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Scour at offshore megastructures

Modeling and simulation of fluid-structure-soil interaction

Scour development around a tripod foundation structure. Large scale model test in the Large Wave Flume (GWK).

Offshore wind energy structures (OWES) present a physical barrier on the seafloor and in the water column.

Due to the complex interaction of OWES with waves, currents, and the seabed scouring can occur in the near-field of the structures.

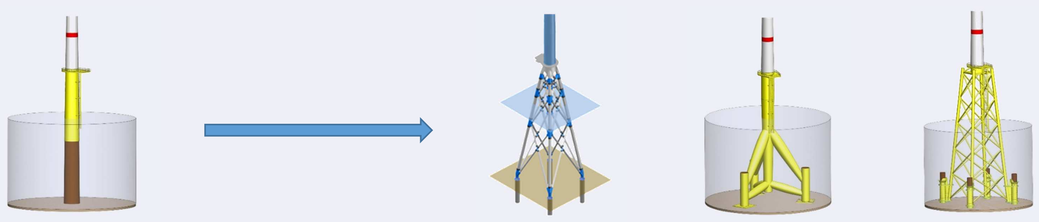
The formation of scours always has a direct influence on the stability of the structures.

The reliable prediction of scour development is thus an essential element of foundation structure design.

Research objectives

Key question: How does the scour development at future offshore megastructures differ from present structures?

- Prediction of scour formation for offshore megastructures under varying metocean conditions.
- Assessment of the transferability of scour prediction approaches between different length scales and complexity of structures.



- Development of scour protection and mitigation systems.

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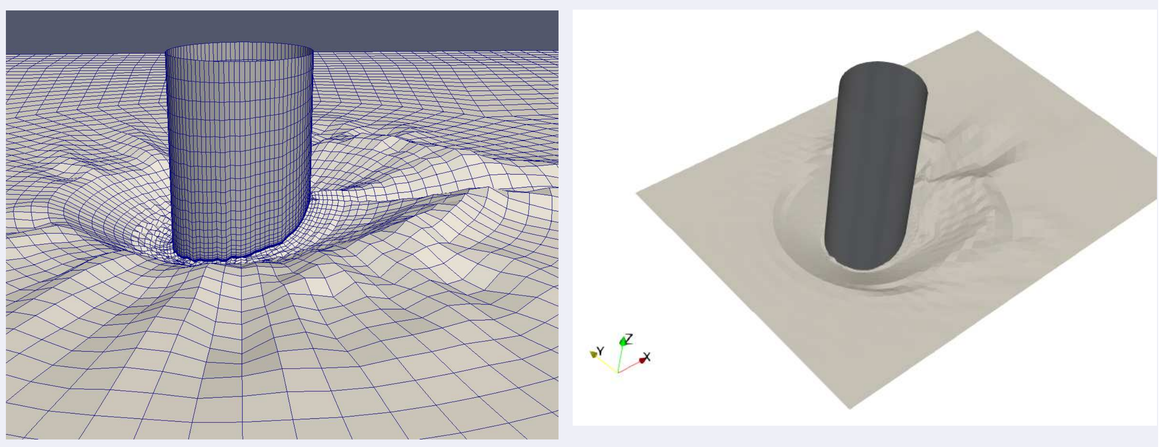
Methodology

Numerical and physical modeling of scour development:

- Model tests in different length scales and with different structures in wave-current basins and flumes.

Scour development around different foundation structures (left: jacket; right: monopile) during model test in a 3D wave-current basin.

- Numerical 3D simulation of flow and scouring processes with OpenFoam.



3D OpenFoam simulation of scour around a monopile foundation in a time varying current.

- Coupled modeling of bottom current and bottom motion ("winnowing effect") within a scour protection system due to current and wave.

Outcome

Improved understanding of scouring processes around large and complex offshore structures.

Reduction of uncertainties in the prediction of scour development and improved reliability in scour protection design.

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