIND**

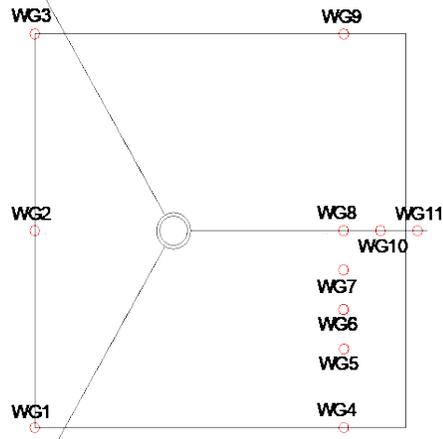
Regular waves			Irregular waves		
H [m]	T [s]	Dir [°]	H [m]	T [s]	Dir [°]
0.05 0.13 0.25	0.8	0 20	0.06	1.12	0 20
	1.1		0.08	1.53	
	1.4		0.10	1.15	
	1.6		0.15	1.44	
	1.9		0.20	1.69	
	2.2				

Wind conditions	
No wind	Operational wind speed [m/s]
	1.25
	1.45 *
	1.65
	1.85 **
	1.95

*below rated, **rated

Instrumentation

- Wave gauges



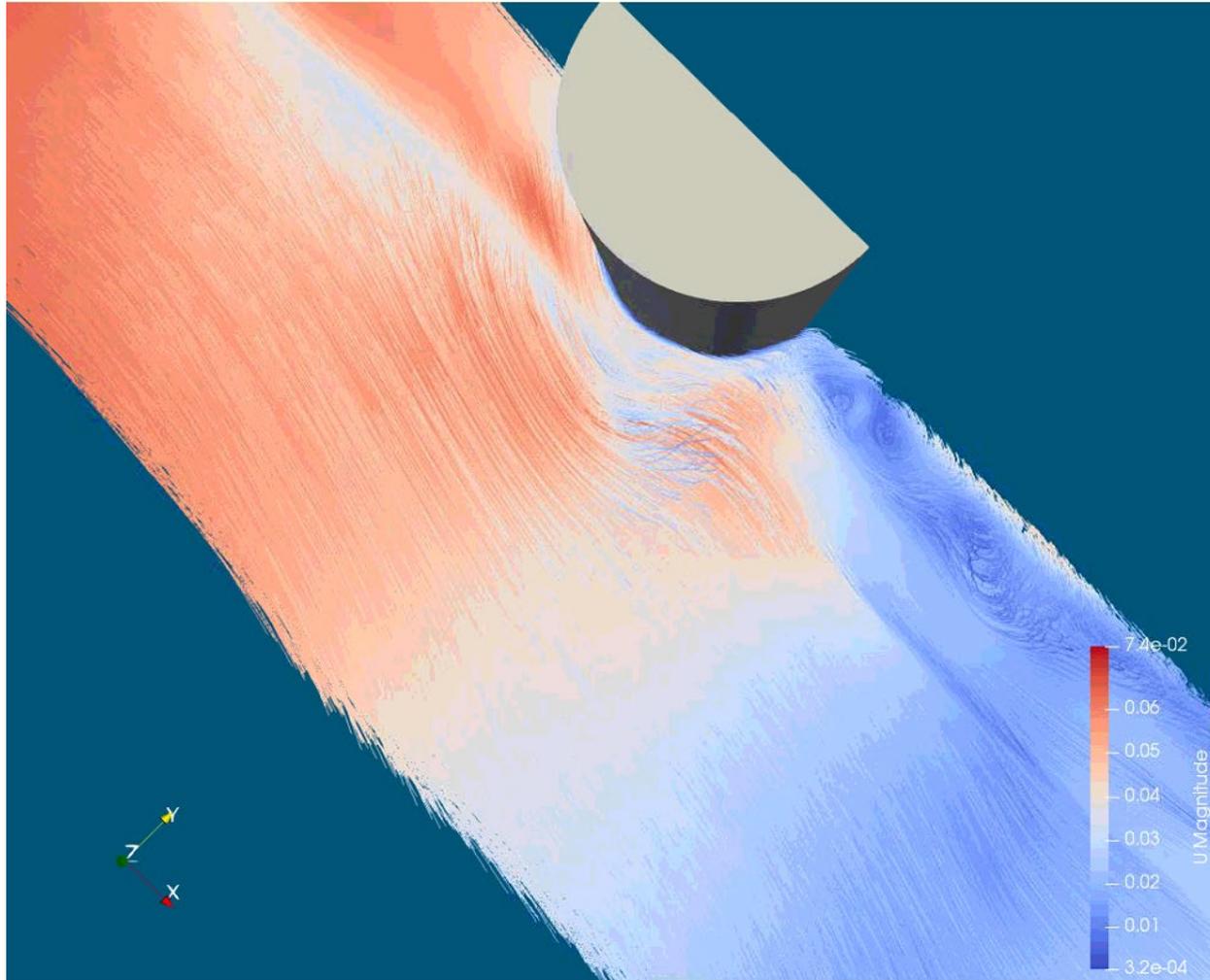
- 2 Vectrino Acoustic Doppler Velocimeters
- 3 pressure transducers on the spar buoy
- Load cells on each mooring line

- Qualisys tracking system for 6DoF rigid body motion
- 2 inertial frames on top and at tower/spar interface
- 2 uniaxial accelerometers at the top

Further work at KU Leuven

- Improved understanding of the floating wind-turbine spar
- Validation of the numerical models, CFD, predicting the hydrodynamic behaviour currently being developed

CFD modelling at KU Leuven



Thanks