

MOFFATT & NICHOL



Creative People, Practical Solutions.

Passing Vessel Analysis: Overview of ROPES JIP Software

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Prevention First

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Outline

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- **ROPES JIP Objective**
- **Background on Passing Vessel Analysis**
- **JIP Work Packages**
- **ROPES Software**

A Joint Industry Project (JIP) is a project funded by a number of companies or organizations choosing to collaborate. Projects typically addressed in JIPs are either too complex or costly to be solved by one party alone or require specialized knowledge or equipment, which is not readily available for individual parties (e.g. hydraulic modeling facilities). The parties involved jointly agree on a scope of work, time schedule and contract conditions. JIP participants work together, share costs and benefits.

Research on Passing Effects on Ships Joint Industry Project (ROPES JIP) Objective

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“To provide insight into the effects of passing ships and to validate and develop methodologies for the evaluation of such effects on ships moored in a port in order to provide solutions for existing and new port terminal developments”

- Provide Insight and Understanding
- Develop Numerical Model and Tool
- Verify, Validate, and Deliver Tool
- Develop Best Practice

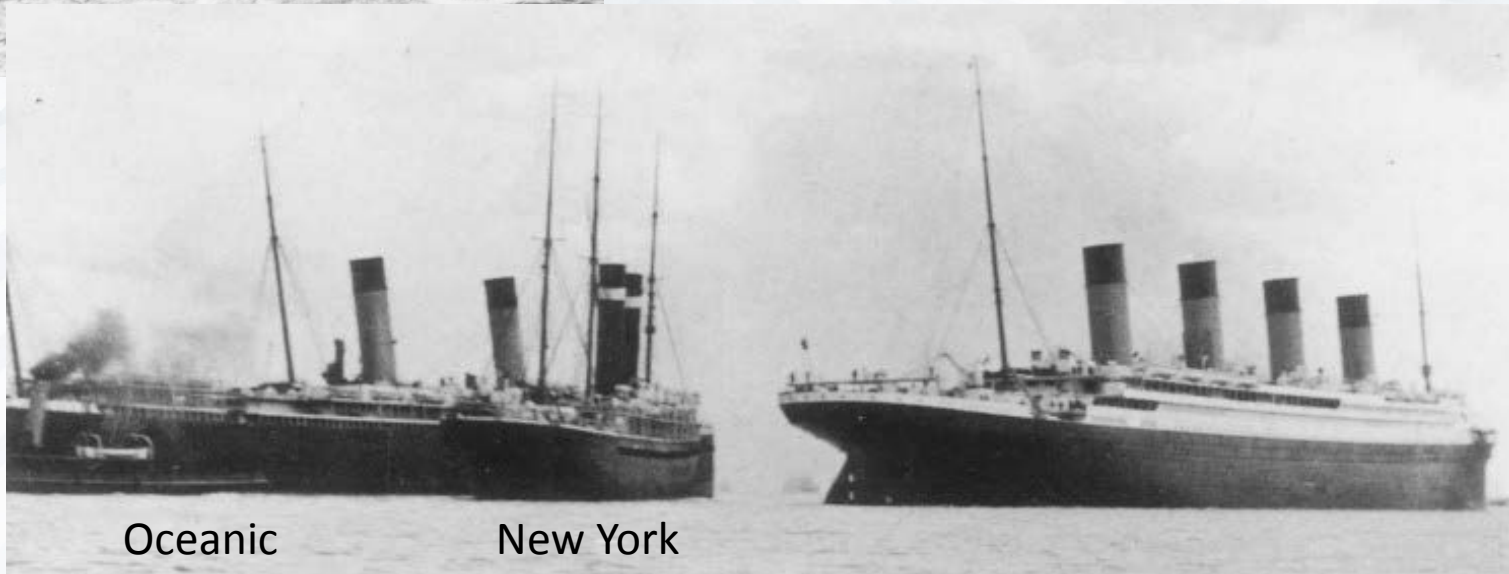
Background on Passing Vessel Analysis

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- Why is this important?
 - New terminals
 - Regulatory Requirements (MOTEMS)
 - Larger ships
 - Constrained channels
 - Increased risk/consequences
- Previous incidents
 - Titanic leaving Southampton (1912)
 - Jupiter Incident, Bay City Michigan (1990)

Titanic Leaving Southampton

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Photos from
<http://www.rmstitanicremembered.com/>

Jupiter Incident, Bay City Michigan

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Photo Credit: Bill O'Rourke (Photo.net)

JIP Work Packages

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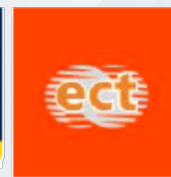
- Work Package #1: State of the Art Prediction Methods for the Effect of Passing Ships
- Work Package #2: ROPES Software
- Work Package #3: Model Testing
- Work Package #4: Full Scale Testing
- Work Package #5: Correlation of Prediction, Verification, and Validation

JIP Participants

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Haven Amsterdam



ExxonMobil



Rijkswaterstaat



OKB.V.E.



Siport21



CAVOTEC

PMH BV



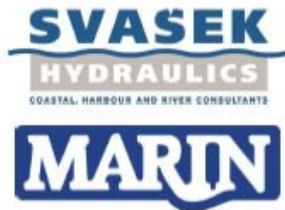
Rijksoverheid



Loodswezen



Work Package Products



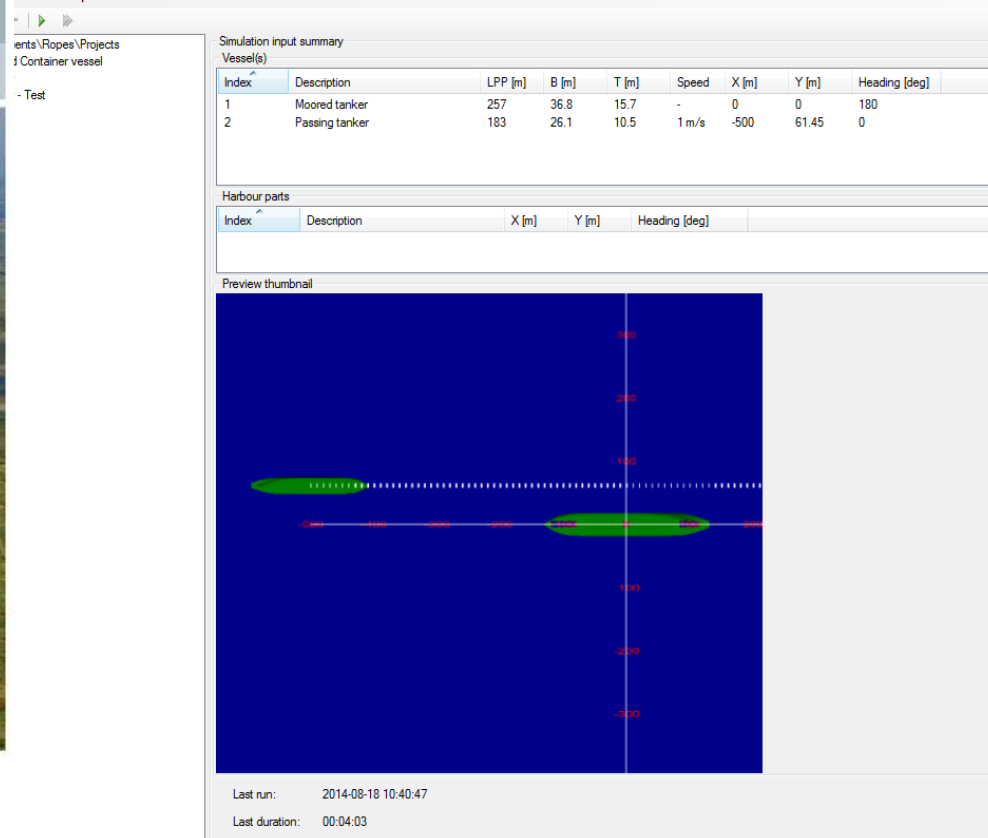
JIP Ropes, WP1 - Framework and overview

State-of-the-art prediction methods for the effect of passing ships



JIP Ropes - Work Package 1 : REVIEW AND USE OF STATE-OF-THE-ART PREDICTION METHODS

REPORT NO. PMH 02 : REVIEW OF THE HISTORICAL DEVELOPMENT OF PREDICTION METHODS FOR PASSING VESSEL EFFECTS



Overview of Numerical Models

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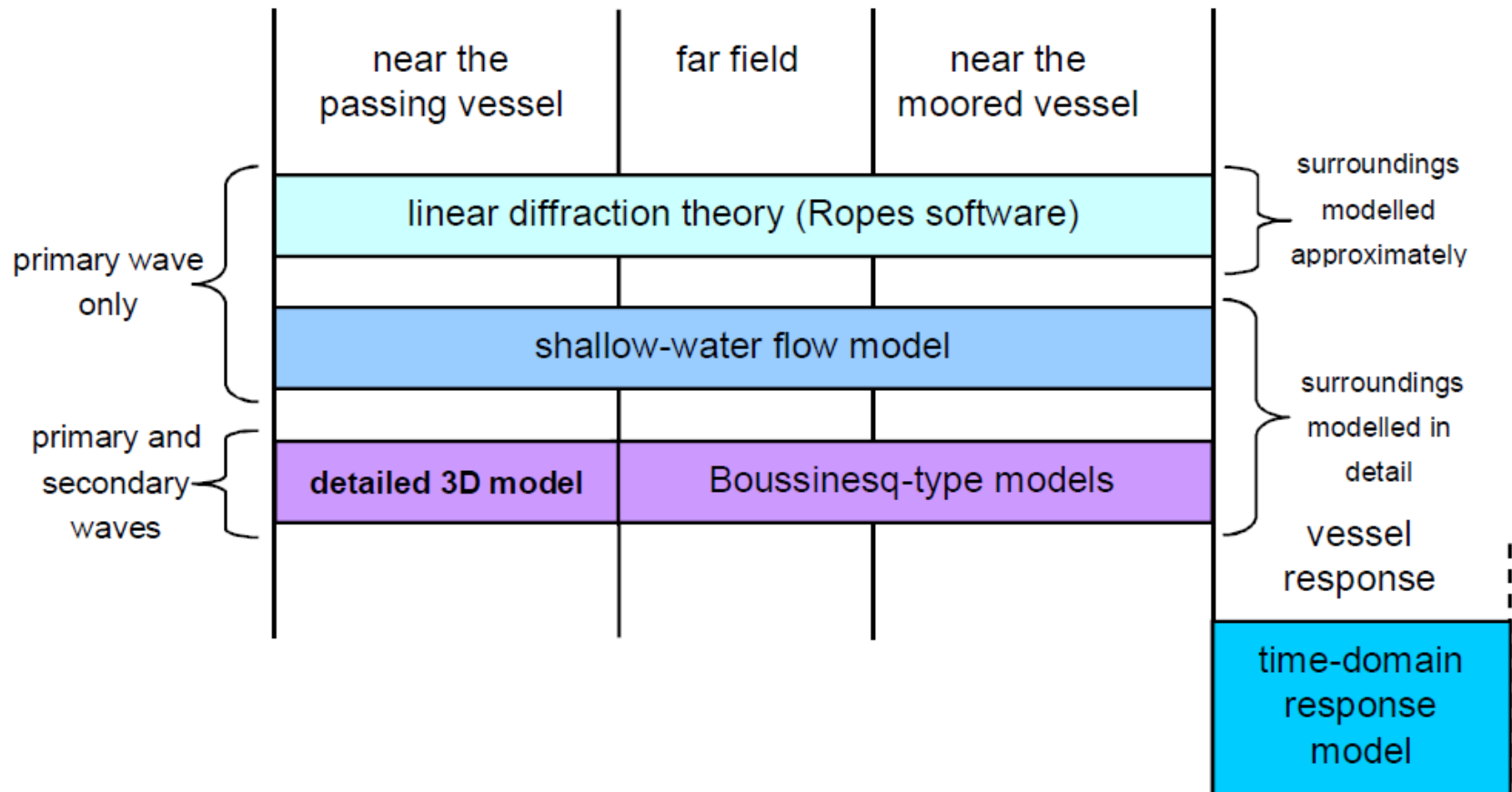
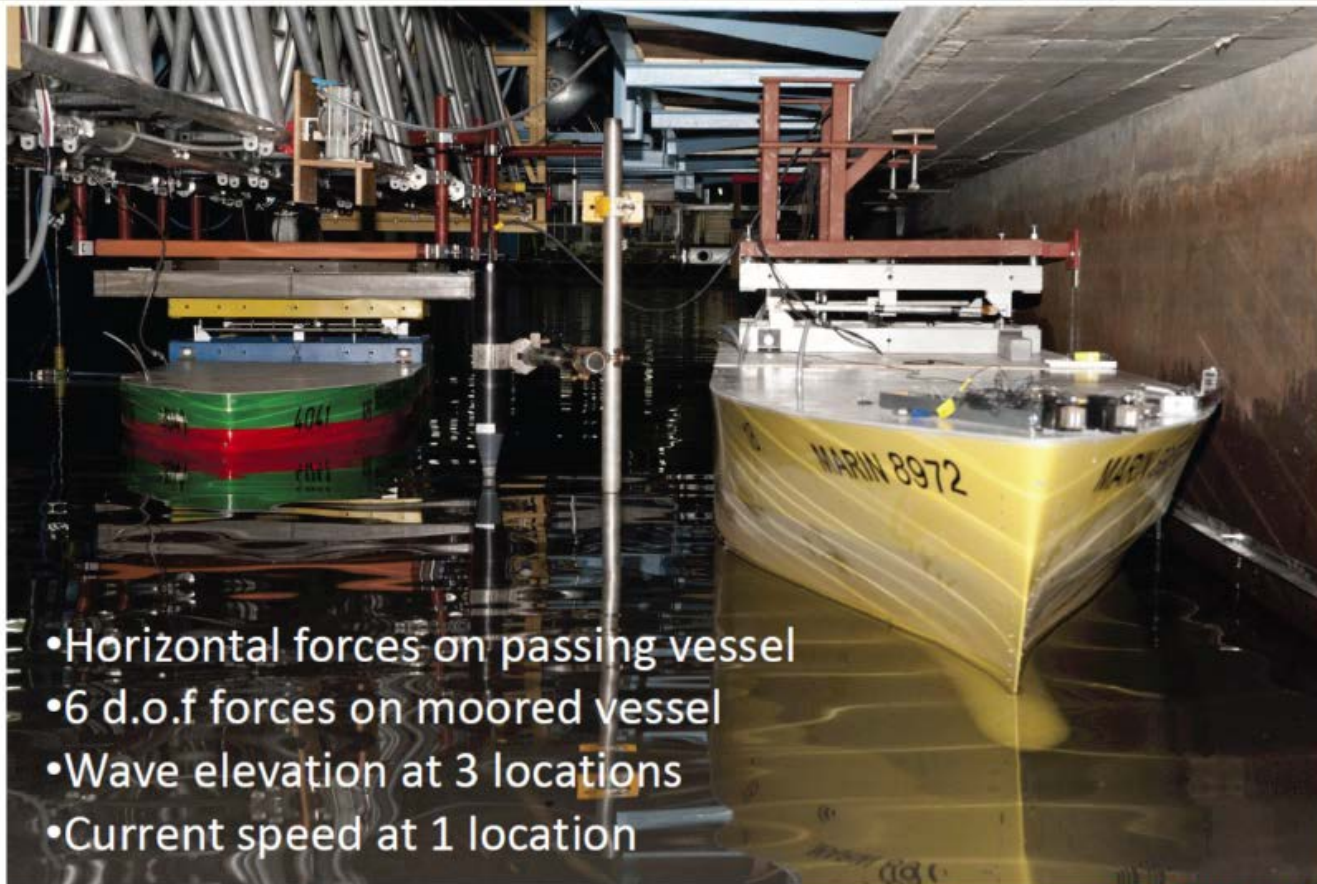


Figure 2.2: Schematic overview of the different numerical models considered in WP1.

Work Package Products

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Scale model tests at MARIN, captive (hull forces)



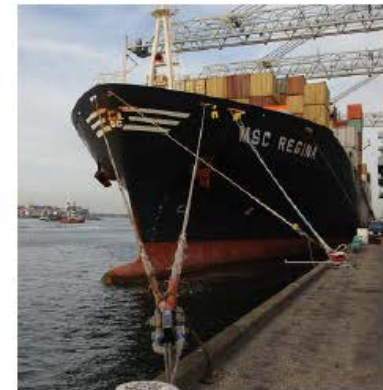
- Horizontal forces on passing vessel
- 6 d.o.f forces on moored vessel
- Wave elevation at 3 locations
- Current speed at 1 location

Work Package Products

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REVIEW: MAASVLAKTE DDN

- 31 passing events along ECT DDN quayside
- 4 vessels using traditional mooring lines
- 2 vessels with ShoreTension breast lines
- Very high traffic volume from 2 adjacent container terminals



Full Scale Tests

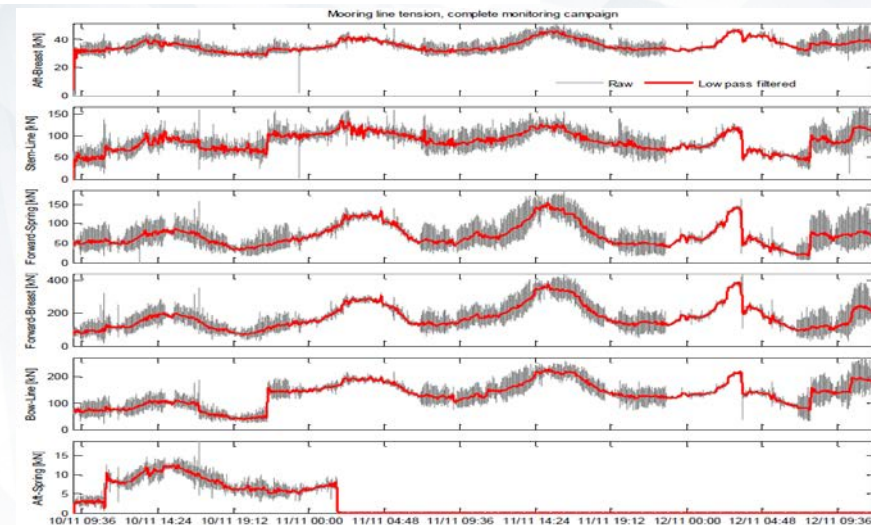
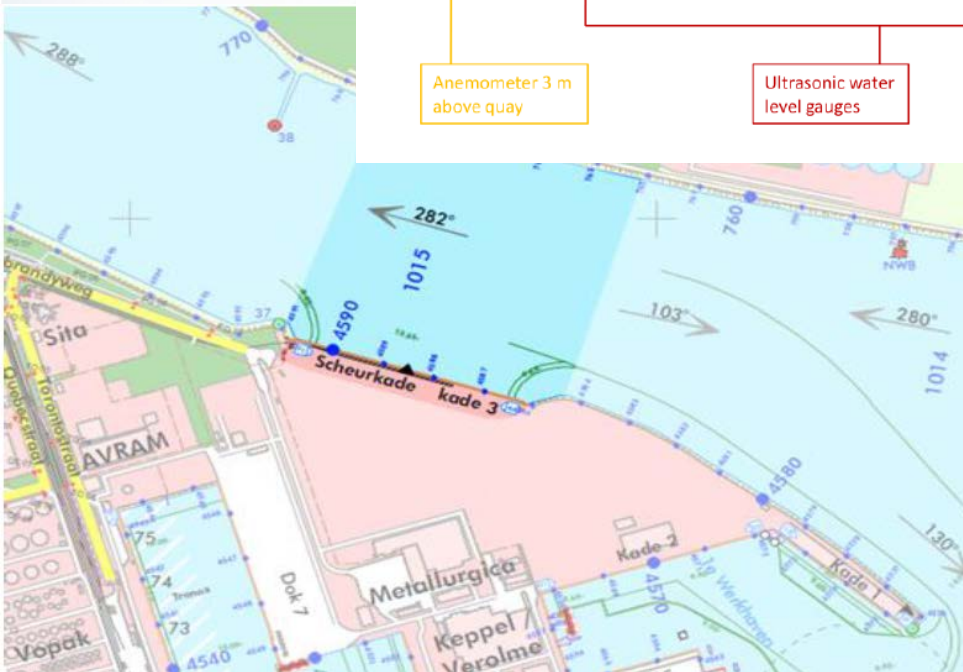
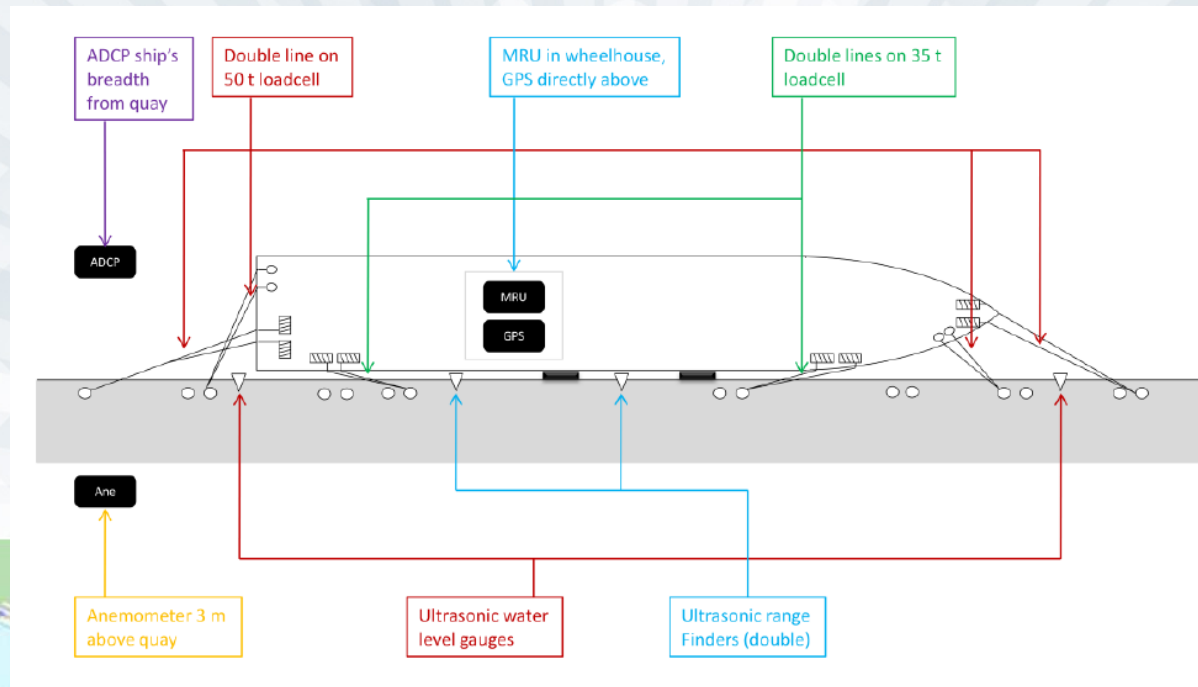


Figure 1: Monitoring campaign location Nieuwe Waterweg / Scheur

Work Package Products

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Correlations work on field scale: “reality checks”

General impression of field-scale correlation results:

- *For a number of selected passing events with significant dynamic effects, a reasonable correlation between measurements and ROPES was found taking into account the large uncertainties.*

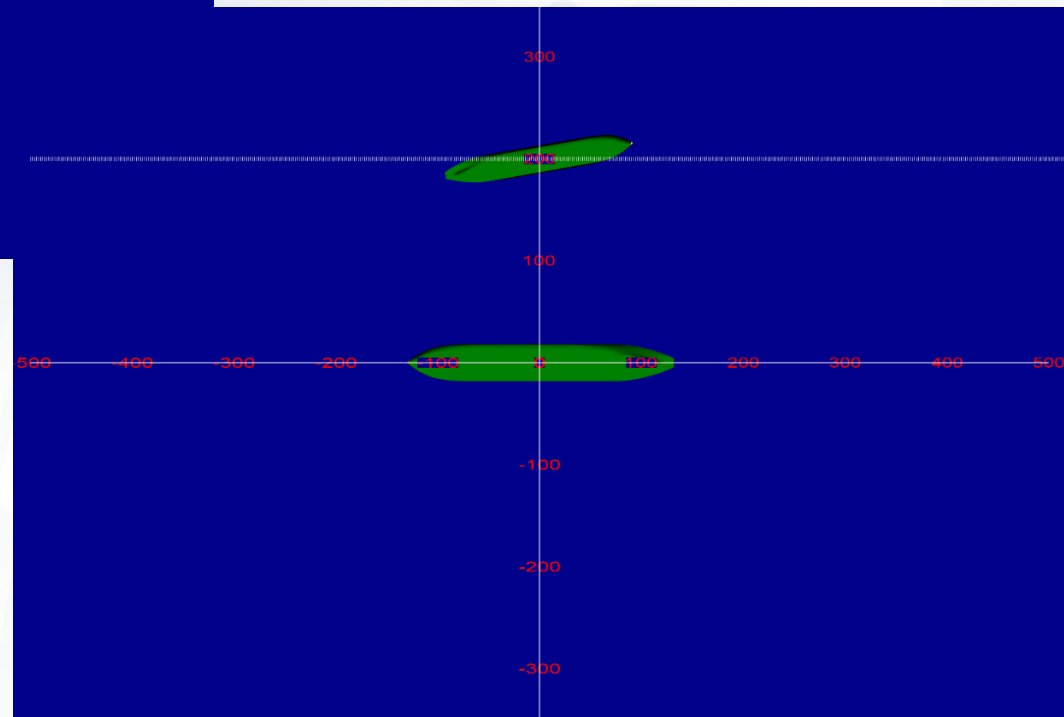
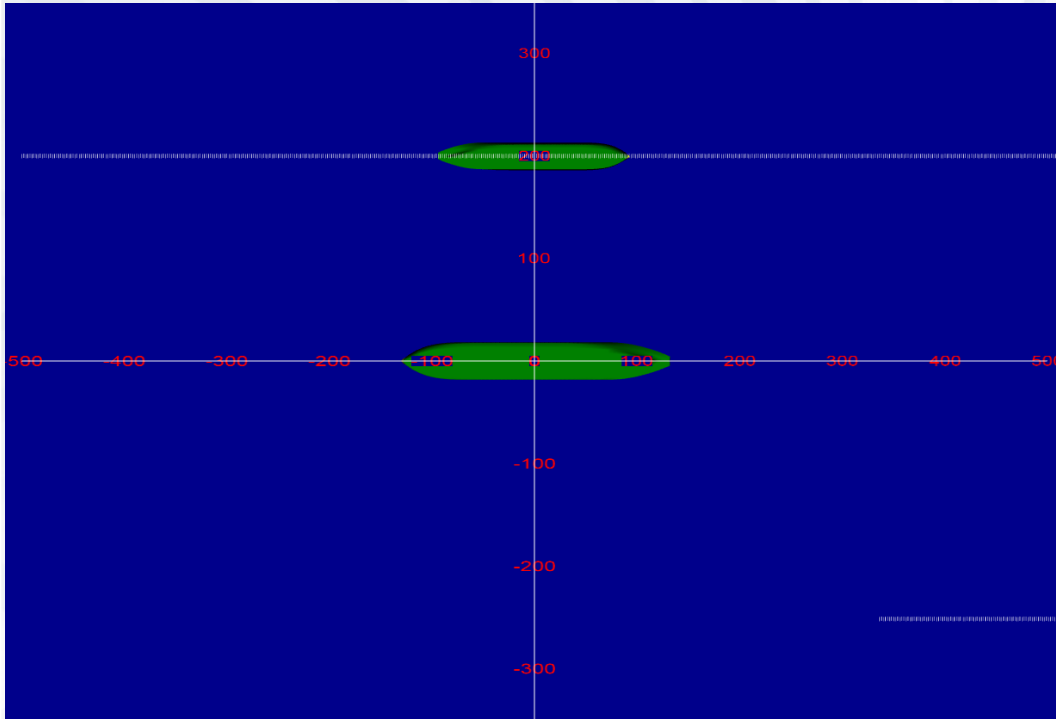
Some practical aspects:

- Limited passing effects due to caution taken by passing vessels
- Mooring line configurations and pre-tensions are often not adequately maintained by vessel crews
- Large influence of pre-tension and fender friction
- Large influence of active mooring systems



Typical ROPES Runs

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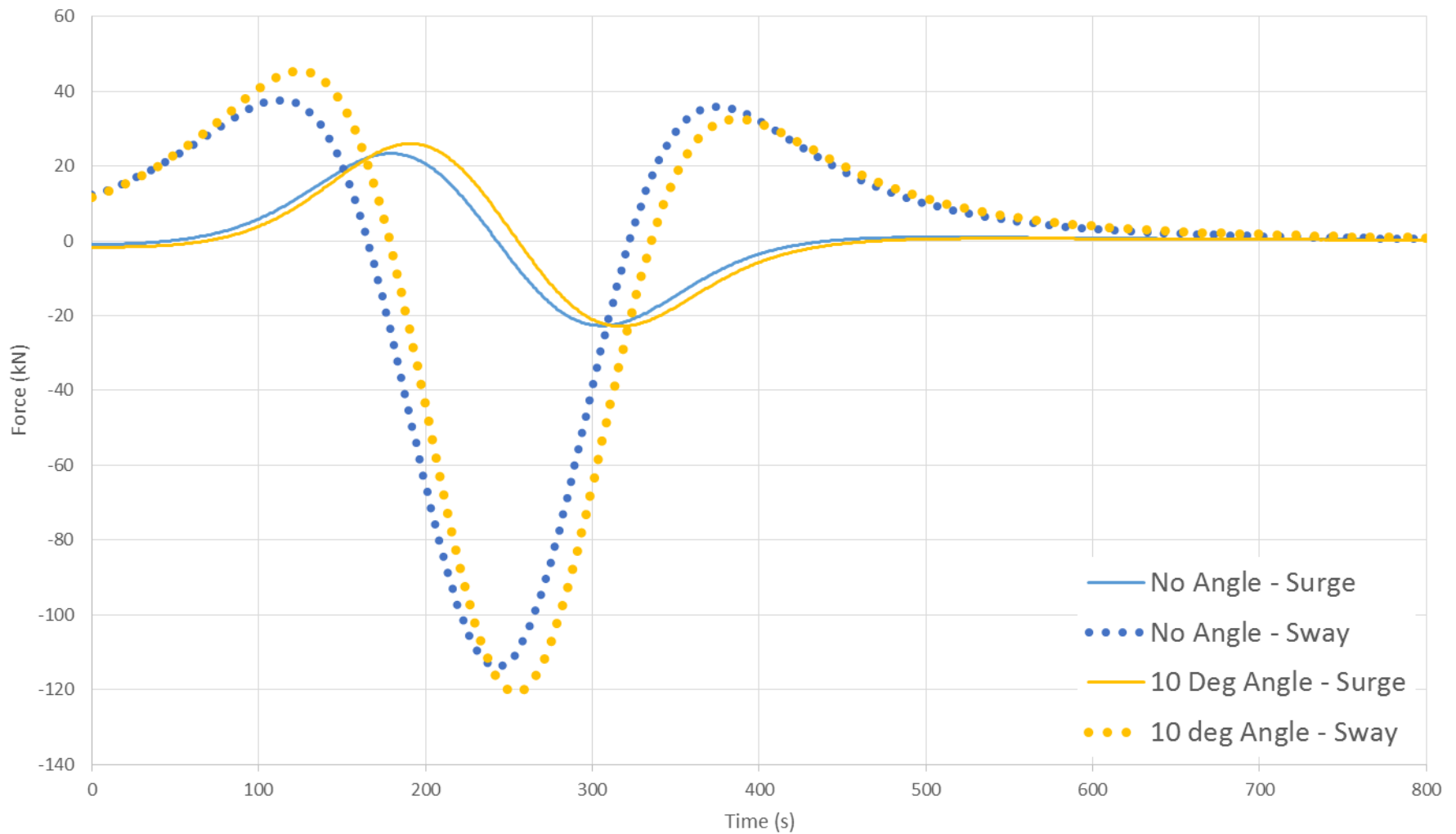


ROPES Software

Comparison of Moored Vessel Surge and Sway Forces

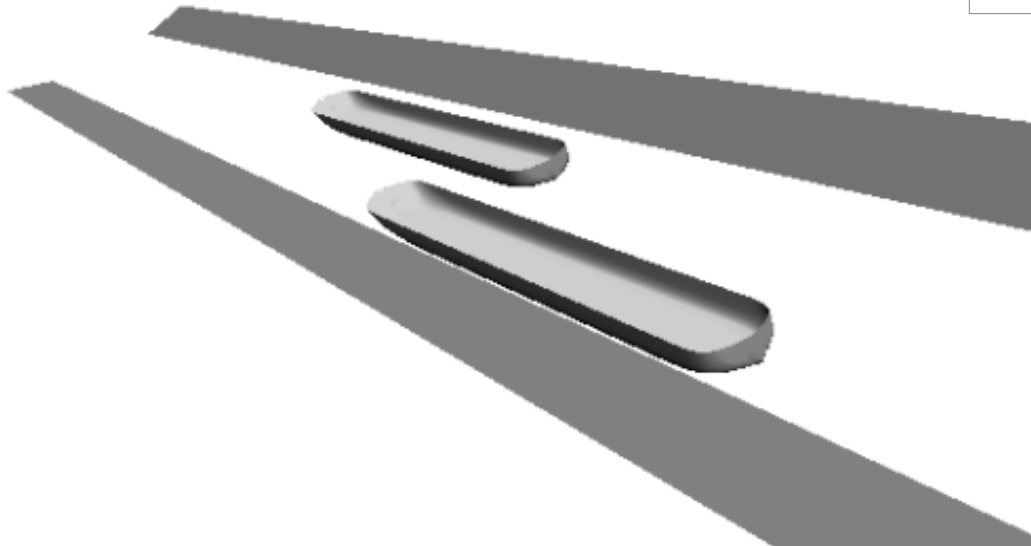
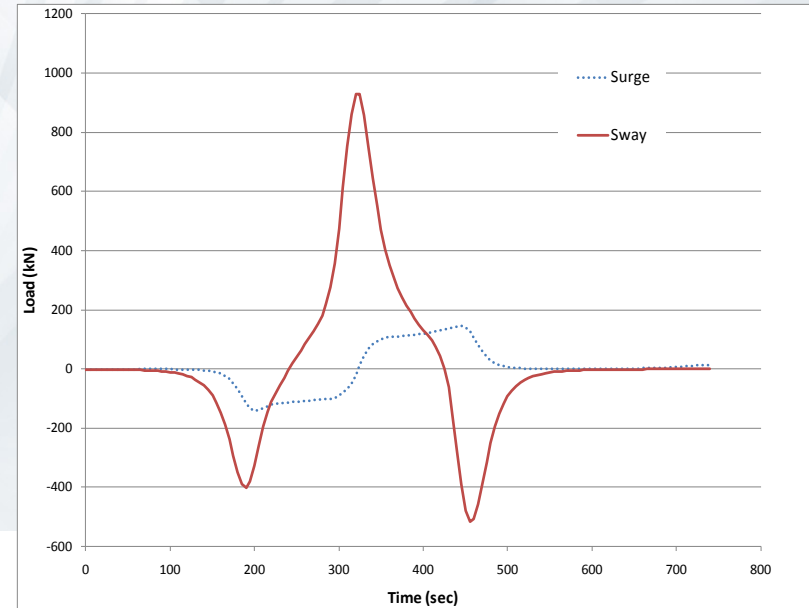
No Angle Passing Vessel vs. 10 deg Angle Passing Vessel

$V = 2 \text{ m/s}$, Distance = $\sim 100 \text{ ft}$ (Side-to-side)



ROPES Software

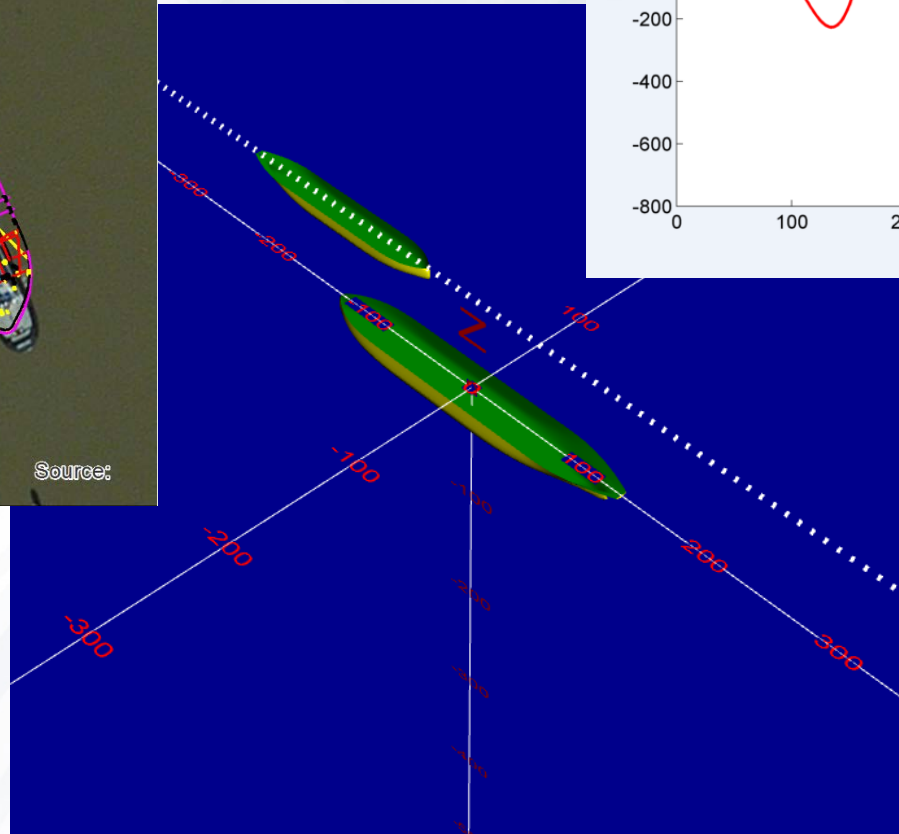
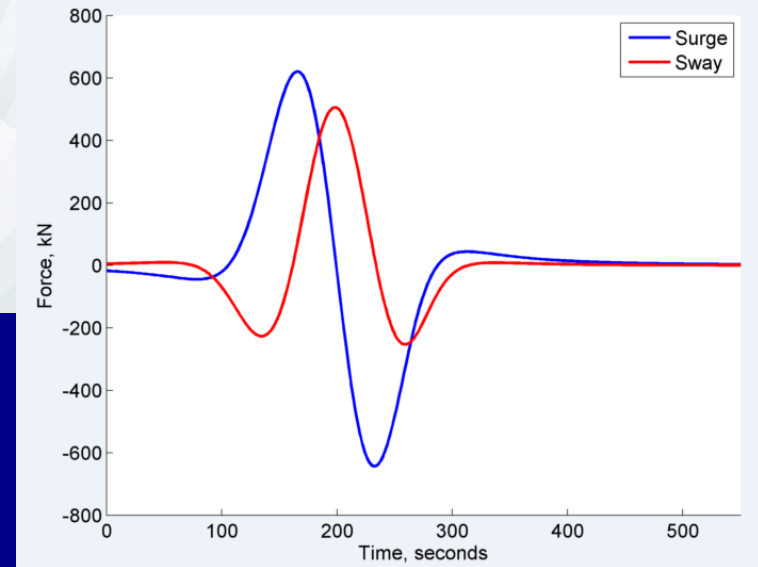
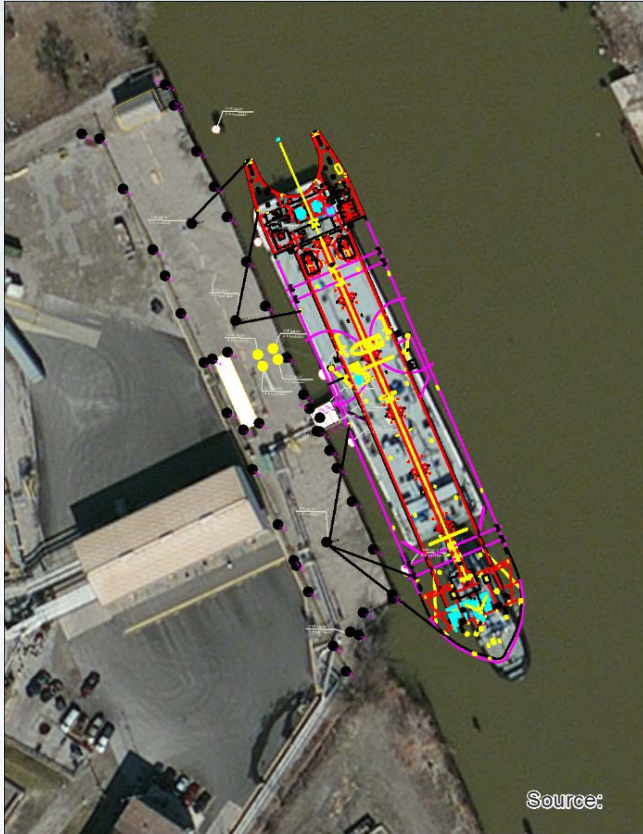
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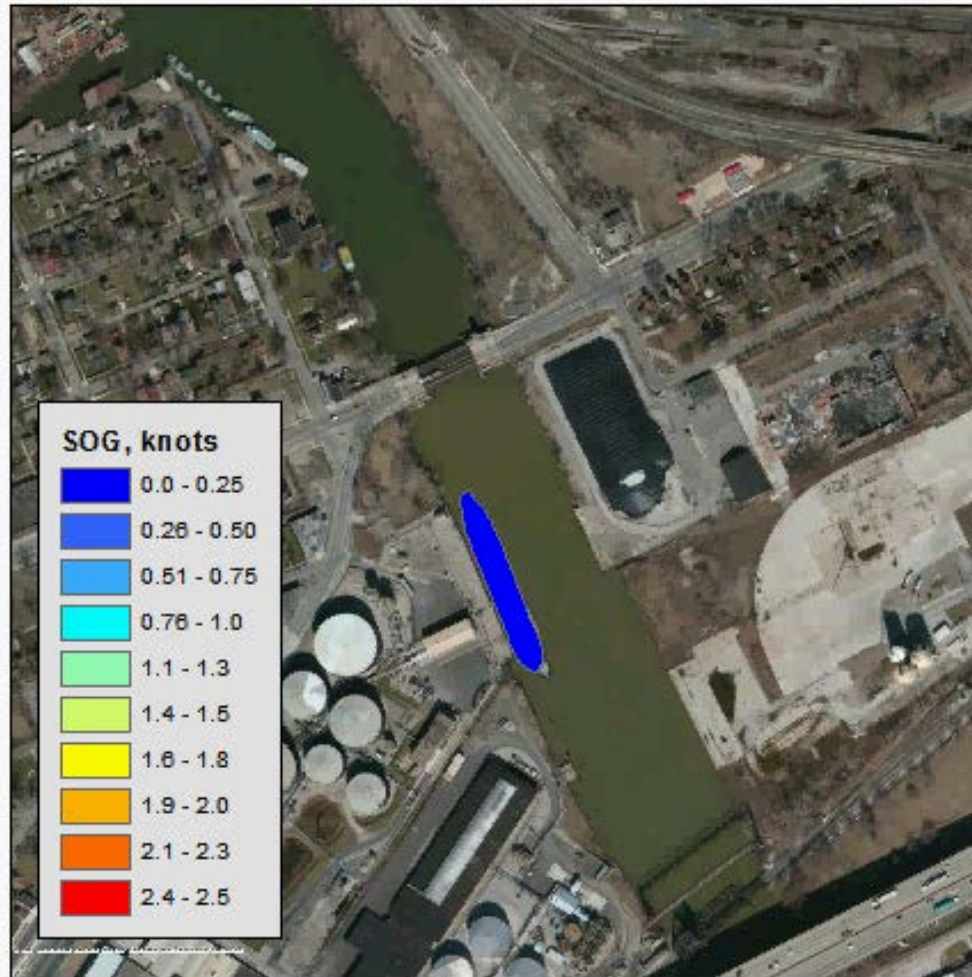
Welland Canal Tie-Up Wall Reconstruction Program

Analysis

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Analysis Case



ROPES JIP Achievements

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- ROPES software; versatile & user friendly
- Huge set of systematic model test data
- Effect of drift angle, current, port layout
- Correlation between ROPES & model tests showing applicability & accuracy of software
- Correlation of mooring analysis with model test data using ROPES as input for the exciting loads
- Full scale data for 4 locations with reality check
- Understanding of the effect of passing ships

THANK YOU!



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