

Introduction

- Fishing at sea is the most dangerous occupation with a fatality rate that is more than 16 times higher than the UK average.
- Harsh environment is one of the root causes of accidents.
- Small fishing vessels have the highest fatality rate.
- The payload and its position, which always change continuously during operation, determine the dynamic stability.
- One of five stability failures assessed by IMO, Parametric Roll, was selected as the subject for the investigation in this study.

Goals

- To investigate how changes in payload and its position influence the occurrence of the parametric roll.
- To optimise fish placement and hull form design to avoid parametric roll which can lead capsizing.

Methodology

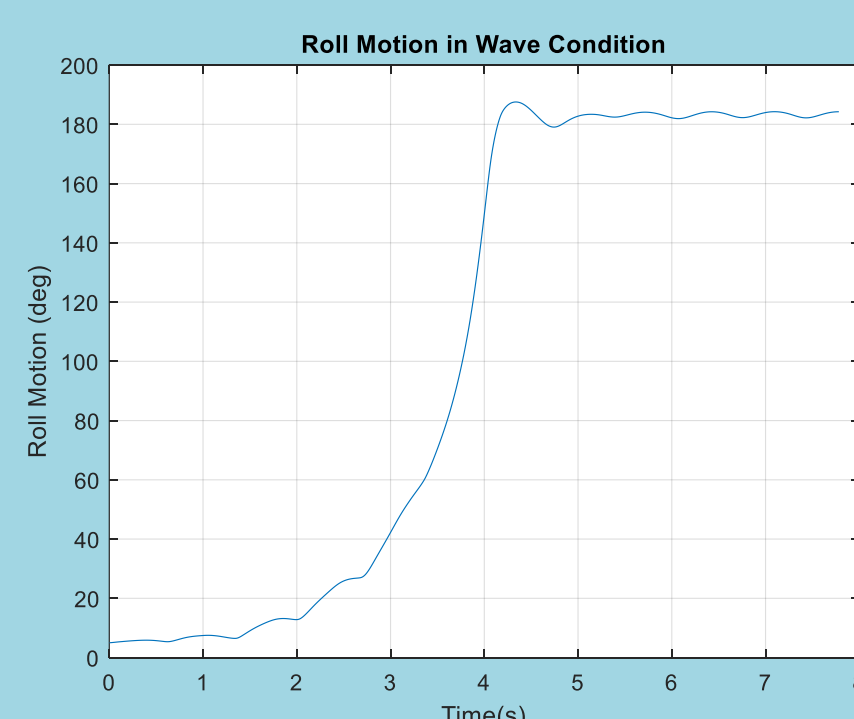
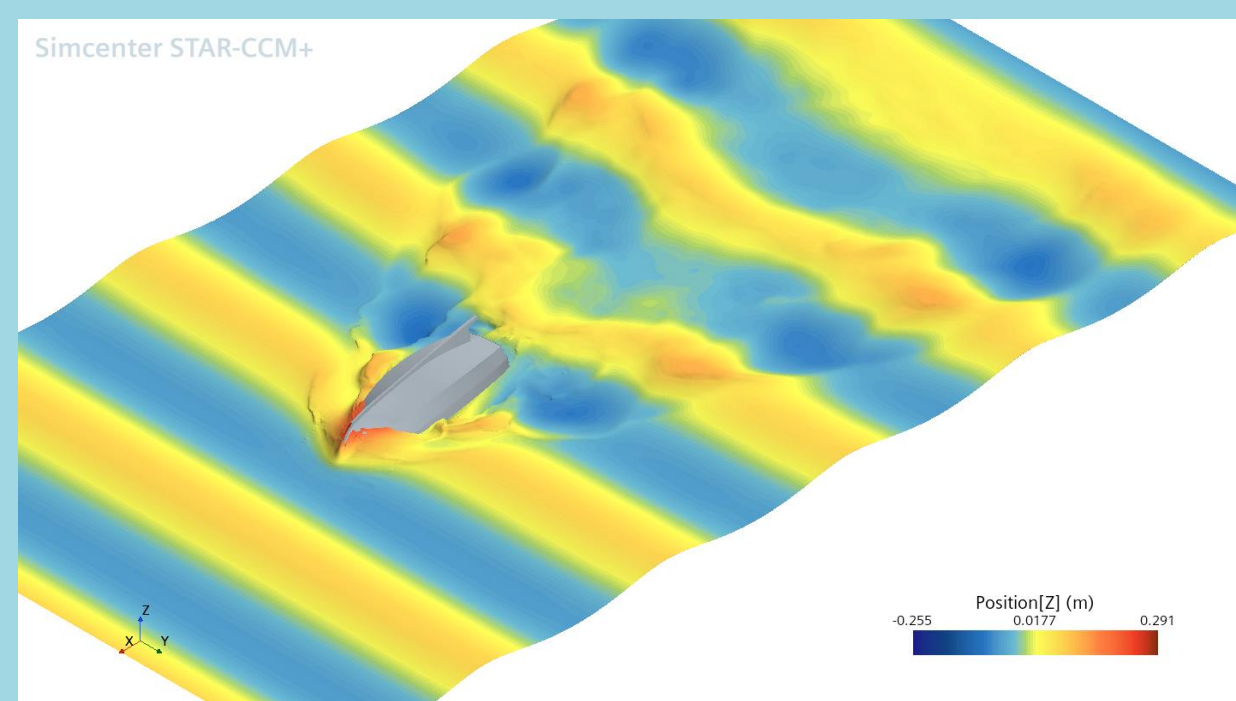
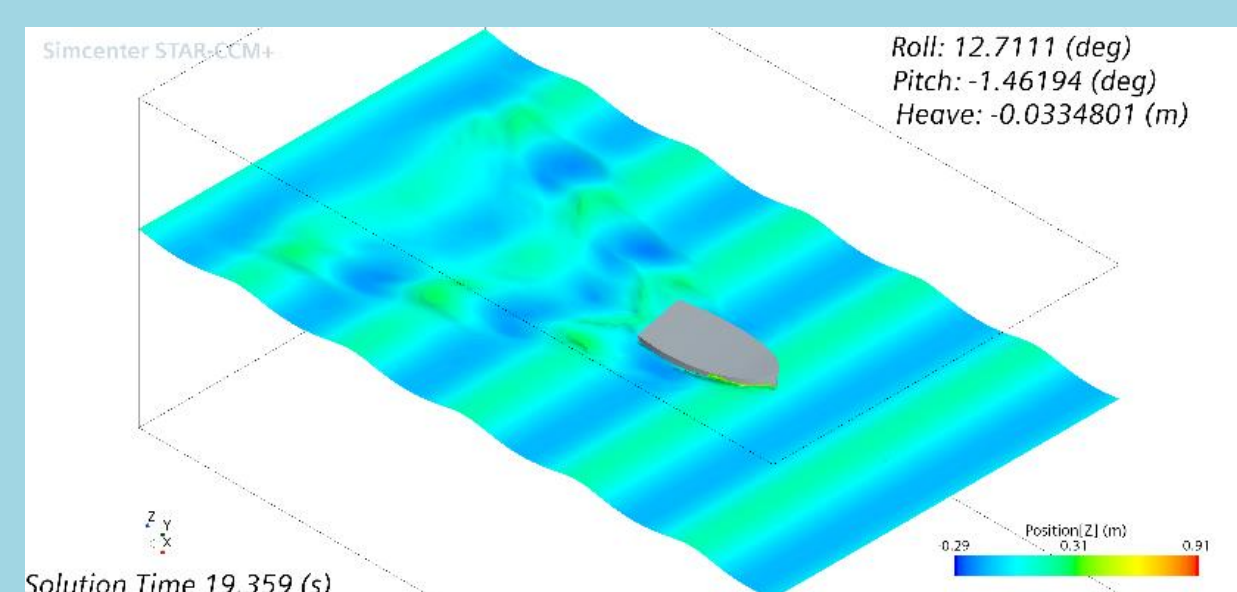
Problem Definition

1. To identify how fishermen load caught fishes on board their vessels.
2. To select the environmental conditions that trigger parametric roll for each loading condition.
3. To assess the loading conditions by using a high-fidelity Computational Fluid Dynamics tool.
4. To classify the results from different loading conditions so that the complex fishing vessel behaviour in waves can be simplified to a single variable which is Metacentric Height (GM) ratio.

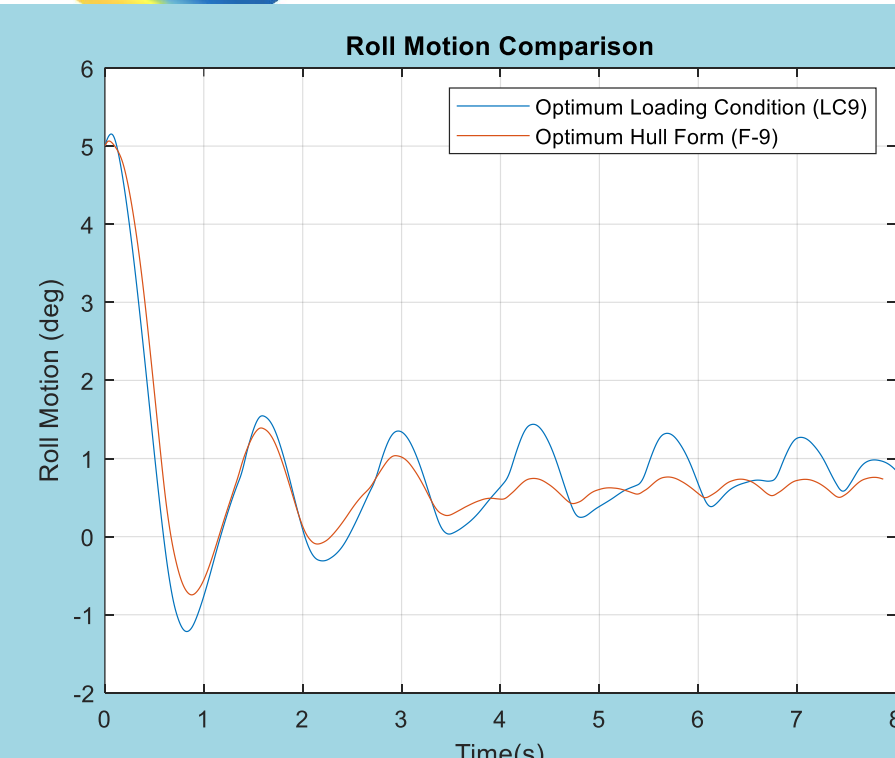
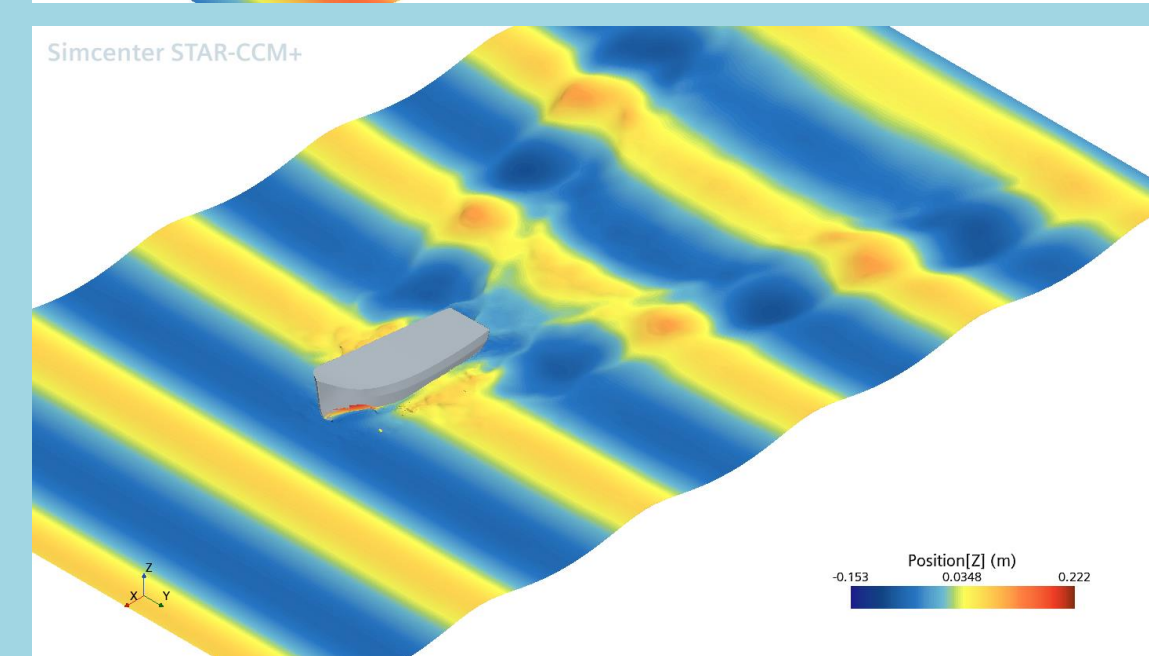
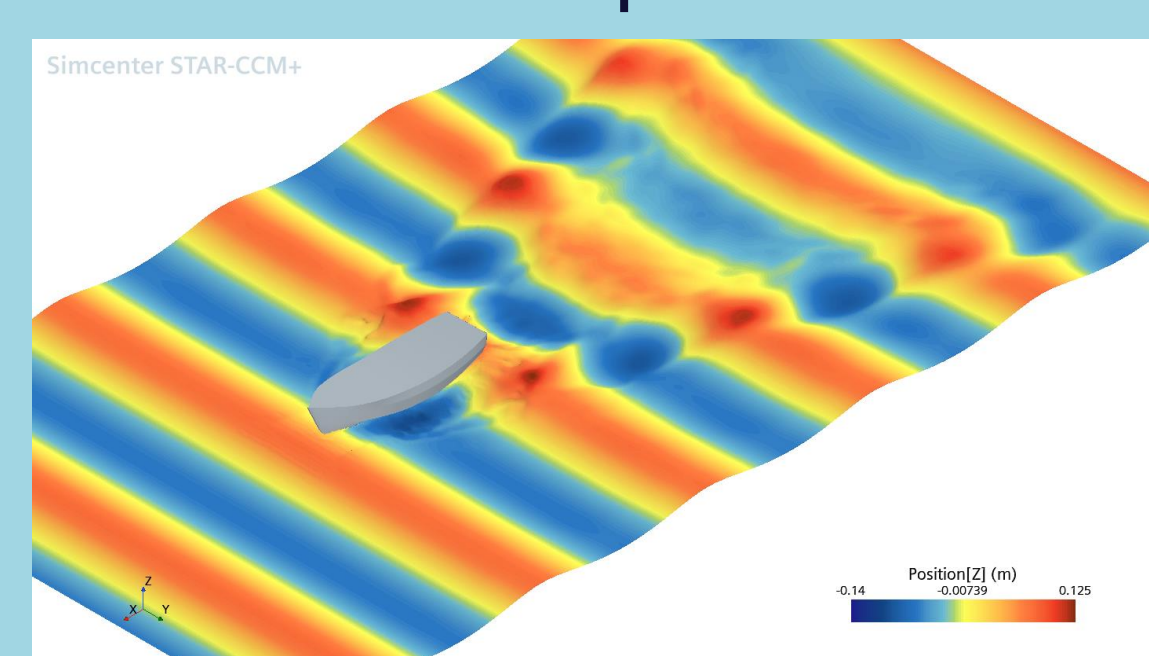
Optimisation

1. To develop a mathematical model that will be used to optimise loading conditions and the geometry for safe operations.
2. To determine the best fish placement and the best hull form as the result of the optimisation study.
3. To validate the results of the optimisation study.

Results of Problem Definition



Results of Optimisation



Conclusion

1. It was concluded that the GM ratio of the vessel should be kept below the threshold value of 0.17, to avoid the parametric roll occurrence and the increase in pitch and heave motions during the vessel's operation.
2. The fishing vessel operators will be advised of the recommendation from this study as given above so that capsizing due to parametric rolling can be avoided.

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simulation
video

