MARIN activities in ice

Hannes Bogaert
MARIN

KIVI NIRIA

170 34e lustrum 170 jaar TU Delft

Arctic Battle

Symposium - 8 March 2012

NEED FOR ARCTIC SERVICES

- Consultancy for ice conditions & forecasts
- Concept development
- Feasibility studies
- Design & Engineering support
- Operational support

SAM'S NEEDS

- Ice knowledge to define design conditions
- Knowledge of necessary and relevant ingredients w.r.t. ice loads
- In-service information of ice loads and structural response
- Reliable numerical models, integrated with existing software
- Reliable model test results
- Experienced people

MARINICE SERVICES

We are teaming up and gearing up to provide:

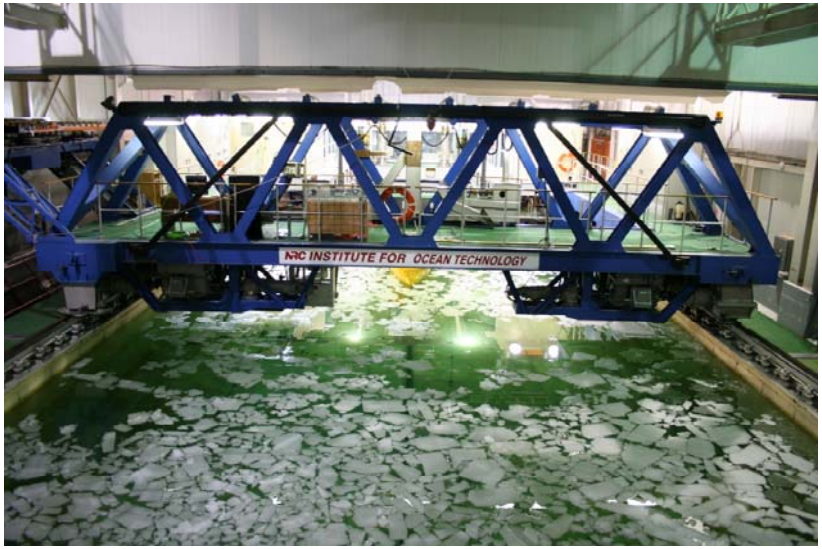
- Model testing at Partner facility
- Full scale and in-service measurements
- Numerical modeling (development, validation and services)
- Simulator training (development, validation and services)

MODEL TESTING AT PARTNER FACILITY

MODEL TESTING AT PARTNER FACILITY

NRC – OCEANIC

- Co-operation restricted to Arctic operations
- Model tests with natural ice
- Joint propositions to arctic market
- Joint JIP initiatives
- Co-operation with MUN & C-Core on numerical modeling



FULL SCALE AND IN-SERVICE MEASUREMENTS

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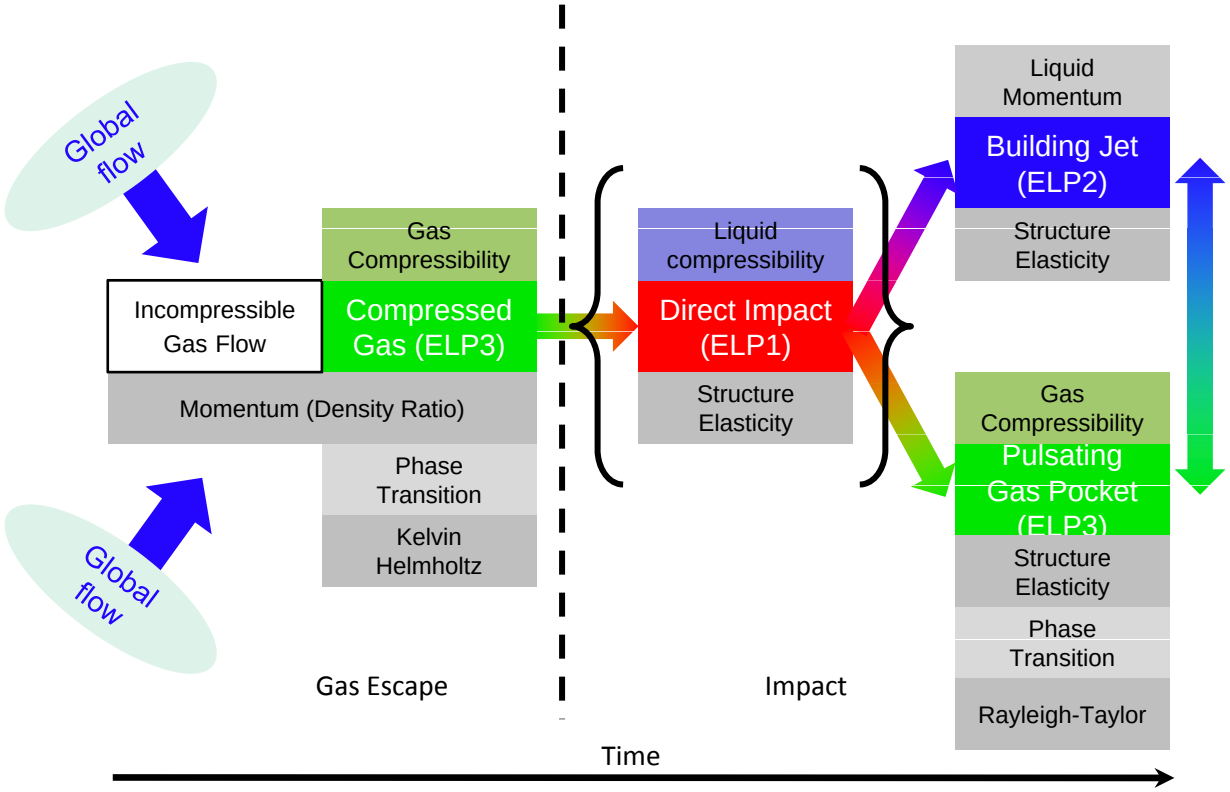
FULL SCALE AND IN-SERVICE MEASUREMENTS



FULL SCALE AND IN-SERVICE MEASUREMENTS

Greenland expedition onboard JCR Ross

- Observation & measurement of sea ice
- Vessel performance in managed ice
- Flow of broken ice around and underneath hull
- Flow of broken ice in the propeller

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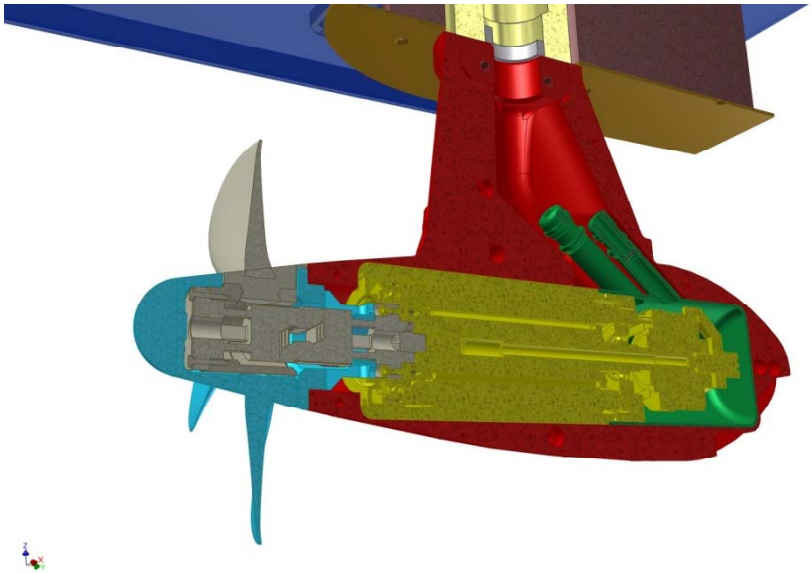
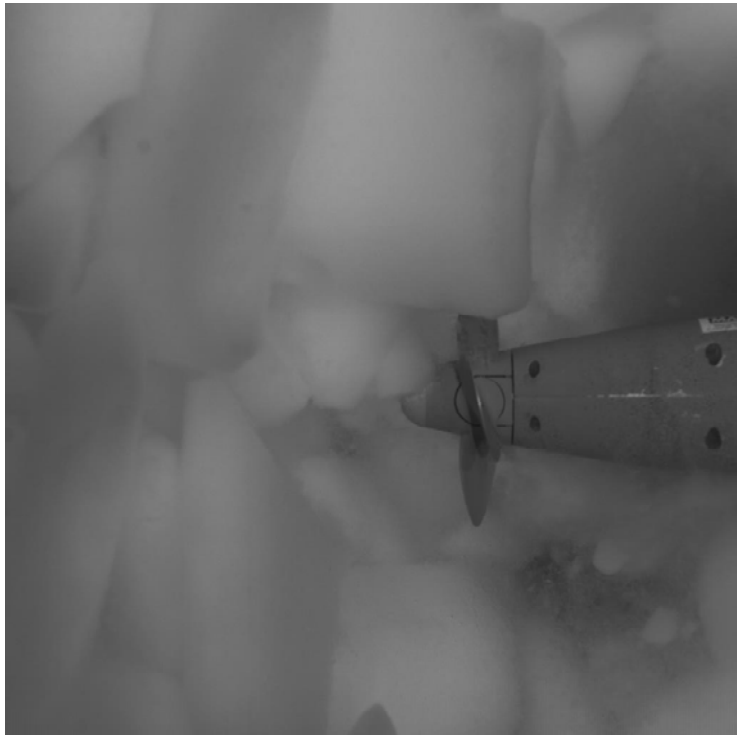
NUMERICAL MODELING

CRS PROPOLLAR: ice loads on propellers of pods

- Numerical modeling: hydrodynamic and milling loads
- Experimental investigations





NUMERICAL MODELING

Time domain analysis of multi body dynamics for offshore operations

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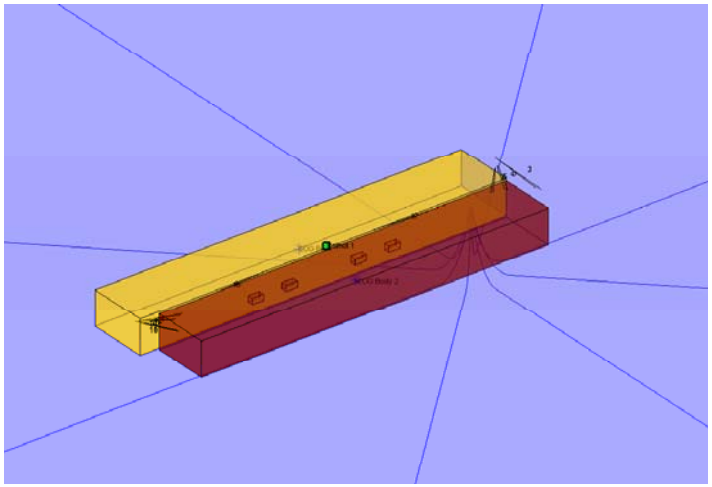

1. Flow of broken ice around and underneath floaters
2. Impact of broken ice on floaters and appendages

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NUMERICAL MODELING

Time domain analysis of multi body dynamics
for offshore operations

1. Flow of broken ice around and underneath floaters

icestream.

HEEREMA

SBM OFFSHORE

bluewater

Royal Boskalis Westminster nv

IHC MERWEDE

Huisman

INTECSEA
WorleyParsons Group

TU Delft
Technische Universiteit Delft

CANATEC

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TNO innovation for life

IMARES
WAGENINGEN UR

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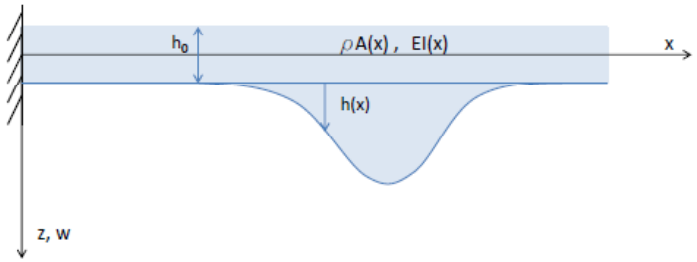
NUMERICAL MODELING

Time domain analysis of multi body dynamics
for offshore operations

2. Impact of broken ice on floaters and appendages

   - Beams impacting floating body (bending failure)



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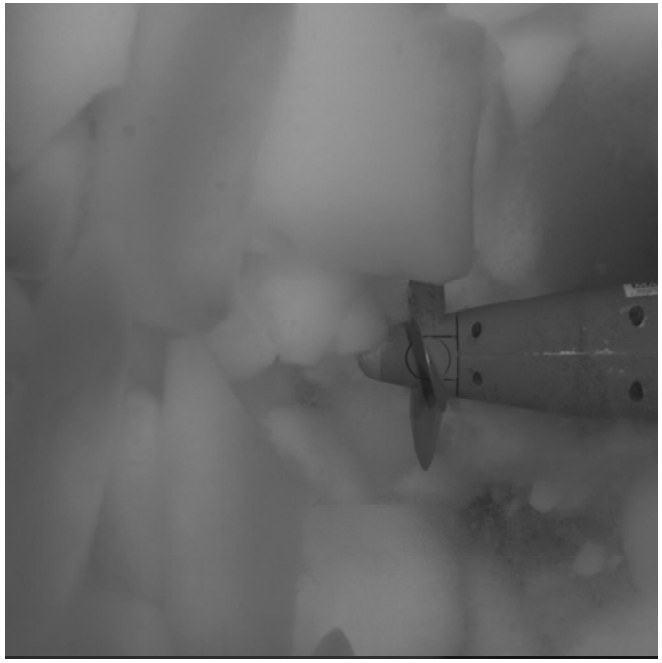
   - Coupling to existing ice model

NUMERICAL MODELING

Success factors:

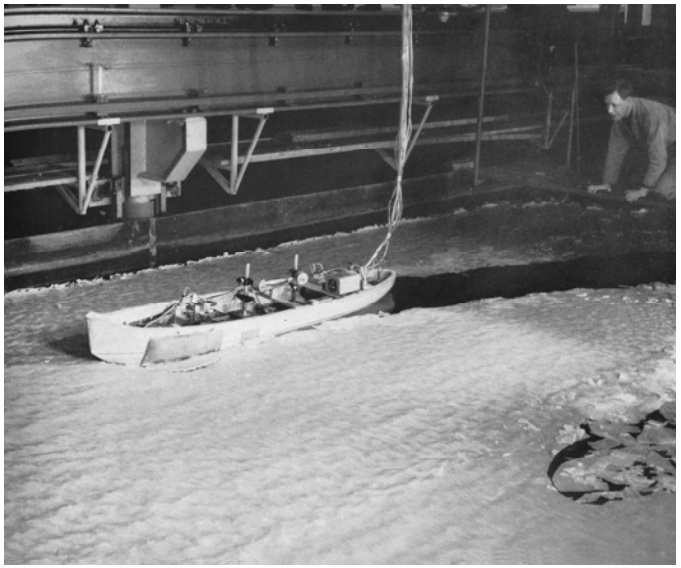
- Knowing the necessary and relevant ingredients
- Implemented the ingredients well



Validation technique:

- Repeatability of model ice properties
- Flexibility in shape and properties
- Modular
- Scaled physical properties
- To be made in continuous process

VALIDATION TECHNIQUE



VALIDATION TECHNIQUE

flexice

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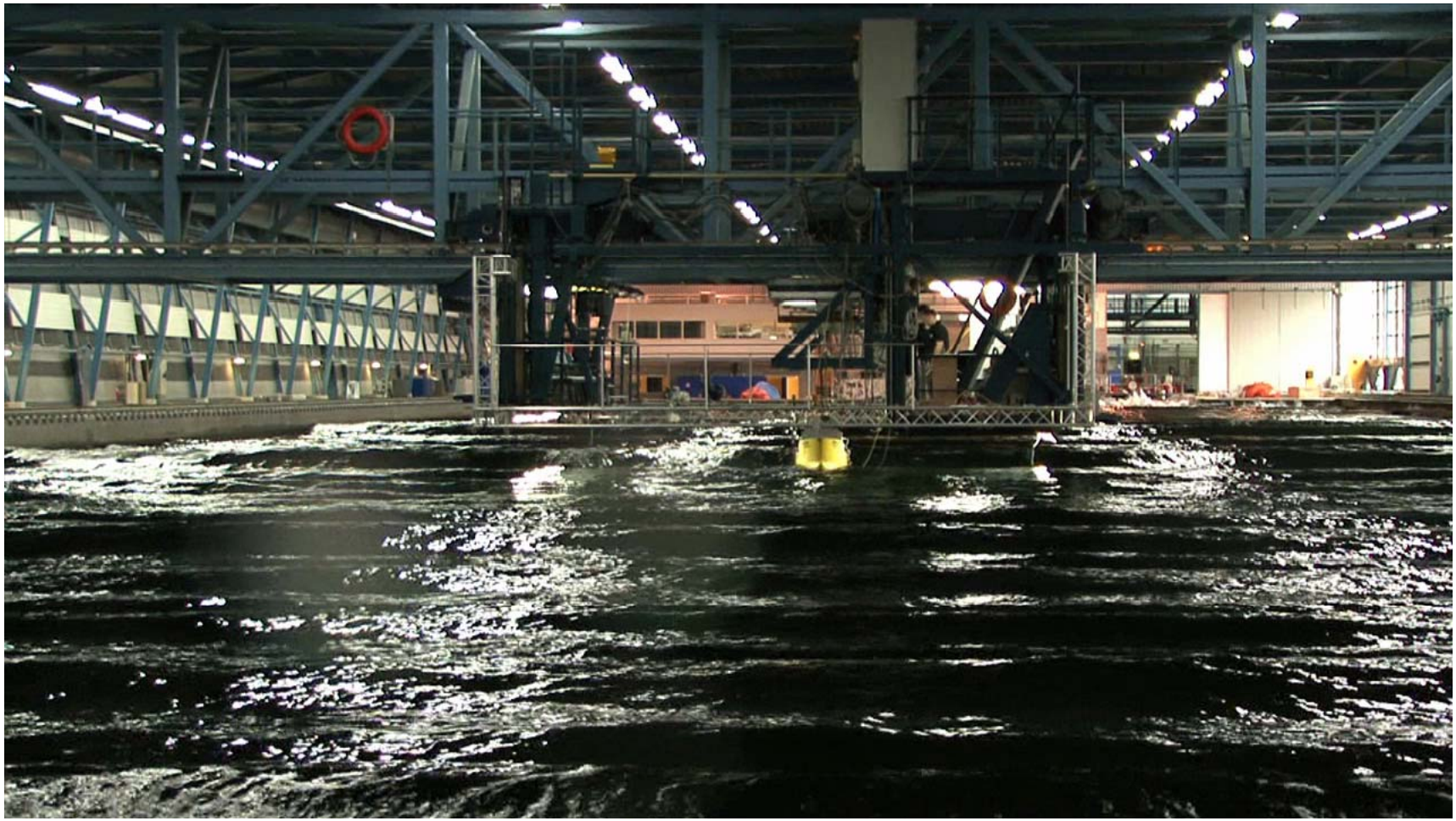
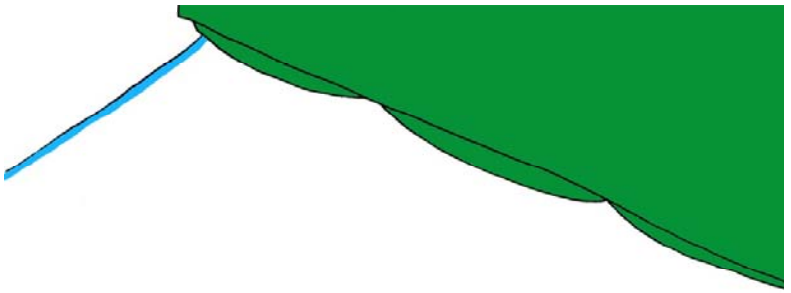
VALIDATION TECHNIQUE

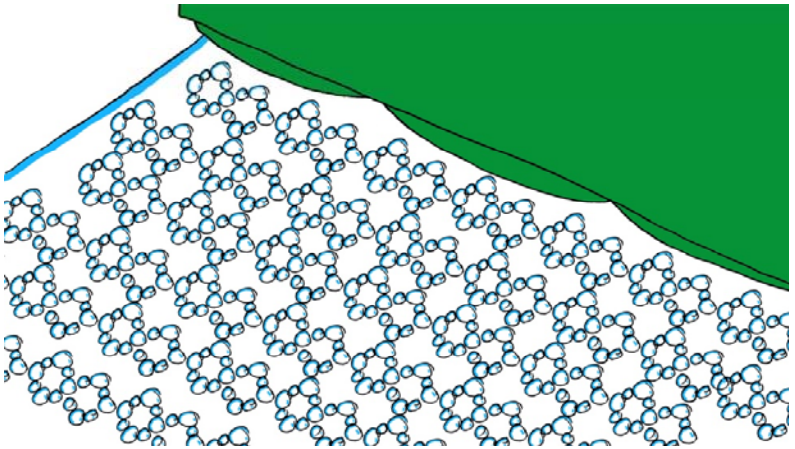


VALIDATION TECHNIQUE

- Layer concept



- Building block concept



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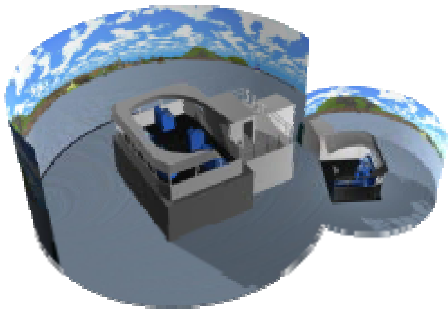

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