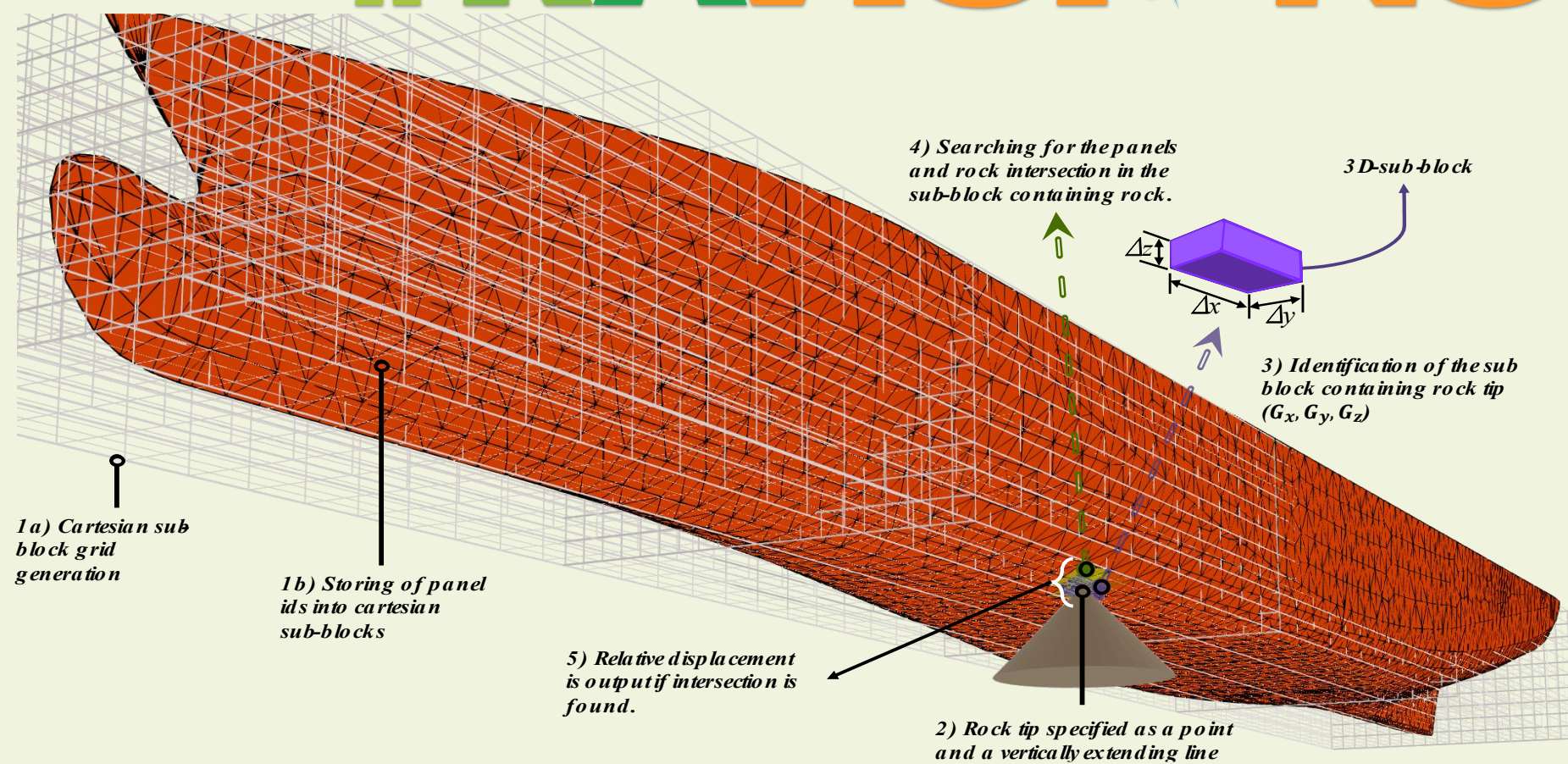


A rapid assessment tool for the evaluation of ship hard grounding



Key Characteristics

- ❑ Idealisation of ship dynamics in realistic environmental conditions
- ❑ Coupling of evasiveness and structural crashworthiness by a contact model
- ❑ Evaluation of accidental loads following a hard grounding event
- ❑ Damage stability assessment

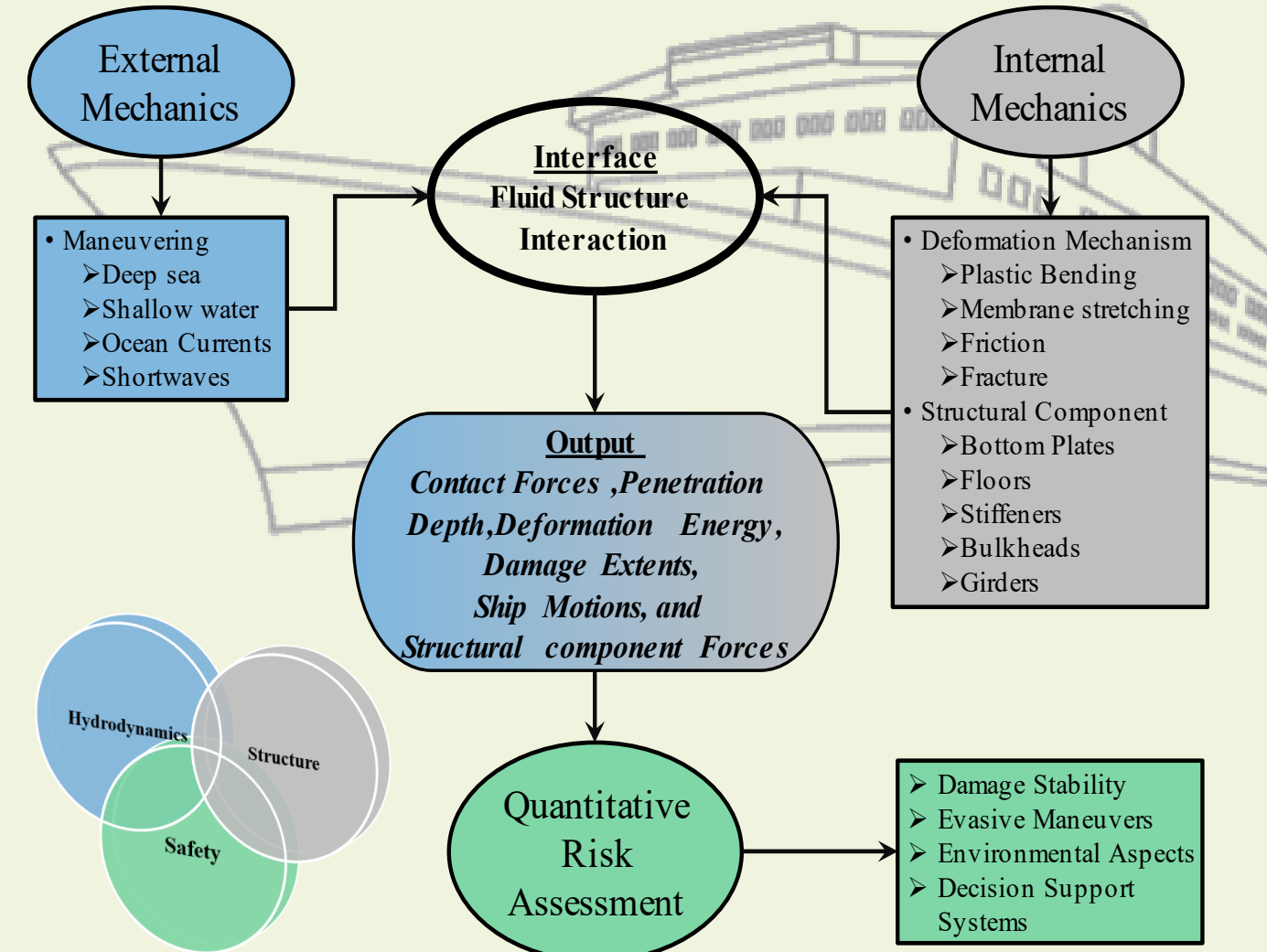


Motivation & Objectives

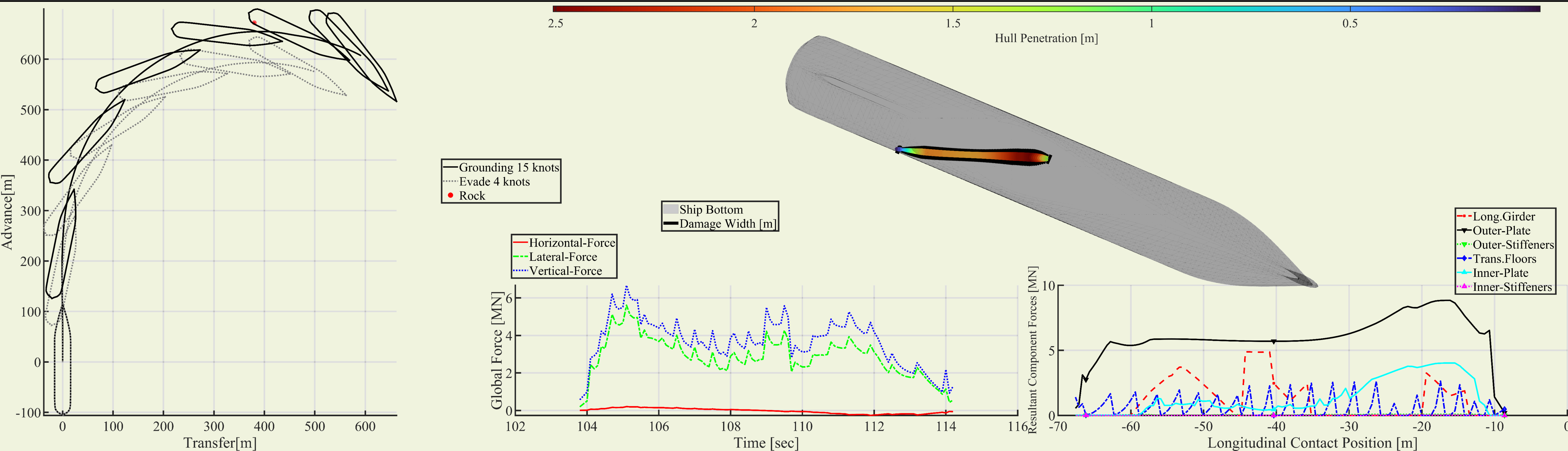
Ships that navigate in confined and shallow waters are prone to grounding accidents. Grounding can cause contamination of marine habitats, disruption of traffic flow, serious ship damages and loss of human life. The purpose of this work is to develop a rapid time domain two-way coupled fluid structure interaction tool that combines ship dynamics and structural crashworthiness models. The idealization accounts for realistic environmental conditions and seabed geometry. It can be used for the rapid assessment of dynamic response of ships following hard grounding events and for the assessment of damage stability of ships following serious flooding. The method has been developed under EU Horizons 2020 project FLARE (<https://flare-project.eu/>; Grant no : 814753-2) and can be used in bridge simulators, modern decision support systems and for ship damage stability assessment.

Methodology

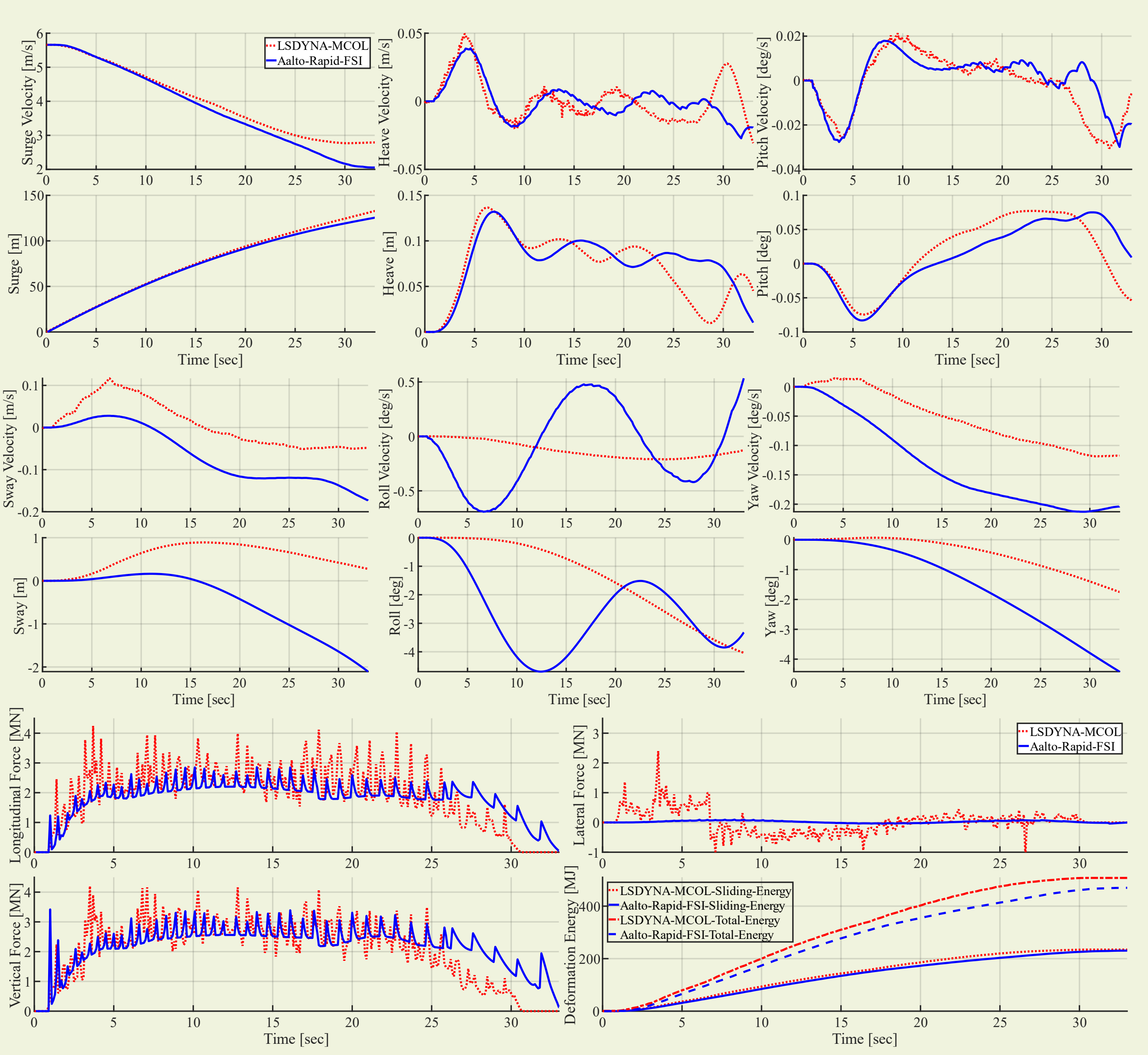
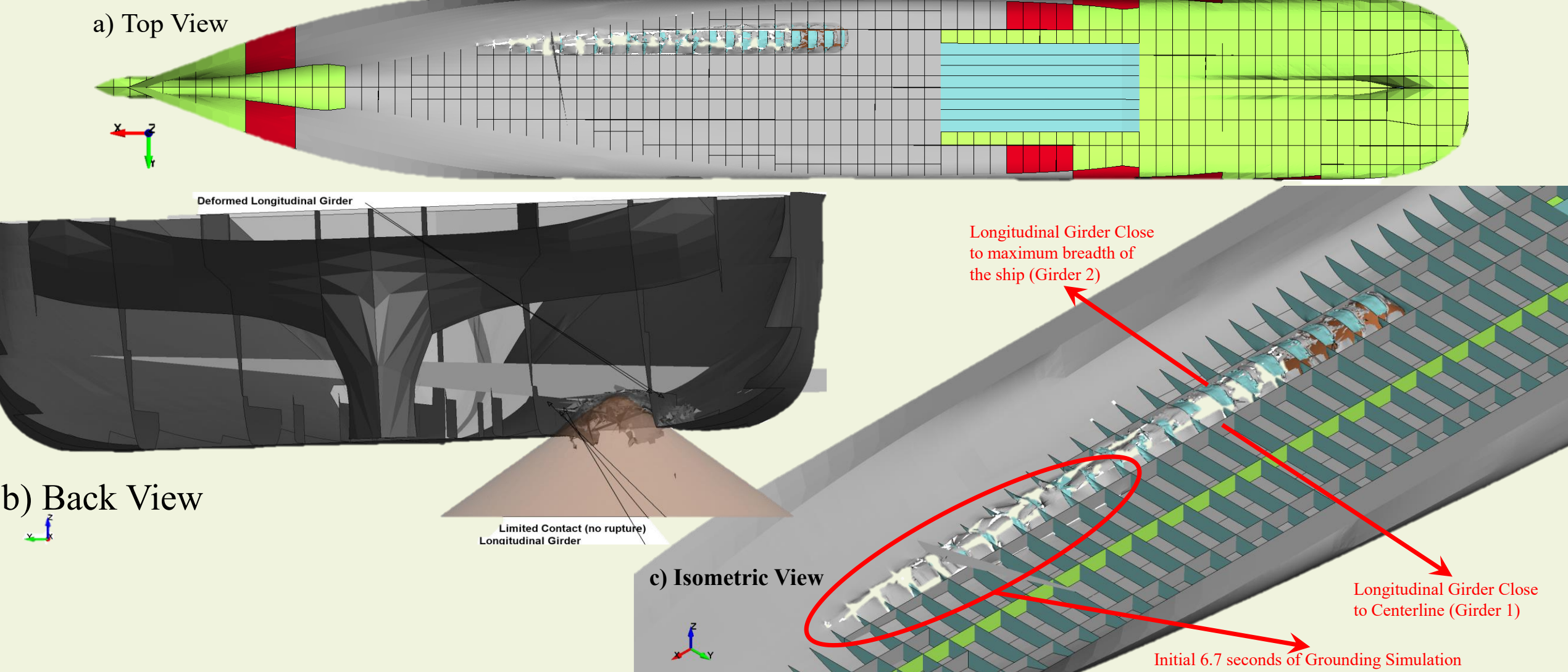
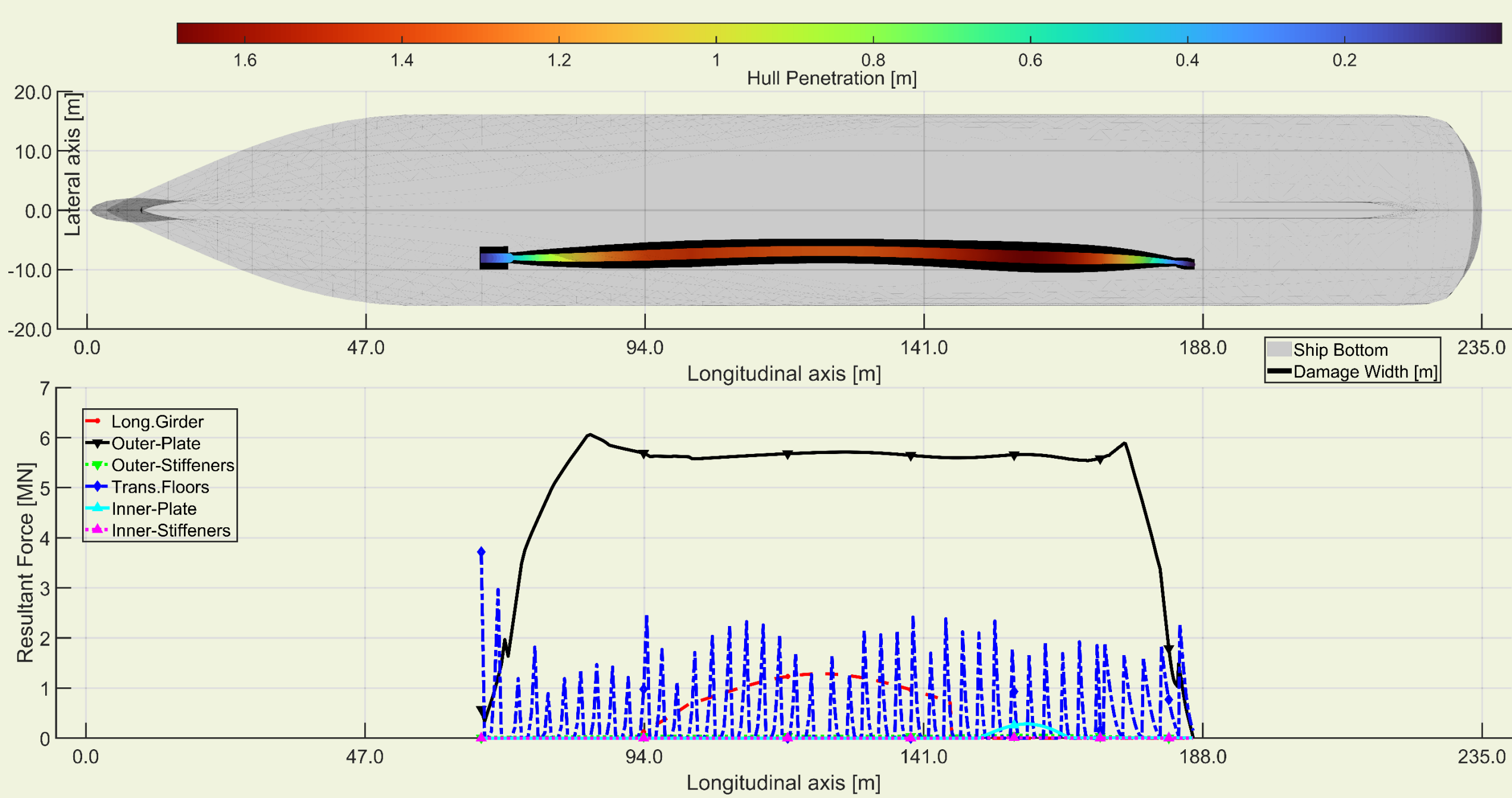
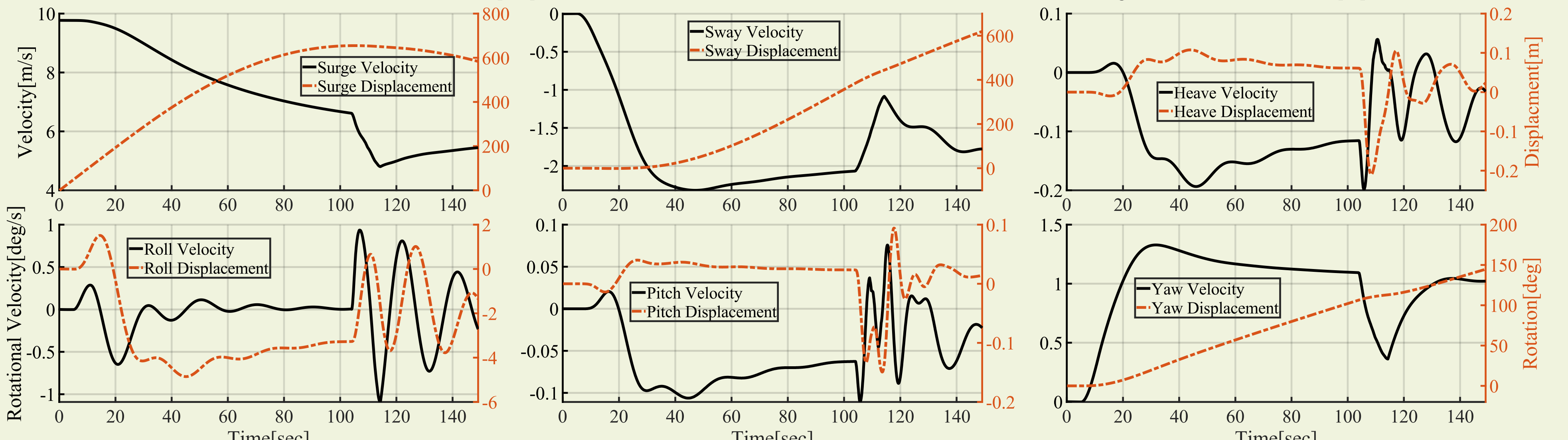
- ❑ 6-DoF Maneuvering dynamics
- ❑ Motion dependent structural failure model
- ❑ Ray-tracing algorithm for contact mechanics
- ❑ Rupture mechanics by fluid structure interaction modelling
- ❑ Damage stability assessment



Results



- ❑ Idealisation of ship motions and realistic evaluation of hydrodynamic actions in way of contact
- ❑ Rapid evaluation of structural deformation energy and resistance forces following hard grounding events
- ❑ Suitable evaluation of ship damage extents
- ❑ Probabilistic damage stability assessment following serious flooding



Research Outlook

- ❑ Evasive maneuverability assessment
- ❑ Structural component and design optimization
- ❑ Damage stability assessment
- ❑ Hull form, controlling devices optimization
- ❑ Modern structural arrangement evaluation
- ❑ Decision support system

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FLARE
FLOODING ACCIDENT RESPONSE
Aalto University
School of Engineering

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