COMREN
Canadian Ocean Mapping
Research & Education Network

RéCREH
Réseau Canadien de Recherche
et d'Enseignement en Hydrographie

Costas Armenakis (York University), Craig Brown (NSCC), Paul Brett (Marine Institute, Memorial University), Ian Church (UNB), Sylvie Daniel (Laval University), Sean Galway (BCIT), Anders Knudsby (Ottawa University), Nicolas Seube (CIDCO)

What is COMREN ?
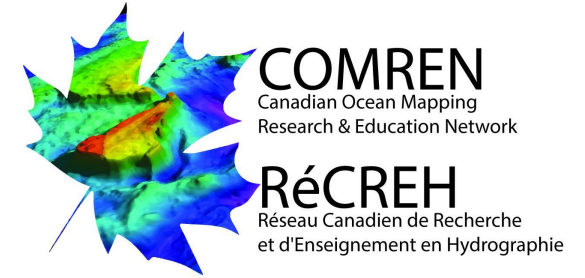
A Network of Universities, Research centers all across Canada, sharing:

- Interest in developing activities in Hydrography;

- Competencies in research and hydrography education

- Motivation for cooperation at the Canadian level

York University

Department of Earth & Space Science & Engineering

Geomatics Engineering / Geomatics Science

Research Interests

- Positioning / Navigation
- Unmanned Aerial / Surface Vehicles / Marine Systems
- Geodesy / Gravity / Satellite Altimetry
- Remote Sensing / GIS
- Marine Infrastructures
- Dense 3D Surface Reconstruction
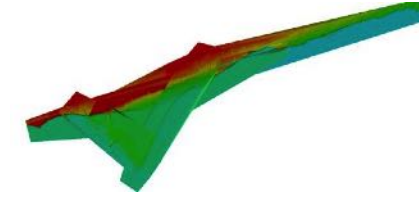- Data Analytics / Visualization
- Coastal Risk Mapping
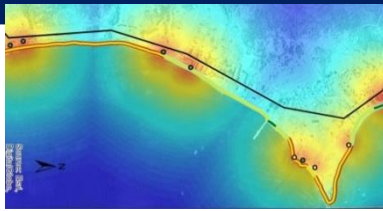
Educational Capacity

- BEng (Geomatics Eng.)
- BSc (Geomatics Sci.)
- MSc (Earth & Space Sci.)
- PhD (Earth & Space Sci.)
- Certificate GIS & Remote Sensing
- CEAB Engineering Accreditation
- Association of Ontario Land Surveyors Accreditation
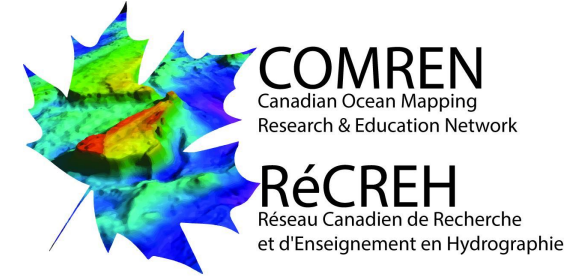- Esri Canada GIS Centre of Excellence
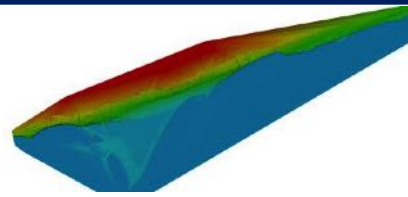
Equipment

- GNSS receivers
- GNSS simulator
- Geodetic equipment
- Autopilots
- UAVs
- CARIS HIPS and SIPS
- ArcGIS
- ERDAS Imagine
- PCI Geomatica
- Terrasolid

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BCIT
School of Construction & Environment – Geomatics Department

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Educational Capacity

- Diploma (2yrs) in Geomatics Engineering Technology (50 students per cohort)
- Degree (+2yrs) (w/ prior diploma) in Geomatics - Bachelor of Technology (20 students per cohort)

Aligned with CBEPS Curriculum (Canadian Board of Examiners for Professional Surveyors) upon graduation students attain 11/13 CBEPS "Certificates of Completion", allowing them to article as an LST

Equipment

Institute Vessel including:
- Knudsen 320BP Dual Frequency Single Echo-Sounder
- Imagenex Sportscan SideScan Sonar
- Valeport Tide Gauge
- ODOM DigiBar SVP

- CARIS HIPS/SIPS – LOTS
- Terrascan LiDAR Tools - TSCAN/TMODEL software (BathyLiDAR compatible or Vessel Mounted Lidar)
- Photogrammetry Tools – DATEM Summit/*AgiSOFT/*Pix4D (*for drone work)

University of Ottawa
Department of Geography, Environment and Geomatics

uOttawa

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Research Interests

- Satellite derived bathymetry
- Mapping an monitoring of Canadian Arctic Glaciers

Educational Capacity

- BSc (Geography)
- MSc (Geography)
- PhD (Geography)

Equipment

- Four CFI labs with computing and field equipment
- SBES
- Drones
- Hyperspectral imaging sensor
- Cessna 172

University of Ottawa
Shallow-Water Earth Observation Lab

uOttawa

Université Laval

Departement des Sciences Géomatiques

UNIVERSITÉ LAVAL

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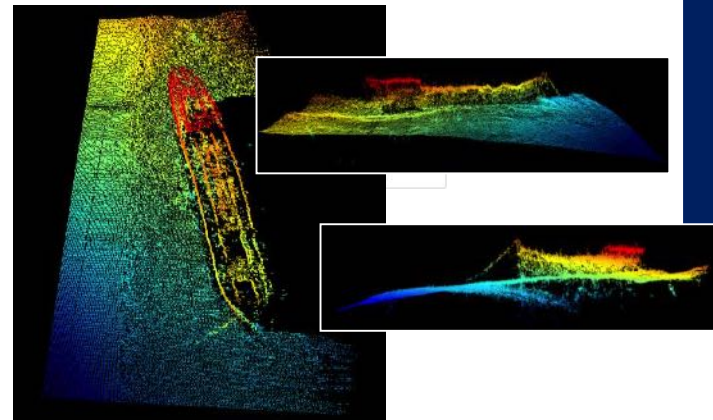
Research Interests

- Sonar Image processing
- Seabed mapping and classification
- Multibeam and Sonar image fusion
- Sedimentology
- Geomorphology
- Automatic calibration and LiDAR performance analysis

Educational Capacity

- BSc (Land Surveying, Gematics Engineering)
- BSc (Geography)
- MSc (Geomatics, Geography)
- PhD (Geomatics, Geography)

Equipment

- Metrology lab, laser interferometer
- GNSS
- Land surveying equipement
- Trimble MX2 Laser scanner
- EM2040C, EM302, Reson 8101
- Klein Side Scan Sonar

Hugin AUV

CIDCO
Centre Interdisciplinaire pour le Développement de la Cartographie des Oceans
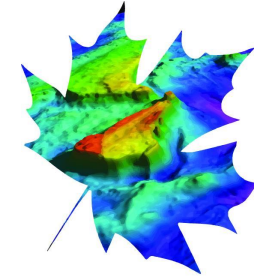
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Research Interests

- MBES and LiDAR data processing
- Automatic calibration of MBES and mobile LiDAR systems
- Automatic methods for MBES QA/QC and performance analysis
- Autonomous Survey systems design
- Special works in Hydrography

Educational Capacity

- CIDCO Course in Hydrographic Surveying, Recognized in Category B by the FIG/IHO/ICA IBSC

Equipment

- F.-J. Saucier survey vessel
- Coriolis II (ISMER)
- EM2040, EM302
- Reson 7125, IXblue HYDRINS
- Zoller-Frölish LiDAR profiler, Ixblue ATLANS-C INS
- ASV

Nova Scotia Community College

nscc | Applied Research

Applied Ocean and Applied Geomatics Research Groups
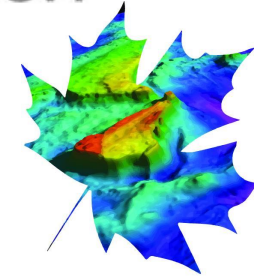
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Research Interests

Applied Oceans Research Group (AORG): Offshore mapping using integrated approaches and tools
- MBES– bathymetry, backscatter and water column collection and analysis
- Ground-truthing technologies technology development
- (ASVs/AUVs)
- Geological, Benthic Habitat and Fisheries Resource Mapping: development and testing of GIS tools and methods

Applied Geomatics Research Group (AGRG):
- Coastal Mapping
- Bathymetric LIDAR, areal imagery, shallow subtidal (multibeam)
- Coastal oceanography
- Various applications of technologies for coastal zone mapping.

Educational Capacity

Certificates, Diplomas and Advanced Diplomas in numerous related fields: e.g
- Marine Geomatics
- Remote Sensing
- Ocean Technology
- GIS
- MSc Applied Geomatics (joint with Acadia University)

Equipment
- Multibeam echosounder
- Sidescan sonar
- Bathymetric LIDAR
- AUV
- Sidescan sonar
- 4K underwater video system
- ADCP
- UAVs
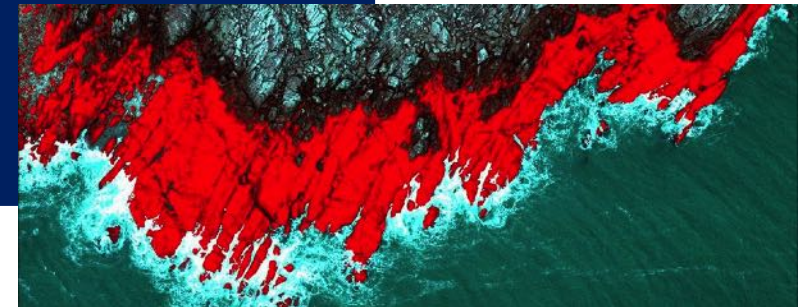
Fisheries and Marine Institute of Memorial University
School of Ocean Technology
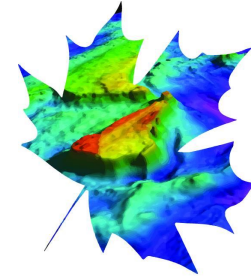
MARINE INSTITUTE

MEMORIAL UNIVERSITY

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Research Interests

- Ocean Mapping
- Fisheries Acoustic
- GIS
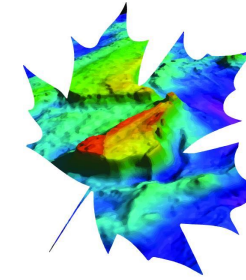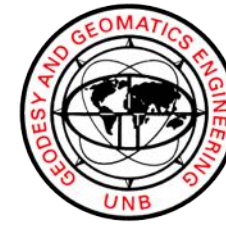- Remote Sensing
- Geodesy
- Big Data
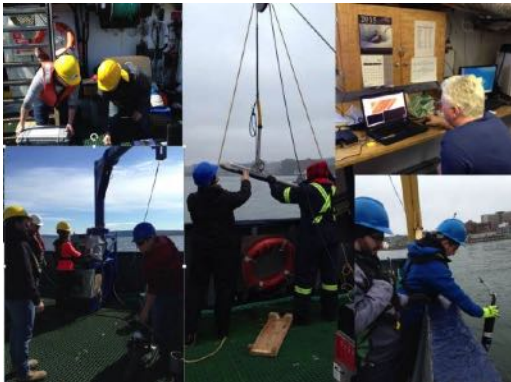
Educational Capacity

- Diploma (Ocean Mapping)/Bachelor of Technology FIG/IHO/ICA Category B.

- Master of Technology Management Eng.

- Graduate Diploma in Ocean Mapping Under development

Equipment

- MV Enquisitor
- Multibeam sonar – Kongsberg EM710
- Sub-bottom profiler – Knudsen 4 channel CHIRP
- Sidescan sonar – Klein 3000 (100/500kHz)

- Scanning LIDAR – Dynascan M250

- Moving Vessel Profiler – Rolls Royce MVP200

- Deck equipment:
- Oceanographic winch (1,000kg pull)

University of New Brunswick
Department of Geodesy and Geomatics Engineering
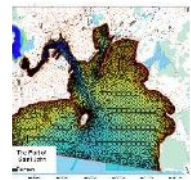# Ocean Mapping Group

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UNB | Engineering
EST. 1785
UNIVERSITY OF NEW BRUNSWICK

Research

- Ocean Mapping
- Numerical Hydrodynamic Modelling Applications
- GNSS
- GIS
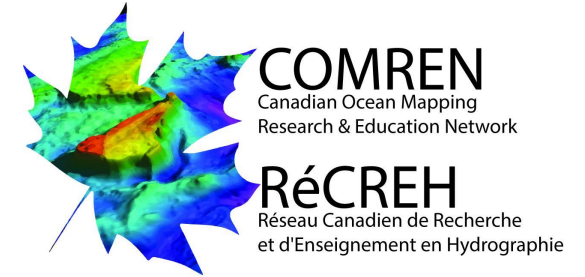- Remote Sensing
- Geodesy
- Big Data

Educational Capacity

- Bachelor of Science in Geomatics Eng.
- Bachelor of Geomatics
- Master of Eng.
- Master of Science in Eng.
- Doctor of Philosophy

Equipment

- CSL Heron
- EM710
- Mesotech M3
- EM3002
- 2 x MVP30
- Applanix POSMv
- Coda F185
- GNSS Systems
- Trimble TX5 3D Laser Scanner

COMREN Objectives

- Discuss and prepare research plans between COMREN or COMREN members and Granting Agencies;

- Manage research funds according to funding agreements between COMREN or COMREN members and Granting Agencies;

- Facilitate personnel exchange within COMREN members;

- Facilitate the emergence of educational programs in ocean mapping, including field training camps;

- Organize and participate in COMREN annual meetings and workshop, contribute actively to the Canadian Hydrographic Conference;

- Facilitate technology transfer of COMREN research results to Industry;

- Offer COMREN hydrographic survey competences and facilities to ocean mapping joint projects or in cooperation with external partners.

COMREN ongoing projects
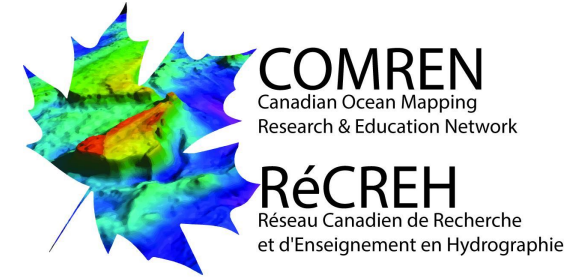
1. Hydrography to Biology: Developping integrated approaches for benthic habitats (NSCC, UNB)

2. CrowdSourcing Bathymetry (CSB) in Northern areas (CIDCO, MI, UNB, YORK University)

3. ASV (MI, CIDCO, NSCC, UNB)

4. MBES Automated tools for MBES QA/QC (CIDCO, Université Laval, UNB)

5. LiDAR calibration and performance analysis (CIDCO, Université Laval, MI)

6. Education (workshops, summer schools)

Hydrography to Biology: Developing integrated approaches for benthic habitats (NSCC, UNB)
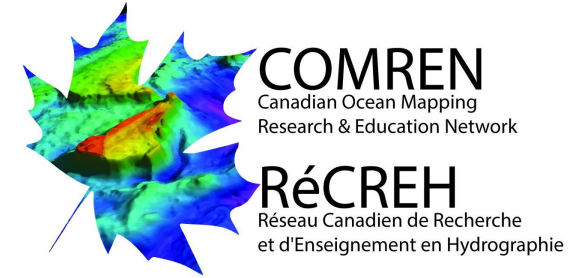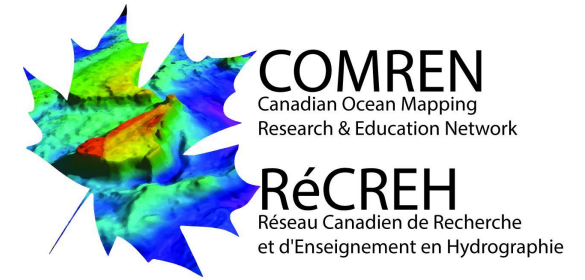

Objectives:
- To design seafloor classification methods based on backscatter
- To validate results using Baited Remote Underwater Video Systems (BRUVS)
- To integrate coastal dynamics models to the classification process

Fisheries and Oceans Canada

Pêches et Océans Canada

CrowdSourcing Bathymetry (CSB) in Northern areas
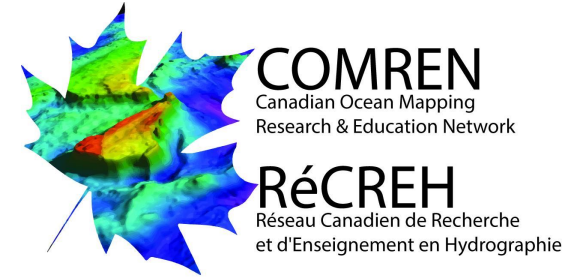# (CIDCO, MI, UNB, YORK University)

- Development of integrated and easy to deploy data collection tools (integrated and pre-qualified systems);

- Training of communities who will deploy the data collection systems;

- Automated data processing tools;

- Data cross-validation tools;

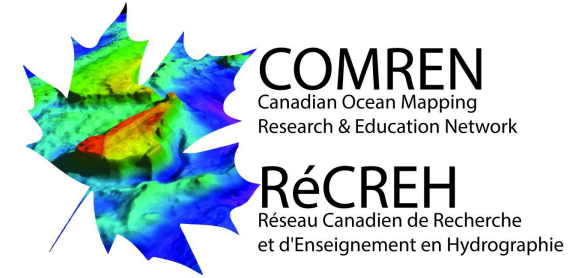- Data access, dissemination and visualization tools.
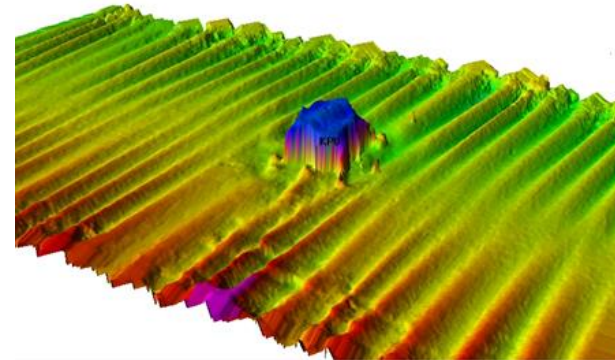
ASV
(MI, CIDCO, NSCC, UNB)

- Conduct workshops to evaluate the capabilities of ASVs;

- Apply automated data processing techniques (Calibration, Quality Analysis) to the data collected by ASVs;

- Analysis of data set on benchmark areas ;

Automated tools for MBES QA/QC (CIDCO, Université Laval, UNB)

- Automation of quality assurance tools, detection of systematic errors in MBES data sets

- Matching between source of errors, morphological analysis wihtin overlapping strips and state of the survey plateform

- Systematic errors (boresight, timing, speed of sound, lever arms, positioning, etc…) detection from overlapping data.
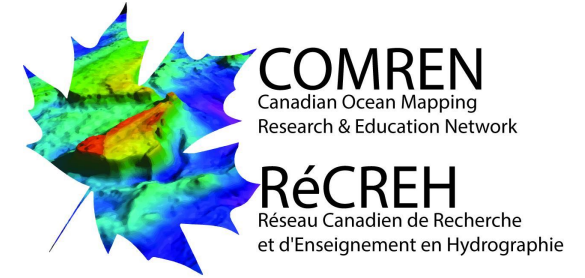
LiDAR calibration and performance analysis
(CIDCO, Université Laval, MI)

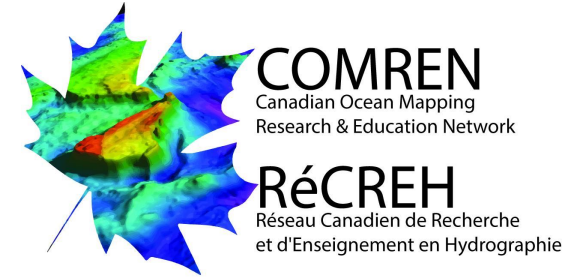Industrial Partners:

- HydroQuébec
- Microdrones Inc Canada

- **Latency, Boresight Calibration of Terrestrial and Airborne LiDAR systems;**
- **Combined Standard Measurement Uncertainty Model**
- **Performance Analysis**
- **Utilization of LiDAR drones for coastal features mapping**

Education
(all partners)

- **Student workshop** (about 30 students from all across Canada)

- Student involvement in current COMREN projects (BSc, MSc, PhD)

- Two FIG/IHO/ICA recognized Category B programmes (MI, CIDCO);

- Summer schools starting in 2019 including survey camps

    - East Coast: Laval University;

    - Wets Coast: BCIT;

- Cooperation for the development of Category A programmes (Laval University, UNB), through joint field projects

Summary
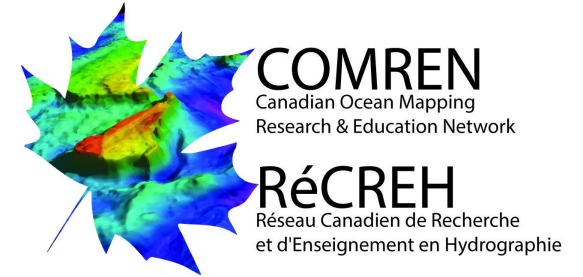
- COMREN was created in November 2016 and has a fast dynamics in response to growing needs;

- 5 significant on-going research projects;

- COMREN should apply for NSERC-CRSNG recognition as a Network;

- Next step will to integrate a "layer " of Canadian industrial partners to integrate the research of COMREN into products.