

Ouragan majeur IRMA
Trajectoire du 30 août au 11 septembre 2017

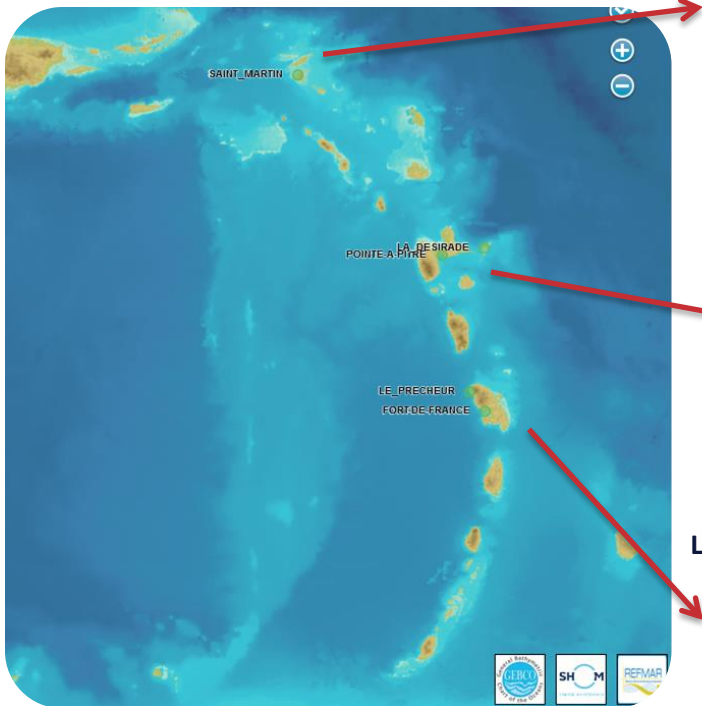


Hurricane IRMA – Shom's actions & lessons learned

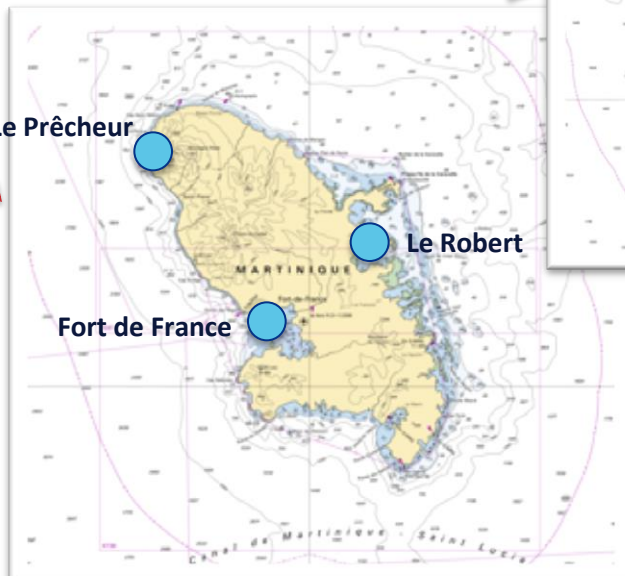
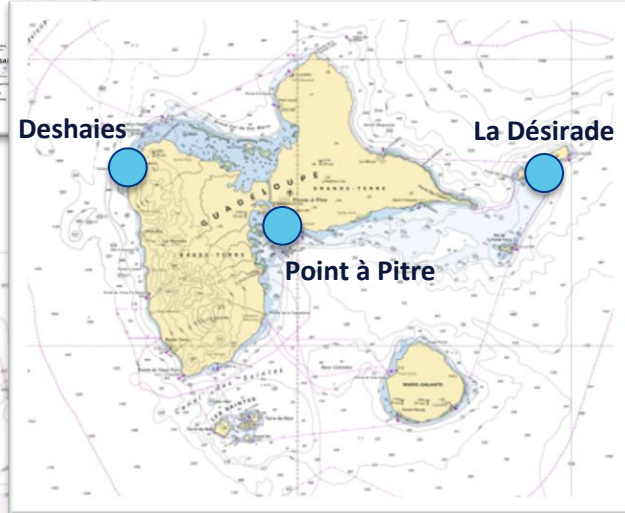
MACHC 18 – Varadero, Cuba

TIDE OBSERVATION

FRENCH PERMANENT SEA LEVEL OBSERVATION NETWORK IN THE CARIBBEAN



data.shom.fr
<http://www.ioc-sealevelmonitoring.org/>



December 2nd 2017

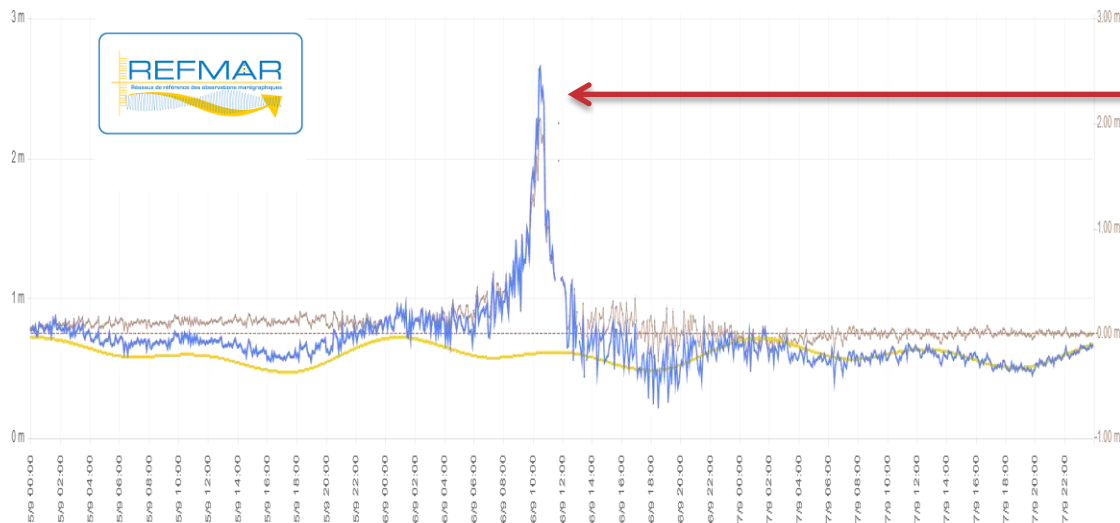
Saint Martin tide station



- **On line since January 2016**
- **Owned and operated by the territorial collectivity of St Marin with Shom's support**
- **Radar and pressure sensor**
- **Real-time transmission through satellite and GPRS network**
- **Solar powered**
- **Permanent GNSS observations**

Irma, observed at Saint Martin tide station

- Real time transmission stopped at 07:50 (potential power supply failure – under investigation)
- Data recorded
- Irma paths over St Martin on September 6th



Peak : 10:30 AM (GMT)

Storm tide : 2,65 m (CD)

Storm surge : 2,04 m

Lessons learned

- **Waterproof shelter conception: approved**
- **Real-time transmission: need confirmation**
- **Some Shom's tide stations in the Caribbean need improvements:**
 - Shelter reinforcement (mechanical resistance and waterproofing)
 - Need to heighten some equipment (radar sensor, data logger, batteries)
 - Power supply (redundancy and capacity)

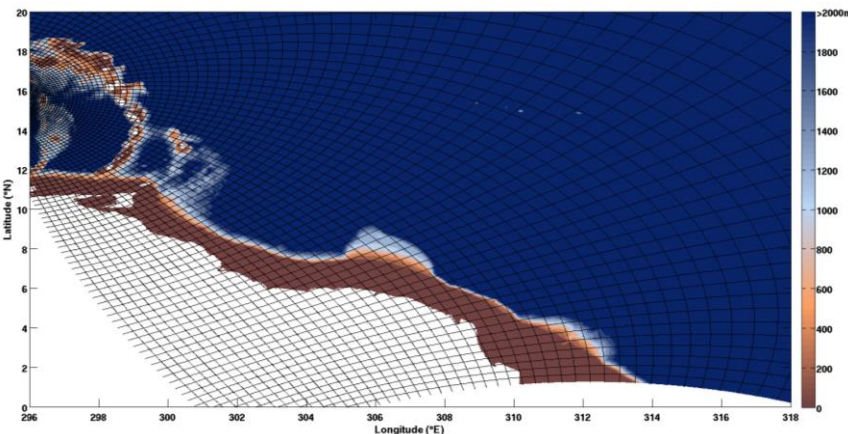
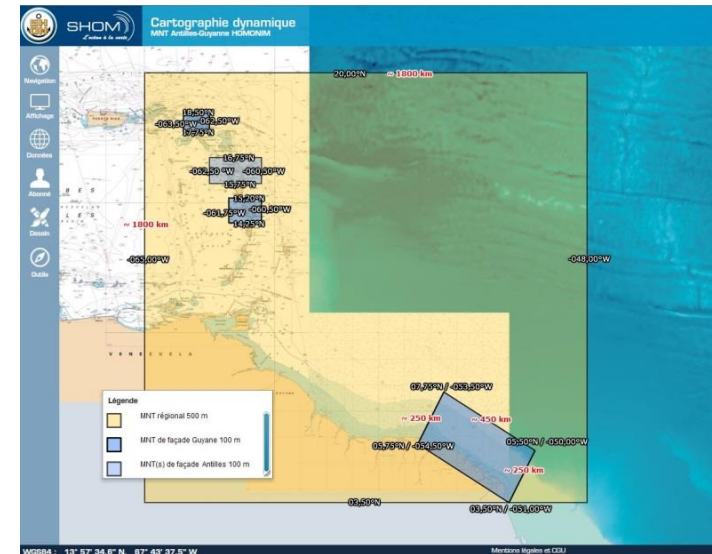
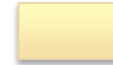
STORM TIDE FORECAST TOOLS

ON GOING PROJECT HOMONIM



Coastal sea state model : WaveWatch-3

- French West Indies & Guiana coast
- Unstructured grid ~200 m at the shore
- Off-the-shelf bathymetry, locally complemented
- Surface forcing (wind, sea level, currents)
- Developed and validated by Shom & Operated in real time by Météo-France



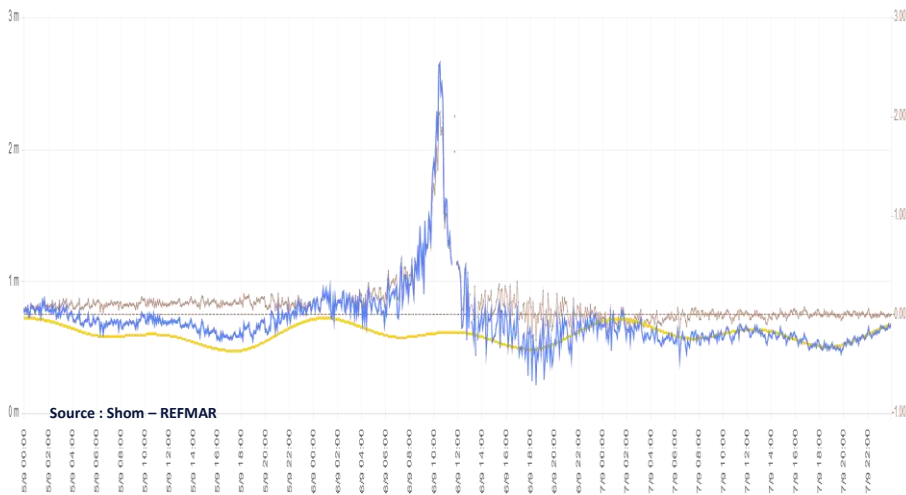
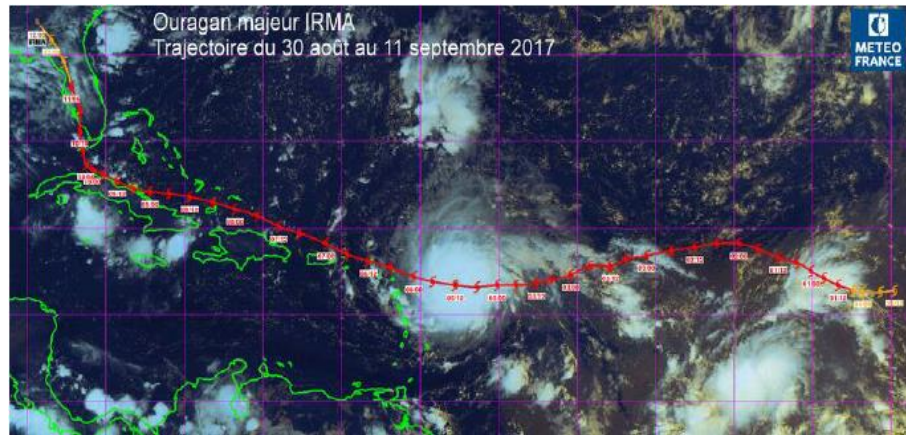
Storm surge model : HyCoM

- Caribbean & Guiana
- Curvilinear grid : 2,5 km in Guiana / ~900 m over Caribbean
- Off-the-shelf bathymetry
- Tidal (open boundaries) and atmospheric (wind + pressure) forcing
- Developed and validated by Shom & Operated in real time by Météo-France



STORM SURGE FORECAST DURING IRMA

PRELIMINARY FEEDBACK



- **Irma at a glance**

- Rated cat. 5 on Sept. 05
- Wind speed > 275 km/h during 3,5 days
- Paths over St Martin on Sept. 6th

- **Storm surge observations**

- peak : 10:30 AM (UT)
- storm tide : 2,65 m (CD)
- storm surge : 2,04 m

- **Operational forecast (Météo-France)**

- HyCoM storm surge model (still in integration phase at that time)
- 4 runs per day (00, 06, 12, 18)
- Atmospheric forcing : Météo-France *Arome* model (1/40°) extended with IFS (1/8°)

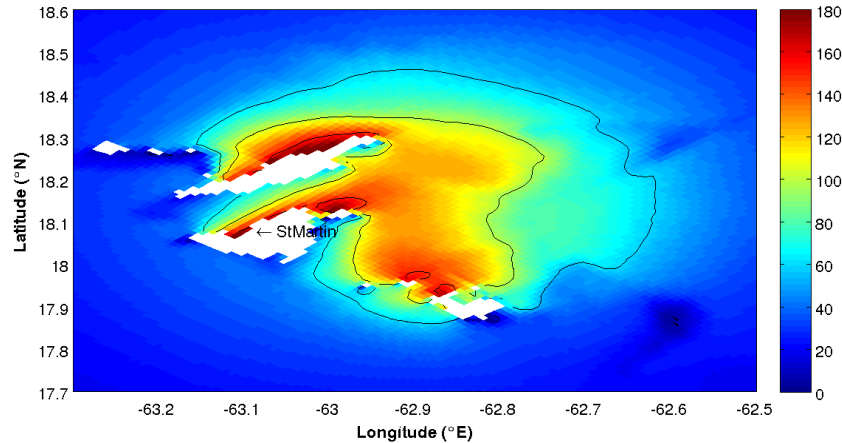


STORM SURGE FORECAST DURING IRMA

PRELIMINARY FEEDBACK



IRMA : Sep.06,2017 11:00:40
Surcote (cm)



Storm surge forecast : 9-day run

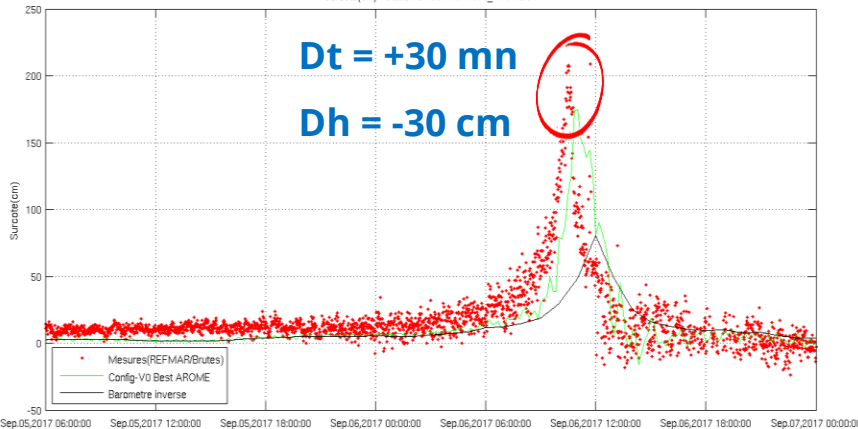
- Aug. 29 (6:00 PM) to Sept. 07 (12:00 AM)
- Forecast mode starting Sept. 6 (00:00)

Results

- Peak : 11:00 AM
- Storm tide (CD) : 2,35 m
(vs 2,65 m observed)
- Storm surge : 1,74 m
(vs 2,04m observed)

With an estimated 80 cm contribution of inverse barometer

Tempête IRMA - 201709
Surcote(cm) - Station SAINT-MARTIN_MARIGOT



Source : Shom et Météo-France – projet *Homonim*



ENCs

In accordance with the UOC (S57 / Appendix B.1 / Annex A / Chapter 2.2.3.1)

- As a result of some disasters, e.g. earthquakes, tsunamis, hurricanes, it is possible that large areas of seafloor have moved and/or become cluttered with dangerous obstructions. Emergency surveys may subsequently be conducted over essential shipping routes and inside harbours. Outside these surveys, all existing detail is now suspect, whatever the quality of the previous surveys. In such cases, the CATZOC value should be reclassified to value 5 (zone of confidence D) in the affected areas outside the area covered by emergency surveys.

Shom changed the CATZOC value on the large scale ENCs of St Martin and St Barthélémy.

CNTARE created, with INFORM:

Major changes to depths and topography in the area covered by this chart may have occurred as a result of hurricane Irma on 5 September 2017. Mariners must be aware of possible uncharted dangers to navigation and contact the harbour authority for access conditions.

Resurveys needed to revert to better CATZOC values (recovery phase)

IRMA'S IMPACT ON SAFETY OF NAVIGATION

IMPACT ON EXISTING NAVIGATIONAL CHARTS



Paper charts

Notes added to FR7471 and FR7472 to warn the mariner

Ouragan de 2017

D'importants changements aux profondeurs et à la topographie dans la zone couverte par cette carte peuvent avoir lieu suite à l'ouragan Irma du 5 septembre 2017. Les navigateurs doivent être conscients de l'existence possible de dangers pour la navigation non portés sur la carte.

N = 2000⁰⁰⁰

in

1999

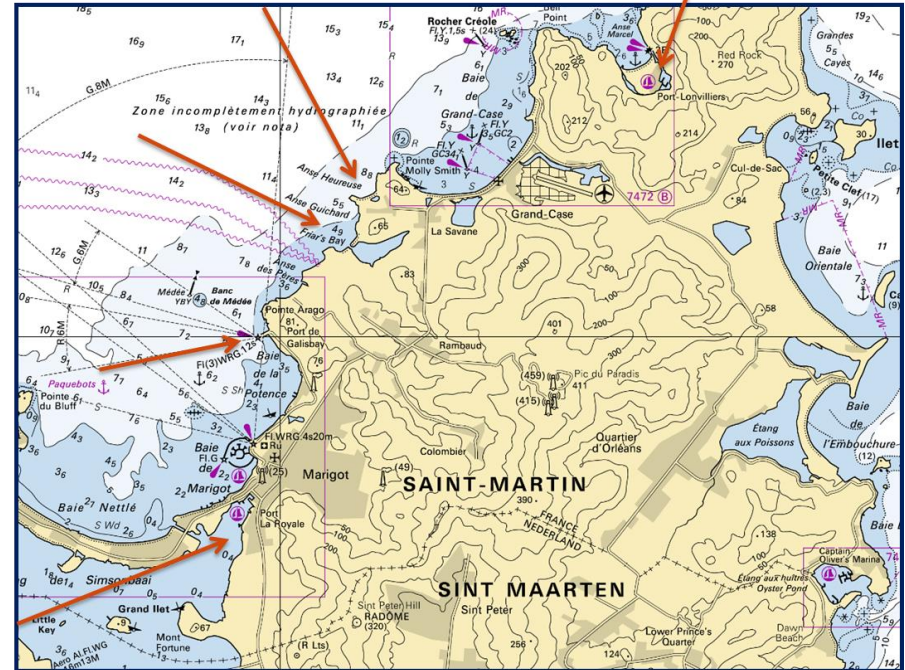
IRMA'S IMPACT ON SAFETY OF NAVIGATION

EXPEDITIONARY SURVEY – RESPONSE PHASE



Survey operations in support of humanitarian relief operations after hurricane Irma.

Main objective: accessibility of ports and landing spots for loading and unloading of relief goods.



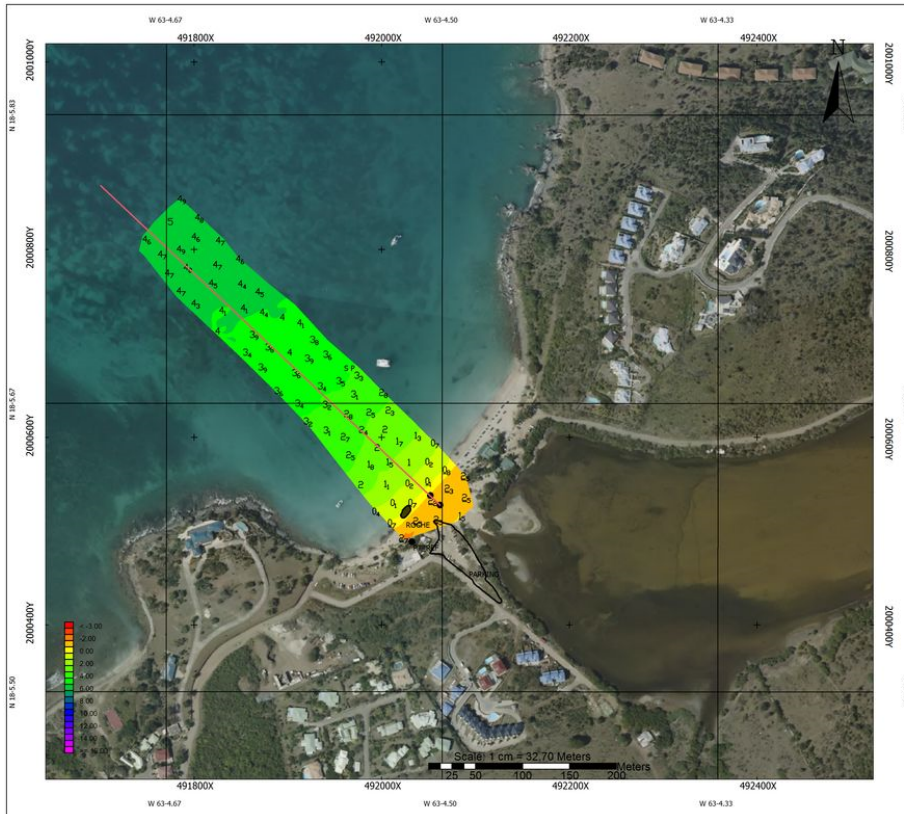
IRMA'S IMPACT ON SAFETY OF NAVIGATION

EXPEDITIONARY SURVEY – RESPONSE PHASE



Survey conducted from the BPC *Tonnerre*

Acces to landing spots : Friar's Bay beach & Anse Heureuse



SYSTÈME DÉPLOYABLE
D'HYDROGRAPHIE MILITAIRE

MER DES CARAIBES
GUADELOUPE
SAINT-MARTIN

SITE XXXX
FRIAR'S BAY

23/09/2017

Échelle 1:2000

Point de Référence (WGS84) :
18° 05.607' N
063° 04.501' W

Axe de présentation au 133° (trait rouge)

Ellipsoïde : WGS84
Système géodésique : WGS84
Projection UTM 20 Nord
Référence altimétrique : Plus Basses Mers
Astronomiques (PBMA, LAT)

Nota :

- 1) Les sondes sont réduites de la marée réelle observée au Port de Marigot.
- 2) Les symboles de nature de fond S (sand) et P (pebbles) correspondent à du sable et des galets.
- 3) Image extraite de Google Earth datant de 2015.

Document à jour de la connaissance à la date
du 24/09/2017. A utiliser en complément des
cartes et ouvrages nautiques.



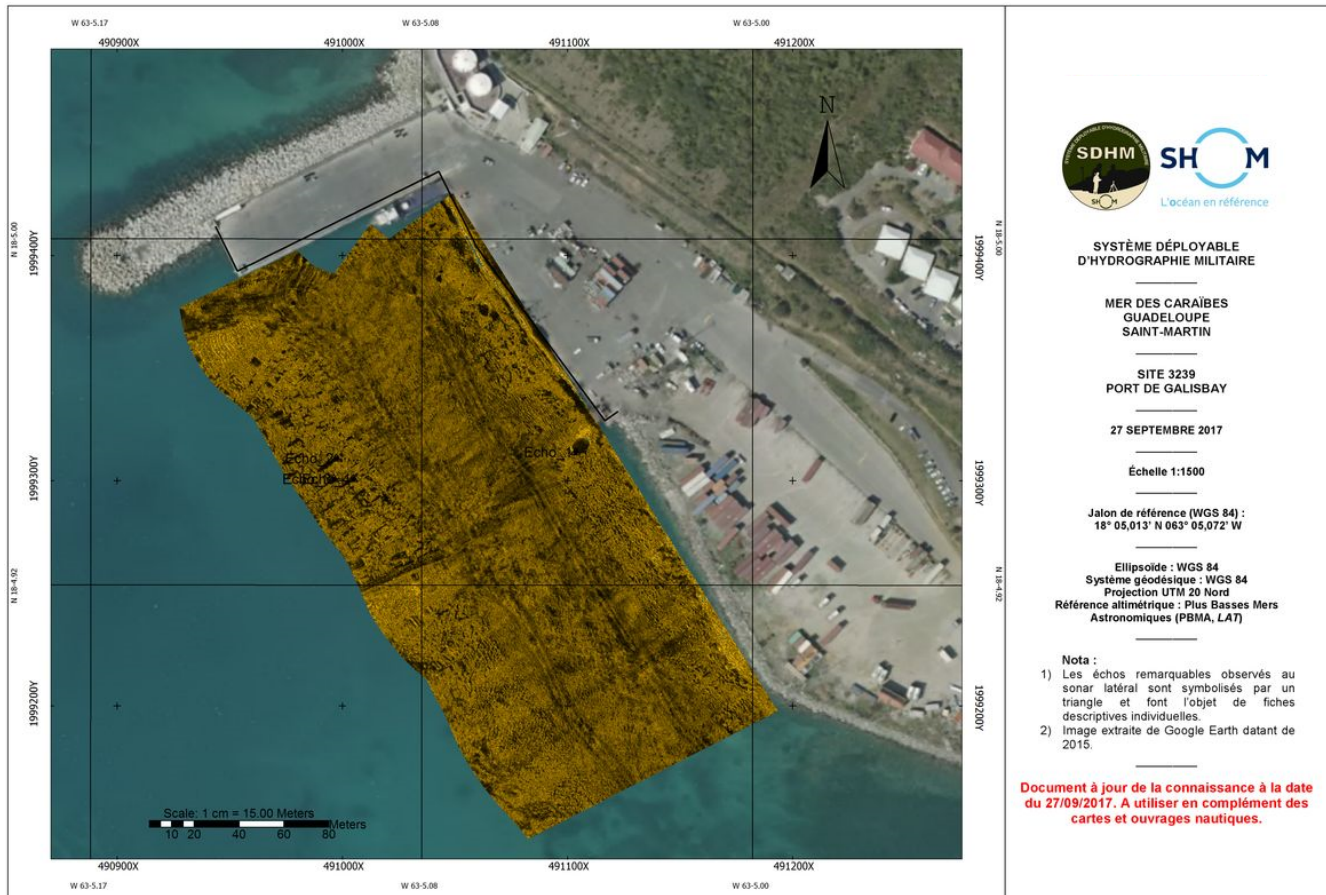
Acces to Friar's Bay beach

IRMA'S IMPACT ON SAFETY OF NAVIGATION

EXPEDITIONARY SURVEY – RESPONSE PHASE



Control survey of Galisbay harbour (presence of wrecks), Anse Marcel (Port-Lonvilliers harbour) and access to Port La Royale



December 2nd 2017

IRMA'S IMPACT ON SAFETY OF NAVIGATION

EXPEDITIONARY SURVEY – RESPONSE PHASE



SDHM used (military hydrographic expeditionary kit)

Simple and modular system:

- ICAO compliant
- Easily fitted to standard French Navyships' dinghies or opportunity crafts
- Robust system: SBES, SSS, GNSS...
- Operated by qualified hydrographers
- 2 systems available in Brest, max. 10 days notice



SDHM packed, ready to go !



SDHM fitted on Army pirogue



SDHM fitted on Navy RHIB



St Martin : SDHM and inflatable boat offload

December 2nd 2017

- **Surge forecast and real-time sea level observation**
Globally satisfactory. On-going *Homonim* program / some improvements needed to improve the resiliency of some tide gages in the area
- **Immediate cartographic actions**
- **Immediate assessment of damages (response phase)**
 - Limited MACHC involvement (compared to SWPHC for example)
 - Limited cooperation with NL
 - SDHM : SBES > MBES to improve the survey efficiency
 - Shom's expeditionary hydrographic capability embedded in the global State relief operation, has to fit in the global tempo of operation
- **Long term recovery phase: planned**



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Renseignements

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