PRESENTATION OVERVIEW

- Academic Programs in Geomatics
- Hydrography = Marine Geomatics
- Research in Navigation and Hydrography
- History of Hydrography Teaching
  - at Laval University
  - in New France (Nouvelle-France)
GEOMATICS PROGRAMS

Undergraduate
- Bachelor’s degree in geomatics sciences
  Access to the Ordre des arpenteurs-géomètres du Québec
- Bachelor’s degree in geomatics engineering
  Access to the Ordre des ingénieurs du Québec

Master’s
- Master’s degree in geomatics sciences
  - Master’s degree with thesis (research)
  - Professional master’s with concentration:
    - Geoinformatics
    - Territorial and land management
    - Applied geomatics
- MBA in geomatics sciences
  offered jointly with the faculty of administrative sciences
  and the Ecole nationale d’administration publique
- Master’s in environmental biogeosciences
  in collaboration with the departments of geography,
  geology, geological engineering, and biology
- Short programs
  - Microprogram in fundamental geomatics
  - Microprogram in advanced geomatics

Doctorate
- Doctorate in geomatics sciences (Ph.D.)

HYDROGRAPHY = MARINE GEOMATICS

Design
Planning
Acquisition
Processing
Modelling
Visualization
Analysis
Updating
Fusion
Quality control
Dissemination

Surveying
Geodesy
GPS
Photogrammetry
Remote Sensing
Digital Mapping
GIS
Spatial DB
Cadastre
Economics
Environment
Management
Health & Safety
BACHELOR PROGRAM HIGHLIGHTS

- 4 year bachelor programs
  - 120 credits (about 40 courses)
  - 1 course = 3 h (lecture) and 2 h (laboratory) per week
  - Major engineering projects (4th year)
  - 3 Field surveys (1 week each)
  - Summer industry internships (practical trainings)
  - International student exchanges (1-3 semesters)

Examples of internships and jobs (in hydrography):
CHS, CCG, CIDCO, Port of Montreal, Hydro-Quebec,
Entreprises N. Juneau inc., Verreault Navigation, ...

www.scg.ulaval.ca

HYDROGRAPHY COURSE DESCRIPTION


- Practical works (laboratory):
  ECDIS features; GPS kinematic data processing;
  Tidal analysis and interpolation;
  Bathymetric data processing and analysis.

- CHS (Mont-Joli) and CIDCO (Rimouski) visits
- CCG Speaker from the Quebec Region Office
Comparison of GPS (ellipsoidal) heights and interpolated water levels from SINECO (COWLIS) tide gauges

Difference of GPS (ellipsoidal) heights and interpolated water levels from SINECO (COWLIS) tide gauges

**Not corrected for squat**

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Ebb</th>
<th>Flood</th>
</tr>
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<tbody>
<tr>
<td>Mean</td>
<td>-5.6</td>
<td>-9.1</td>
<td>-3.1</td>
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<tr>
<td>RMS</td>
<td>±7.1</td>
<td>±8.5</td>
<td>±4.5</td>
</tr>
<tr>
<td>RSS</td>
<td>±9.1</td>
<td>±12.5</td>
<td>±5.5</td>
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</table>

**Corrected for squat**

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Ebb</th>
<th>Flood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>-0.5</td>
<td>-2.6</td>
<td>1.1</td>
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<tr>
<td>RMS</td>
<td>±7.3</td>
<td>±9.2</td>
<td>±5.2</td>
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<tr>
<td>RSS</td>
<td>±7.4</td>
<td>±9.5</td>
<td>±5.3</td>
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Michaud, Santerre et Condal
Berthing loops at Trois-Rivières harbour

Ueno et Santerre

RESEARCH PROJECT: GPS SHIP BERTHING

Loop 1

Loop 2

Loop 3

Difference (GPS – Total Station)

<table>
<thead>
<tr>
<th></th>
<th>Position</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>RMS</td>
</tr>
<tr>
<td>Loop 1</td>
<td>-0.6</td>
<td>±1.7</td>
</tr>
<tr>
<td>Loop 2</td>
<td>-1.1</td>
<td>±4.8</td>
</tr>
<tr>
<td>Loop 3</td>
<td>2.4</td>
<td>±5.7</td>
</tr>
</tbody>
</table>

Ueno et Santerre
**RESEARCH PROJECT: GPS SHIP BERTHING**

<table>
<thead>
<tr>
<th>Differences (GPS-TSS or Gyro)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>Roll</td>
</tr>
<tr>
<td>Pitch</td>
</tr>
<tr>
<td>Yaw</td>
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</tbody>
</table>

**OTHER RESEARCH PROJECTS**

- Processing and filtering of bathymetric data
- Kriging and Voronoi interpolation of bathymetric data
- Kalman filtering of tidal data
- Analysis of SINECO tidal data
- Determination of river high water line
- Precise GPS navigation (GEOIDE NCE project)
- Ship squat determination using RTK-GPS
- Multi-antenna GPS attitude determination
- GPS-PPP (Precise Point Positioning)

N.B.: M.Sc. and Ph.D. theses can be written in French or English
OTHER RESEARCH PROJECTS

• Presentations at the CHC 2010

- Naouraz Brahim, Sylvie Daniel, Didier Guériot. Reconstruction tridimensionnelle de scènes sous-marines à partir d'images acoustiques. (3D reconstruction of underwater scenes using acoustic imagery).
  Wednesday, June 23th PM, session 8B

- Mathieu Rondeau, Stéphane Roche. Le WikiSIG: Un outil de cartographie participative appliqué à l'espace maritime. (WikiSIG: A participative mapping tool applied to the maritime context)
  Wednesday, June 23th PM, session 9

DEPARTMENT HISTORY

• Established in 1907 (École d'arpentage – Surveying School)
  - Total of 2155 bachelors, 315 Master and 60 Ph.D. degrees
  - Formal hydrography course established in the 1950’s
  - Hydrography topics included in the Surveying (Topométrie) course since 1907
  - Currently, 12 Hydrographers working at CHS-IML have graduated from our Department
OUR GEOMATICS DEPARTMENT IN 2010

- Currently, 190 undergraduate students, 40 M.Sc. and 20 Ph.D. students
- Full time personnel: 18 professors, 3 research assistants and 2 technicians
- Research activities at the CRG (Centre for Research in Geomatics)
- GEOIDE NCE Head Office and Scientific Director at Laval University
- One of our professors is a member of the CIDCO scientific committee
- A hydrographer from CHS (Mont-Joli) is the external member of the Geomatics Engineering program committee

HYDROGRAPHY TEACHING IN NEW FRANCE

- Collège de Québec (1635 - 1775); building destroyed in 1878
  - Formation of pilots, hydrographers, land surveyors
- Hydrography professors (1671-1759):
  Boutet, Franquelin, Jolliet, Deshayes, Silvy, Lebrun, de Lauzon, Guignas, Deslandes, Ailloux, Messaïger, de Bonnécamps
HYDROGRAPHY TEACHING IN NEW FRANCE

- Louis Jolliet, *Hydrographe du Roi* (from 1697 to 1700)
  - Born in Québec, co-discoverer of the Mississippi River

La Grande Rivière du Canada (1715)

Source: Bibliothèque et Archives nationales du Québec (www.banq.qc.ca)
GEOMATICS (HYDROGRAPHY) MUSEUM
Located at Pavillon Casault, Laval University

or http://www.fig.net/hsm/collections.htm

GEOMATICS DEPARTMENT - BOOTH #39

- Virtual visit on Google Earth of special interest sites related to Hydrography in Quebec City
- Academic programs flyers
- Research project posters
- Museum artefacts
FURTHER INFORMATION

Visit our Web sites:

- Laval University: www.ulaval.ca
- Geomatics Department: www.scg.ulaval.ca
- GPS group: www.scg.ulaval.ca/gps-rs/
- CRG: www.crg.ulaval.ca
- GEOIDE NCE: www.geoide.ulaval.ca