



Scour and Scour Protection Effects: Monopile Flume Experiments

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Introduction

Problem Definition:

- (a) Scour around offshore structures due to erosion;
- (b) Influence of scour on structural dynamics;
- (c) Reduced foundation ultimate capacity;
- (d) Uncertain geotechnical modelling of scour protection

Industry Sponsors:



Experiment Overview

Aims:

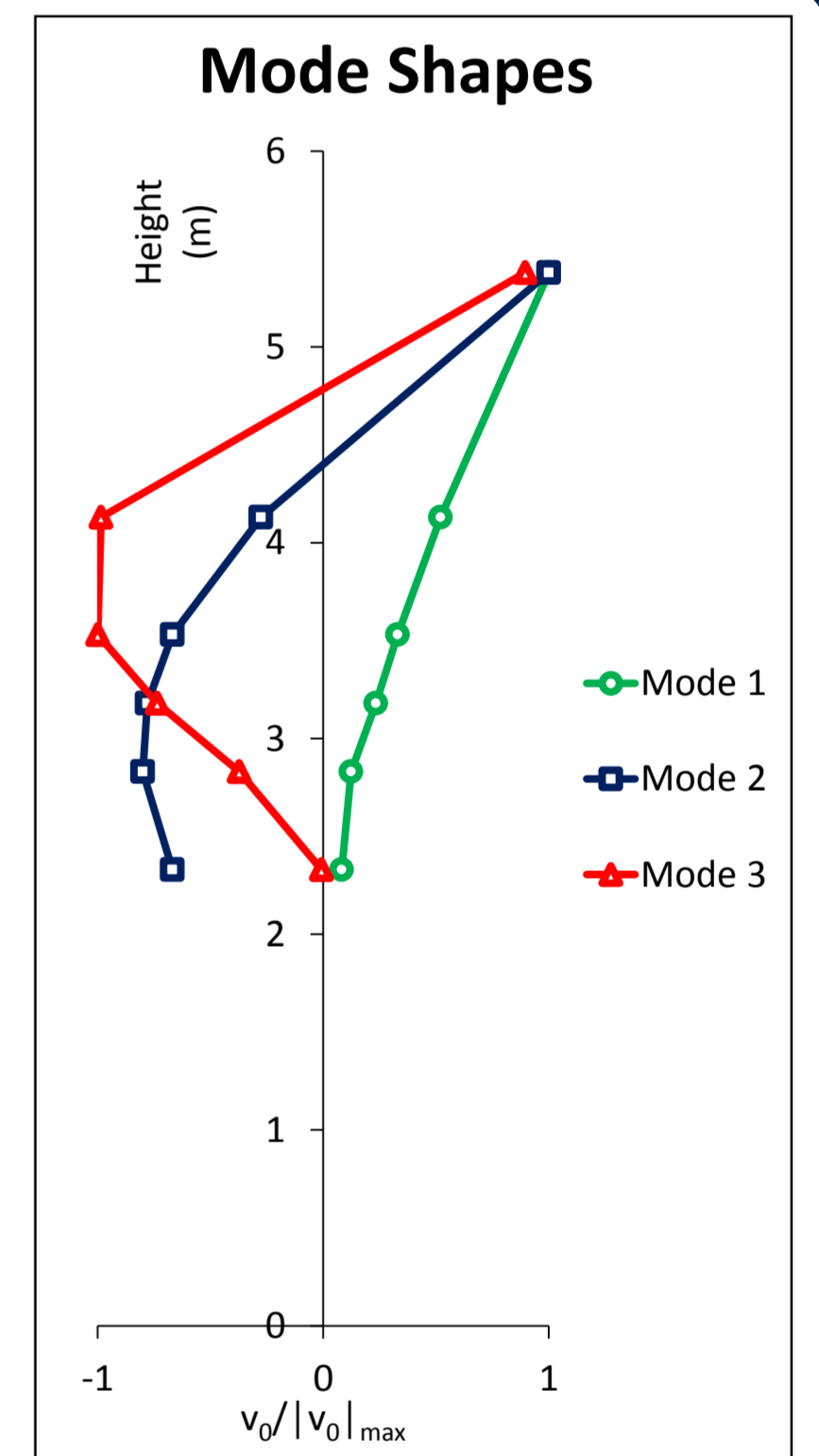
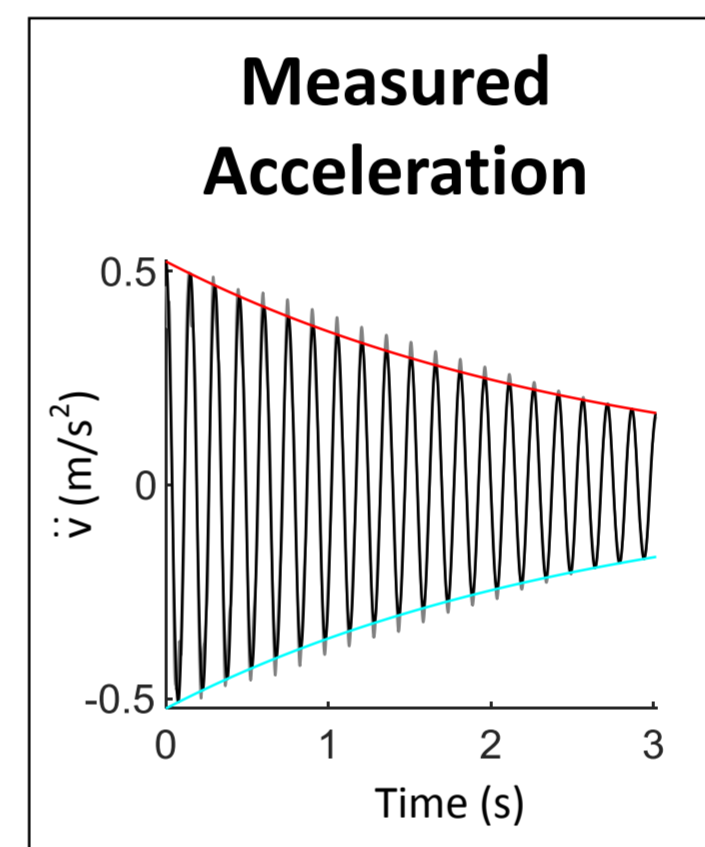
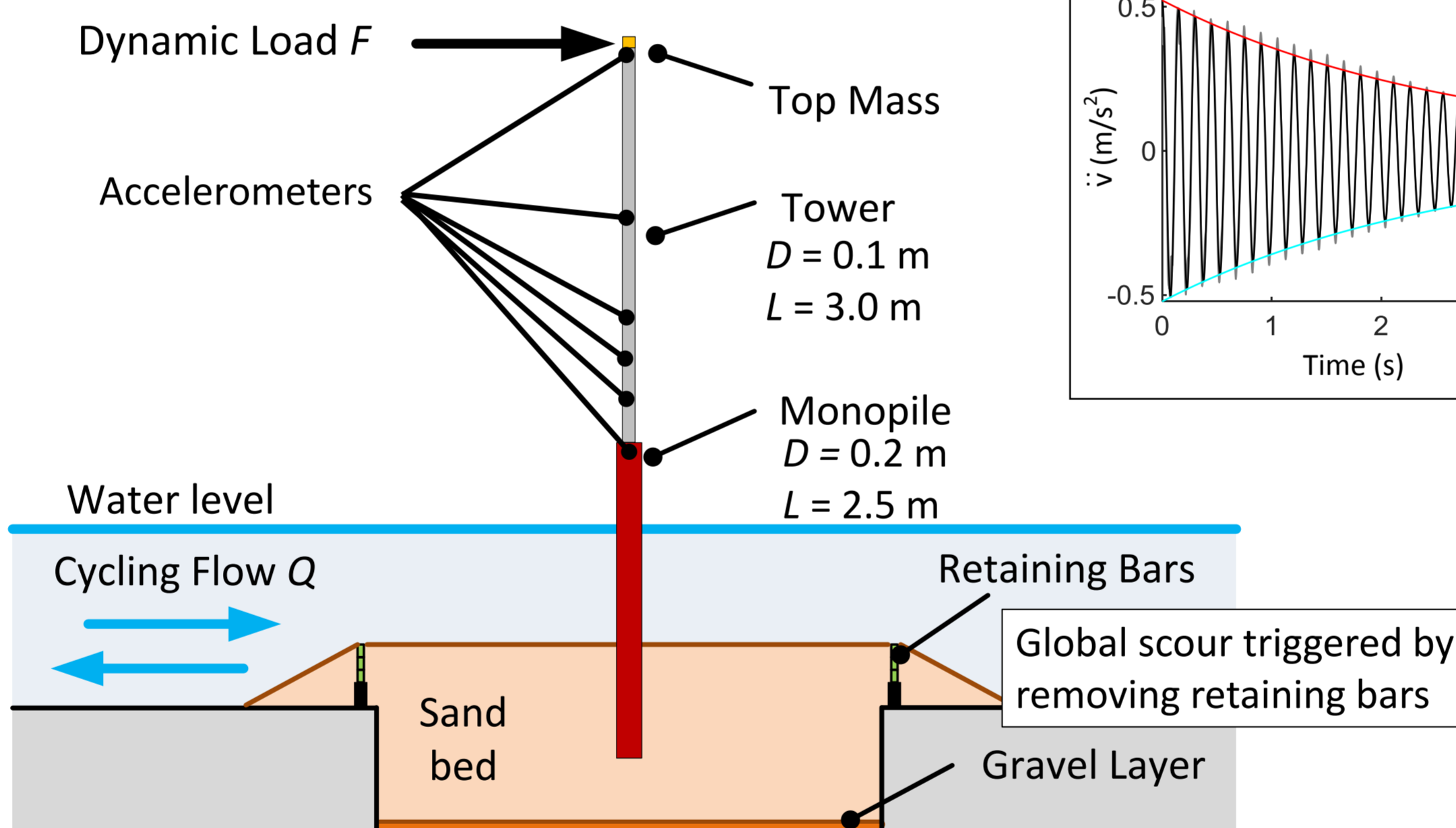
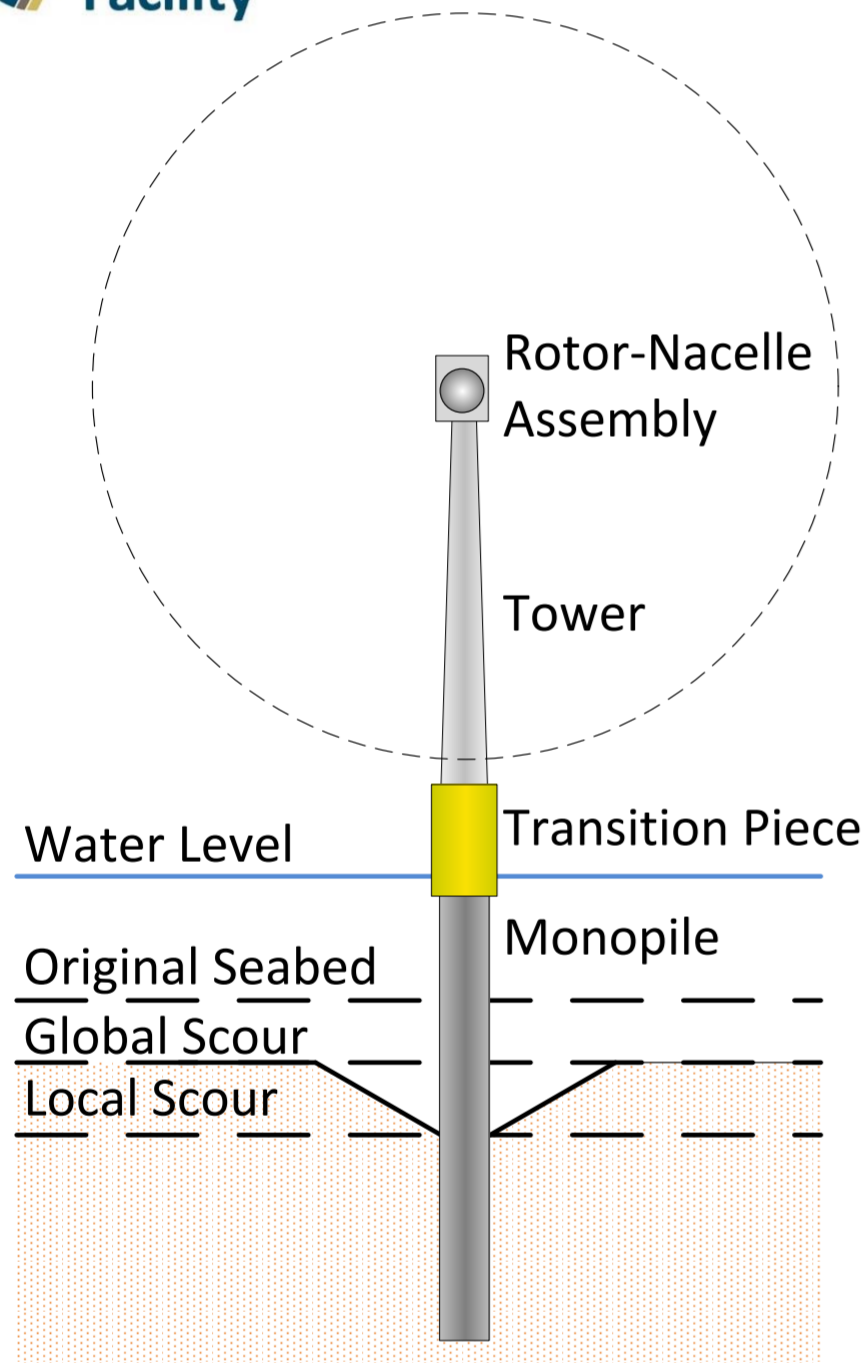
- Measure natural frequency changes with scour evolution
- Provide benchmark data for validating new field prediction methodologies

Six tests performed:

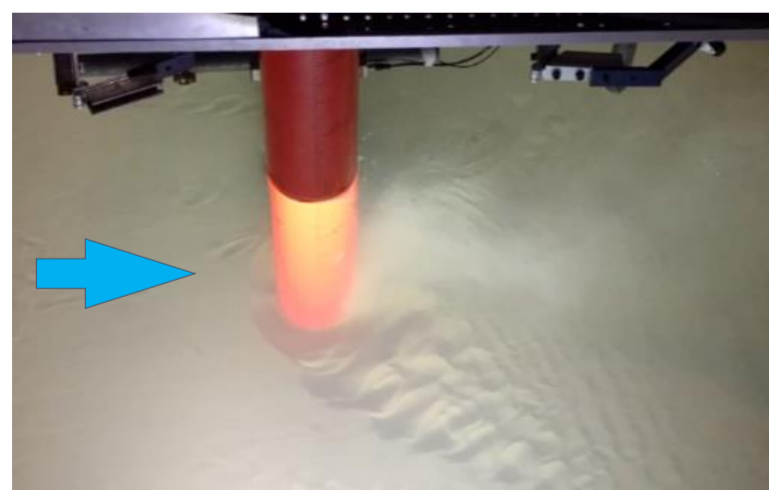
- Initial pile embedment 4.5 to 5.5 D
- Target local scour depth 0.75 to 1.5 D
- Scour protection models: none (x1), rock fill remediation (x3), preinstalled rock (x1), tyre-filled nets (x1)



Flume Tank Experiments



Example Scour Protection Model



Local scour development



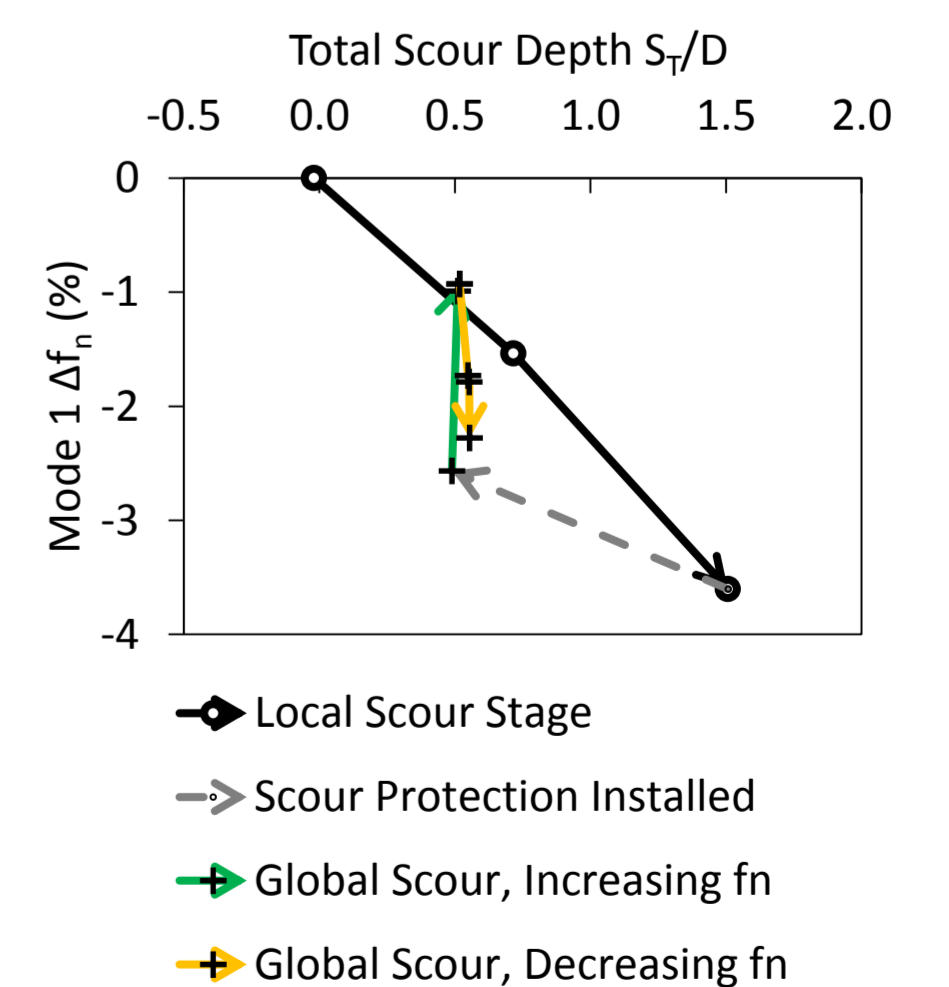
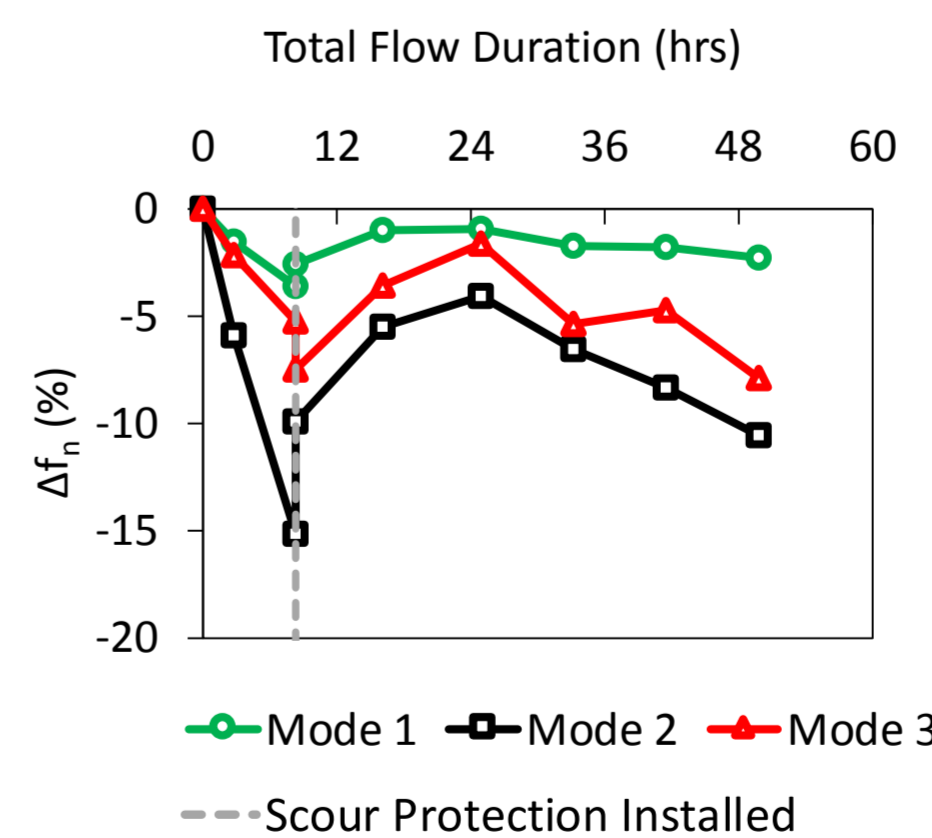
Fall pipe rock placement



End of test excavation:

- Sand deposited in rock material
- Falling apron developed with global scour
- Rock stable at pile wall

Example Results



Selected Findings:

- Mode 2 natural frequency most sensitive to scour depth
- Scour protection contribution influenced by:
 - 1) Positive effect of sand deposition
 - 2) Negative effect of falling aprons and global scour