Ocean/Marine Engineering and Naval Architecture Research and Education Experience and Capacity at Canadian Universities

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Polar Ice
Greenland Sea
UK
Russia
Arctic Ocean
Ellesmere Island
Alert
Iceland
Bering Strait
North Magnetic Pole
Kalaallit Nunaat
(Grønland)
(Denmark)
Arctic Circle
Beaufort Sea
Banks I
Resolute
Baffin Bay
Alaska
(USA)
Inuvik
Victoria Island
Baffin Island
Davis Strait
Dawson
Great Bear Lake
Gjoa Haven
Yukon Territory
Mackenzie River
Whitehorse
Northwest Territories
Nunavut
Iqaluit
Labrador Sea
Atlantic Ocean
Baker Lake
Yellowknife
Ungava Bay
Fort Nelson
Great Slave Lake
CANADA
Newfoundland and Labrador
Nain
British Columbia
Prince George
Fort McMurray
Hudson Bay
Churchill Falls
Pacific
Alberta
Edmonton
Saskatchewan
Churchill
Manitoba
L Winnipeg
St John's
Fraser River
Vancouver
Kamloops
Calgary
Saskatoon
Sandy Lake
James Bay
Saint-Pierre et Miquelon
(France)
Victoria
Ocean
Regina
Winnipeg
Quebec
Prince Edward Island
Charlottetown
Thunder Bay
Ontario
New Brunswick
Nova Scotia
Halifax
Fredericton
United States of America
Ottawa
Lake Superior
Toronto
Lake Michigan
Huron
Lake Ontario
Lake Erie
Atlantic Ocean
UBC
MUN
UNB
UVic
DAL

- Education Programs
- Research Programs
- Research Facilities
- Concluding Remarks

Undergraduate Programs

- Memorial's undergraduate Ocean and Naval Architectural Engineering Program, the only one in Canada
- It is also the only program with co-op in the world
- Marine Institute's diploma programs on marine engineering systems and naval architecture – also unique in Canada.

MEMORIAL UNIVERSITY

Graduate Programs

- Memorial University

  Thesis-based Master and PhD programs in Ocean and Naval Architectural Engineering (ONAE)

  Course-based Master Program (one-year with internship) in ONAE (to be launched in 2017)

  Marine Institute – Course-based Master programs in Maritime or Technology Management

MEMORIAL UNIVERSITY

Graduate Programs

- University of British Columbia

  Course-based Master of Engineering in Naval Architecture and Marine Engineering (one-year multi-disciplinary, industry-focused program with four-month internship)

Thesis based program to be re-launched in 2017!

Graduate Programs

MEL | Master of Engineering Leadership

NAVAL ARCHITECTURE & MARINE ENGINEERING

UBC Applied Science | SAUDER School of Business

UBC

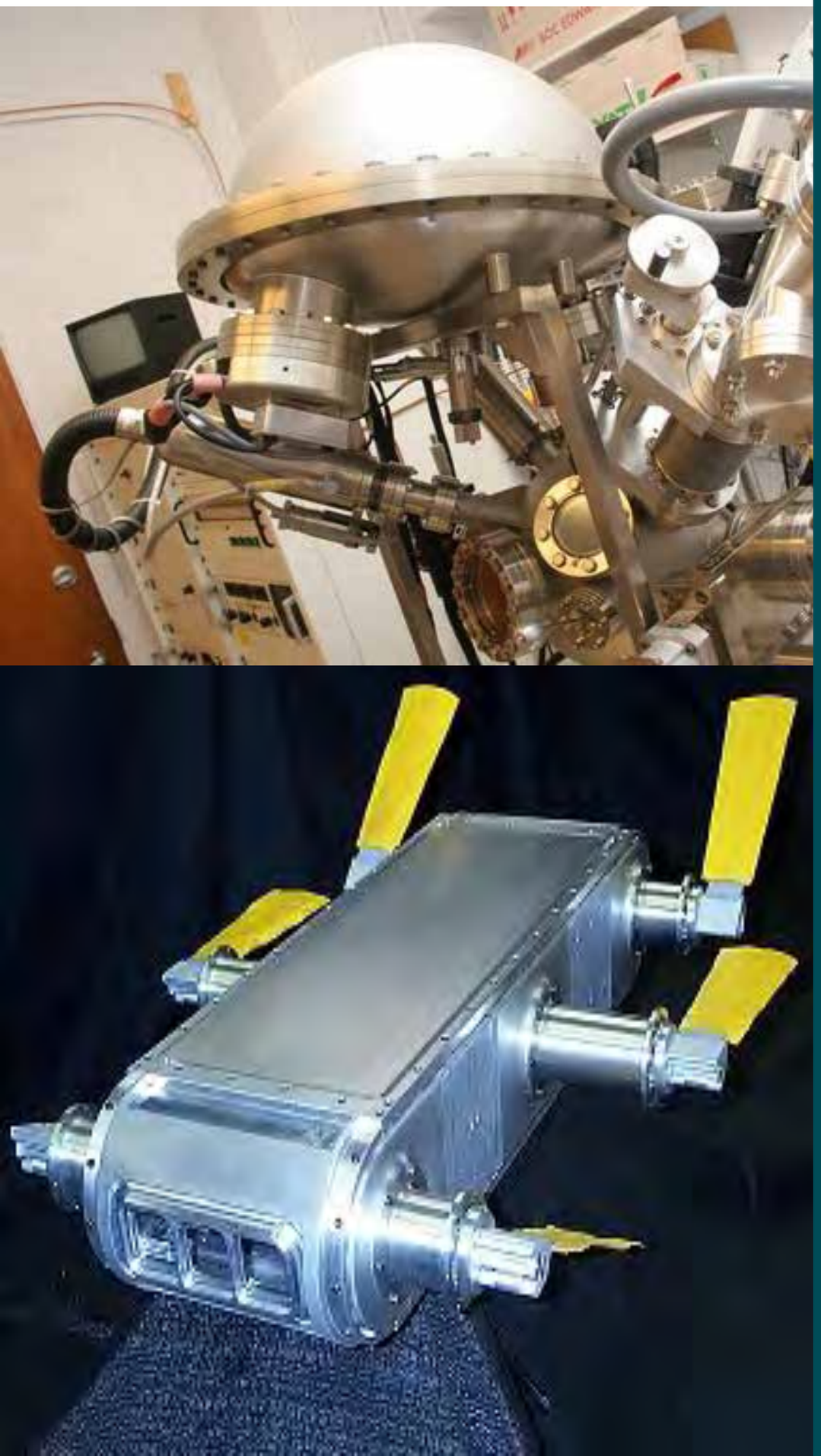
Research Programs

- Ocean and Naval Architectural Engineering
  - Ship and offshore structure design
  - Marine hydrodynamics
  - Ship structures
  - Marine safety and simulation
  - Arctic operations
  - Underwater vehicles
  - Arctic engineering

- Strengths in experimental and numerical methods and in harsh ocean environment engineering

Memorial University

MEMORIAL UNIVERSITY



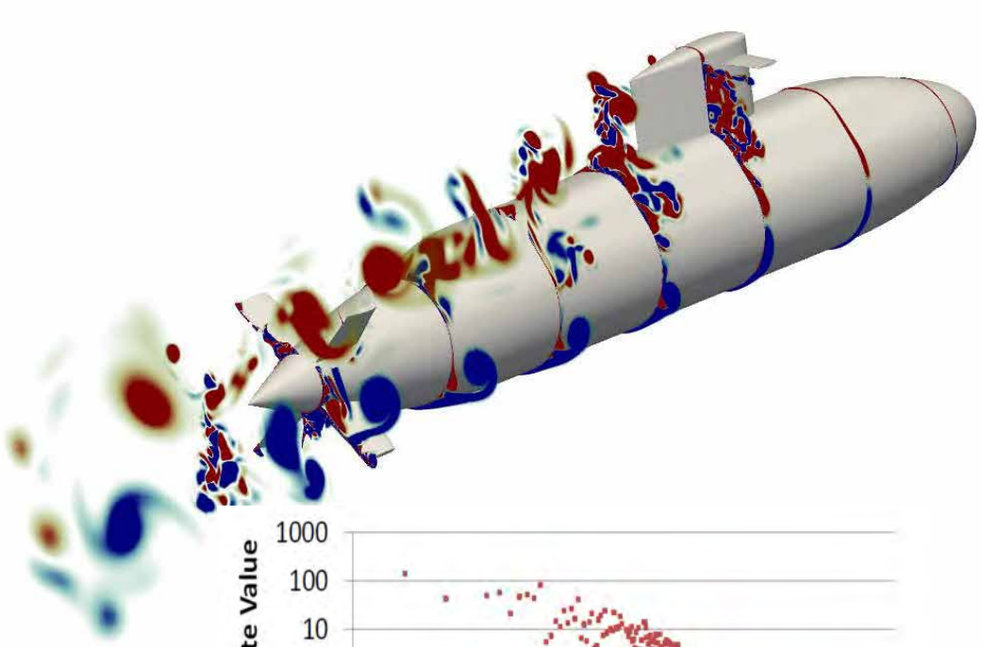
Research Programs

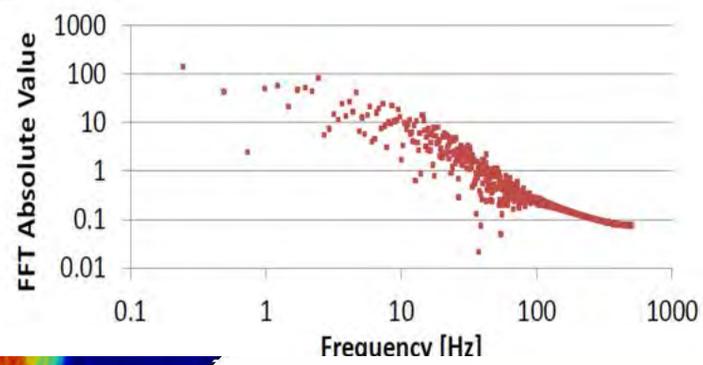
- Institute for Research in Materials
  - structural analysis and design
  - structural health monitoring
  - innovative materials and composites
  - corrosion/degradation and fatigue
  - mechanical testing
  - non-destructive testing
- Tidal energy
- Underwater robots
- Underwater acoustics

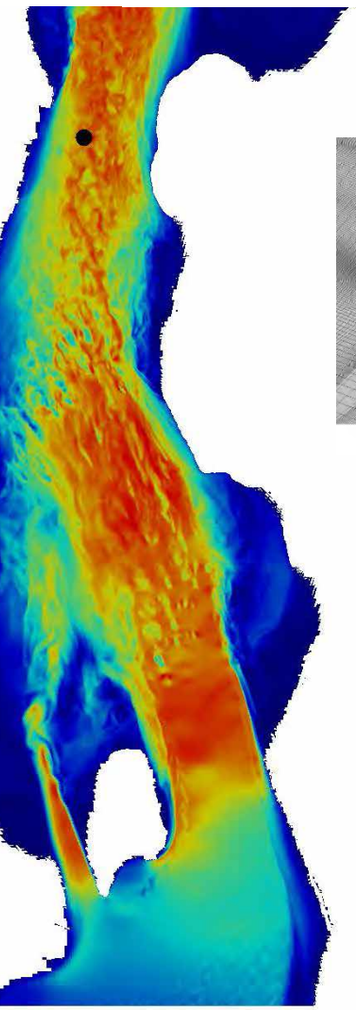
Dalhousie University

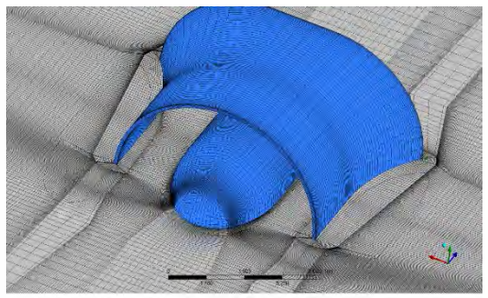
DALHOUSIE UNIVERSITY
Inspiring Minds

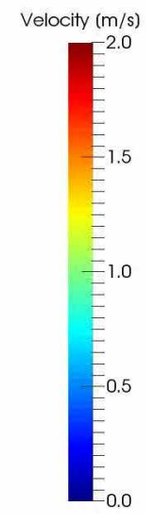
Research Programs





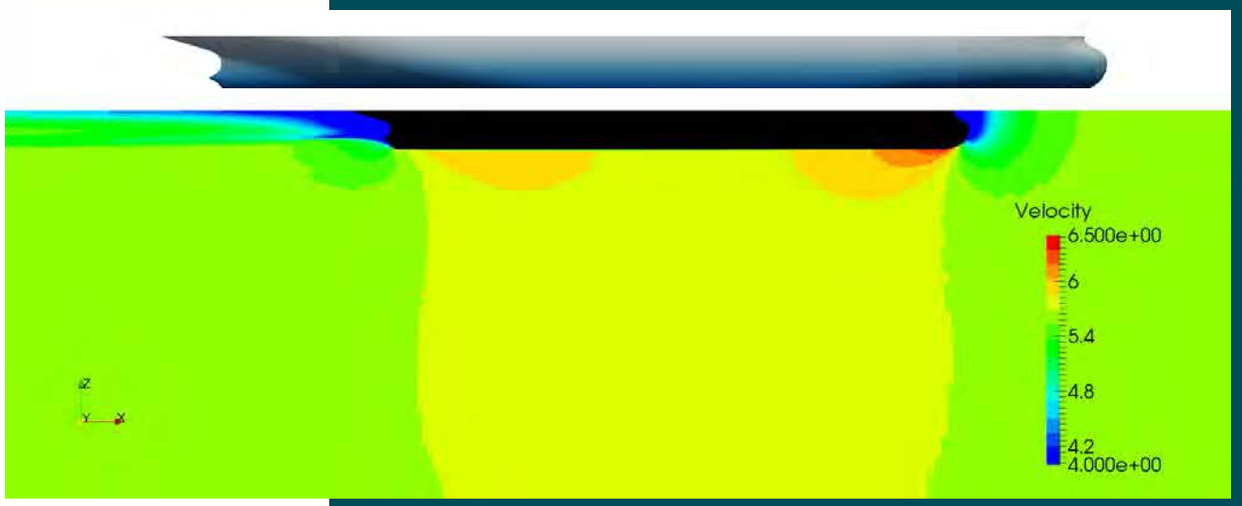






High-Performance Computing and Modeling

- Maneuvering simulations of ships and submarines
- Environmental ocean modeling
- Acoustic source modeling and free-surface waves
- Overset meshing and multi-body interactions
- Ocean device (in-situ) multi-scale modeling
- Reduced order hydrodynamic models for control and fast simulators



University of New Brunswick

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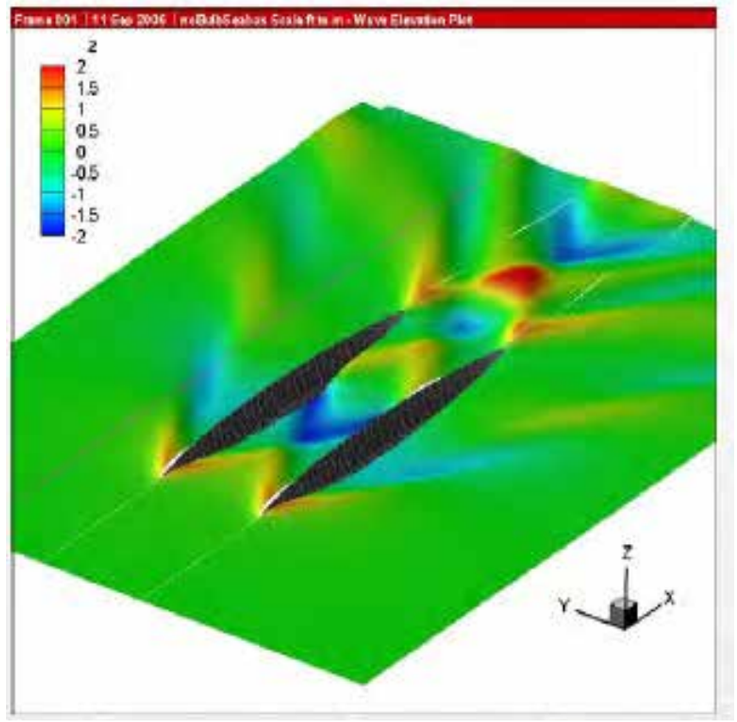
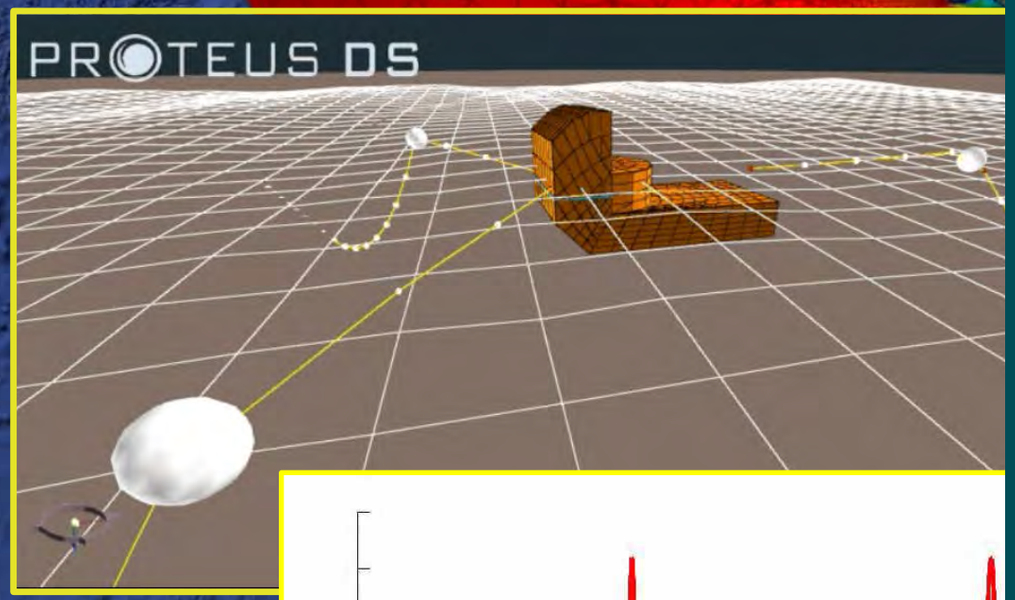
UNIVERSITY OF NEW BRUNSWICK



Research Programs

- Vessel Safety
- Hull form Development/Optimization
- Undersea Technology
- Offshore Platform Motions
- Coastal Engineering
- Ocean Renewable Energy

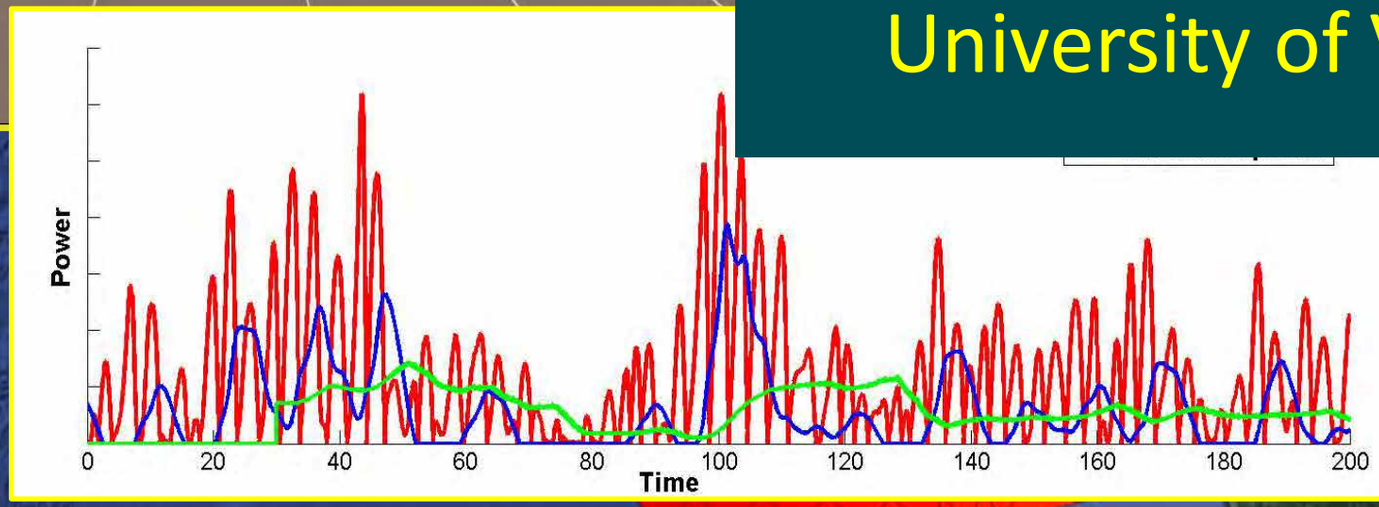
University of British Columbia



Research Programs

- Ocean Renewable Energy
  - Resource assessment (wave and tide hindcasting and forecasting, waves and currents)
  - Mooring dynamics
  - Wave energy conversion (performance assessment)
- Underwater Vehicles
  - Tethered/towed underwater vehicle dynamics and control
  - Coordinated control for Remotely Operated Vehicle-Manipulators

University of Victoria



University of Victoria

Infrastructure

- Memorial University

  - Towing Tank, 58m, hydrodynamic tests
  - Structures Lab, steel and ice tests
  - Underwater labs: AUV and glider
  - Small vessel simulator
  - High-performance computing clusters

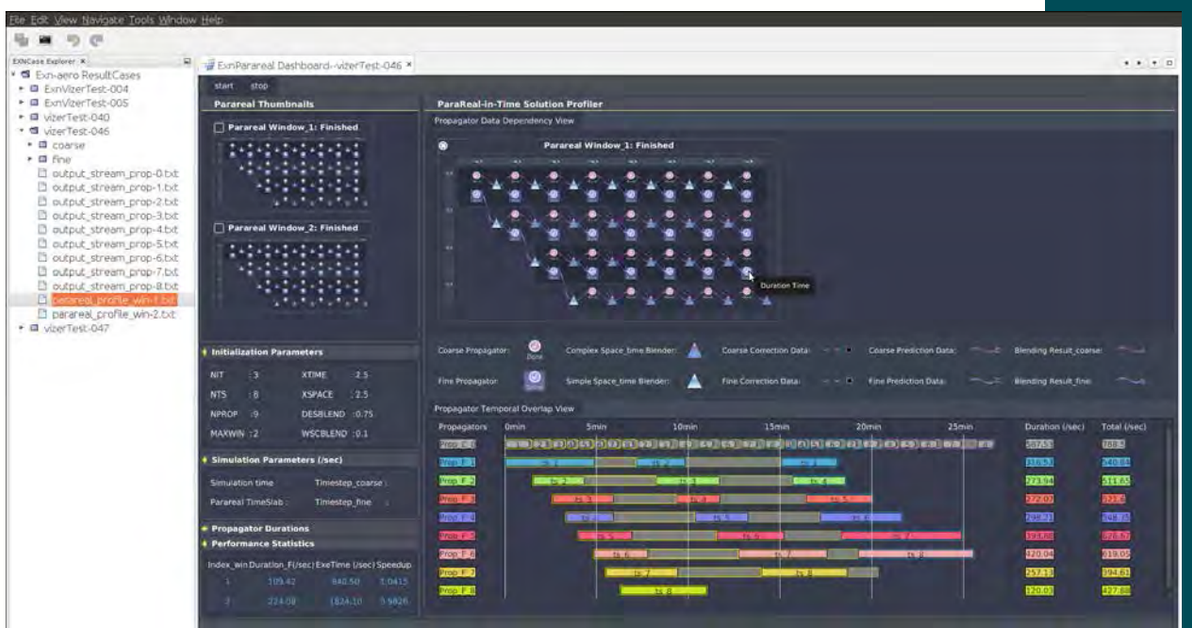
  - Marine simulators (Marine Institute)
  - Flume tank (Marine Institute)
  - Environmental Pool (Marine Institute)
  - SmartBay Test Site (Marine Institute)

MEMORIAL UNIVERSITY

Infrastructure

University of New Brunswick

- Manycore supercomputing hardware and software infrastructure.
- HPC environment for testing new computing hardware and their use for simulating ocean/naval applications.
- Infrastructure capable of running new space-time parallel CFD solutions in the ocean/naval engineering domain.



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Infrastructure

University of British Columbia

Clean Energy Centre
Composites Research Network
Pipeline Integrity Network
High Speed Manufacturing
Earthquake Engineering
Structures Laboratories
High Performance Computing

Infrastructure

University of Victoria

- Falcon ROV-manipulator
  - custom navigation skid (RDI Explorer DVL, IMU, SBL transceiver).
  - Hydrolek 5-function manipulator
- Bluefin AUV
  - Used in partnership with Parks Canada for under ice missions (search for Franklin's vessel).
- Laboratory space at Van Isle marina in Sidney BC.

University of Victoria

Concluding Remarks

- Resources at each university are limited in terms of training, research and infrastructure in the area of marine technology
- Many research programs are moving towards multi-disciplinary cooperation
- Capabilities at these five universities are complementary
- Closer coast-to-coast collaborations are needed
- To expand collaborations with Canadian universities to advance technologies beyond the existing capabilities, for example, unmanned ships

Concluding Remarks

- It is recognized that education is a key aspect in the National Network. In-depth discussions on education may not be possible at the UBC and MUN workshops
- A separate workshop will be planned to address education challenges, gaps and strategies before or after the MUN workshop