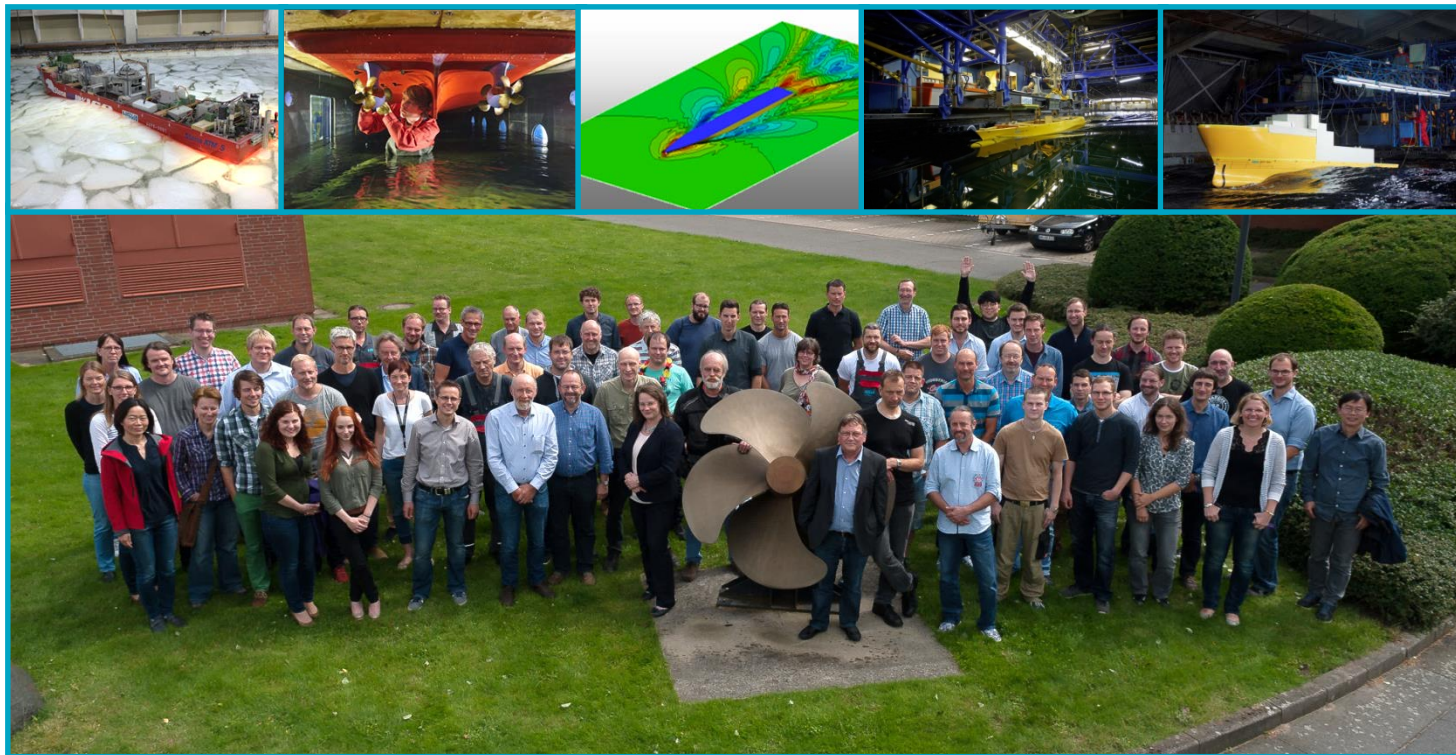


The Hamburg Ship Model Basin (HSVA) Our Services for Your Business



Dr. Janou Hennig (Managing Director)

HSVA

- **Research based services for the maritime industry**
 - **Model tests in calm water, waves and ice**
 - **Models up to 10 m length**
 - **Numerical calculations and simulations (CFD)**
 - **Design and analysis**
 - **Full scale investigations**



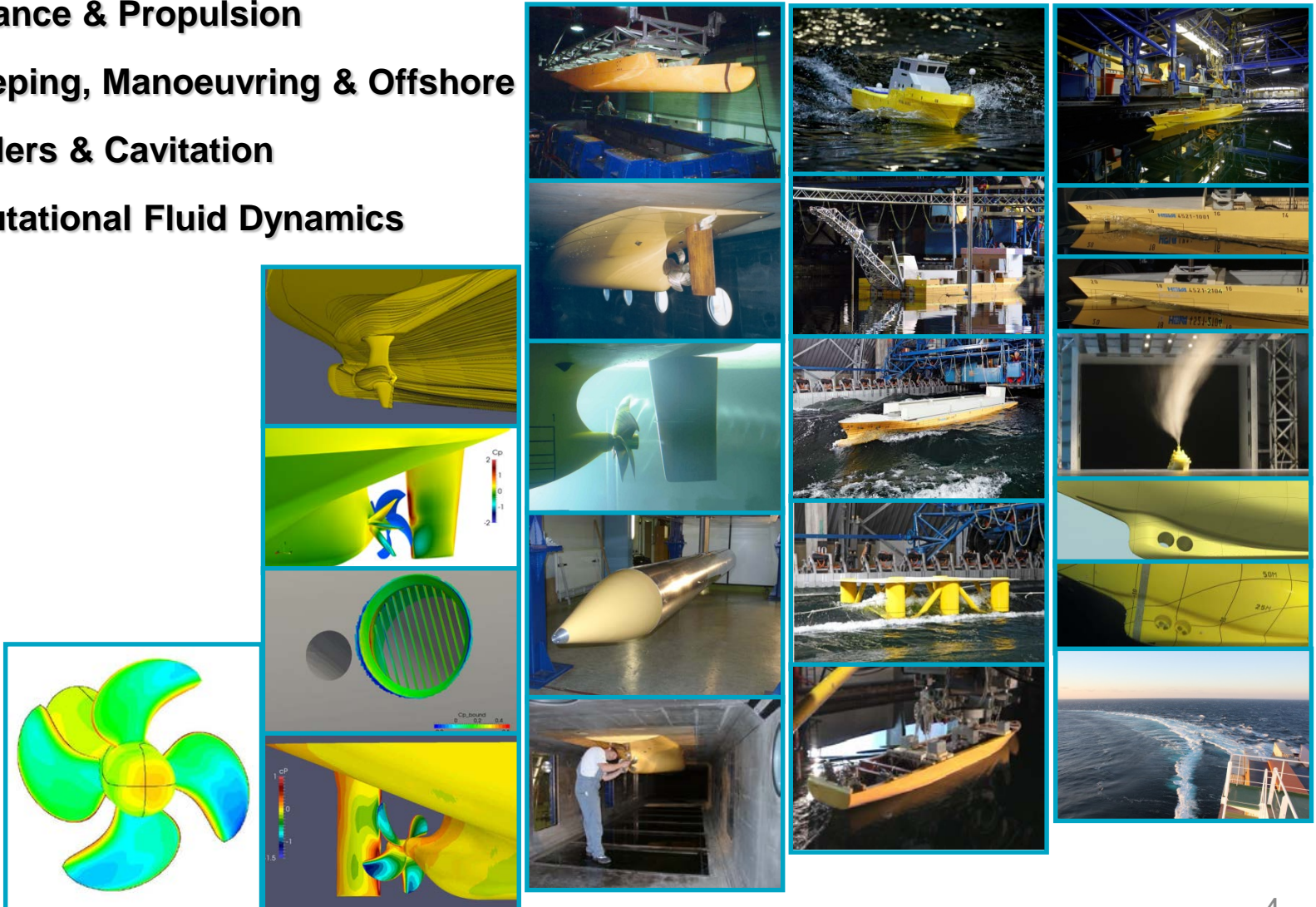
HSVA in brief

- Private, self supporting company, founded in 1913
- 20 shareholders: shipyards, ship owners, supplying industry and a classification society
- 100 employees
- 10-13 million € turnover per year
- 85 % commercial orders
- 15 % research:
 - EU framework programs
 - National programs (D)
- Strong network with clients, universities and research institutes



Services

- Resistance & Propulsion
- Seakeeping, Manoeuvring & Offshore
- Propellers & Cavitation
- Computational Fluid Dynamics

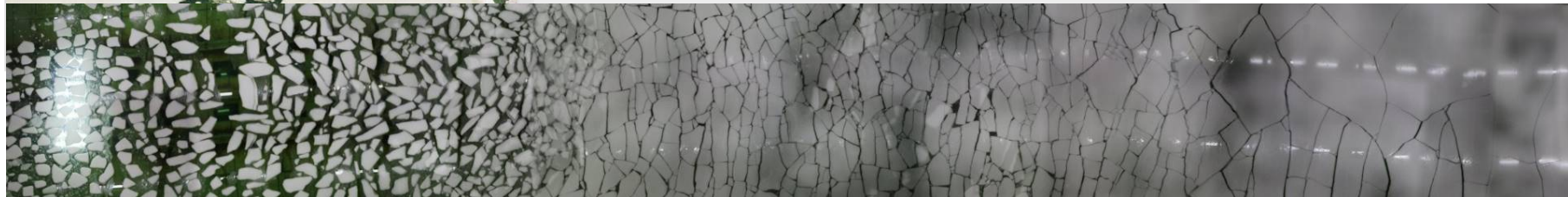
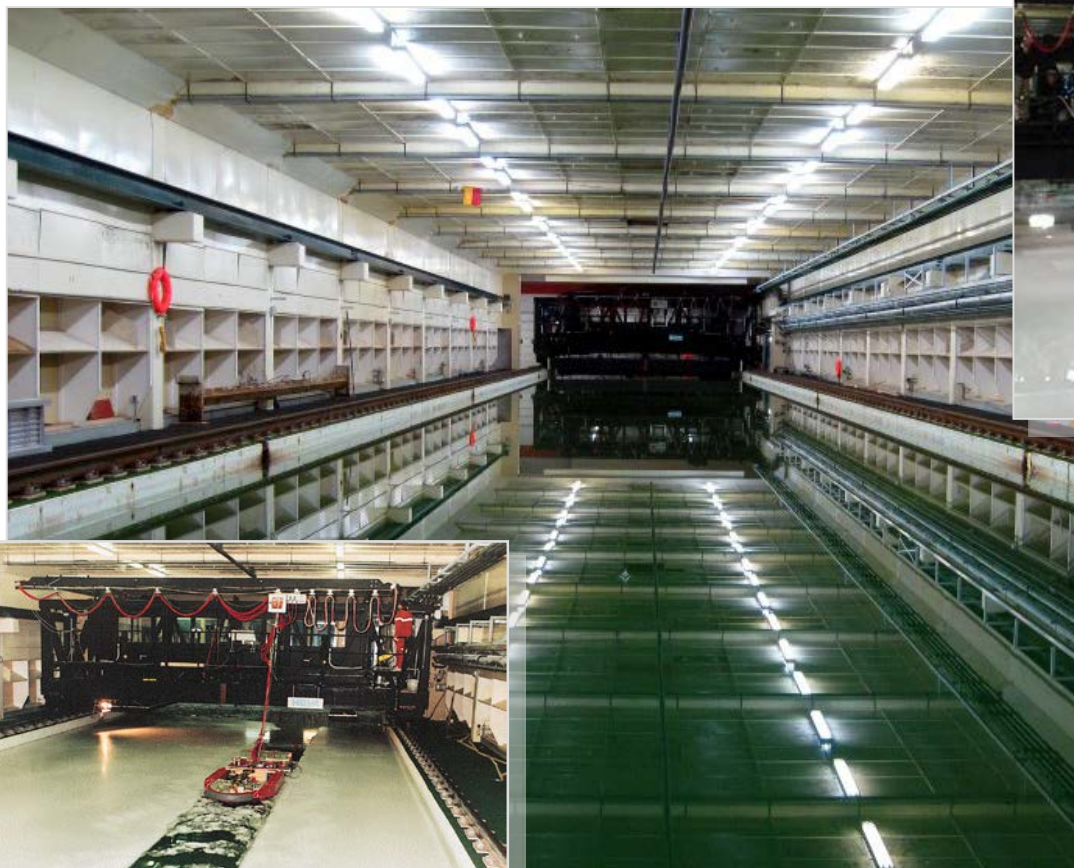


Arctic Technology

- Ice breaking tests, ice forces on offshore structures (model/full scale)
- Brash ice tests
- Model tests of ships and offshore structures in ice and waves
- Environmental tests (marine biology & chemistry, oil spill scenarios)
- Know-how transfer (hydrodynamic, testing technique)
- Sea and ice trials, expert witness and expert opinion
- CFD-calculations for ice breaking resistance
- Simulation of operational procedures in ice, ice management tests, feasibility studies
- Development of ice protection structures
- Investigation of rescue vessels for vessels and offshore structures in ice
- Simulation of various ice conditions (level ice, rafted ice, ice ridges, ice rubble fields, brash ice)



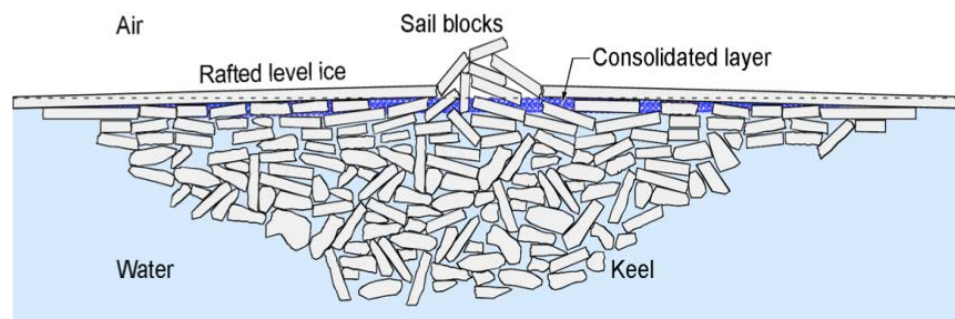
Large Ice Tank



Proposals for Master Thesis

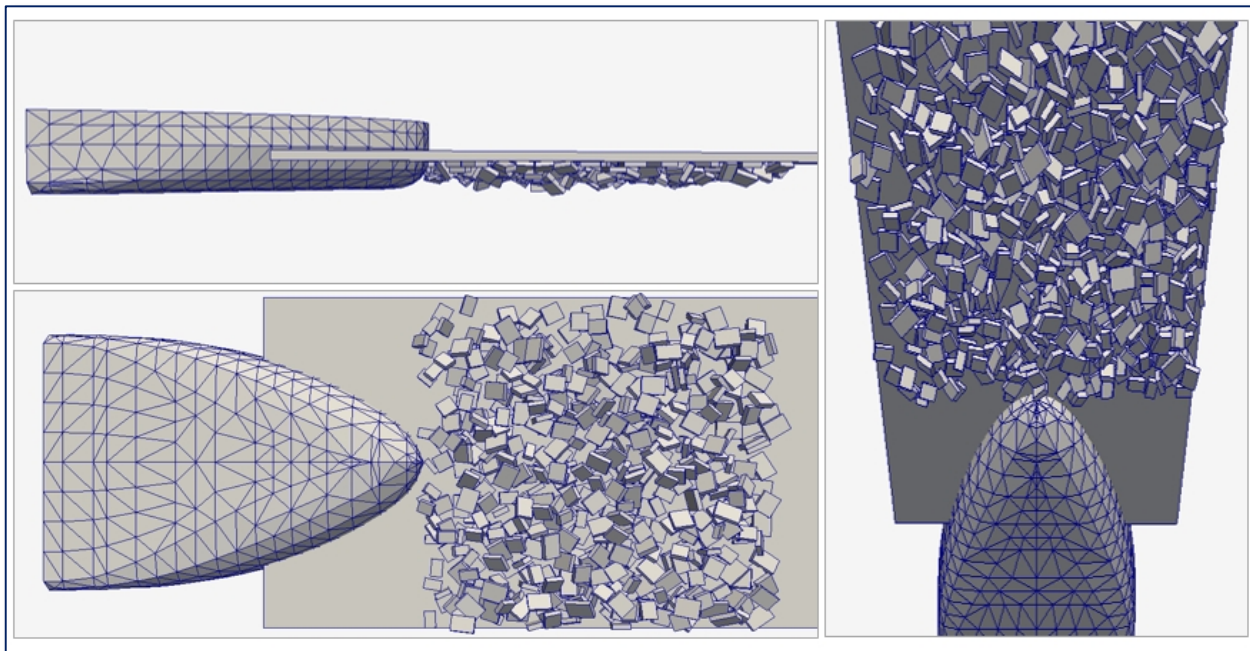
1 – Discrete Element Method in Ice

- Simulation of Ridge Breaking



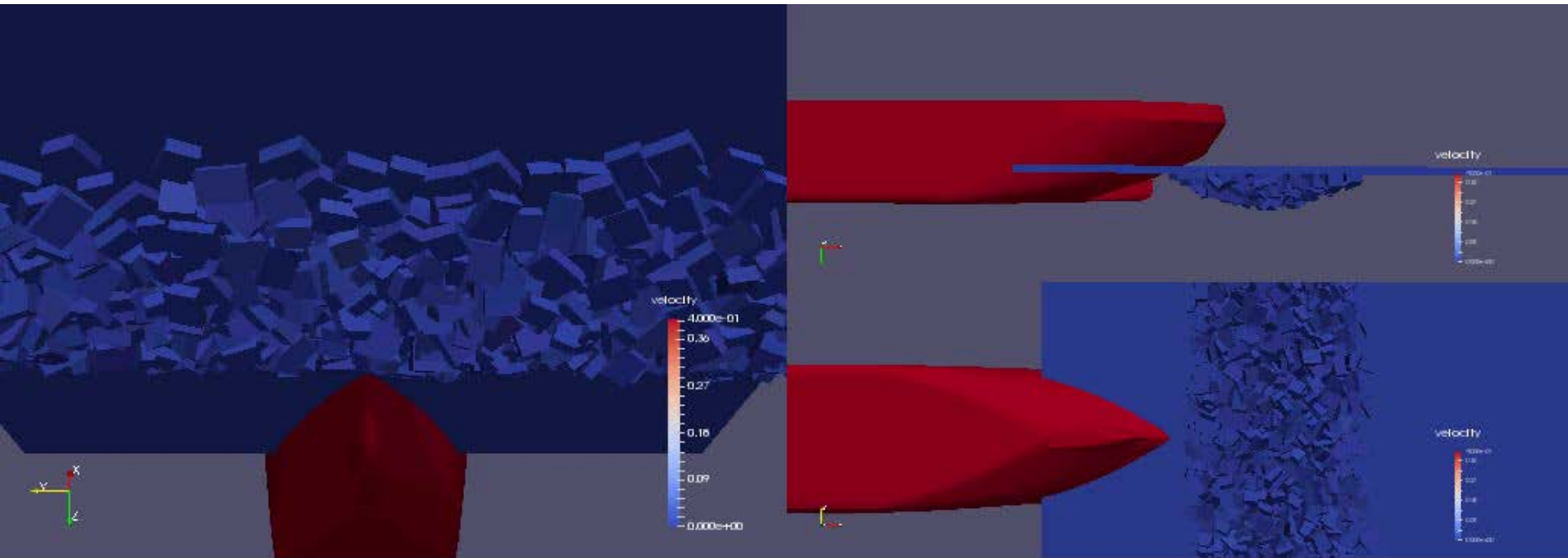
1 – Discrete Element Method in Ice

- Tool under development at HSVA
 - ships and offshore structures
 - physical modelling of interactions
 - up to 2000 elements



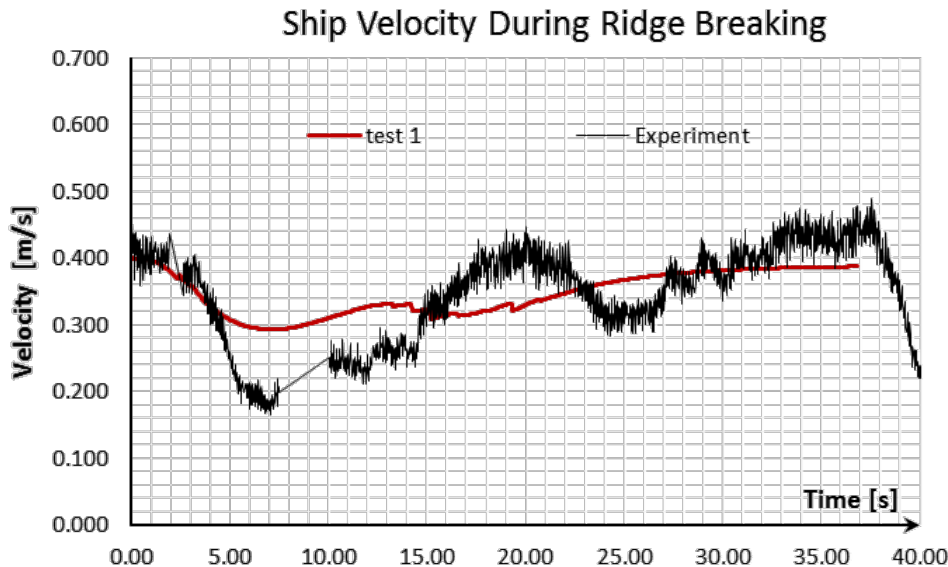
1 – Discrete Element Method in Ice

- Simulation of Ridge Breaking
 - Video:



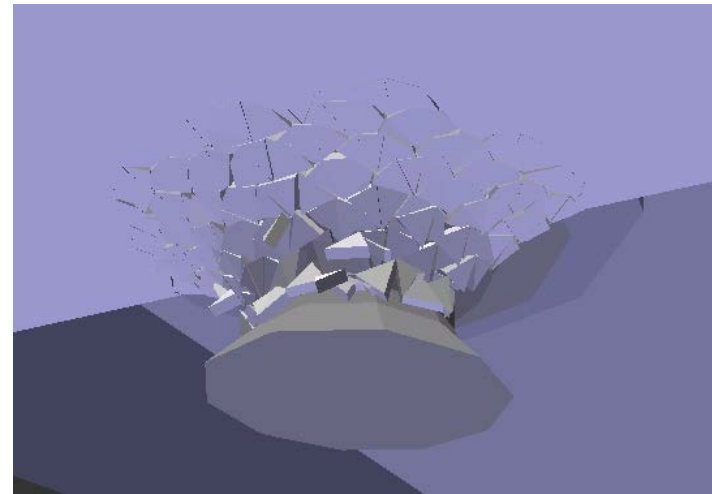
1 – Discrete Element Method in Ice

- Proposals for Master Thesis
 - Validation and calibration
 - Ice test results
 - Model enhancements



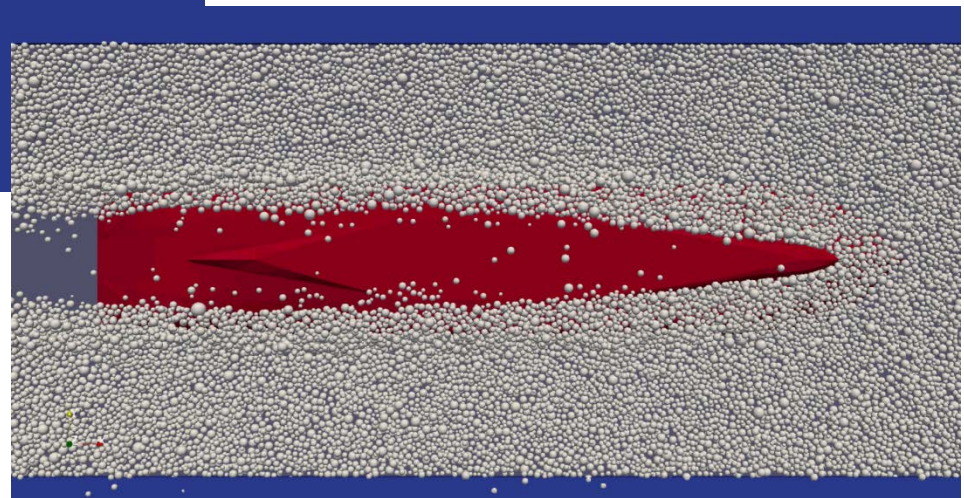
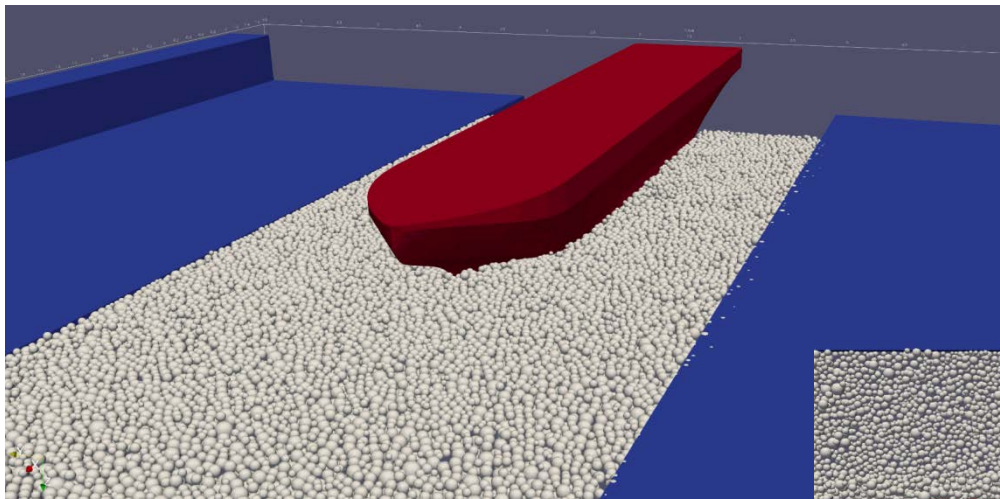
1 – Discrete Element Method in Ice

- Proposals for Master Thesis
 - Validation and calibration
 - Ice breaking simulation
 - Breaking forces
 - Geometry of broken pieces



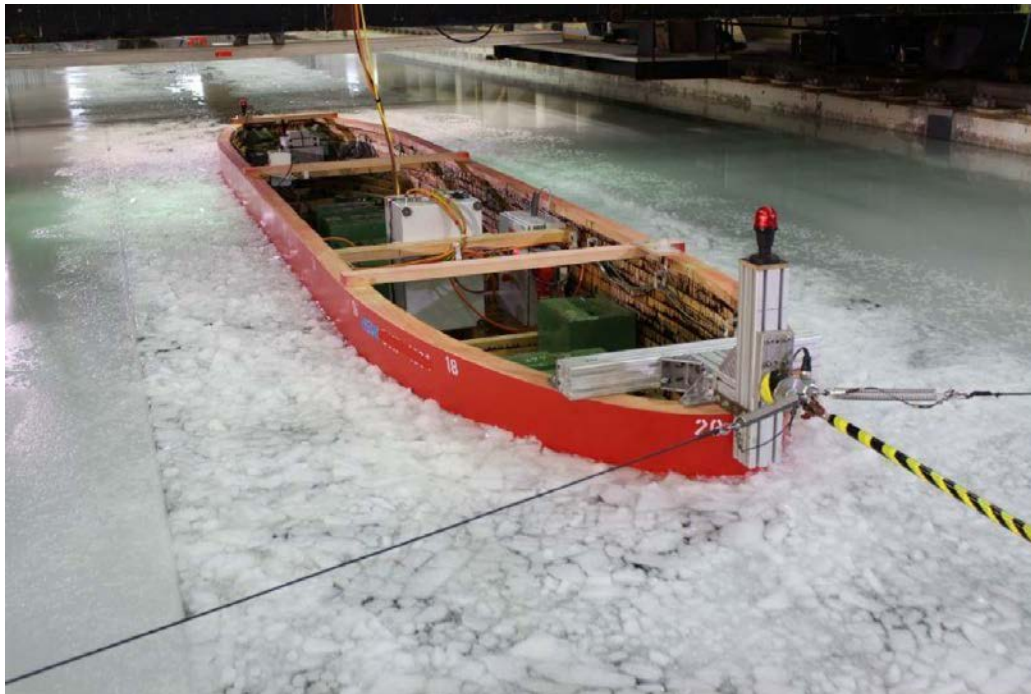
2 – Ship Performance in Brash Ice

- DEM for Brash Ice
 - Up to 100,000 elements
 - Simplified interactions (spheres)



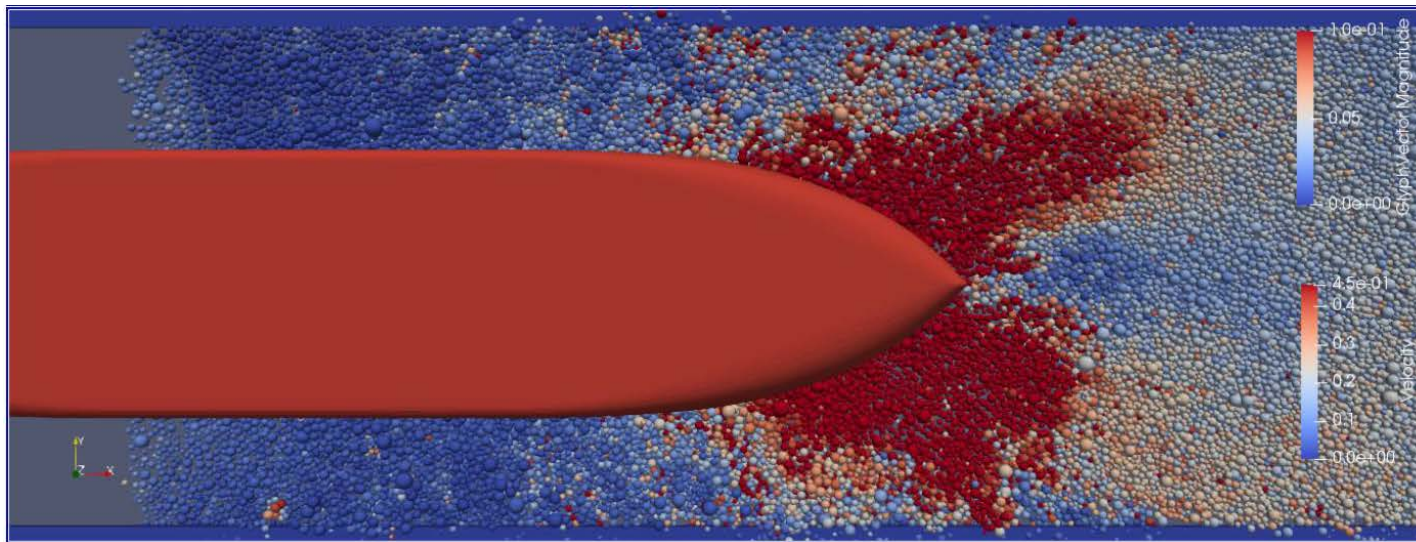
2 – Ship Performance in Brash Ice

- Proposals for Master Thesis
 - Detailed evaluation + experimentally-based calibration



2 – Ship Performance in Brash Ice

- Proposals for Master Thesis
 - Detailed evaluation
 - Improvement of Brash Ice Model + Code Enhancement
 - Ice-ice interaction model, GPU Computing,...



**Looking forward to talking to
you soon!**