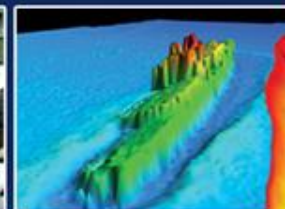




CIDCO

Centre interdisciplinaire de développement
en cartographie des océans

Interdisciplinary Centre for the Development
of Ocean mapping



Les données bathymétriques pour d'autres fins que l'hydrographie

La géomatique marine au CIDCO

Enseignement supérieur,
Recherche, Science
et Technologie

Québec 



Cégep Limoilou



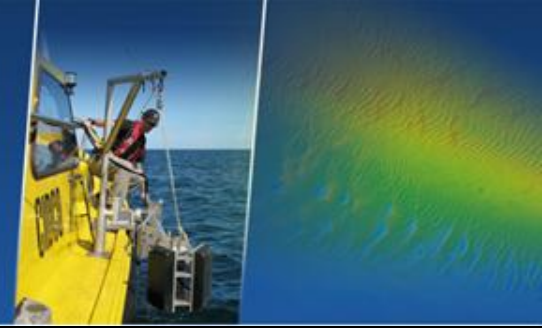
Pêches et Océans
Canada

Fisheries and Oceans
Canada

caris[®]



Axes de travail



Environnement et sécurité civile

Inspection d'infrastructures submergées

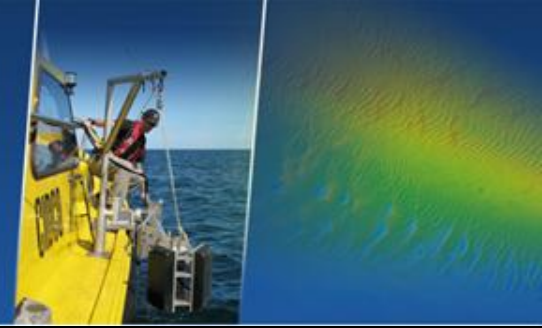
Mariculture

Ressources naturelles et énergies

Milieux non traditionnels



Axes de travail



Environnement et sécurité civile

Inspection d'infrastructures submergées

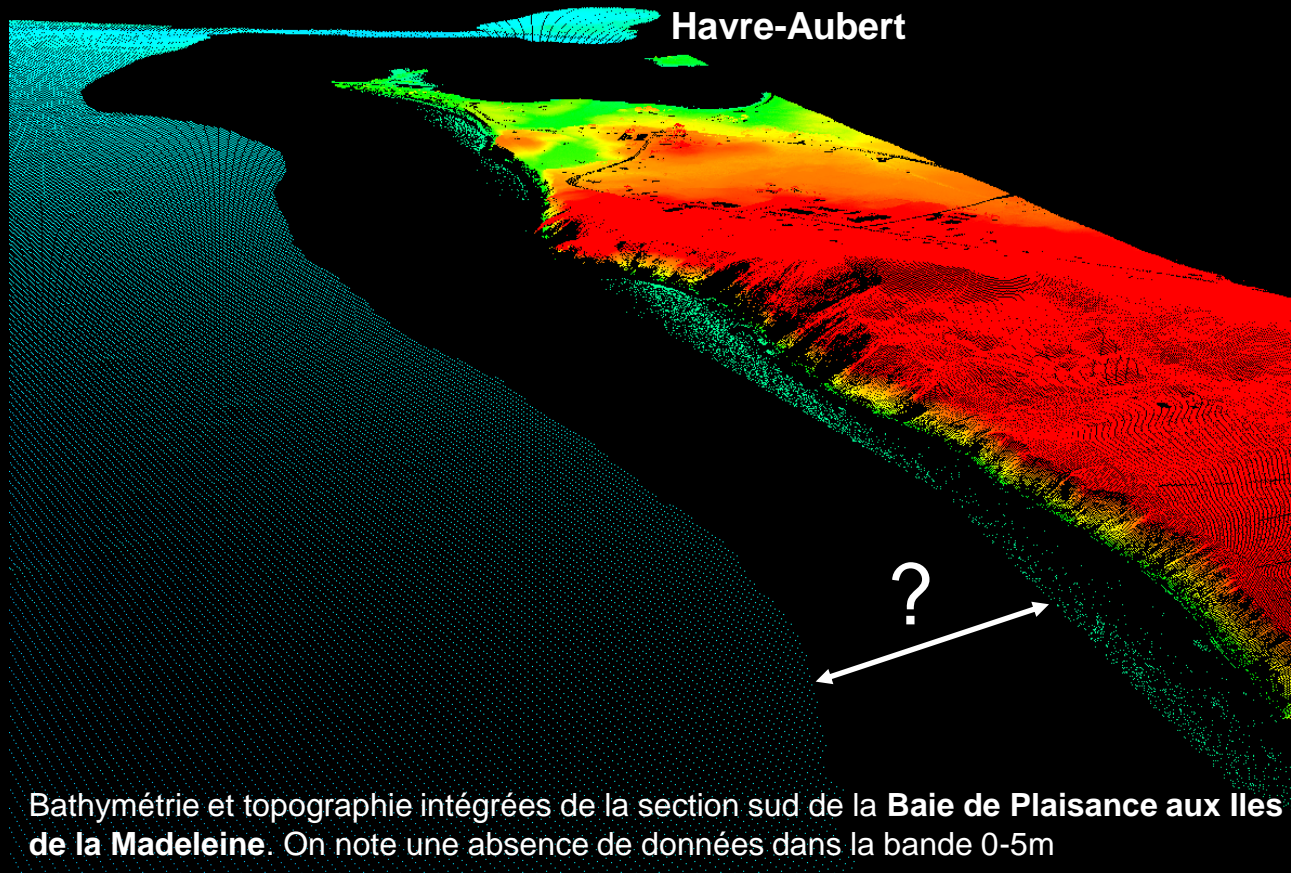
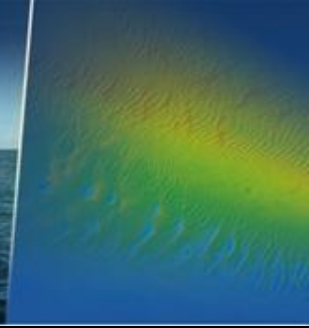
Mariculture

Ressources naturelles et énergies

Milieux non traditionnels



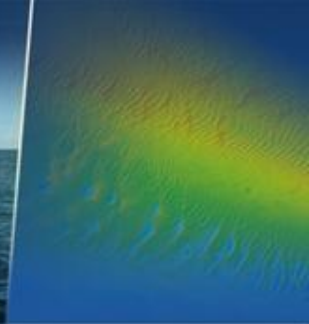
Érosion côtière – levé dans la zone ultra-côtière



Bathymétrie et topographie intégrées de la section sud de la **Baie de Plaisance aux Iles de la Madeleine**. On note une absence de données dans la bande 0-5m



Érosion côtière – levé dans la zone ultra-côtière



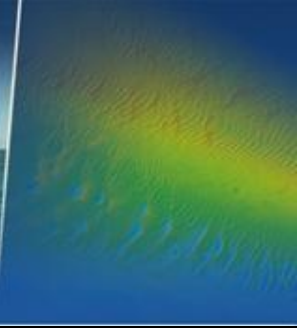
État de l'art



WESP (Pays-bas)
CRAB (Etats-Unis)



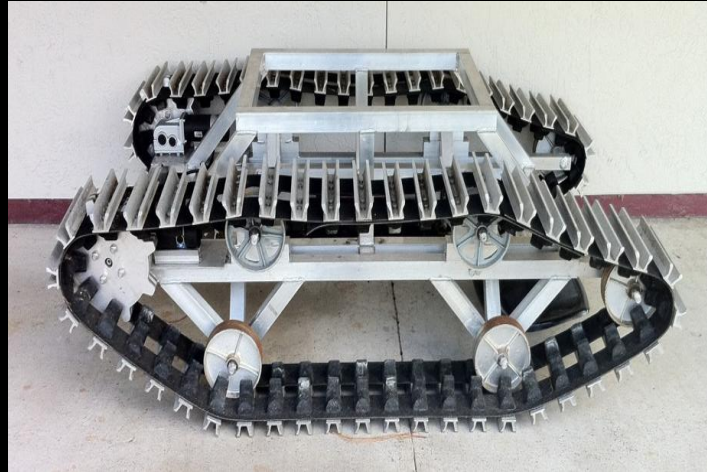
Érosion côtière – levé dans la zone ultra-côtière



État de l'art



C-Talon (QinetiQ, États-Unis)



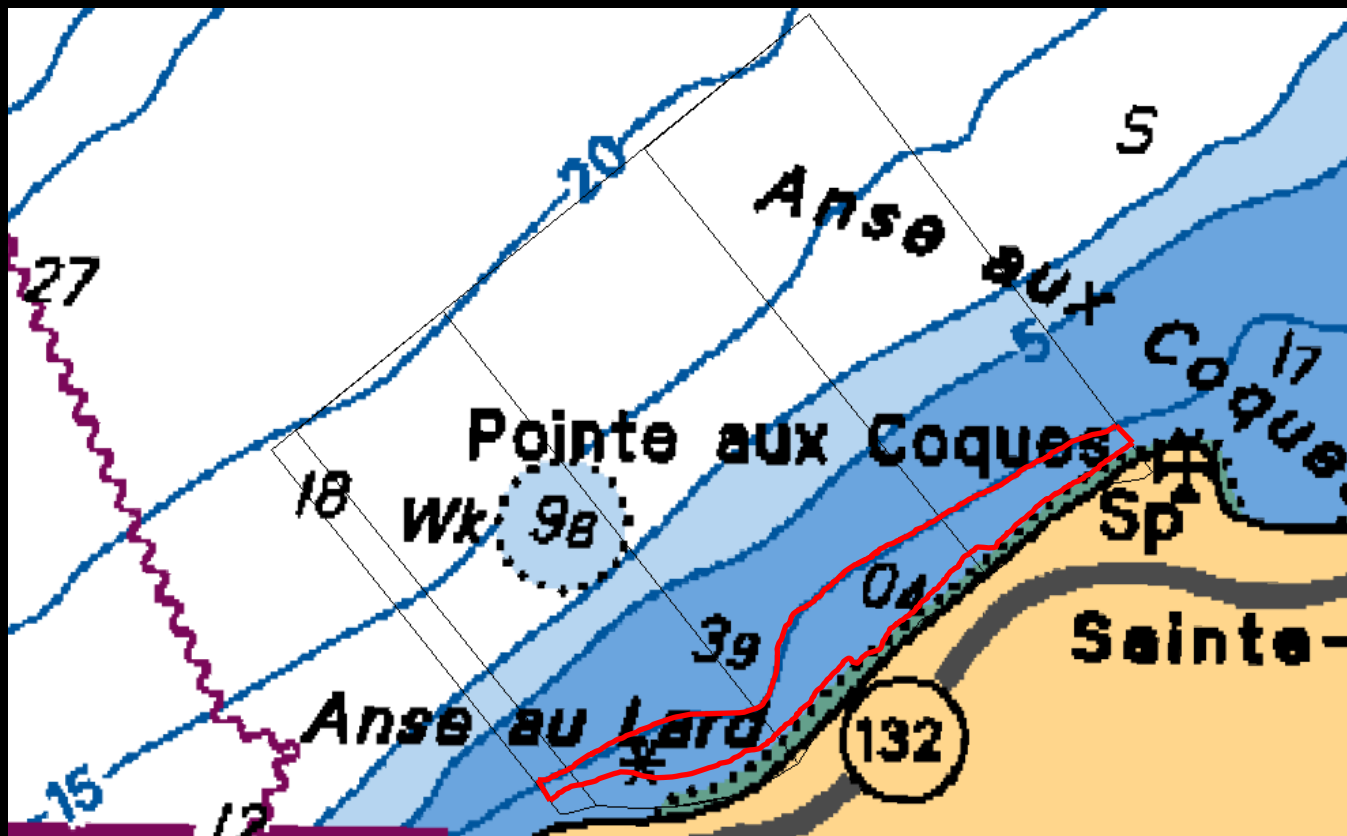
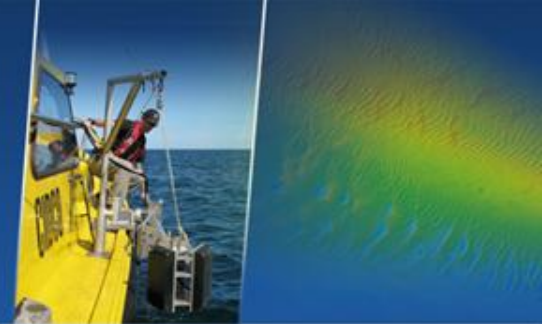
Rosco (FIT, Etats-Unis)

Sensibilité aux obstacles

Couteux, complexe à développer (risque technologique assez fort)



Érosion côtière – levé dans la zone ultra-côtière



20m → 2m (ZC)

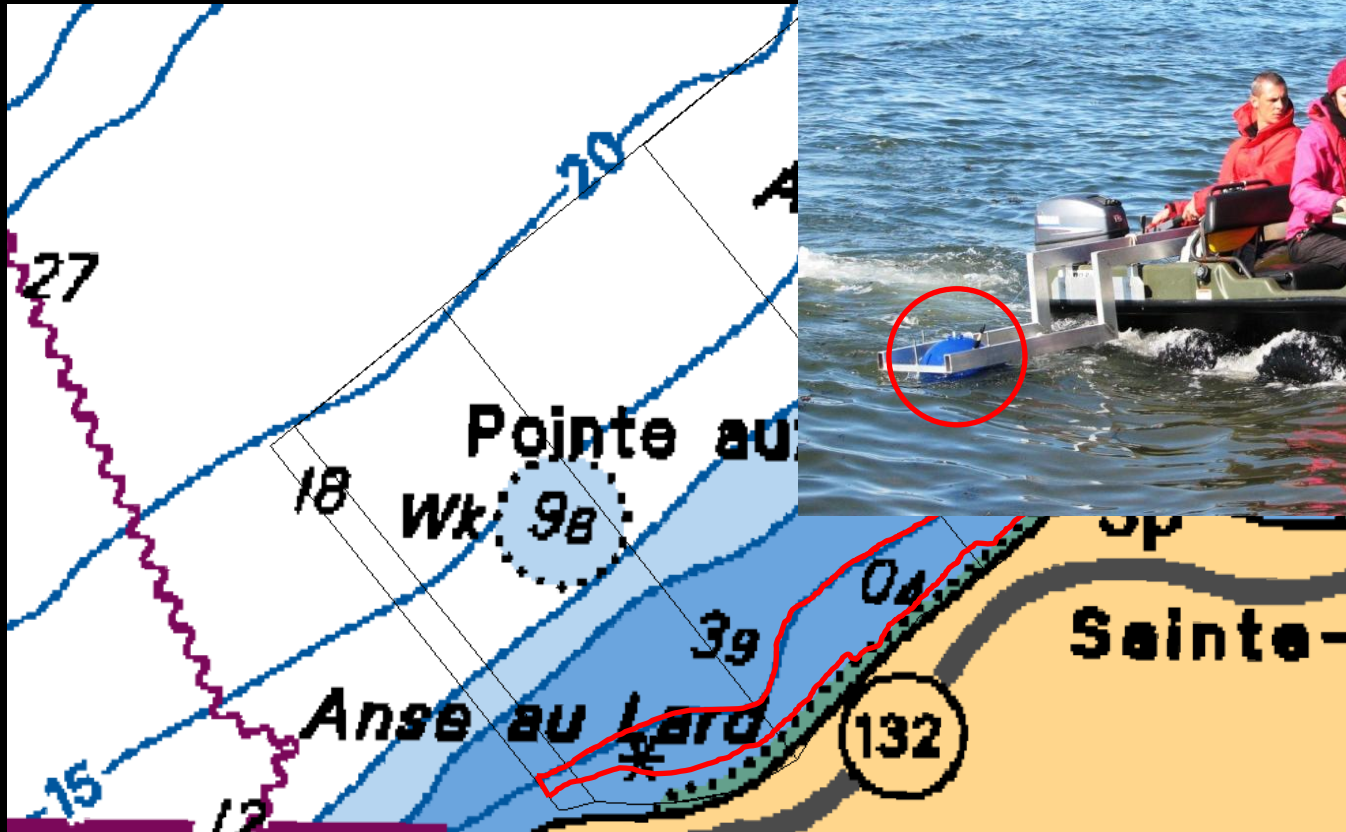
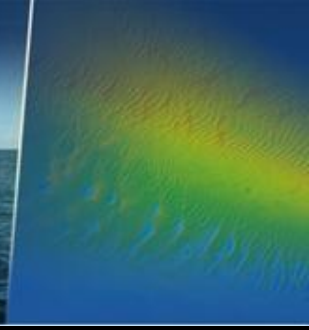


0m → haut de plage (ZC)

2m → 0m (ZC) ?



Érosion côtière – levé dans la zone ultra-côtière

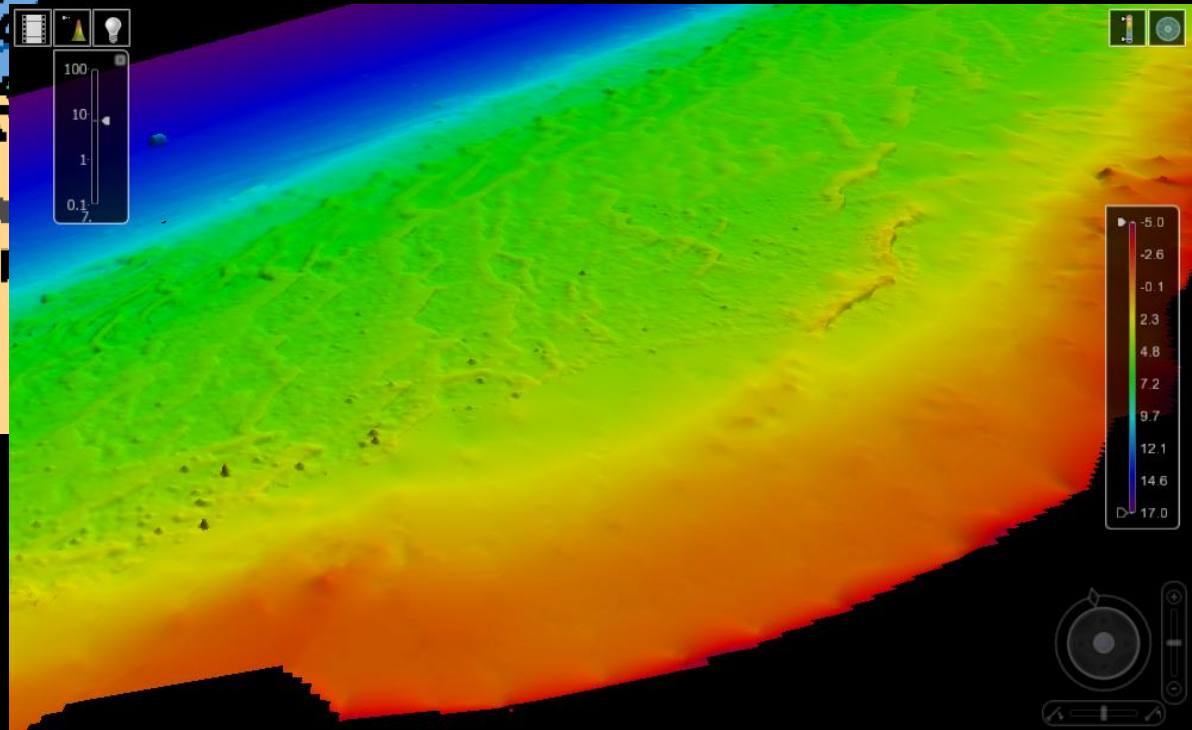
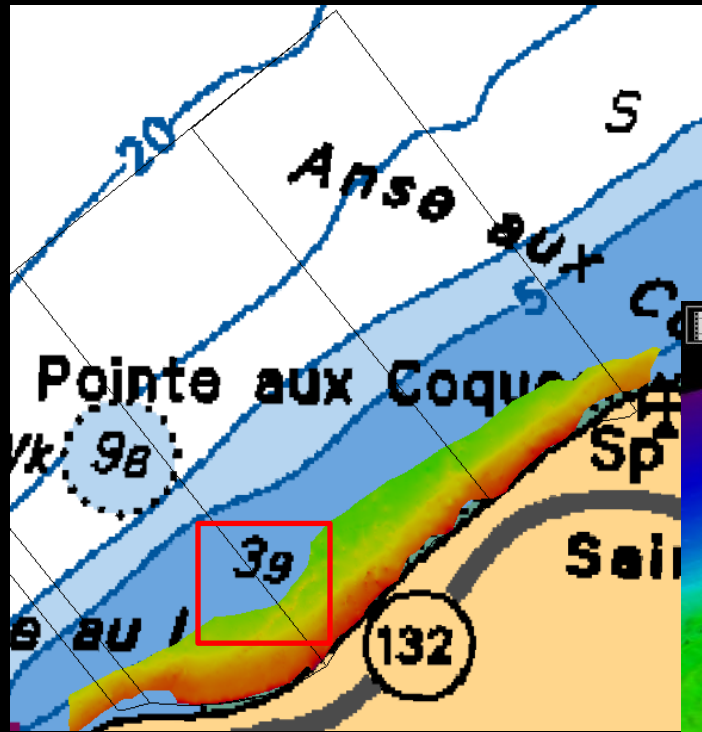
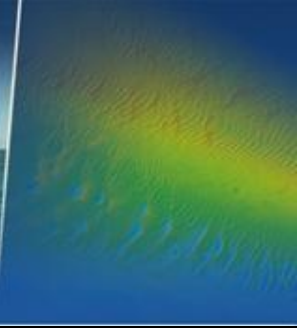


Levé en zone ultra-côtière



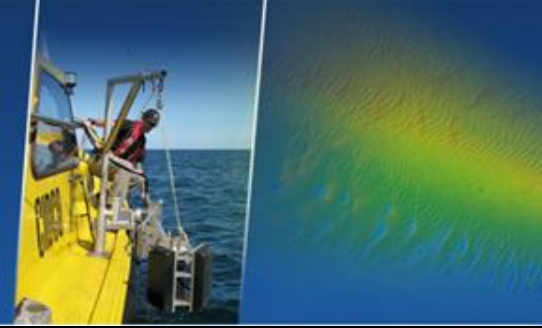


Érosion côtière – levé dans la zone ultra-côtière





Axes de travail



Environnement et sécurité civile

Inspection d'infrastructures submergées

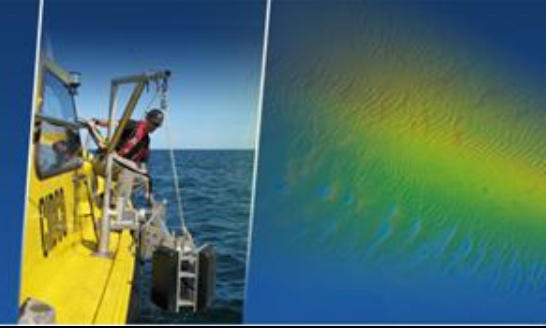
Mariculture

Ressources naturelles et énergies

Milieus non traditionnels



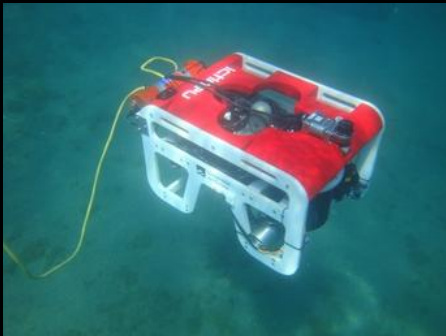
Problématique



Centrale Manic-5. Photo : Hydro-Québec



Scaphandrier (Photo : Hydro-Québec)



Ridao *et al.*



BV5000. (Photo: Teledyne BlueView)



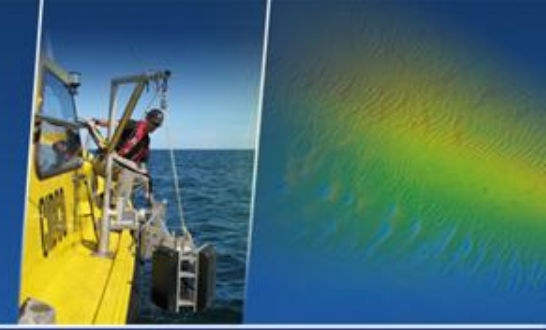
MS1000. (Photo: Kongsberg)



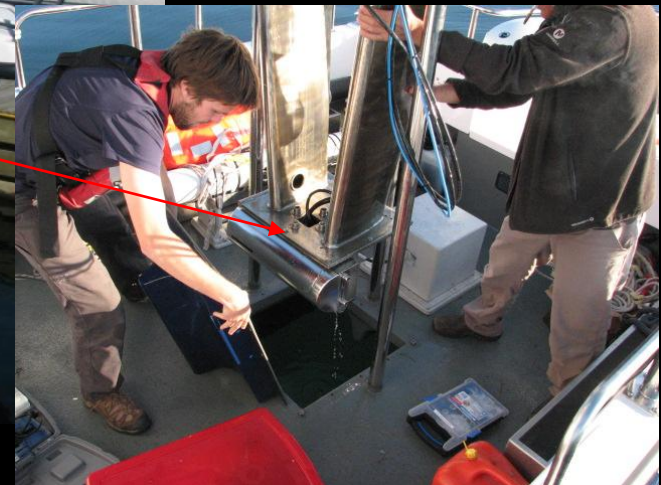
ROV Maski (Photo : Hydro-Québec)



Systeme de levé sonar/LiDAR



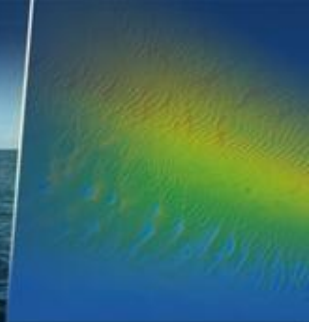
Vedette hydrographique F.-J.- Saucier



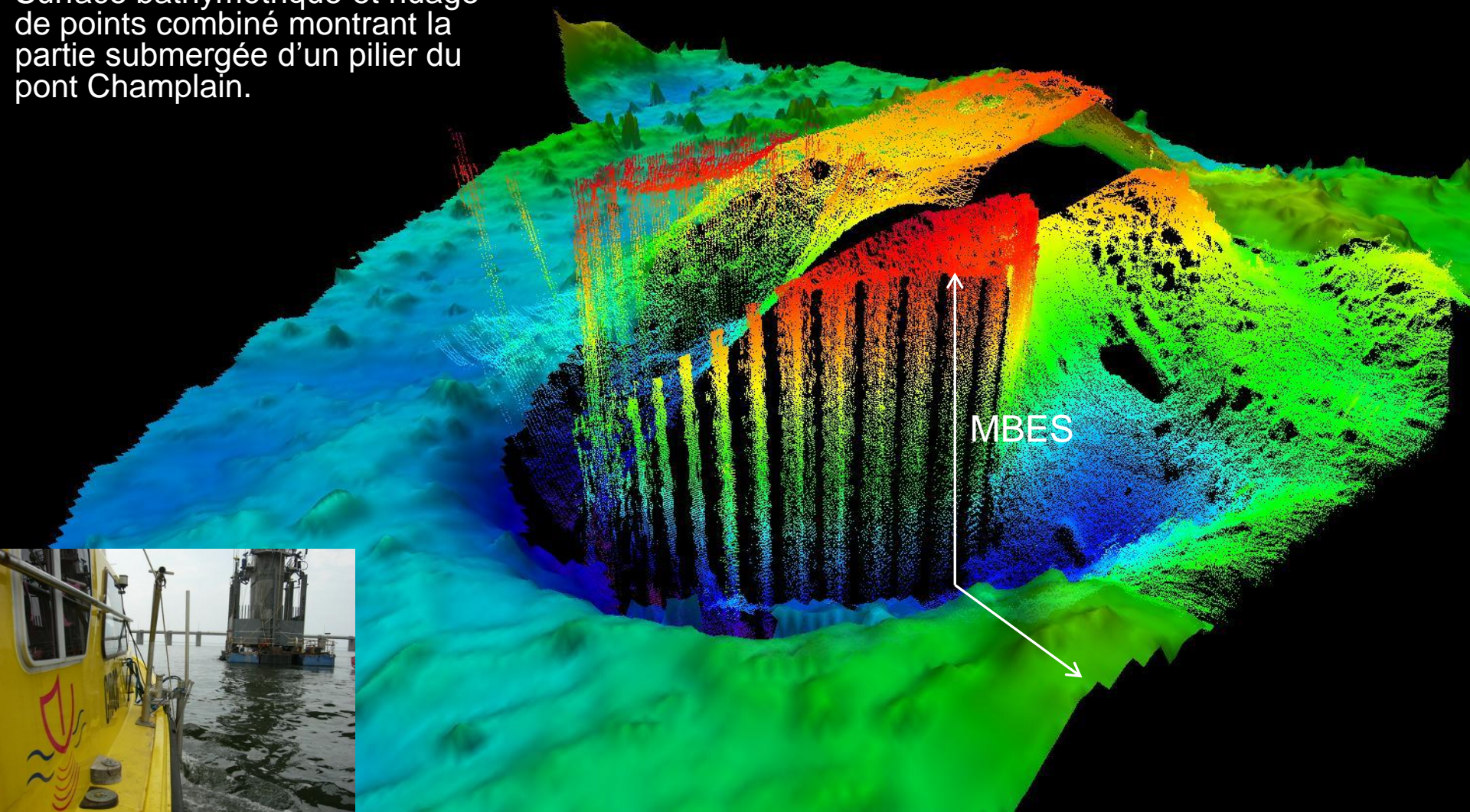
Multifaisceau Reson Seabat 7125
SV à 40 degrés



Produit : Piliers de pont

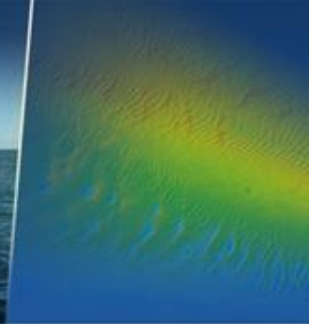


Surface bathymétrique et nuage de points combiné montrant la partie submergée d'un pilier du pont Champlain.

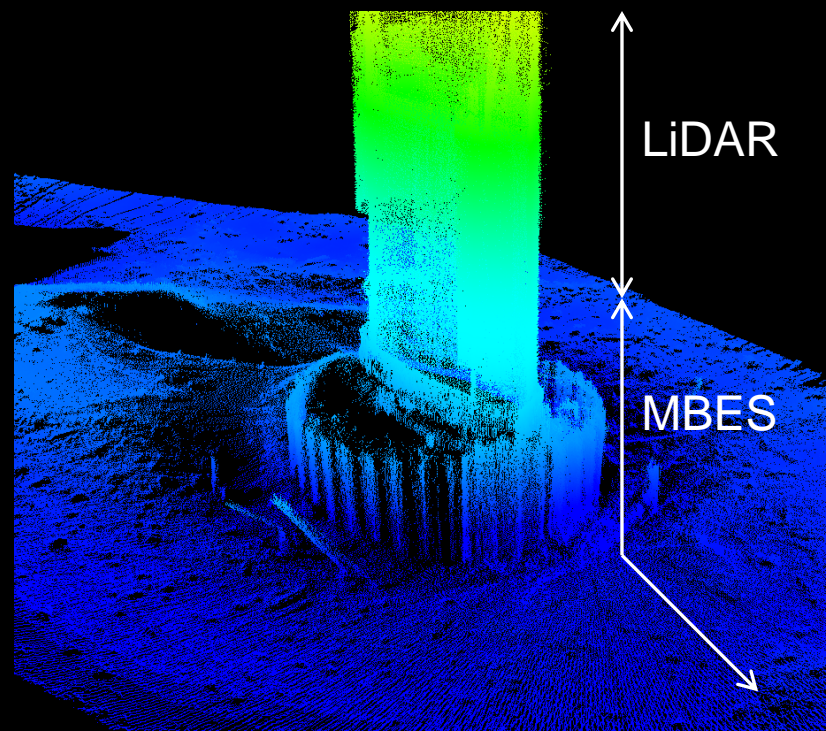
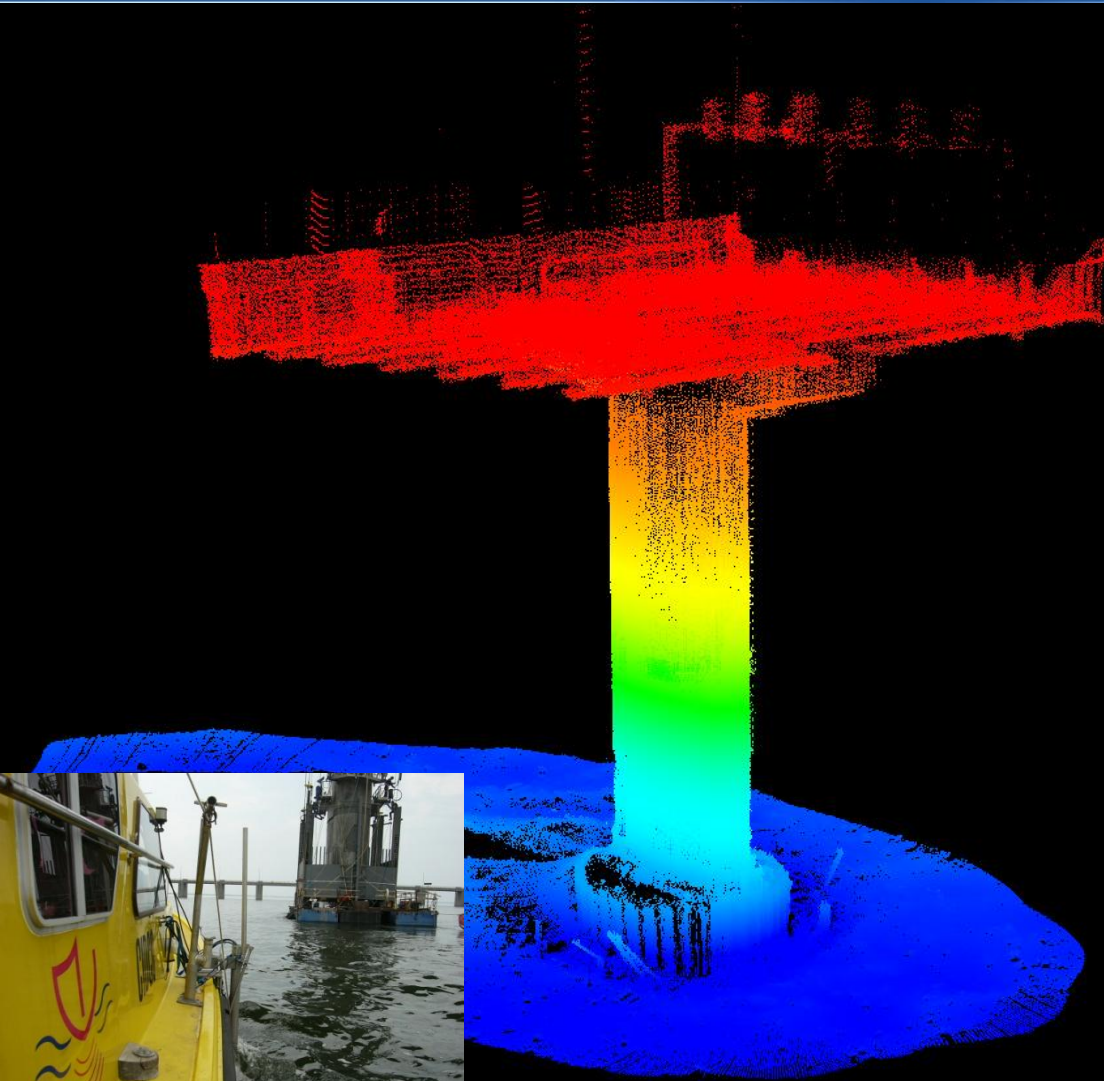




Produit : Piliers de pont

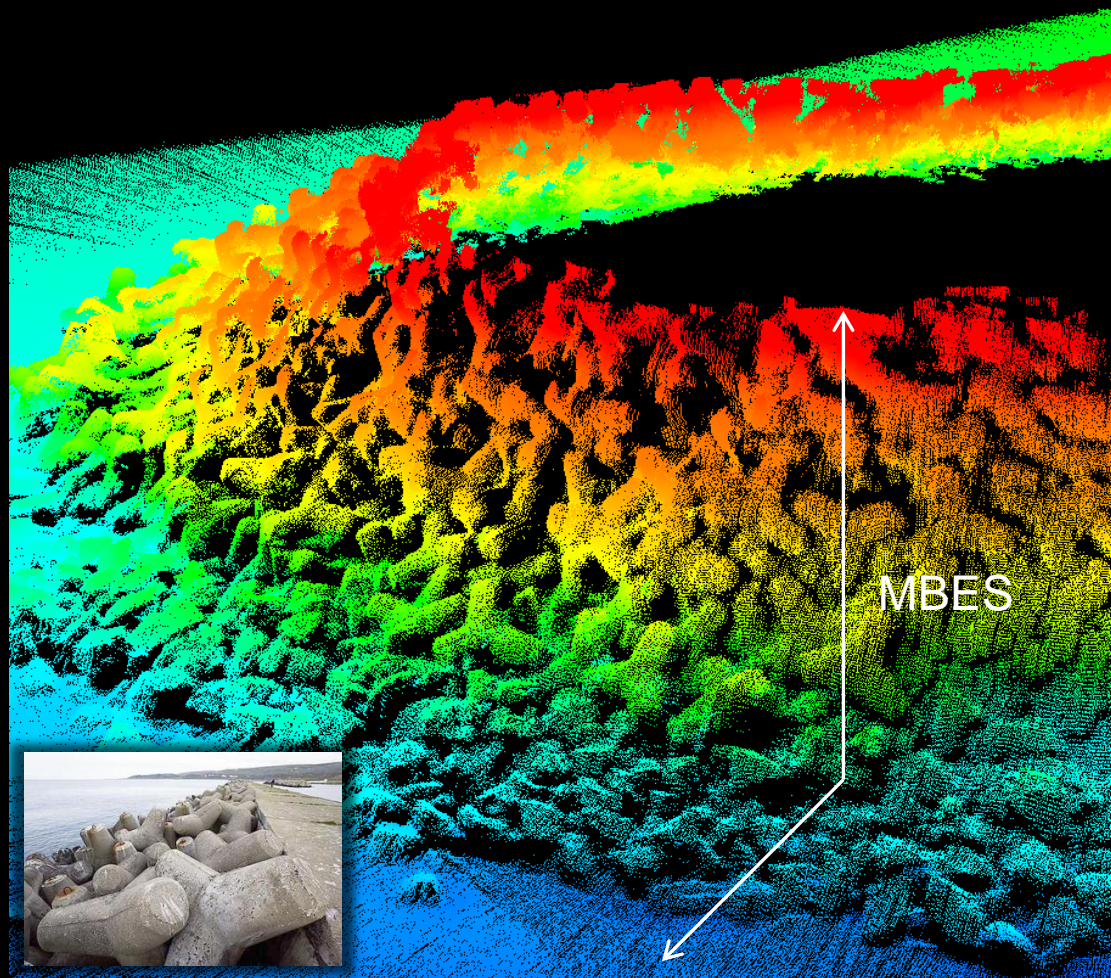
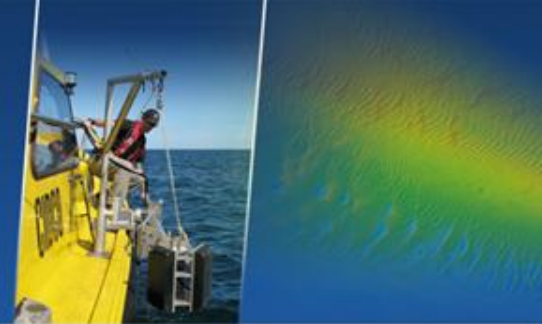


Nuage de points combinée sonar-lidar montrant la structure complète d'un pilier du pont Champlain, Montréal.





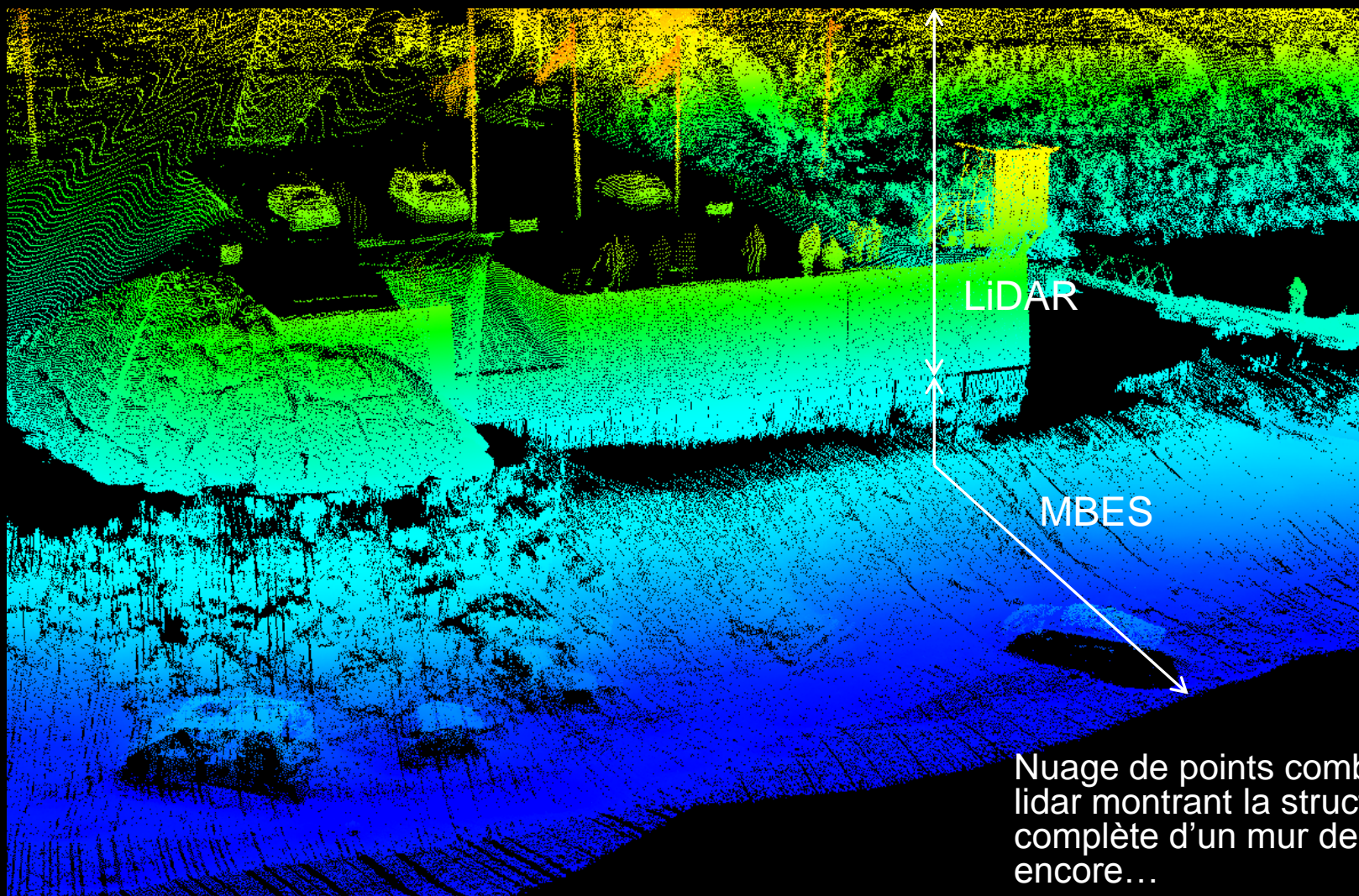
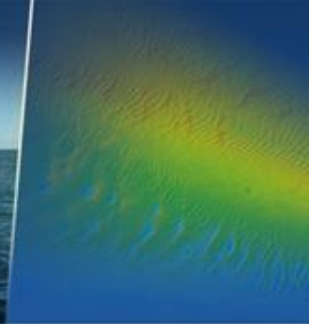
Produit : Brise-lame



Nuage de points montrant
la partie submergée d'un
brise-lame



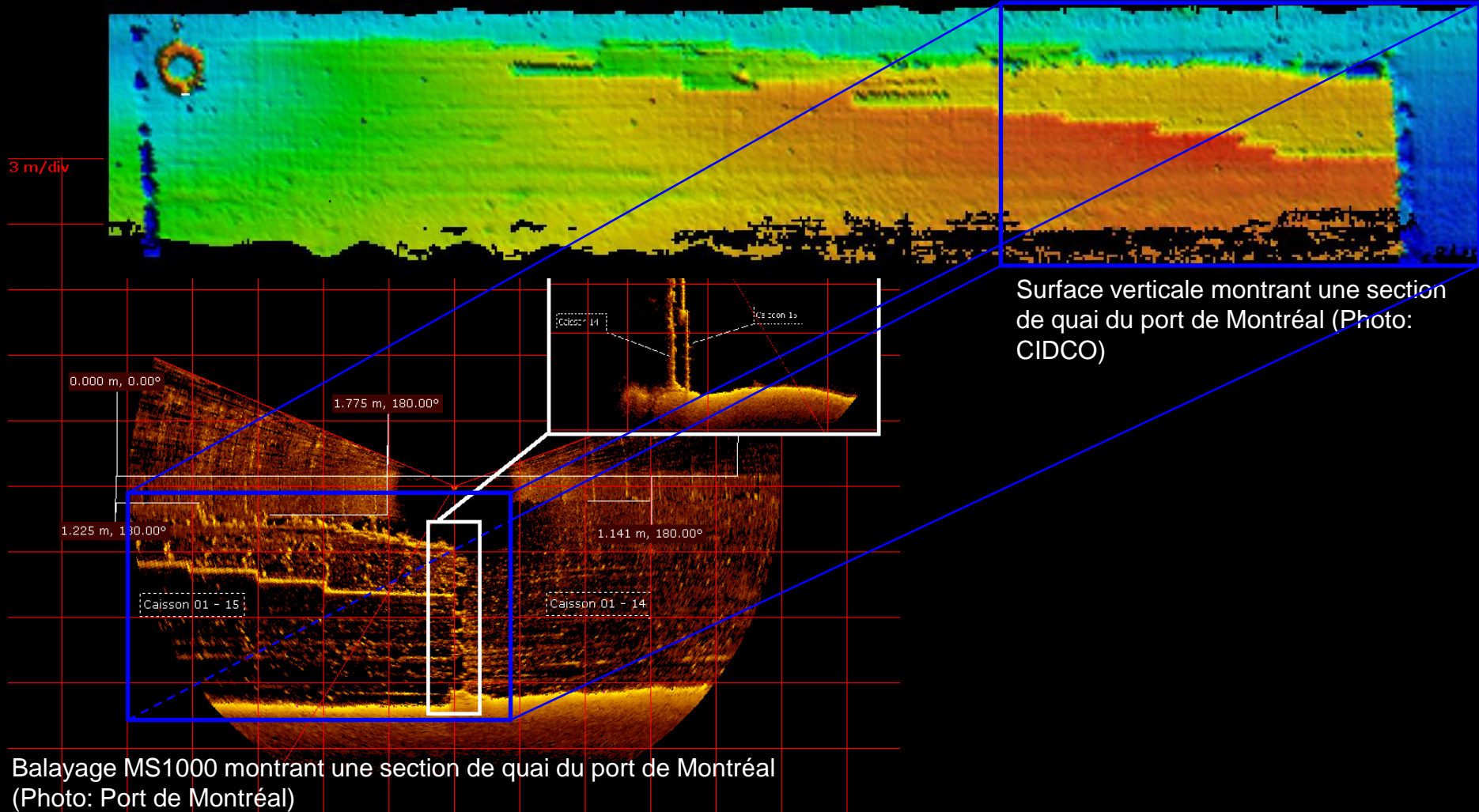
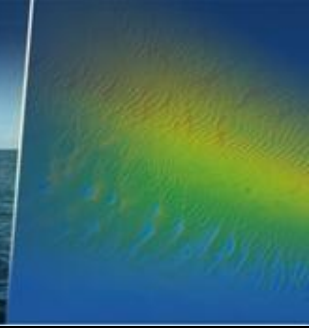
Produit : Mur de quai



Nuage de points combinée sonar-
lidar montrant la structure
complète d'un mur de quai et plus
encore...

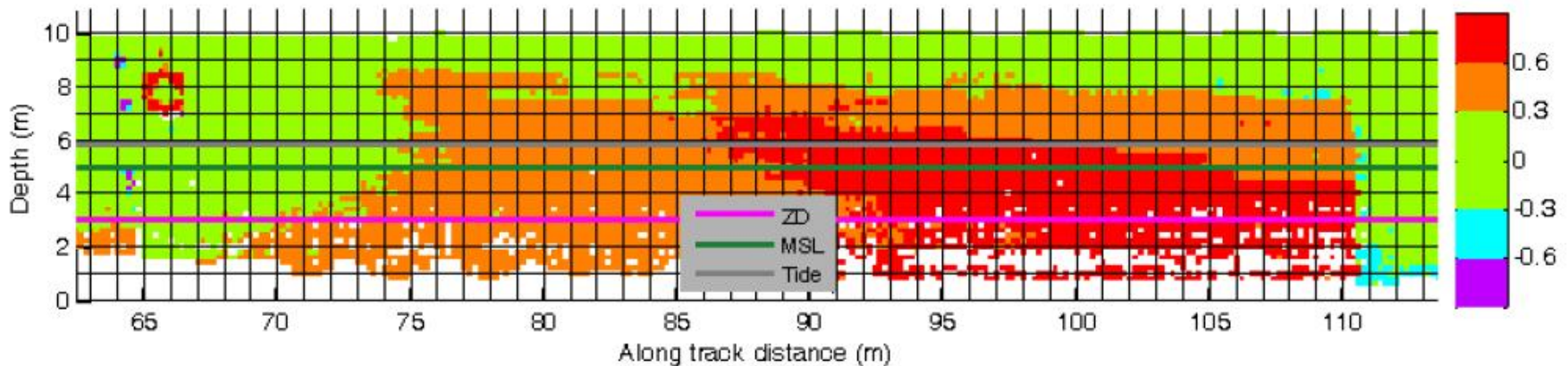
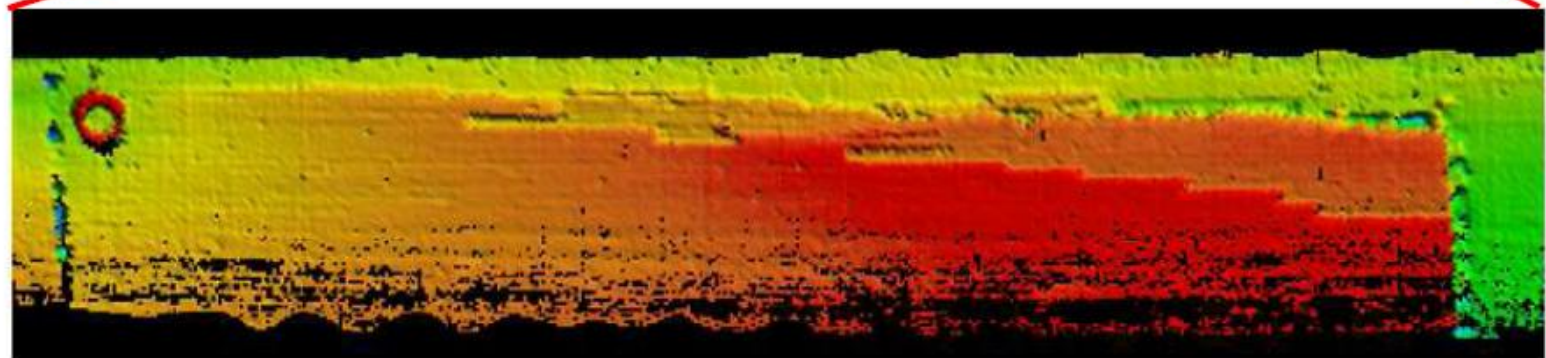
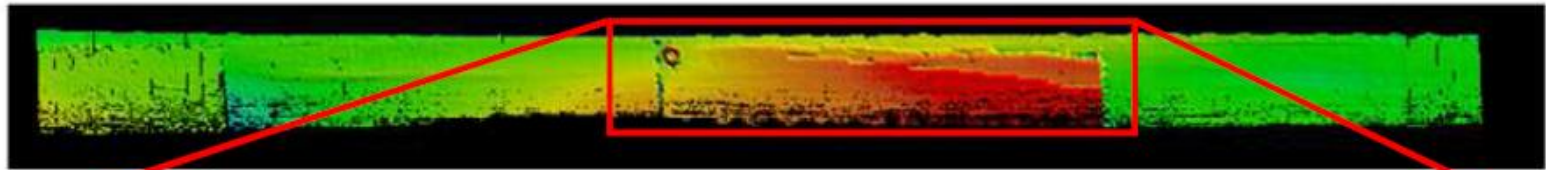
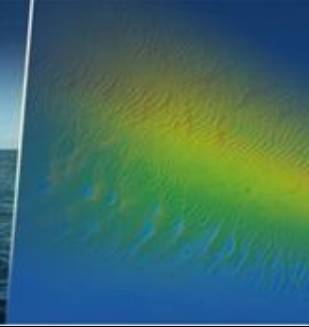


Produit : Surface verticale vs. image acoustique



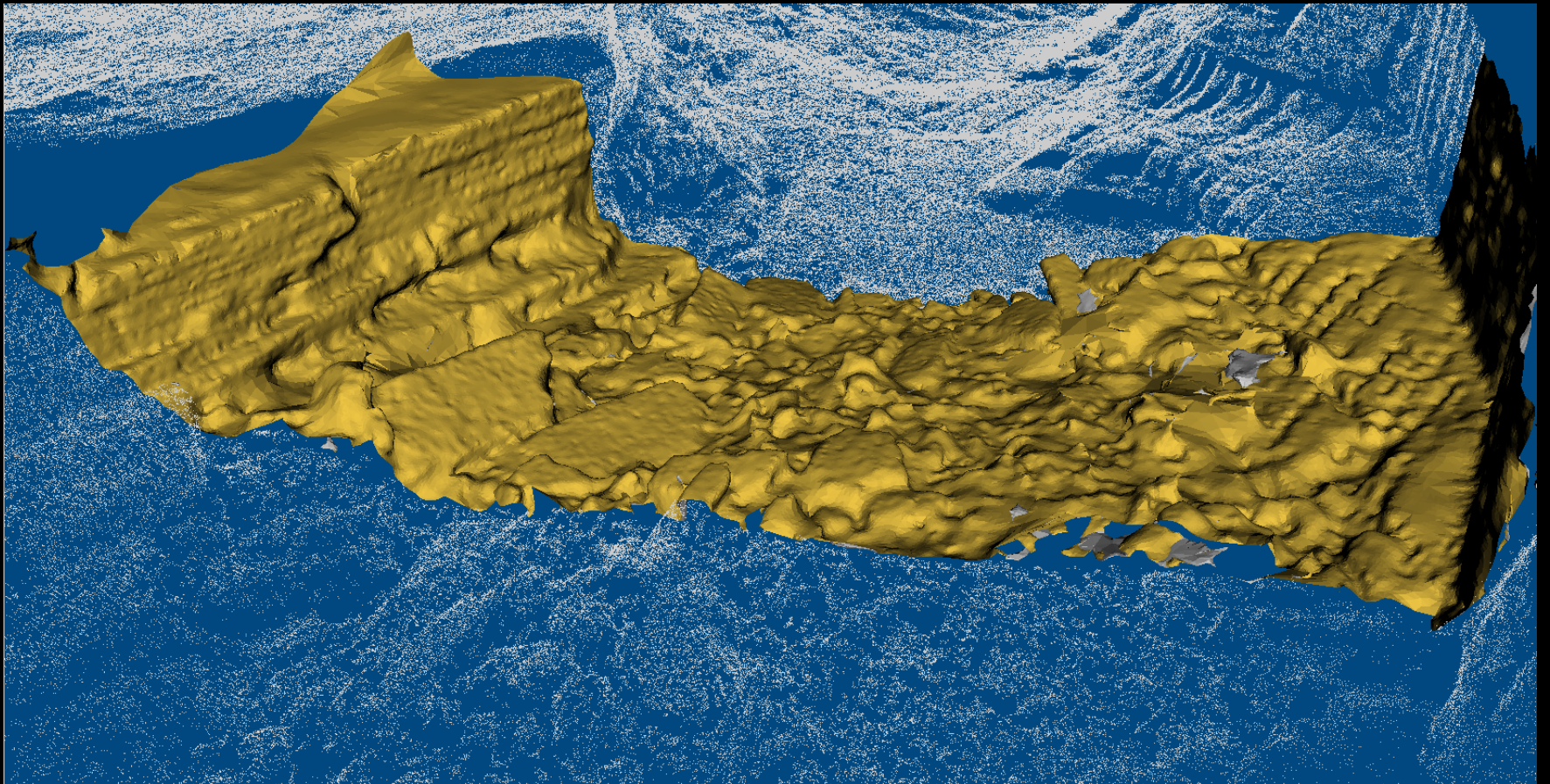
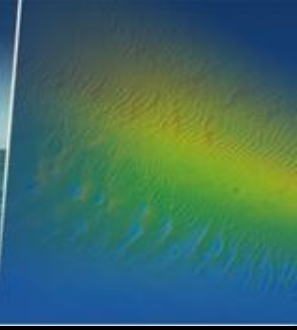


Produit : Surface verticale carte de déformation



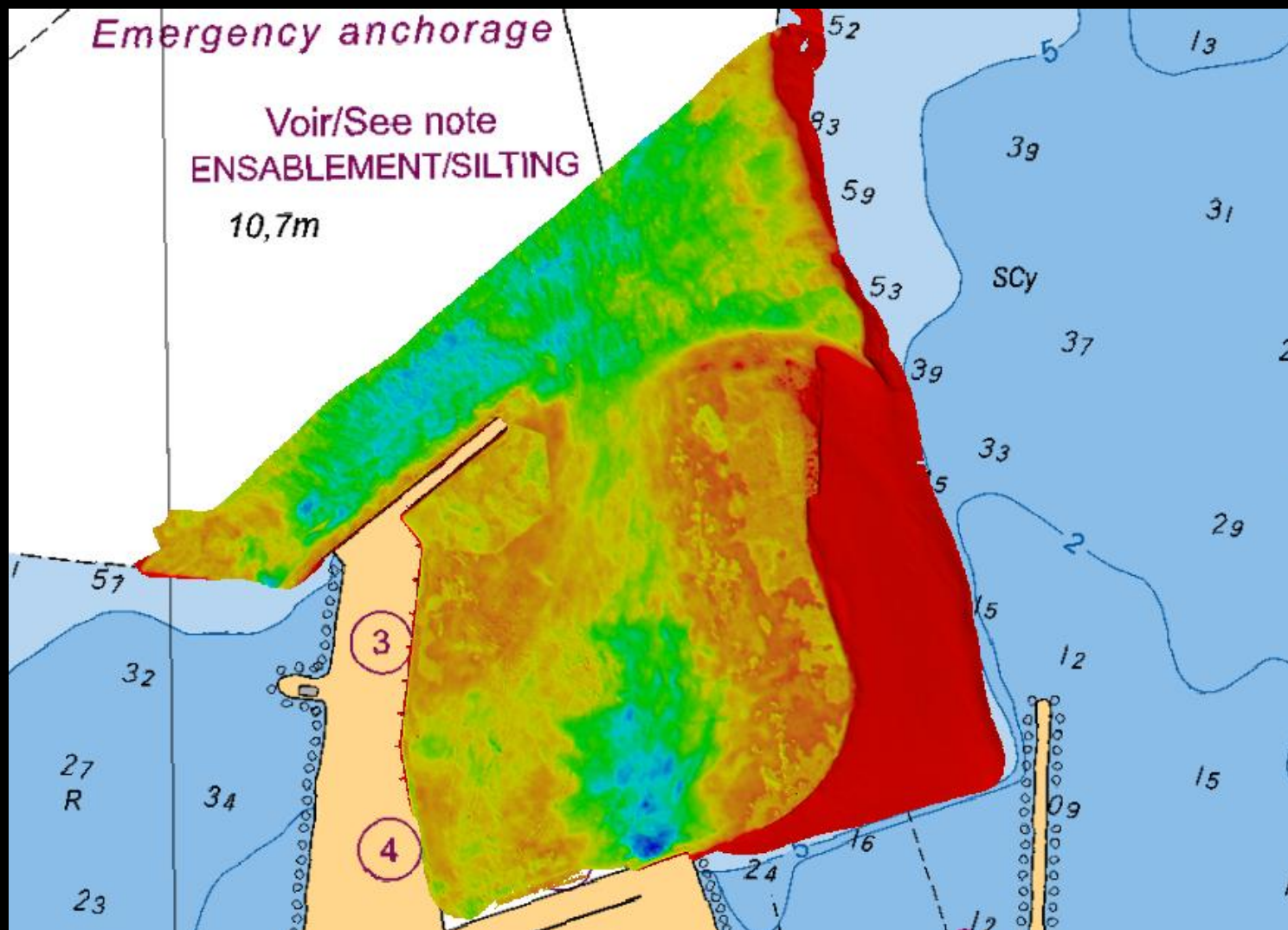
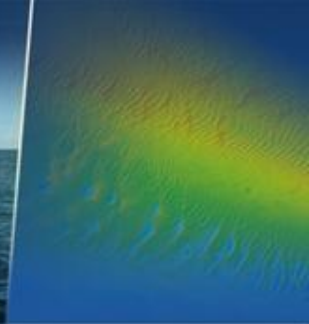


Produit : TIN



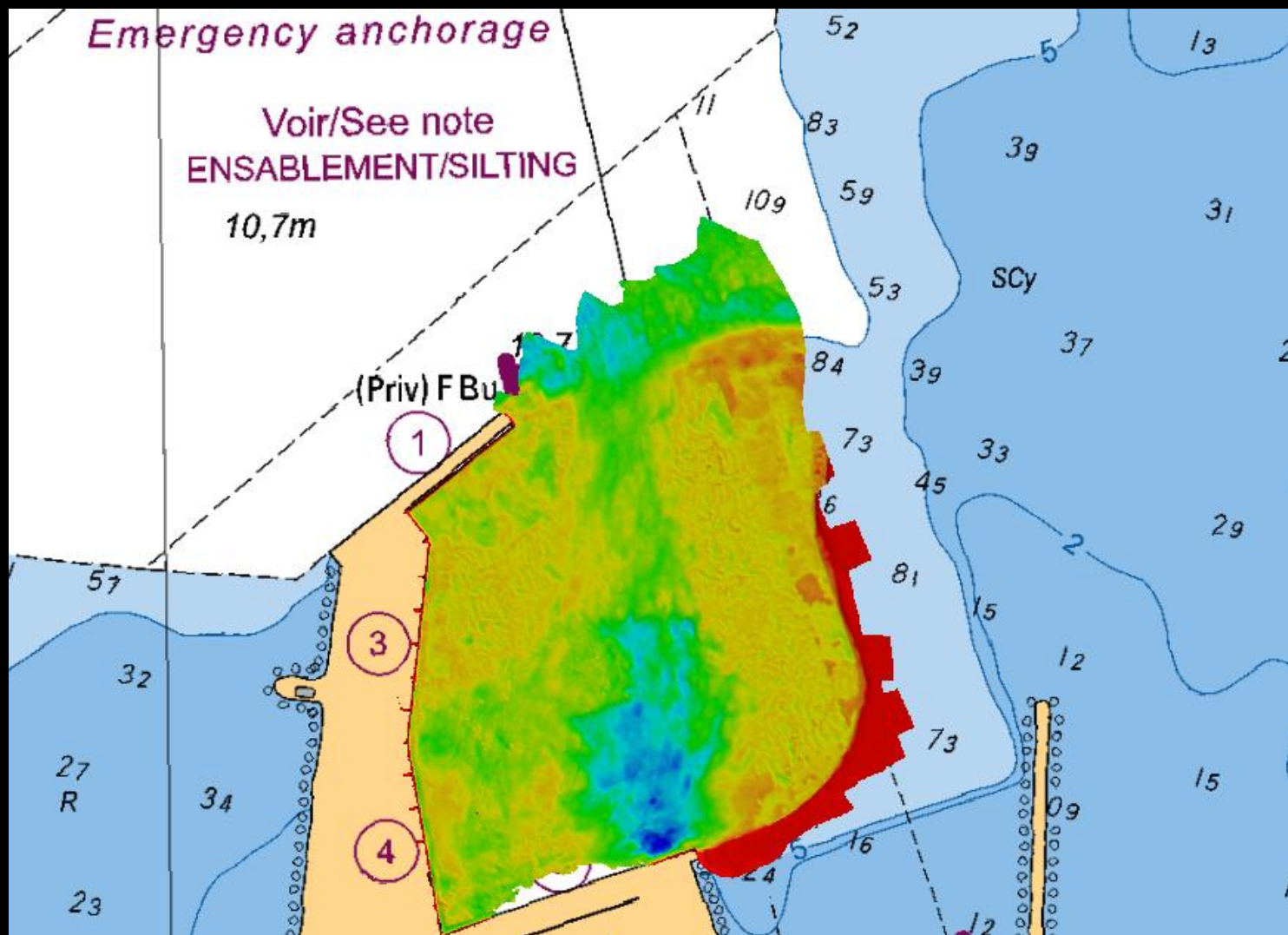
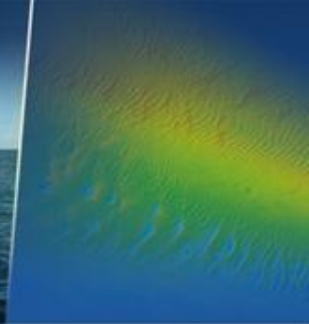


Dragage / Port de Bécancour (Phase I)



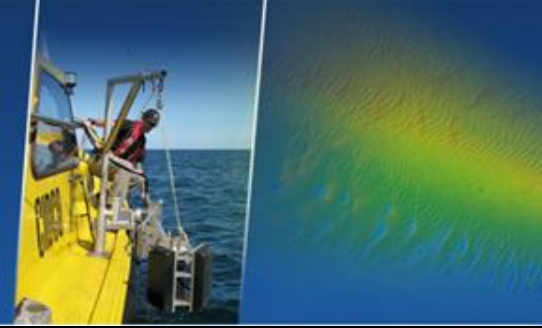


Dragage / Port de Bécancour (Phase III)





Axes de travail



Environnement et sécurité civile

Inspection d'infrastructures submergées

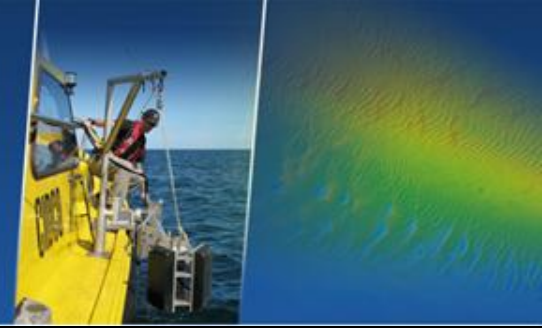
Mariculture

Ressources naturelles et énergies

Milieux non traditionnels



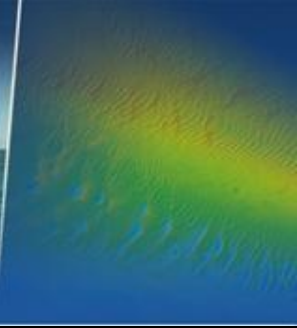
Classification de fonds (algues)



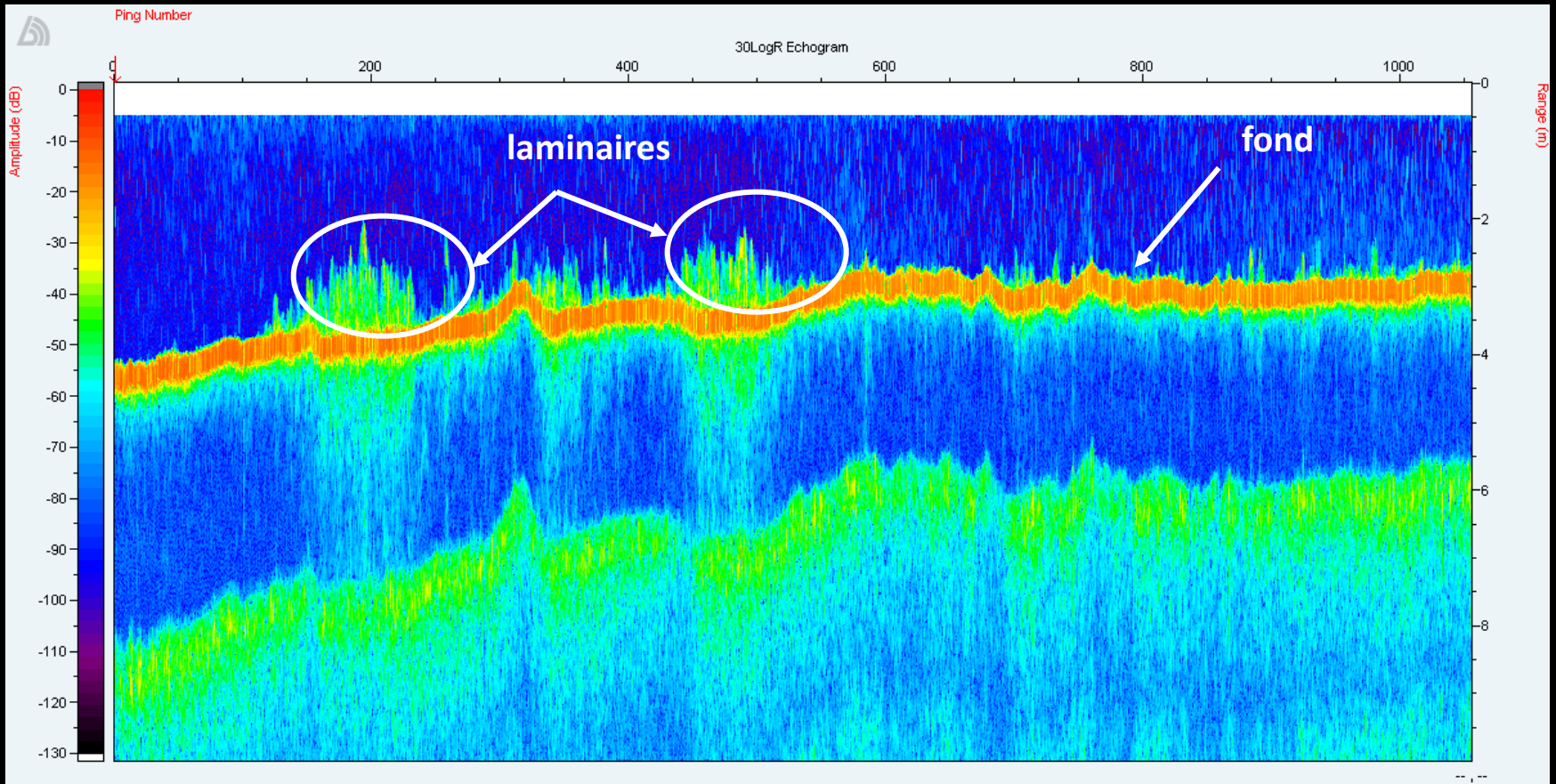
- Objectif
 - Développer une méthodologie rapide et précise permettant de cartographier et d'estimer la biomasse des bancs de laminaires
- Technologies identifiées
 - Échosondeur Biosonics MX Visual Habitat
 - Multifaisceau Reson 7125 SV



Classification de fonds (algues)

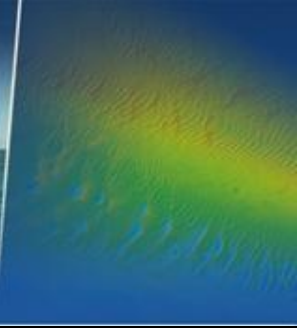


- Biosonics MX

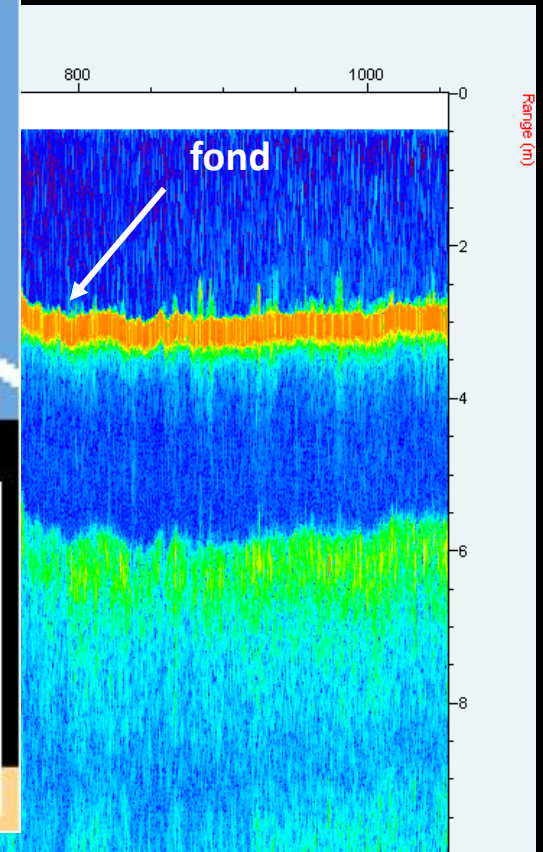
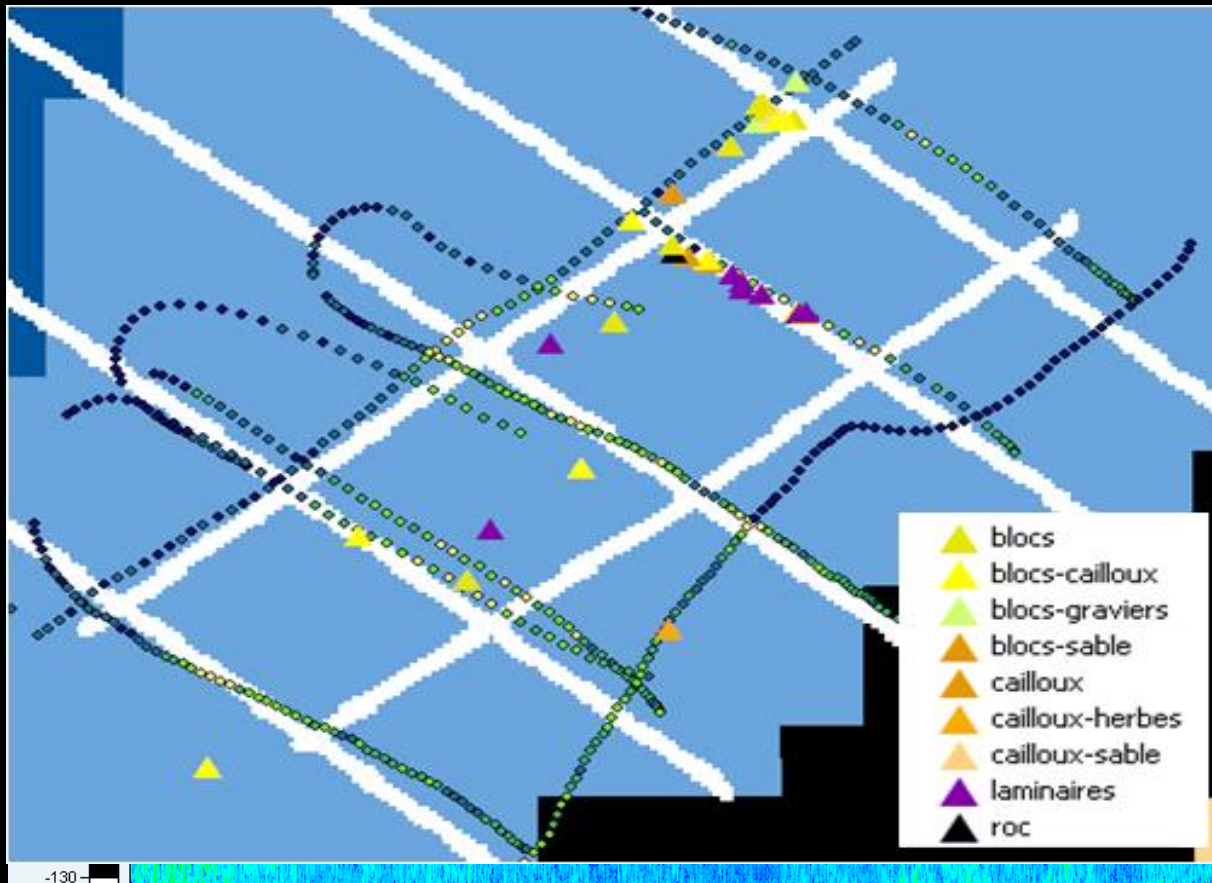




Classification de fonds (algues)

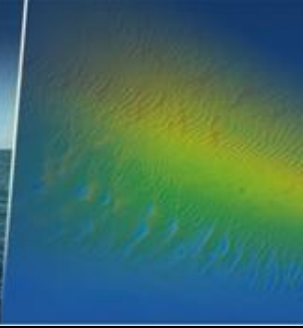


- Biosonics MX

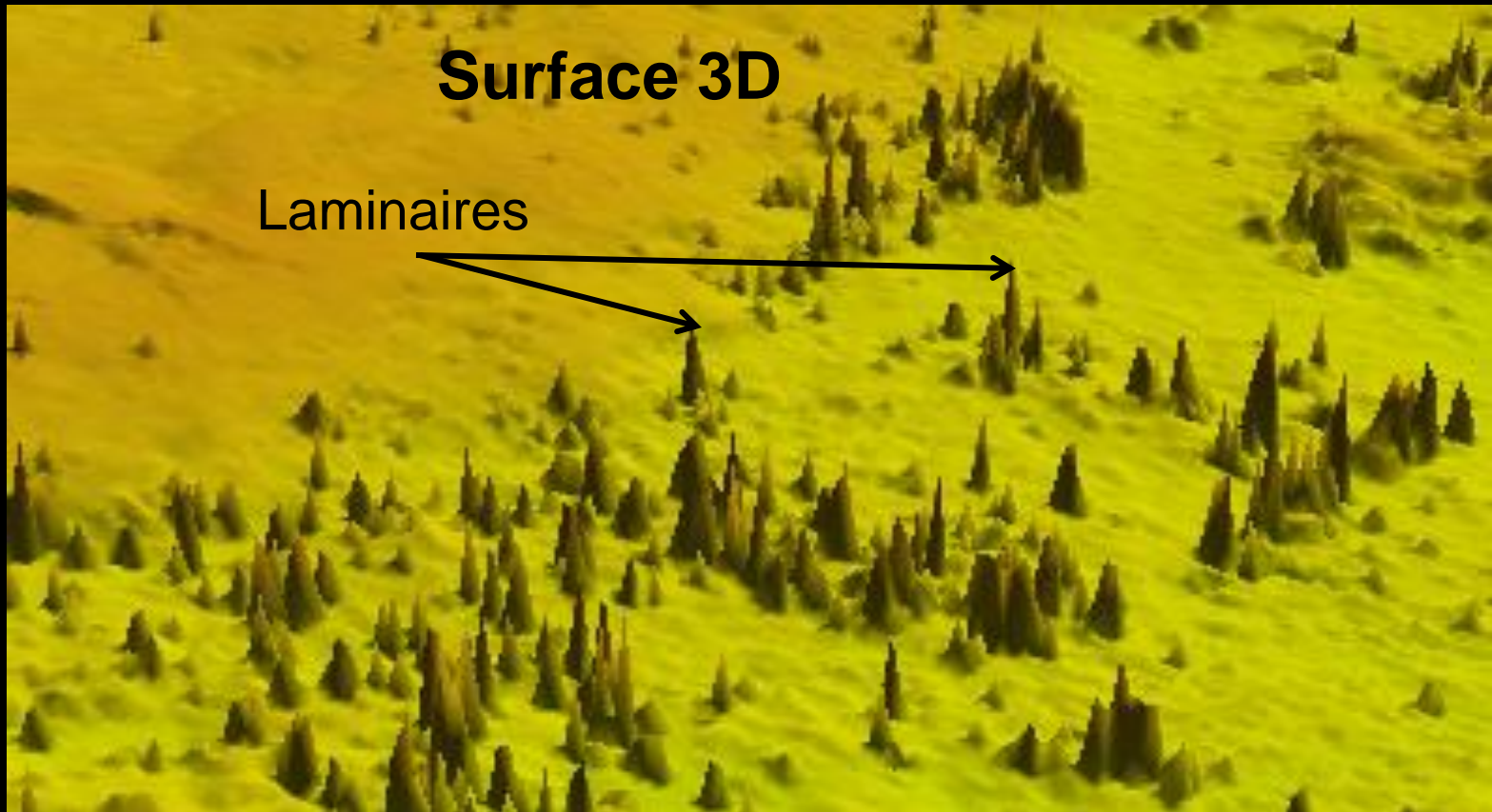




Classification de fonds (algues)



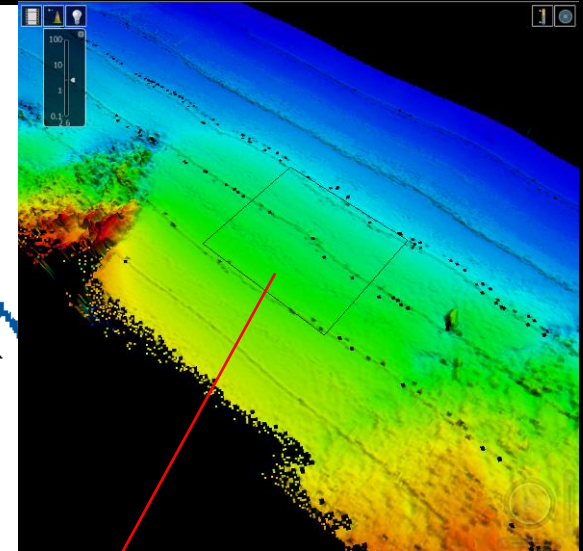
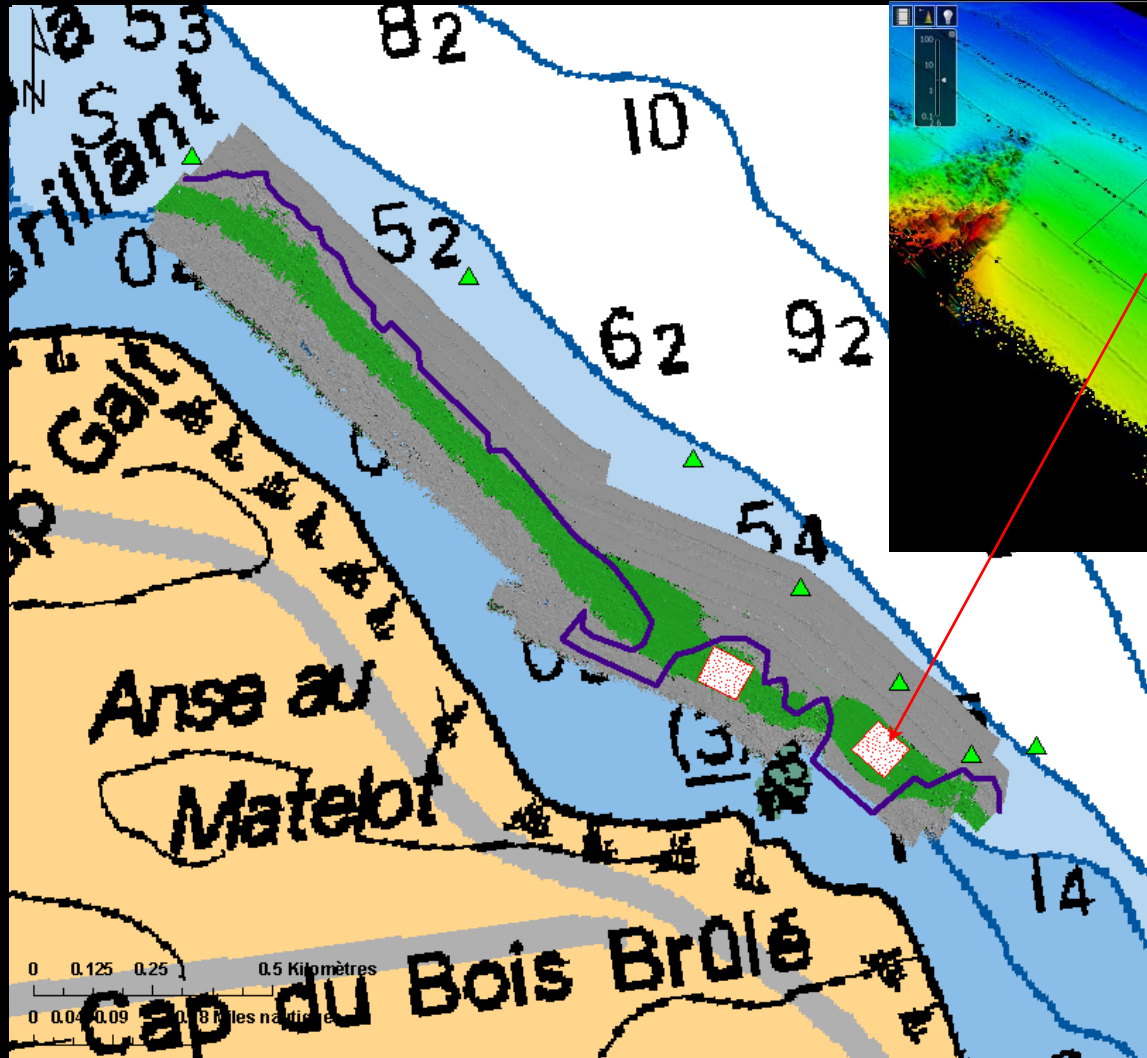
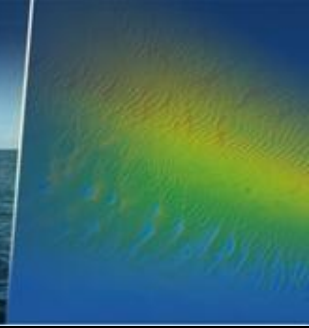
- Reson 7125 SV





Récifs de homard

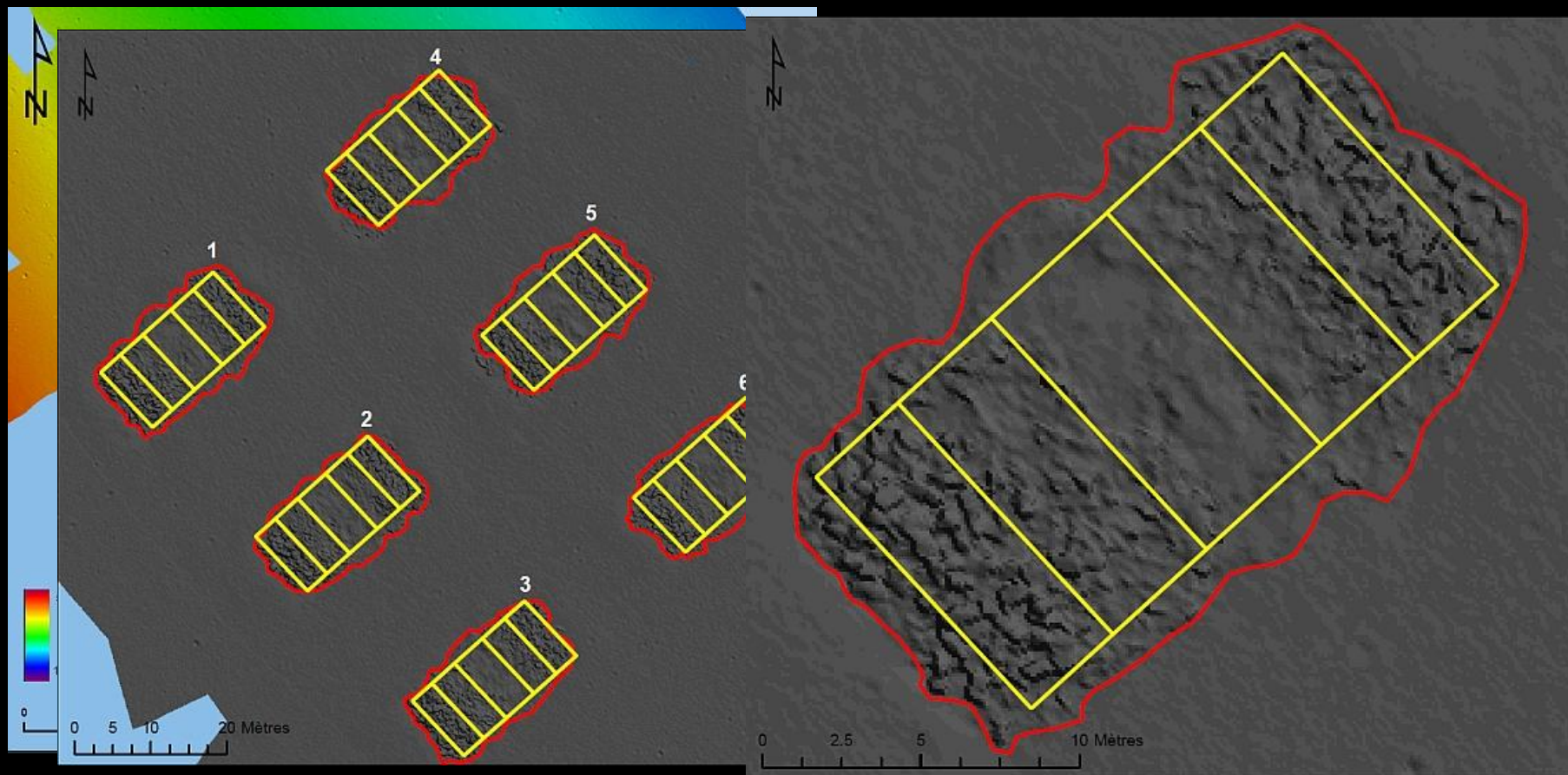
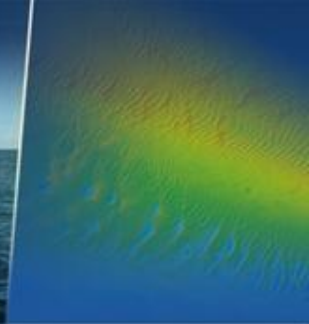
Phase 1 : choix des sites





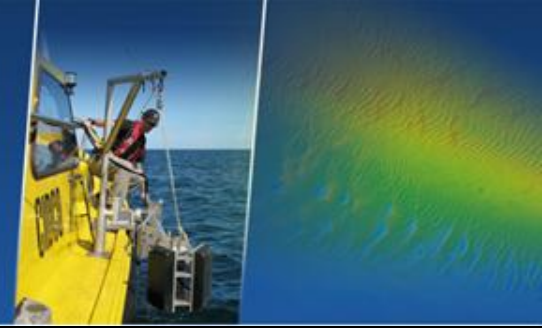
Récifs de homard

Phase 2 : Suivi des installations





Axes de travail



Environnement et sécurité civile

Inspection d'infrastructures submergées

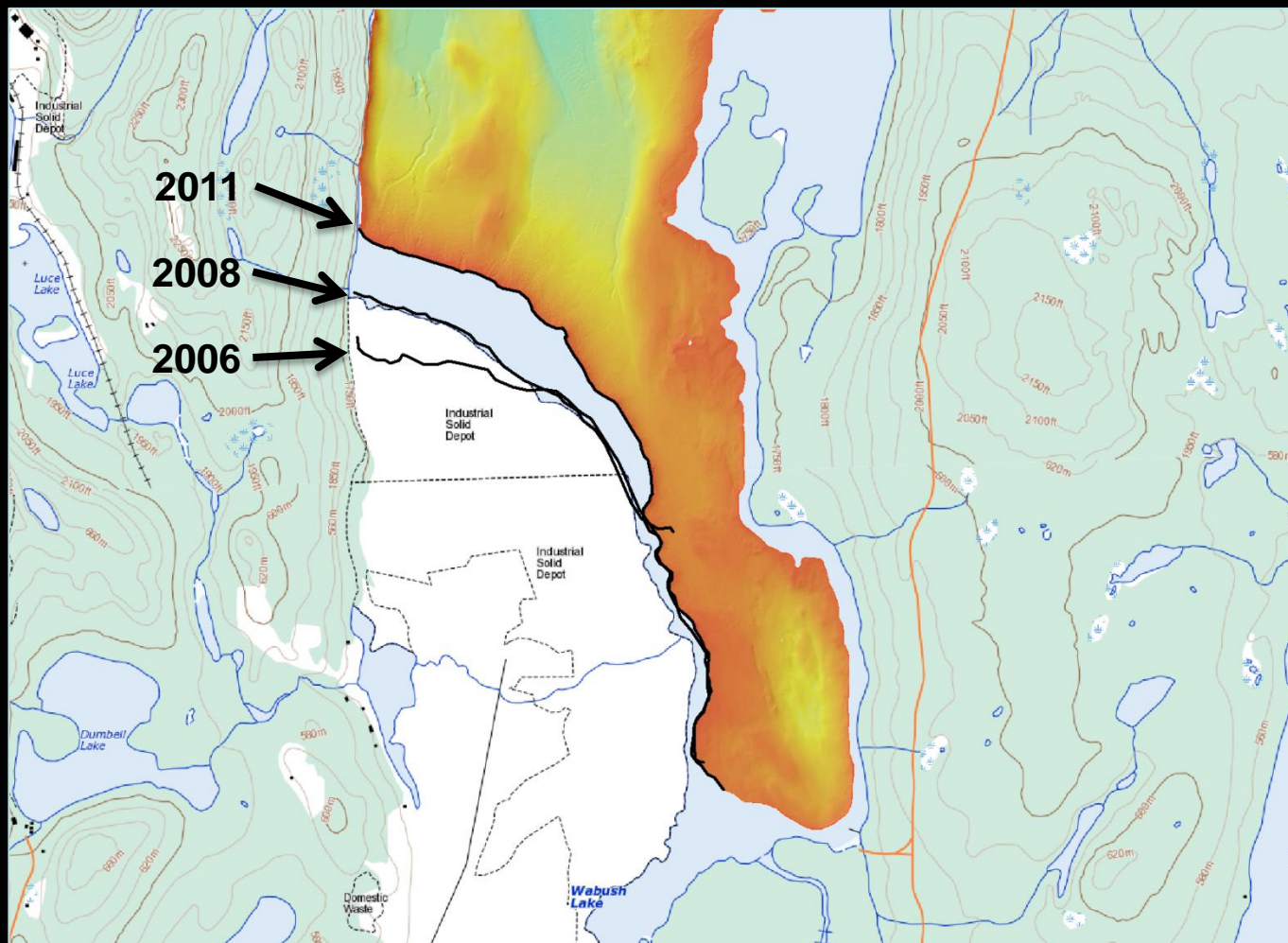
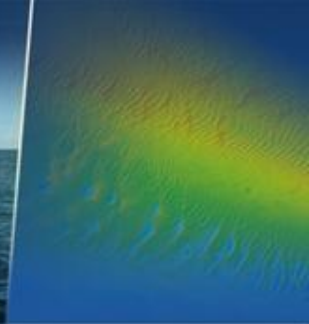
Mariculture

Ressources naturelles et énergies

Milieux non traditionnels

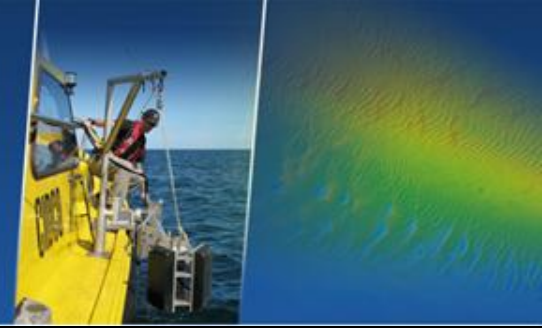


Suivi temporel du bilan sédimentaire d'un lac (mine de fer)





Axes de travail



Environnement et sécurité civile

Inspection d'infrastructures submergées

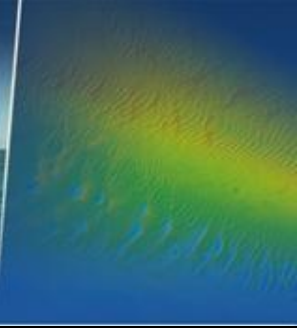
Mariculture

Ressources naturelles et énergies

Milieux non traditionnels



Recherche d'épaves



- Documentaire pour l'émission **Historia** sur les épaves du St Laurent:

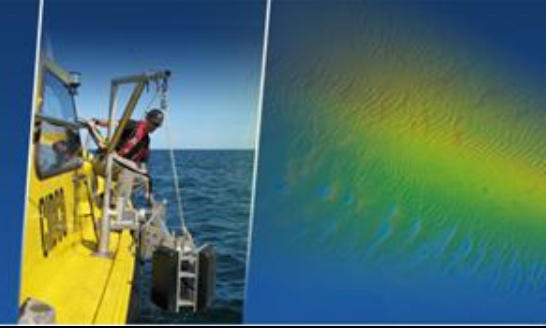


- **Projet Cimetière du St Laurent:**

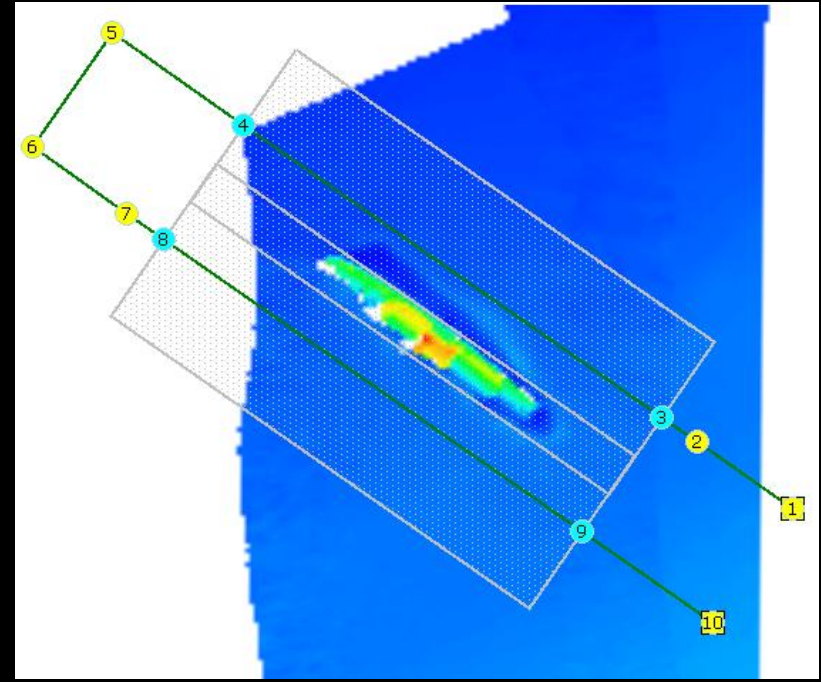
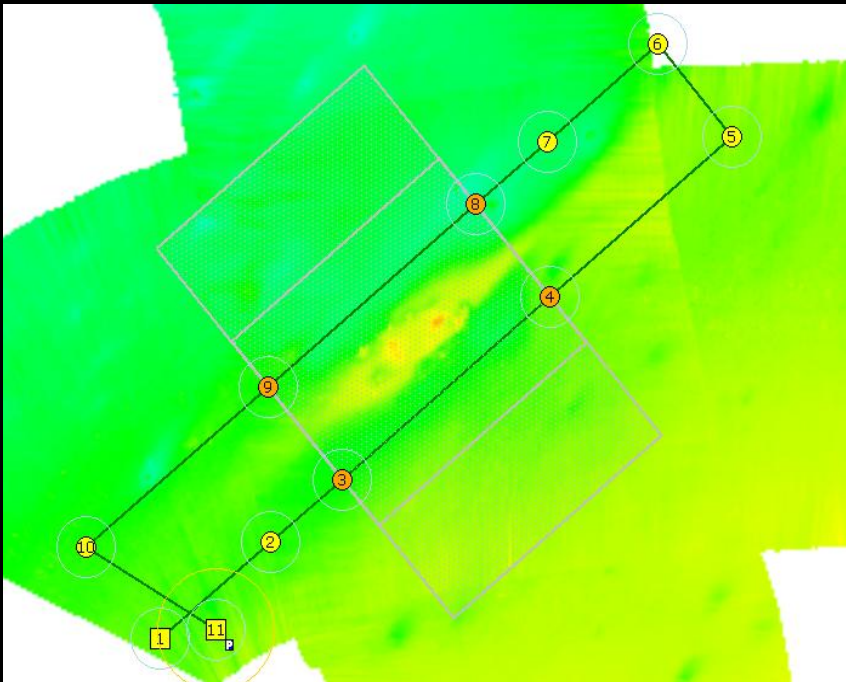




Recherche d'épaves

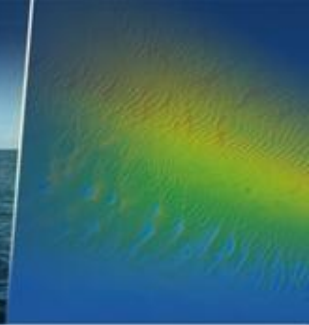


- Passage de reconnaissance au multifaisceau (RESON 7125)
- Planification du trajet AUV optimal pour une résolution maximale de l'épave

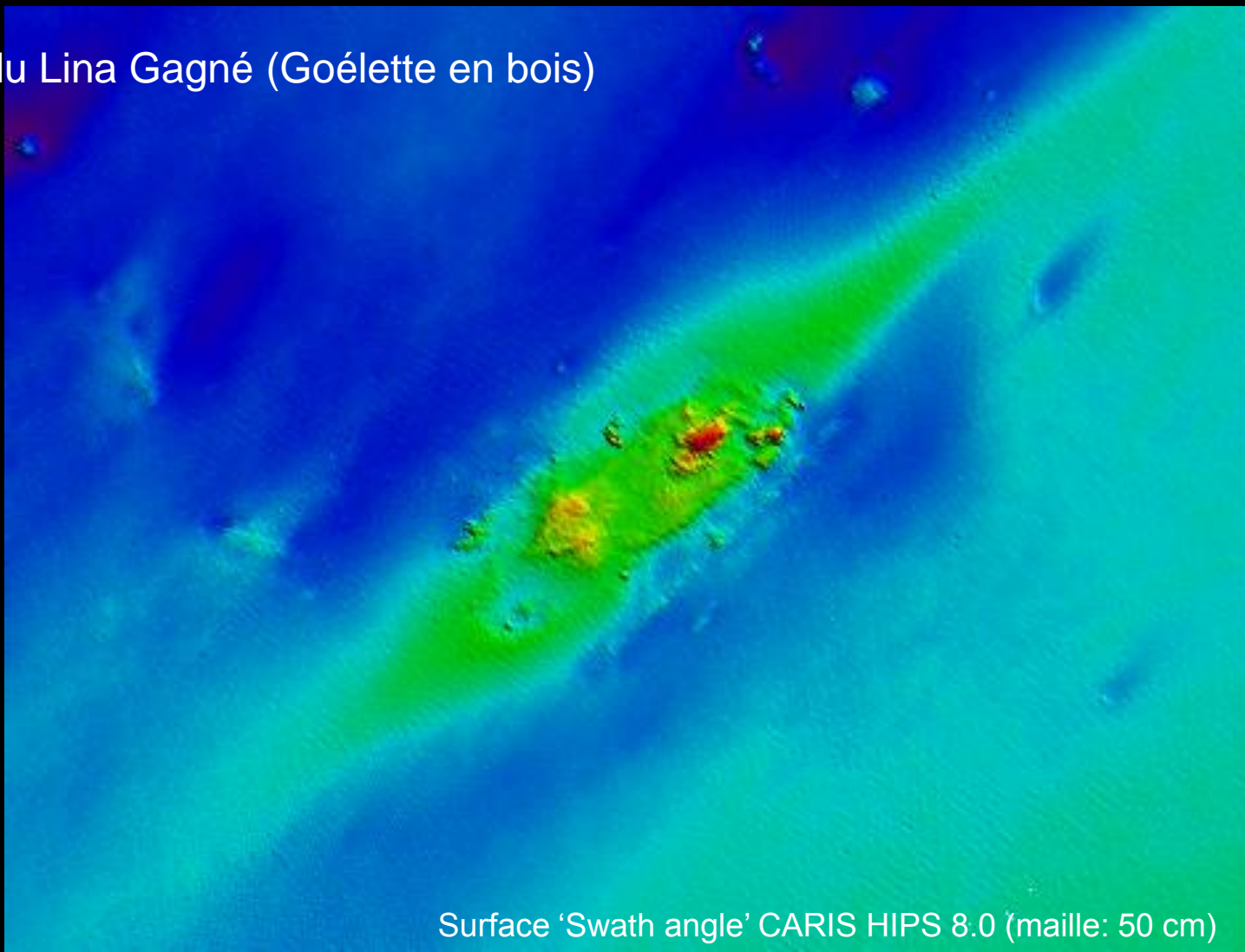




Recherche d'épaves



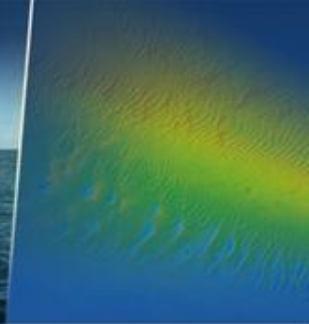
Épave du Lina Gagné (Goélette en bois)



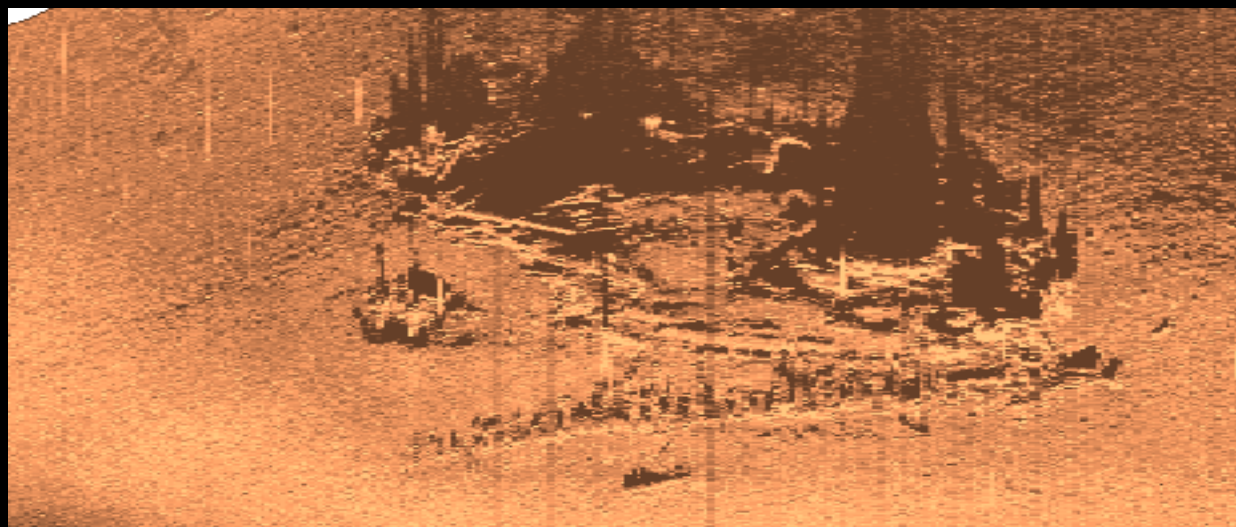
Surface 'Swath angle' CARIS HIPS 8.0 (maille: 50 cm)



Recherche d'épaves

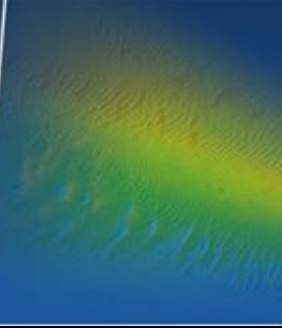


AUV IVER-2

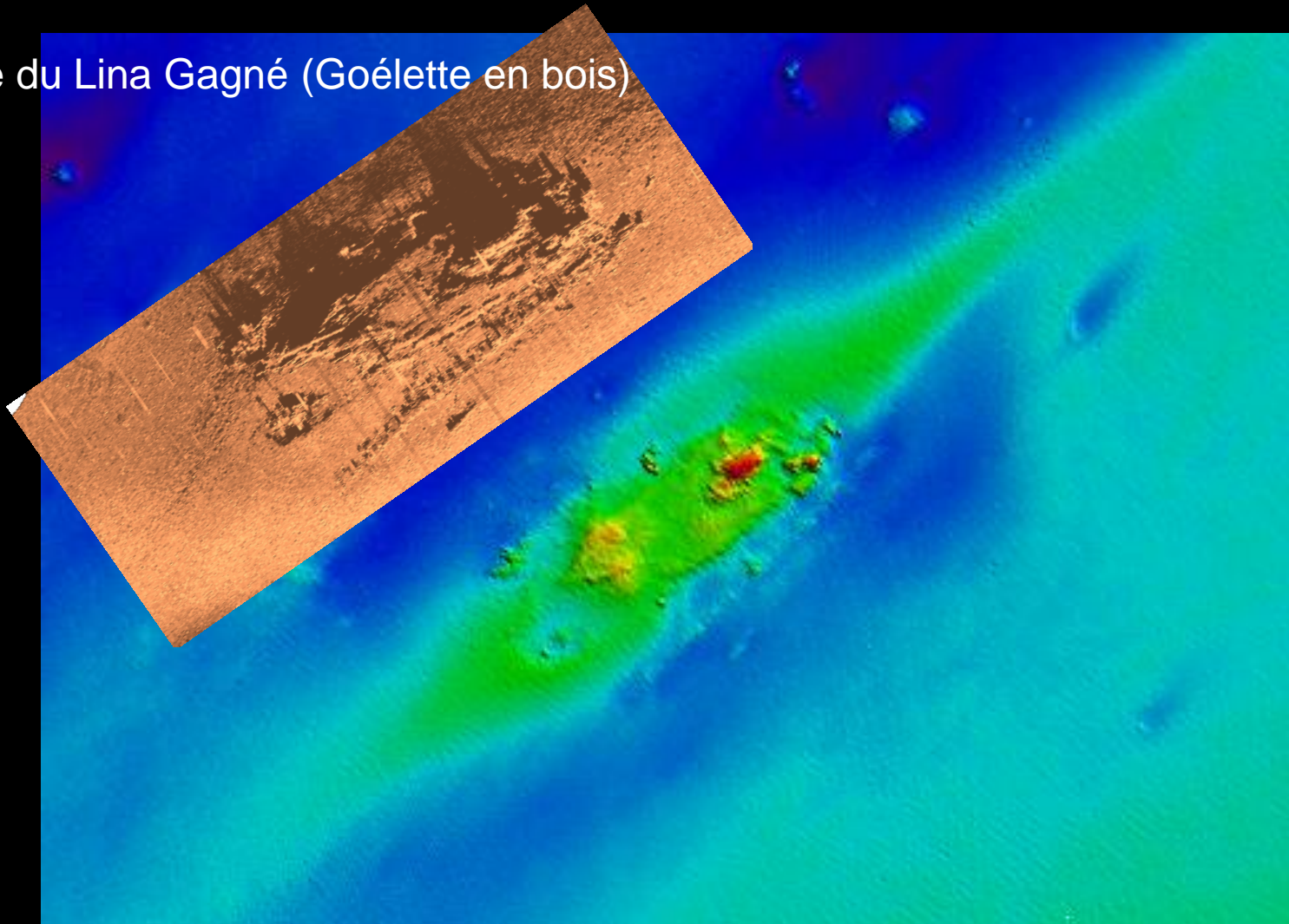




Recherche d'épaves

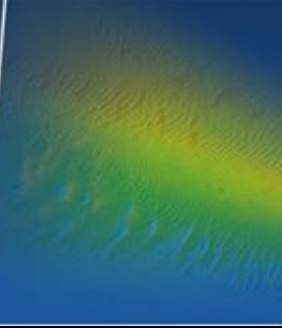


Epave du Lina Gagné (Goélette en bois)





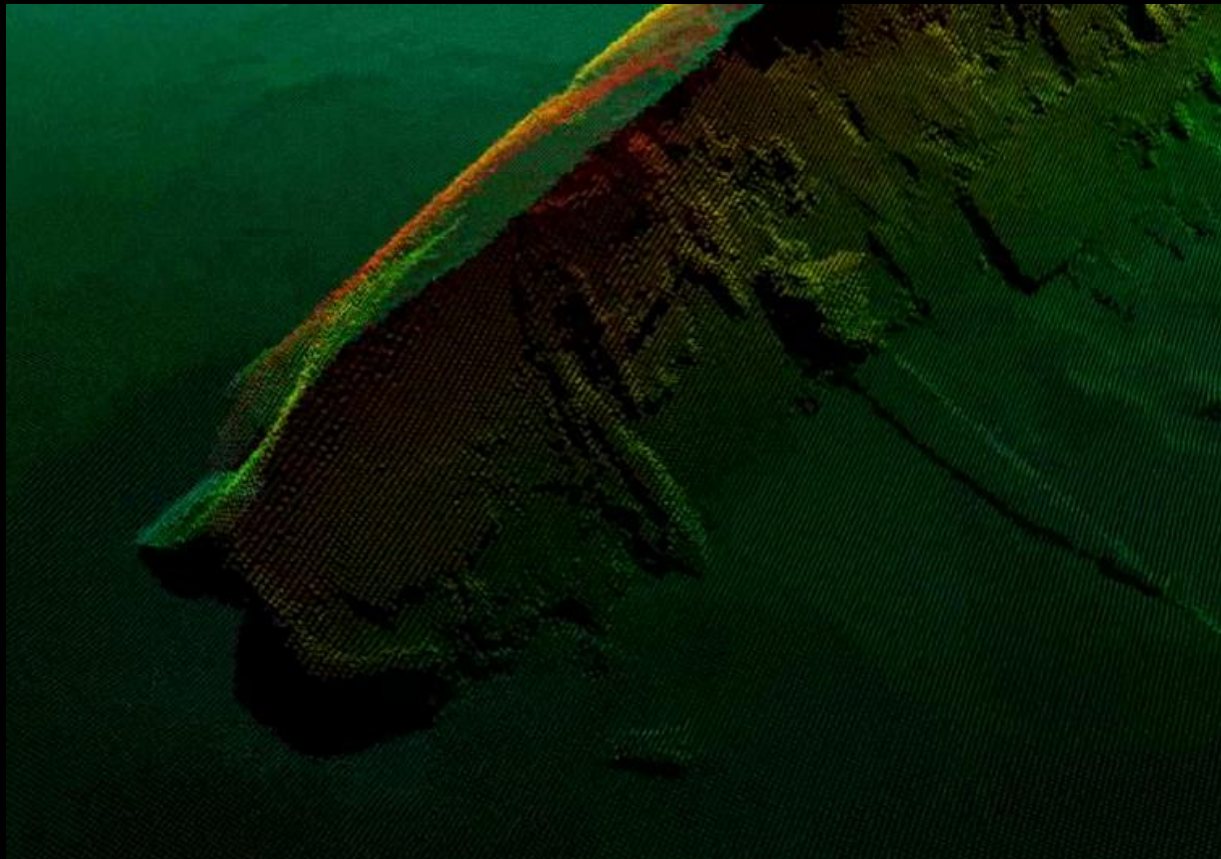
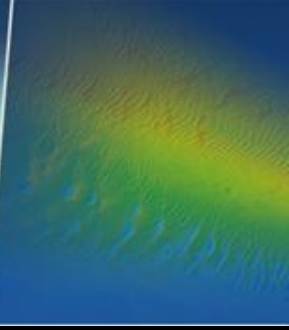
Recherche d'épaves



Nipigon (1200 kHz)



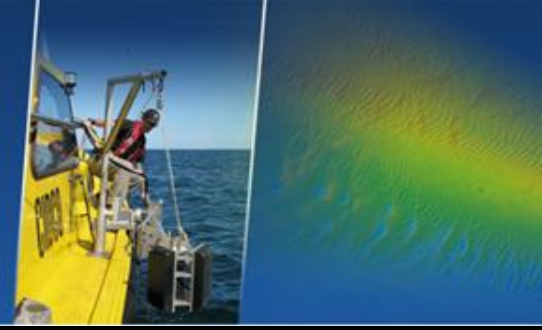
Recherche d'épaves



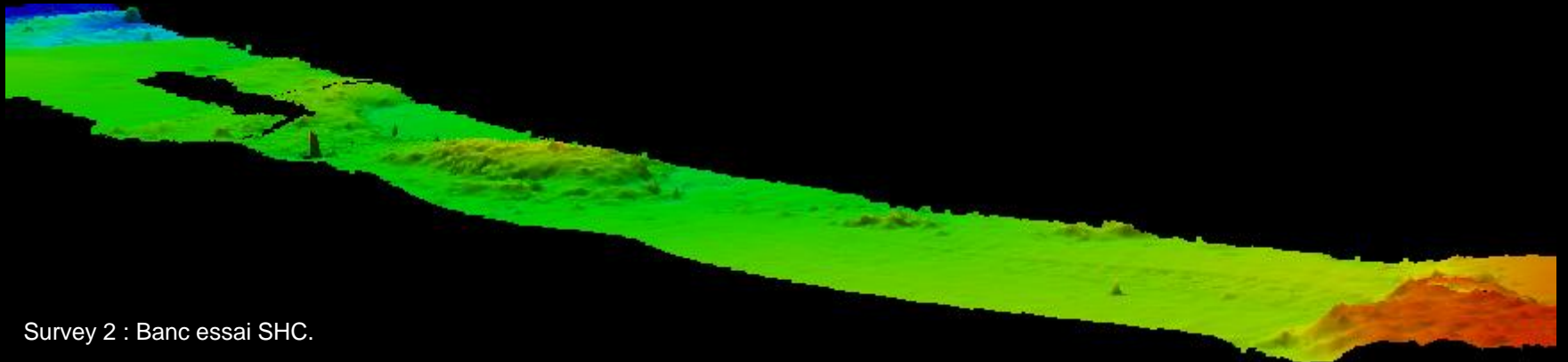
Empress of Ireland



Seaplane bathymetry project



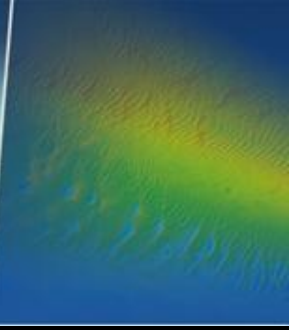
Hydravion SuperCub monté avec : Reson T20-P et CodaOctopus F-180



Survey 2 : Banc essai SHC.



Canada's North hydrography context

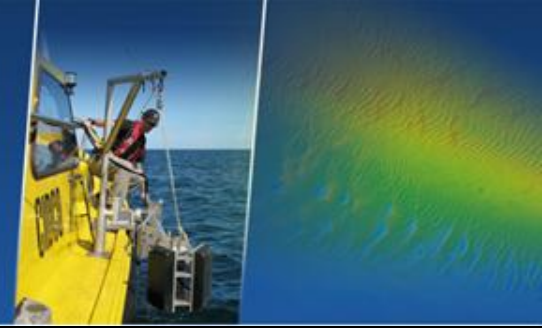


Why mapping Canada's North ?

To support Canada territorial claims in the
Arctic



Canada's North hydrography context



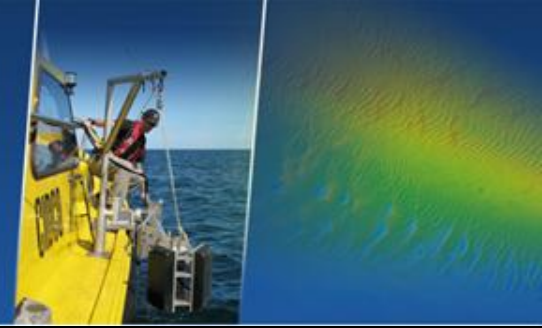
Why mapping Canada's North ?

To secure existing shipping route or to open new ones for :

- oil&gas projects
- mining projects
- procurement activities (supplying communities)
- cruising activities



Canada's North hydrography context

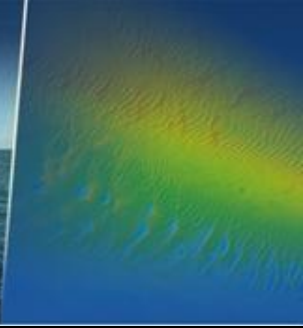


Collecting hydrographic data in Canada's North is difficult mainly due to :

- Access issue
- Positioning issue (geodesy)
- Tide issue (chart datum)



Canada's North hydrography context



Access issue : How bathymetric data is collected in Canada's North ?

Icebreaker



Drifting buoy



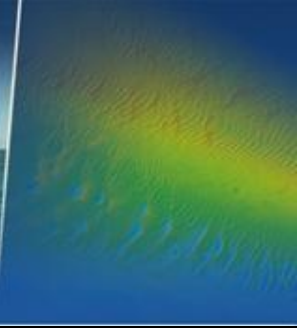
AUV



Helicopter spot sounding



Canada's North hydrography context



The Seaplane Bathymetry Project proposes
a new platform :



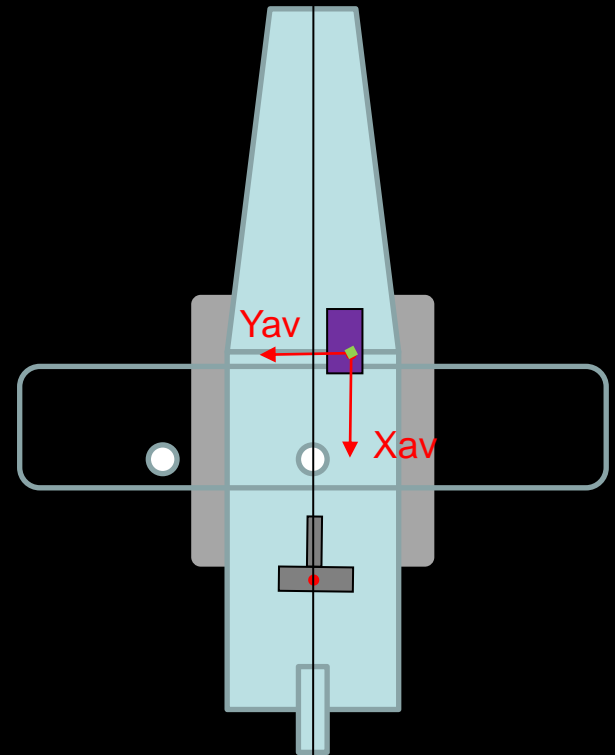
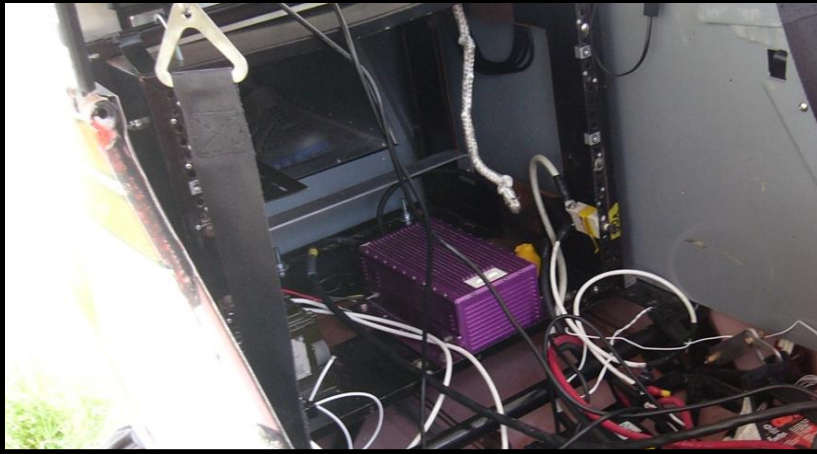
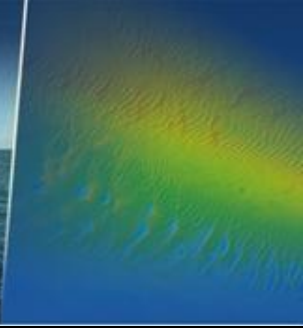
One setup



Quick mobilization

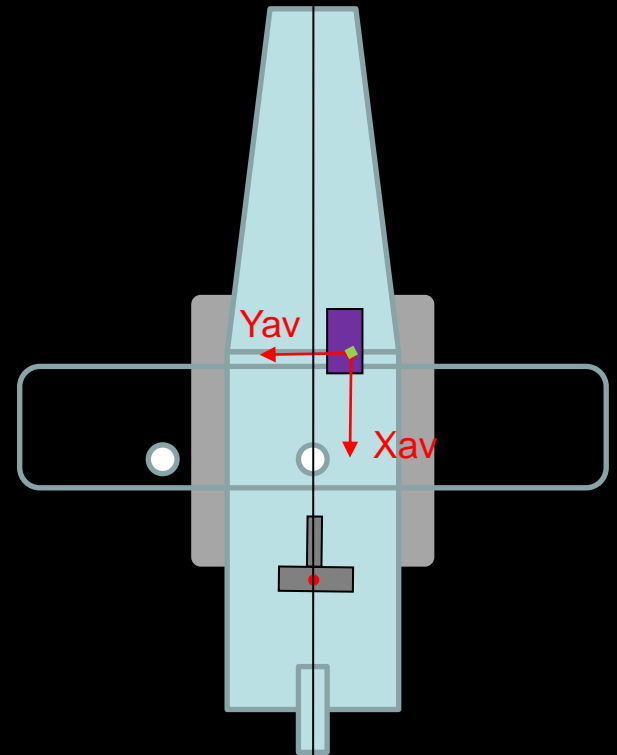
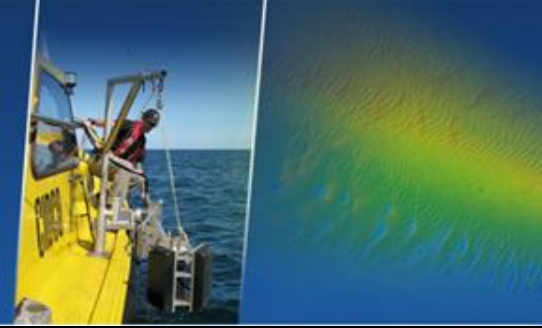


Seaplane set up / IMU & GPS antennas



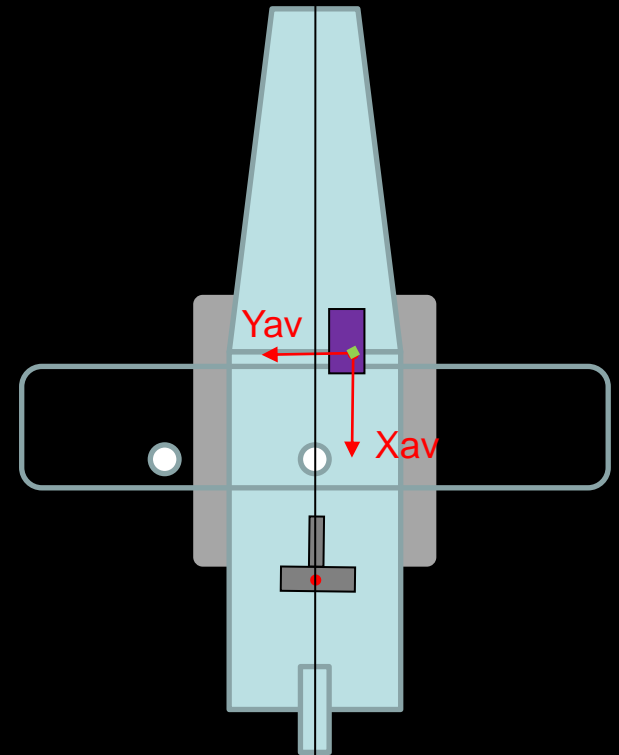
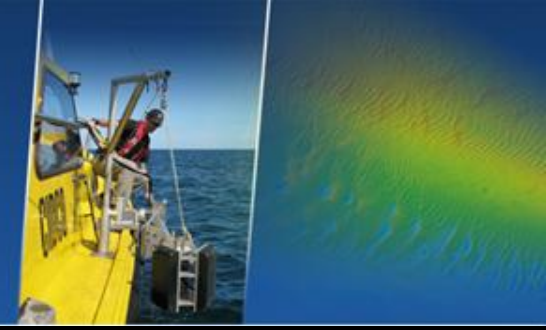


Seaplane set up / MBES



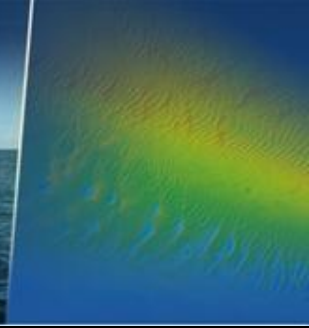


Seaplane set up / equipments rack



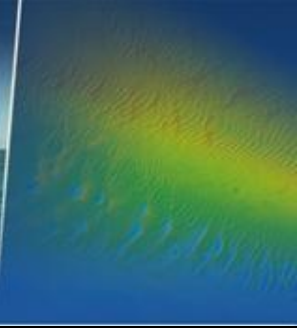


System alignment & Patch-Test



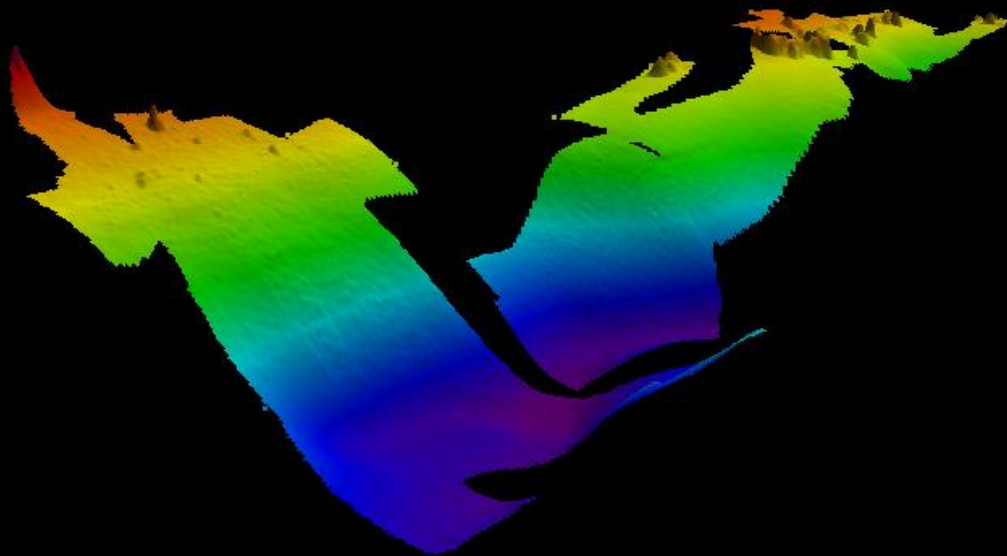
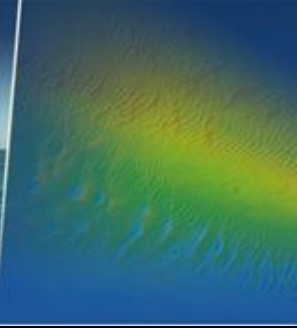


1st survey – Eel Lake (Qc, Canada)

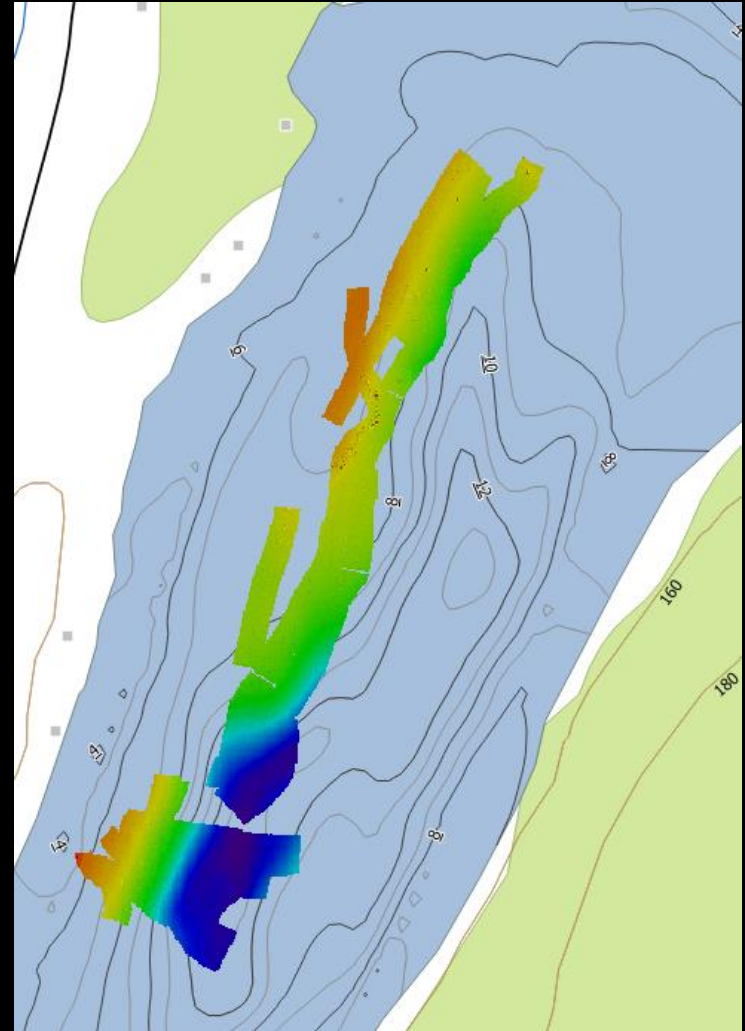




1st survey – Eel Lake (Qc, Canada)

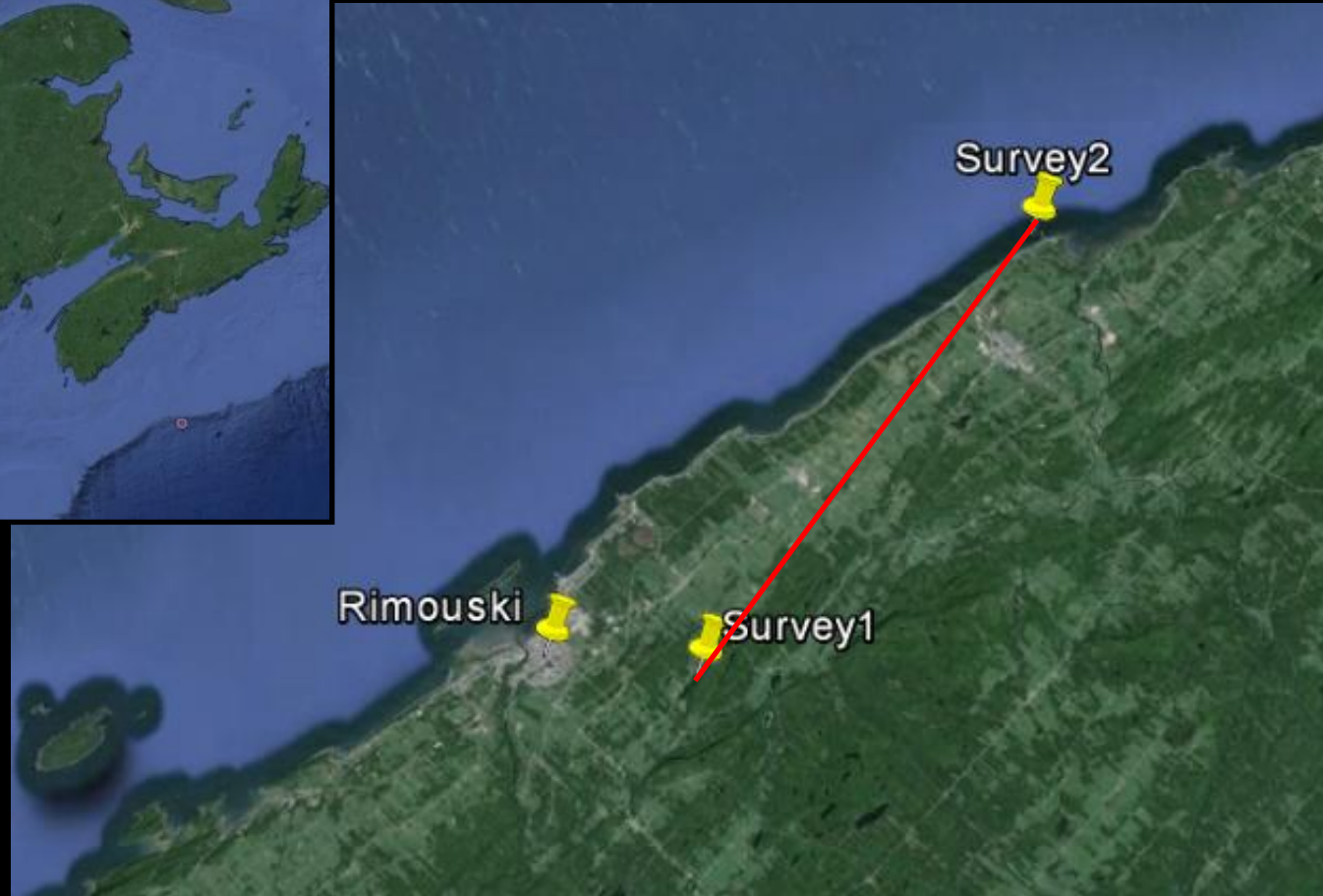
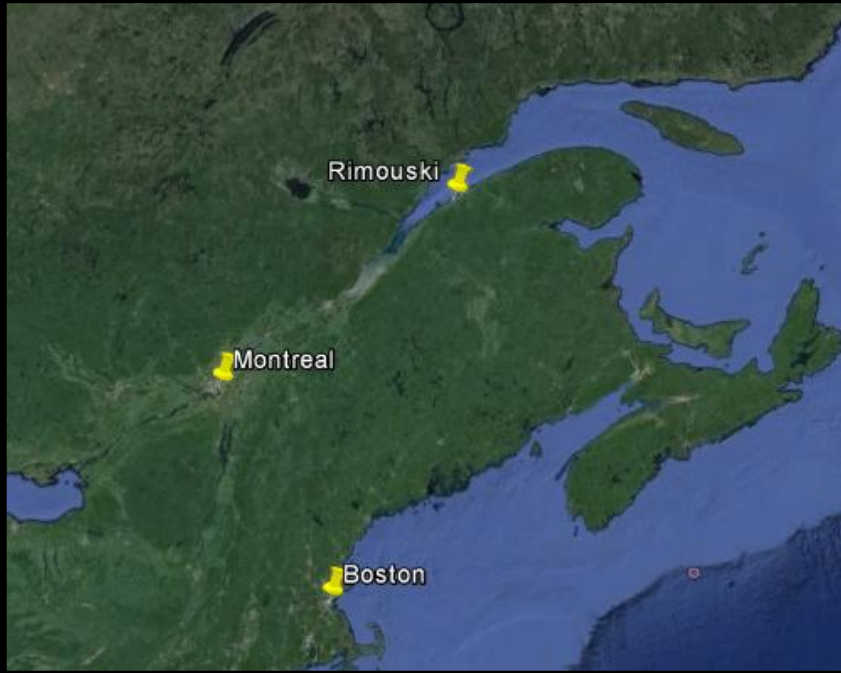
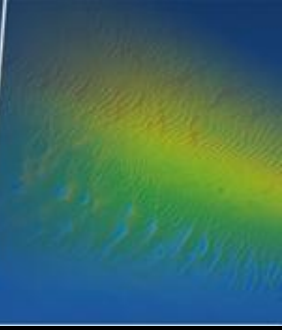


Vertical exaggaration : x10



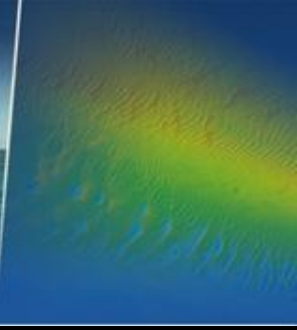


Flight



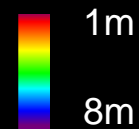
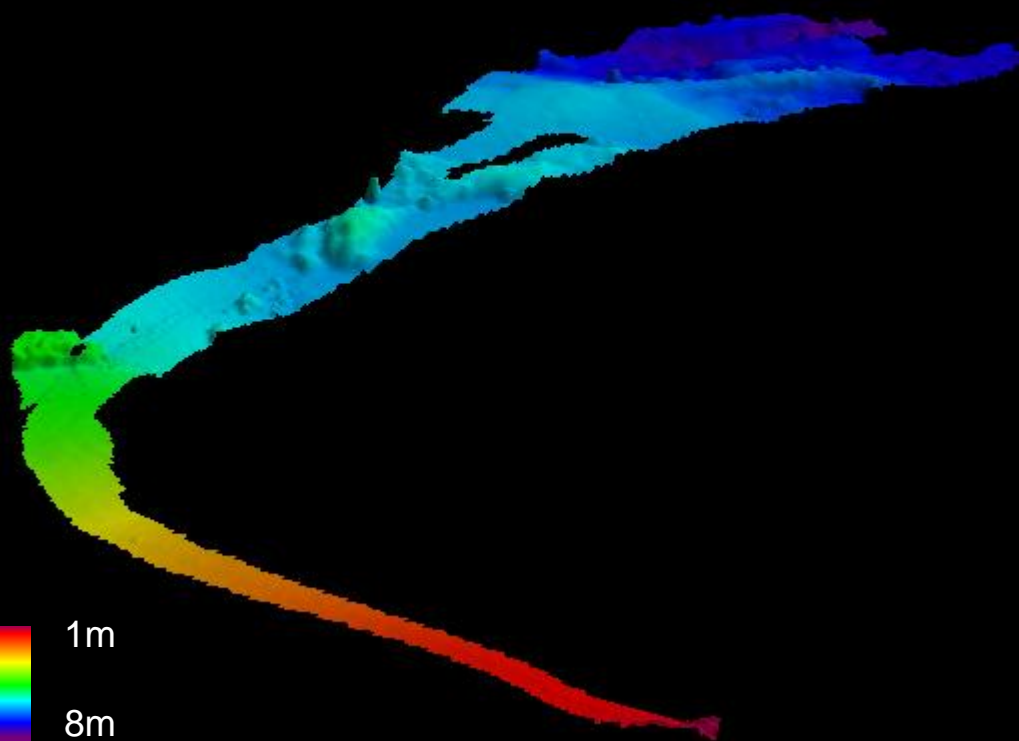
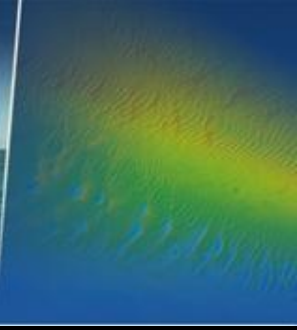


2nd survey – CHS bench test area St-Lawrence River (Qc, Canada)

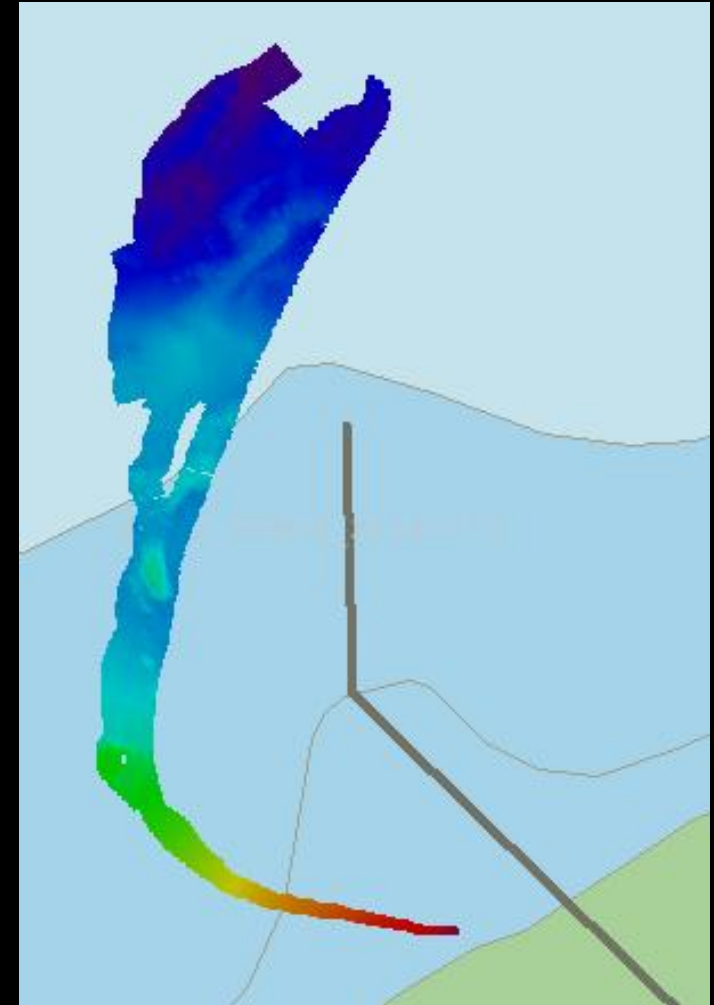




2nd survey – CHS bench test area St-Lawrence River (Qc, Canada)

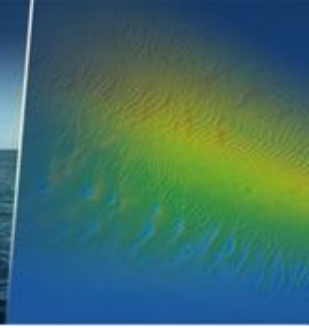


Vertical exaggaration : x10



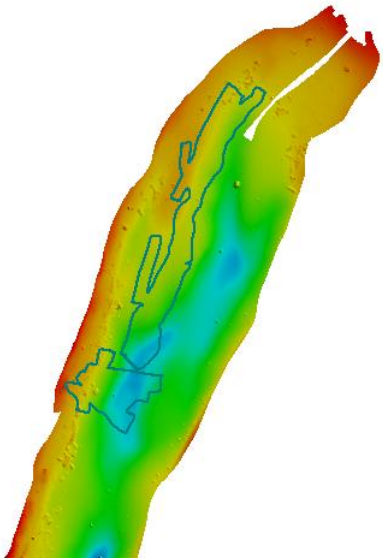


QC / survey accuracy

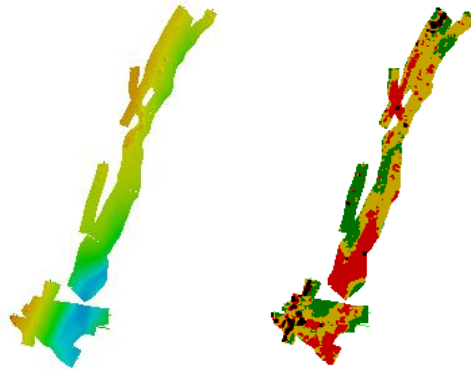


1st survey

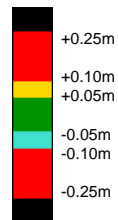
Std = 12cm (95%)



Ref surface



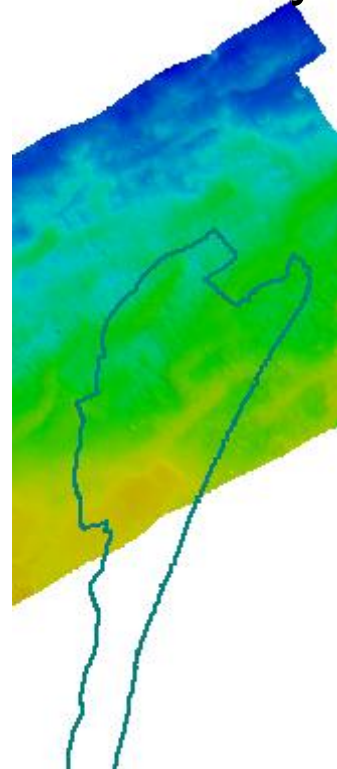
Eval surface



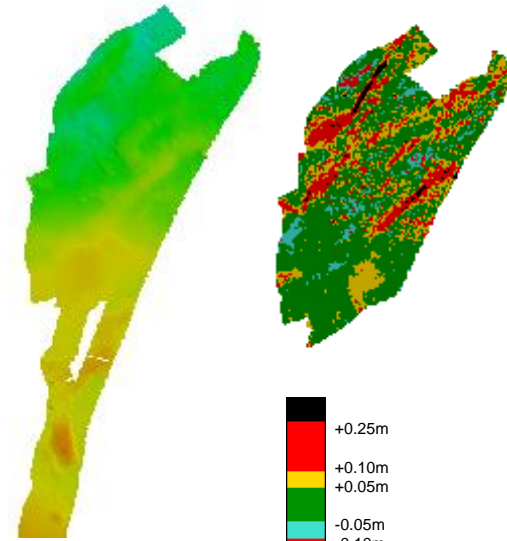
Diff surface

2nd survey

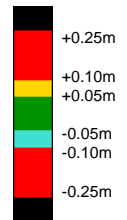
Std = 14cm (95%)



Ref surface



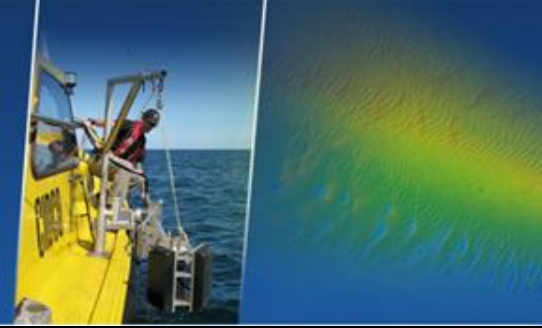
Eval surface



Diff surface



Qu'est ce que HydroBall™



Une coque robuste de forme sphérique
(13kg – 40cm diam) qui renferme :

- un echosondeur mono-faisceau
- un récepteur GPS L1/L2
- un inclinomètre (cap, tangage, roulis)

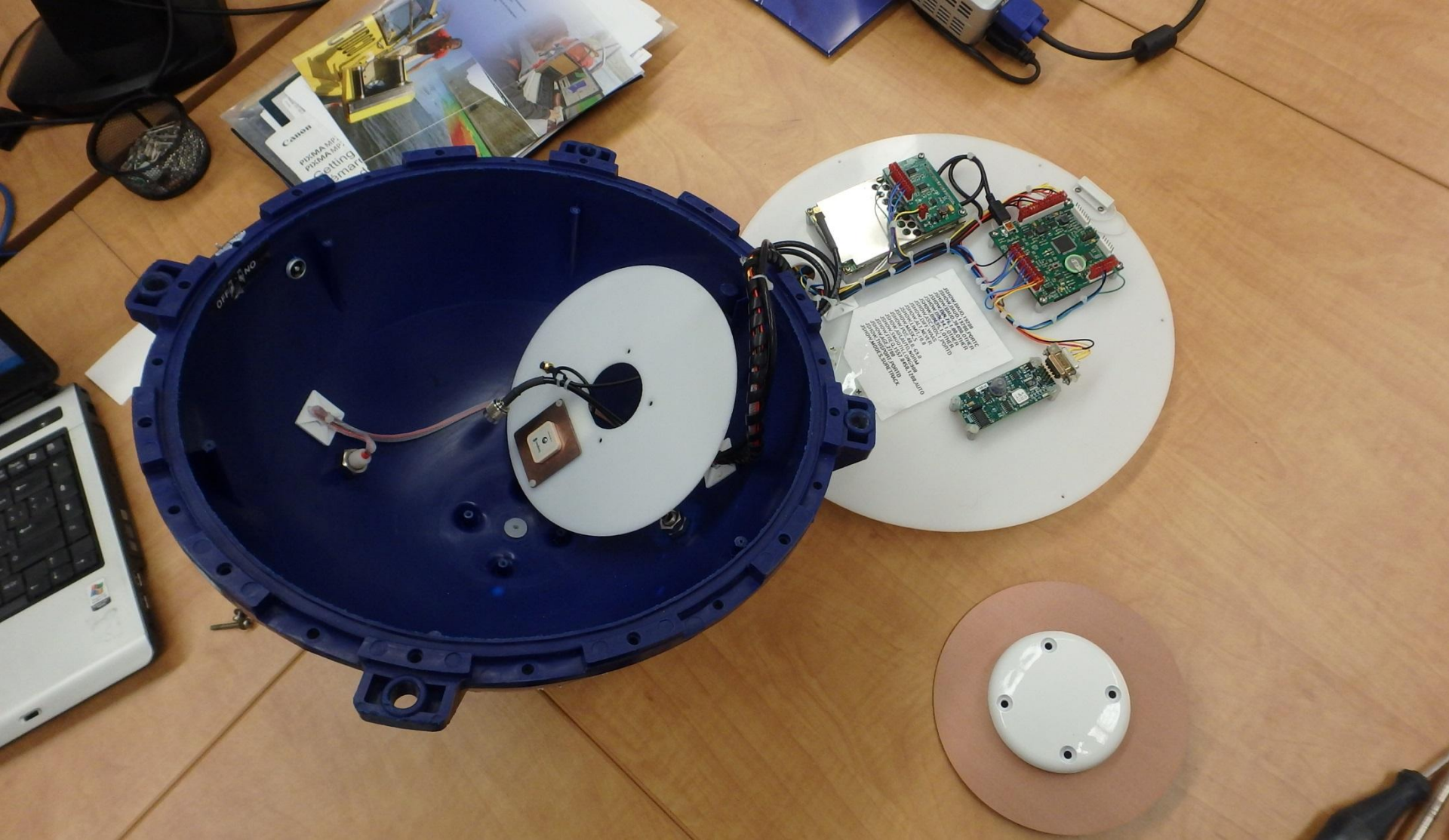
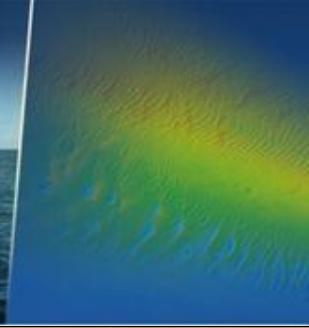
Options

- Iridium
- RTK



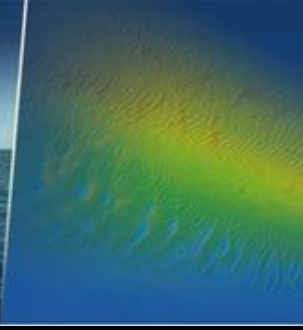


Qu'est ce que HydroBall™





1^{ère} application : levé en rivière



1) Allumage

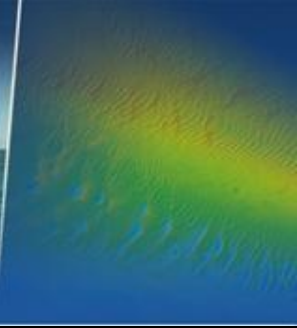


2) Largage





Levé en rivière/ acquisition



3) Acquisition mode autonome

4) Suivi satellite



Bateaux Projets Produits

Plan

Rimouski

Parc Beauséjour

Rue de Lausanne

Rue Goy

Avenue Rouleau

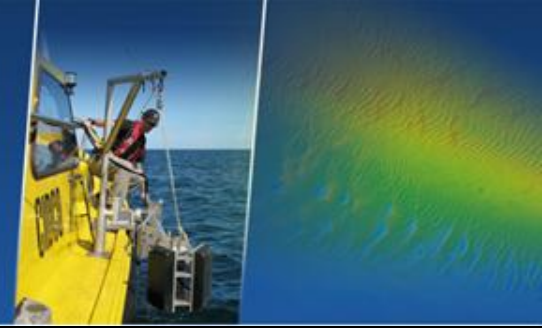
Avenue de la Cathédrale

132 232 20

es cartographiques - Conditions d'utilisation Signaler une erreur cartographique



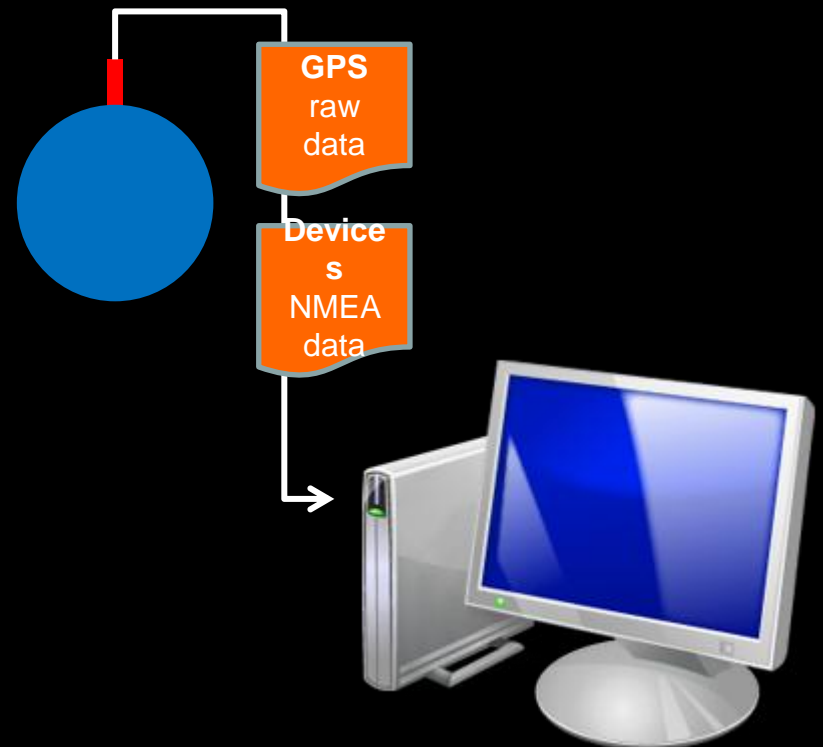
Levé en rivière/ acquisition



5) Reccupération

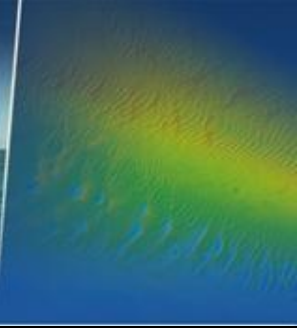


6) Transfert des données

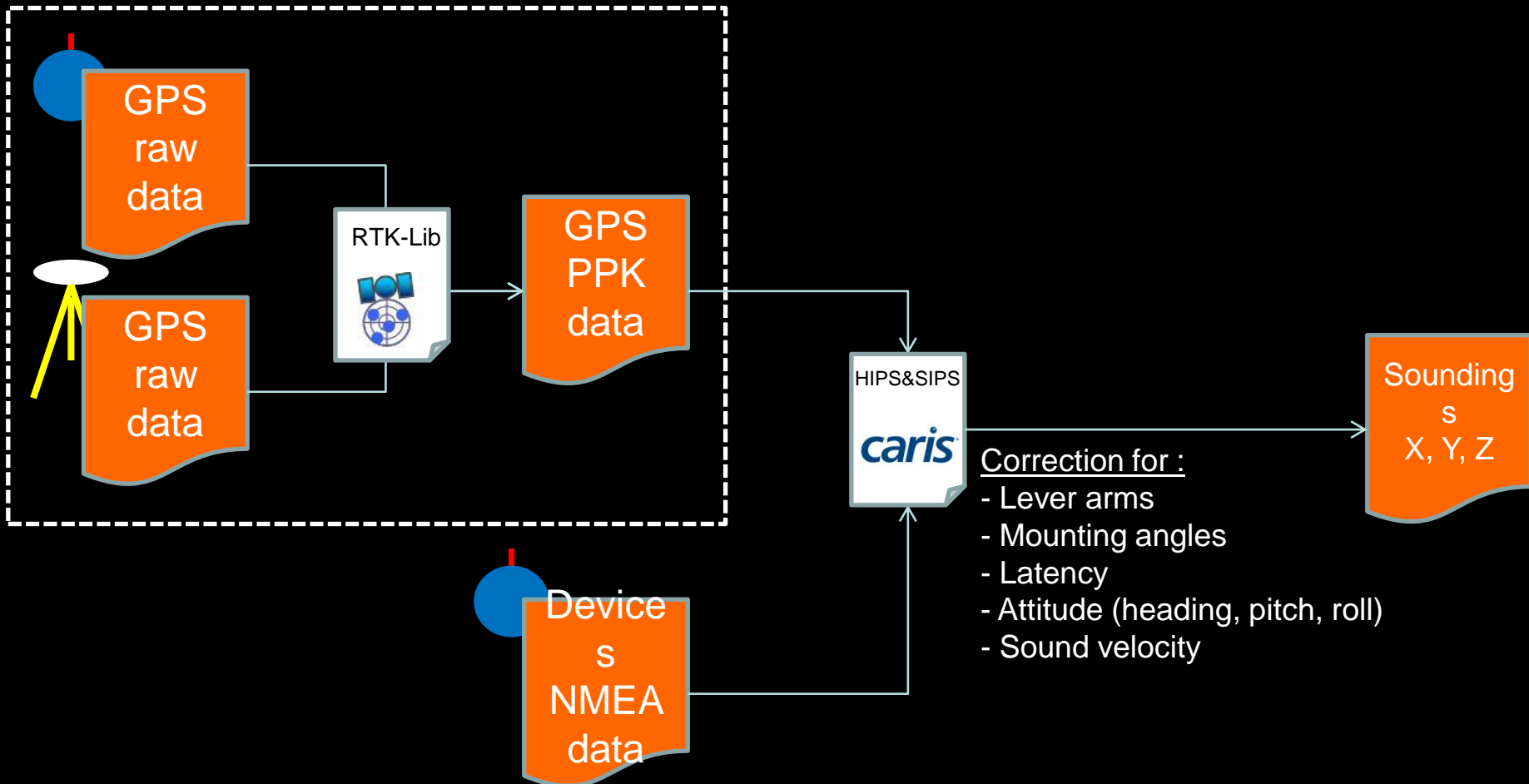




Levé en rivière/ traitement

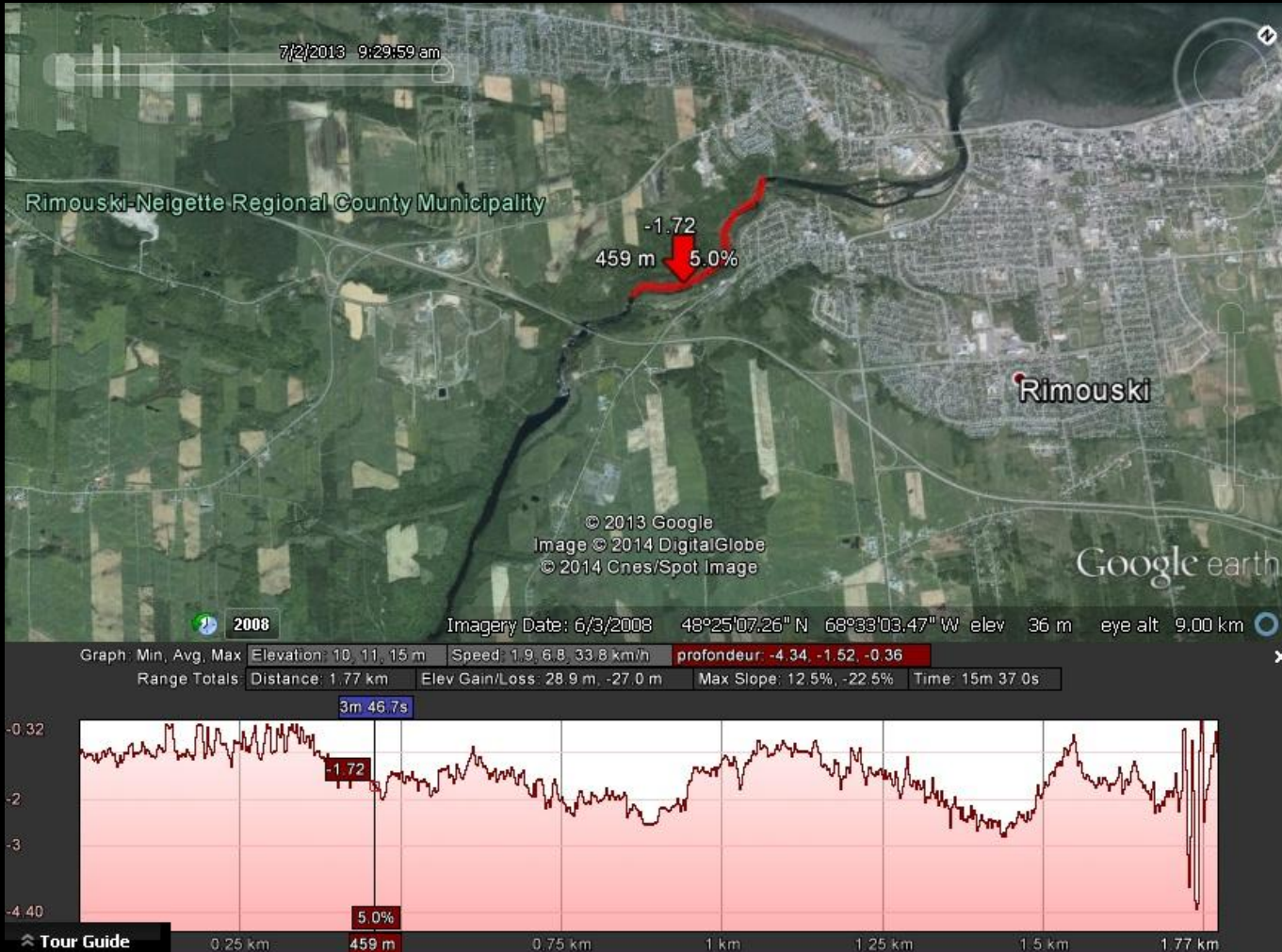
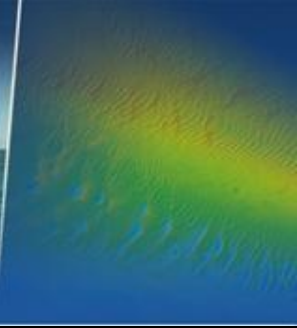


HydroBall™-Pro only



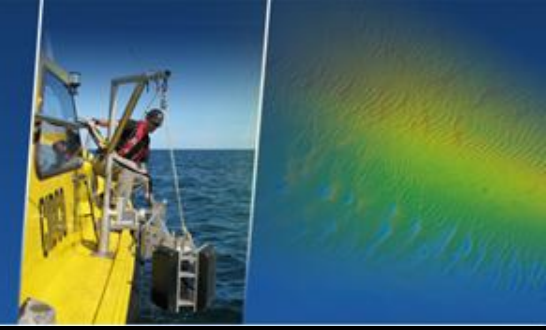


Levé en rivière/ produits





Applications



Levé en zone difficile d'accès



Levé en zone ultra-côtière



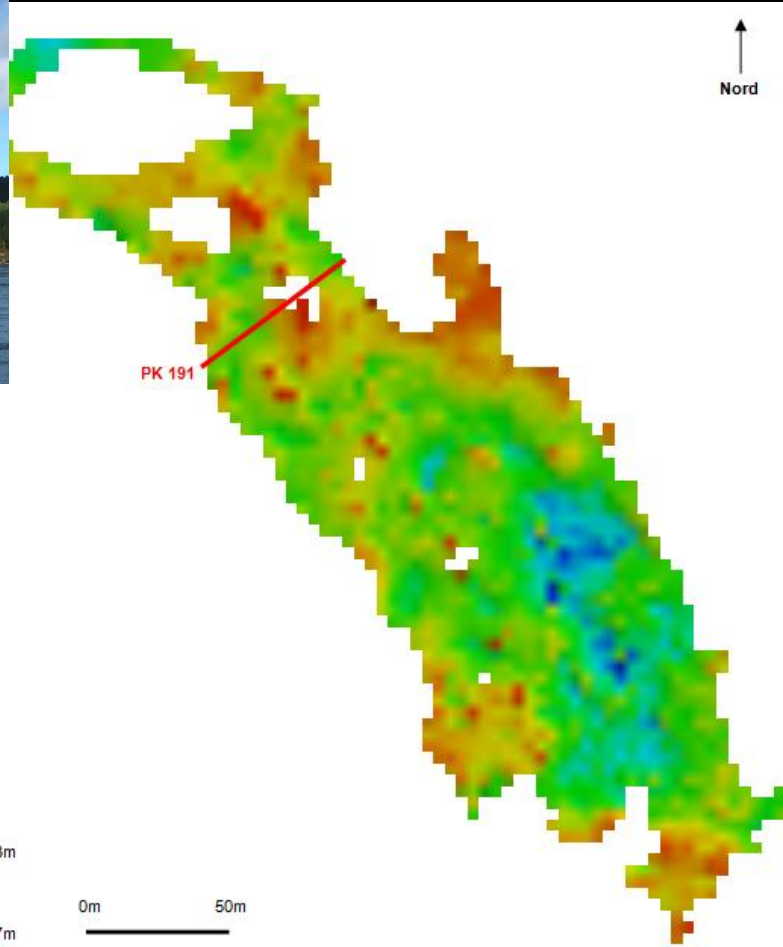
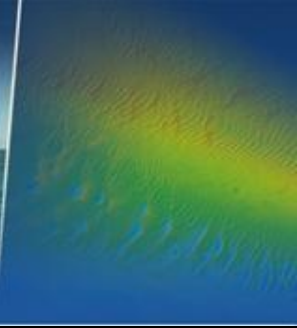
Levé de rivière



Levé hydrographique traditionnel

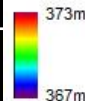


Bouée HydroBall™ rivière Romaine



http://www.cidco.ca/fiche_video.php?id=34

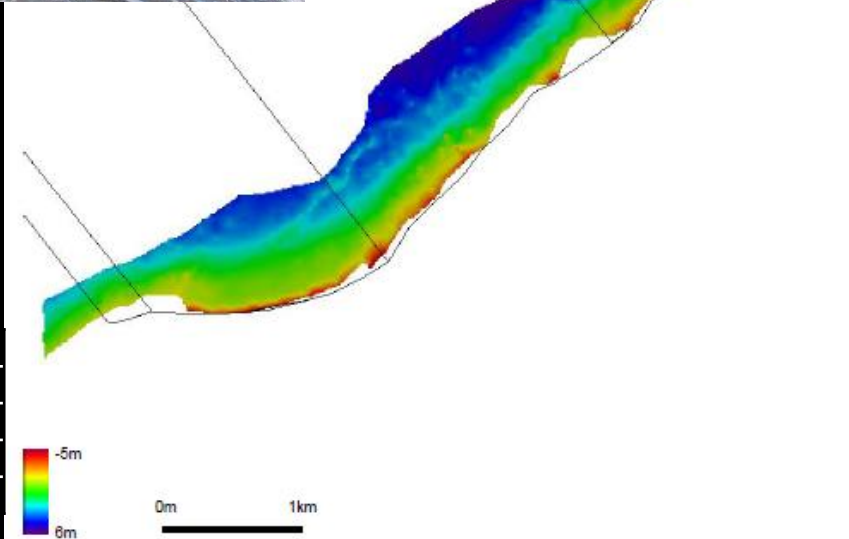
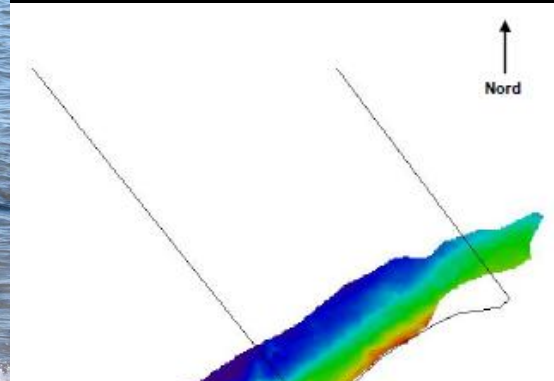
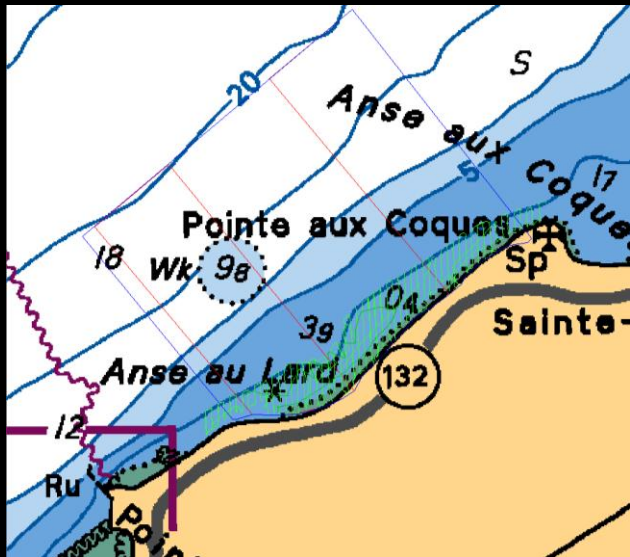
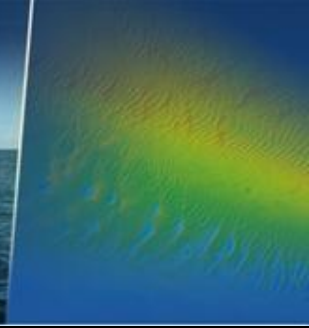
Écart de profondeur mesuré	Nb d'intersections	Pourcentage
$e < 5\text{cm}$	26	37%
$5\text{cm} < e < 10\text{cm}$	12	17%
$10\text{cm} < e < 20\text{cm}$	15	21%
$e > 20\text{cm}$	17	24%



0m 50m



Bouée HydroBall™ Anse au Lard

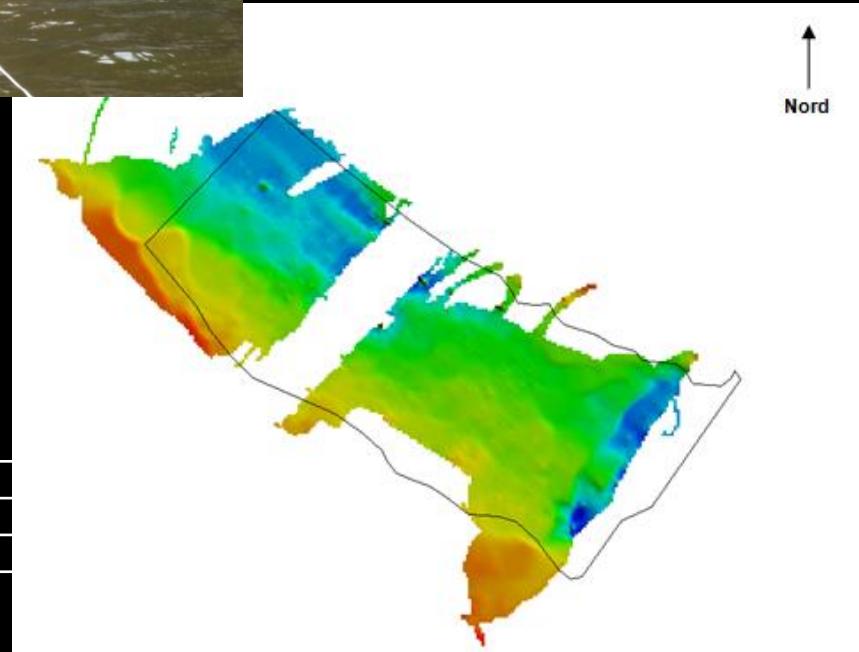
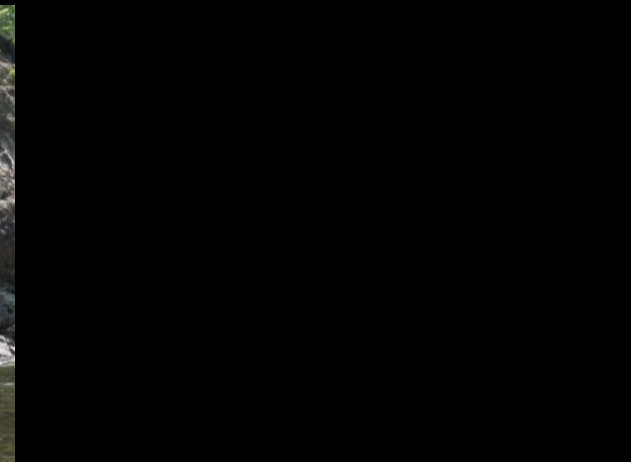
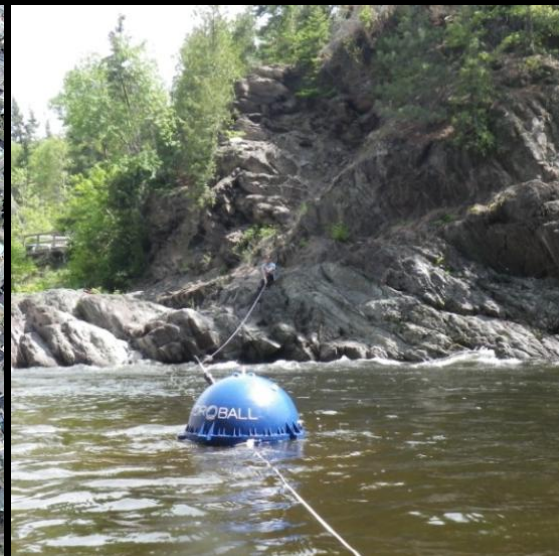
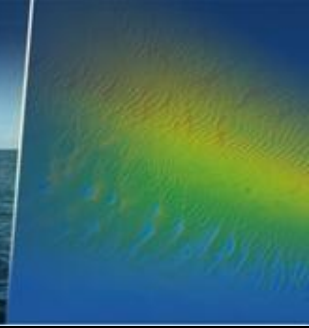


http://www.cidco.ca/fiche_video.php?id=31

Écart de profondeur mesuré	Nb d'intersections	Pourcentage
$e < 5\text{cm}$	25	67%
$5\text{cm} < e < 10\text{cm}$	9	24%
$10\text{cm} < e < 15\text{cm}$	1	3%
$e > 15\text{cm}$	2	6%



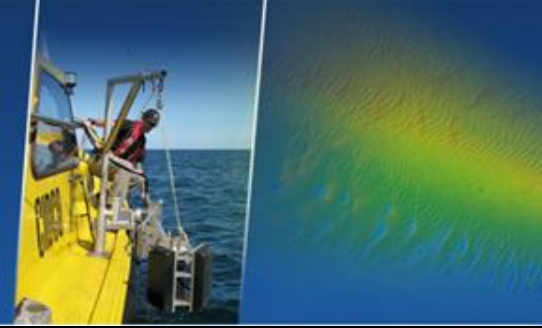
Bouée HydroBall™ rivière Rimouski



Écart de profondeur mesuré	Nb d'intersections	Pourcentage
$e < 5\text{cm}$	17	43%
$5\text{cm} < e < 10\text{cm}$	11	28%
$10\text{cm} < e < 15\text{cm}$	3	7%
$e > 15\text{cm}$	9	22%



Perspectives de carrière



Sécurité de la navigation
Gestion d'infrastructures portuaires
Dragage
Recherche de pétrole et gaz
Pose de câbles trans-océaniques
Recherche d'épaves

Hydrography as a career :

<http://www.youtube.com/watch?v=rFQ1IpkW81Y>