



# Disaster response planning

## Recent examples & lessons learned

### SWPHC 16 – Niue - technical workshop

- **Kea Trader grounding (2017-2019)**
- **Irma storm surge in sept. 2017 (Caribbean)**
- **Lessons learned**
- **France capabilities in SW Pacific**
- **France emergency POC**

# KEA TRADER- New Caledonia



## KEA TRADER GROUNDING - DURAND REEF - July 2017

### Surveys - including cooperation with SPC

Very short notice and quick product delivery

1<sup>st</sup> survey (SBES) to secure the area for rescue operations

2<sup>nd</sup> survey (MBES) in support to refloating attempt

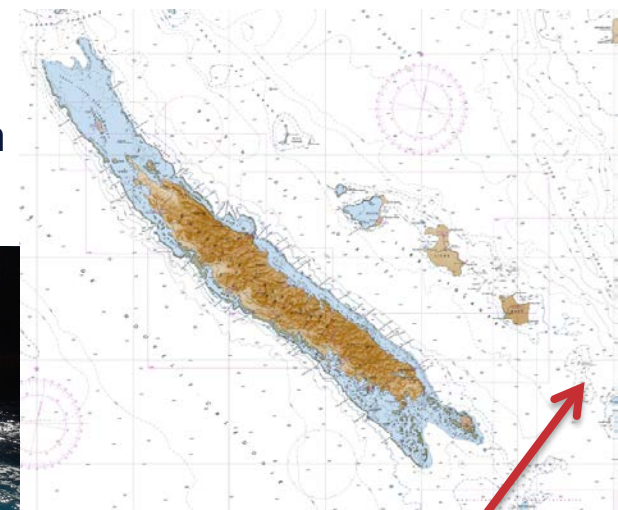
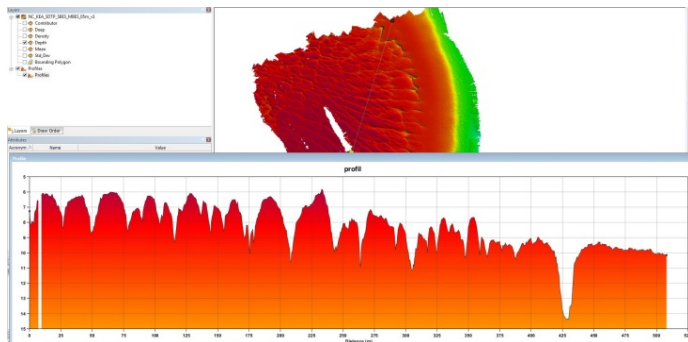
### Support - from July to December 2017 + still ongoing

Seafloor models and analysis

Tide predictions improvement

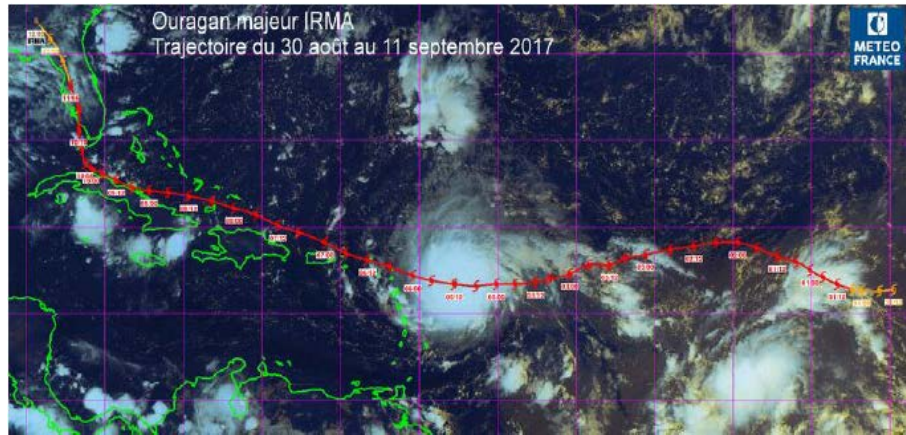
Water level analysis (ocean dynamics, uncertainties)

3<sup>rd</sup> survey (MBES) : private company - controlled by Shom



February 21<sup>st</sup> 2018

# STORM SURGE DURING IRMA



## Irma at a glance

- Rated cat. 5 on Sept. 05 2017
- Wind speed > 275 km/h during 3,5 days
- Paths over St Martin on Sept. 6<sup>th</sup> (Caribbean islands)

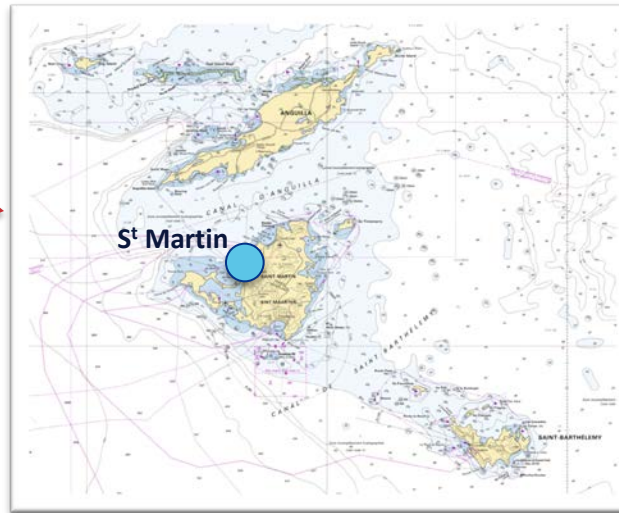
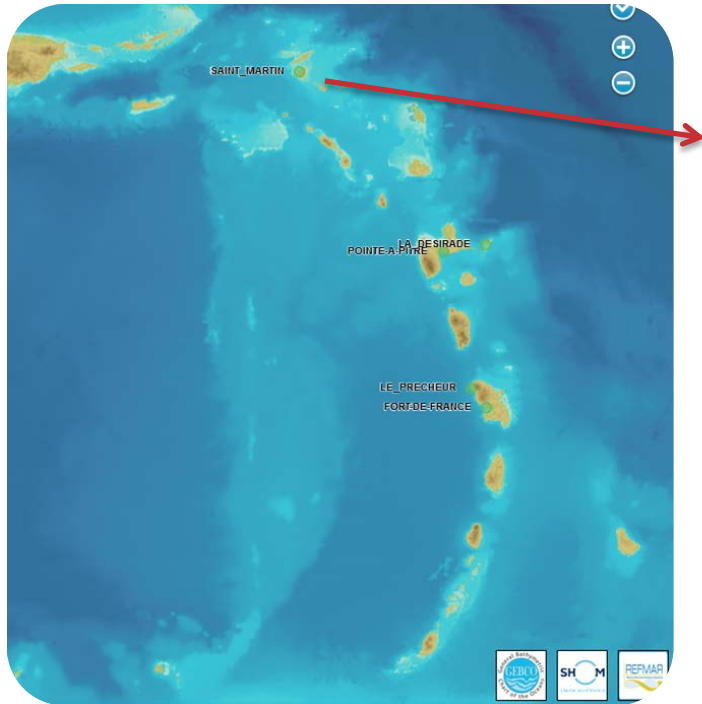


- Real time observations – tide gauge
- Operational forecast - storm surge model
- Deployable hydrographic capability
- Impact on charts – Warning
- Lessons learned

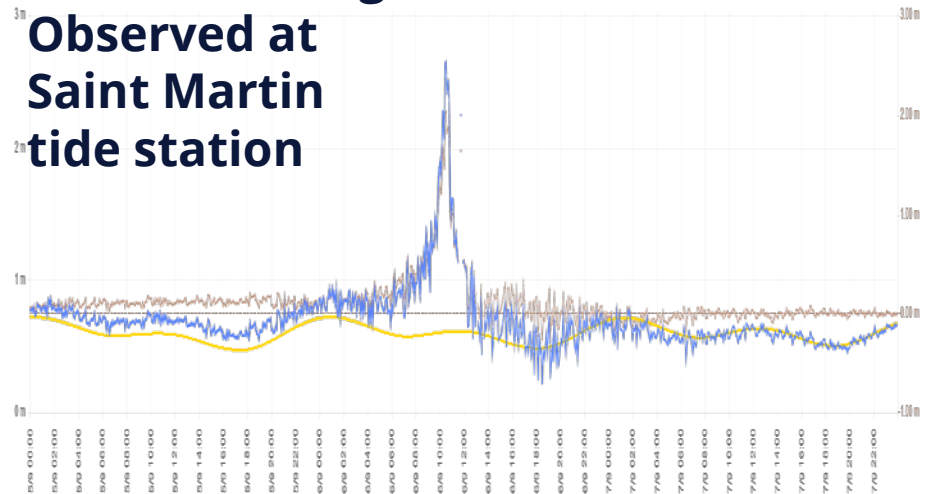


# TIDE OBSERVATION

FRENCH PERMANENT SEA LEVEL OBSERVATION NETWORK IN THE CARIBBEAN



**2 m storm surge  
Observed at  
Saint Martin  
tide station**



Almost real time data :

[data.shom.fr](http://data.shom.fr)

<http://www.ioc-sealevelmonitoring.org/>

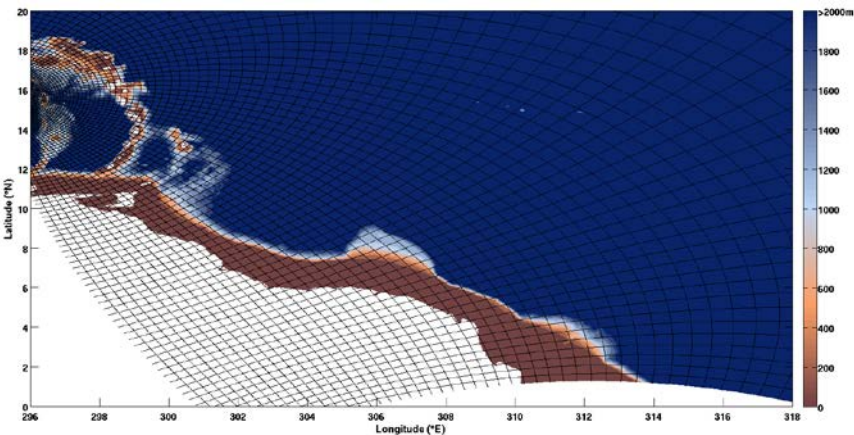
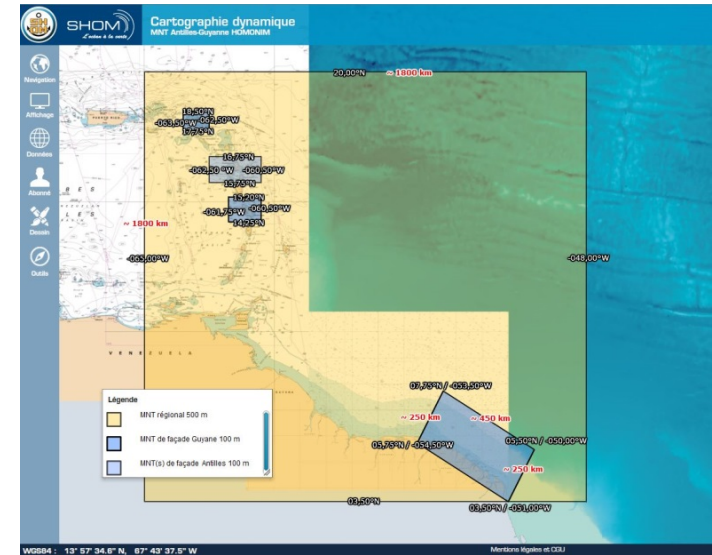
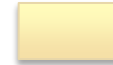
# STORM TIDE FORECAST TOOLS

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

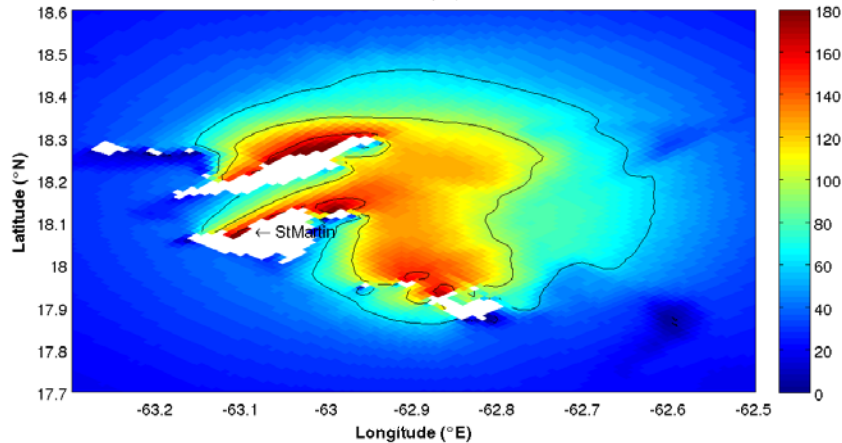


- Caribbean & Guiana
- Curvilinear grid : 2,5 km in Guiana / ~900 m over Caribbean
- Off-the-shelf bathymetry
- Tidal (open boundaries) and atmospheric (wind + pressure) forcing
- Developed and validated by Shom & Operated in real time by Météo-France

# STORM SURGE FORECAST DURING IRMA



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



## Storm surge forecast : 9-day run

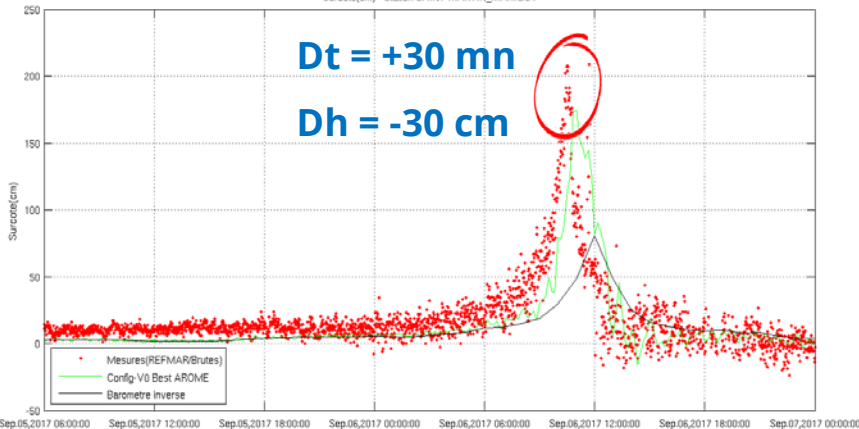
- Aug. 29 (6:00 PM) to Sept. 07 (12:00 AM)
- Forecast mode starting Sept. 6 (00:00)

## 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*

# IRMA'S IMPACT ON SAFETY OF NAVIGATION

## IMPACT ON EXISTING NAVIGATIONAL CHARTS



### 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 = 2000<sup>000</sup>

in

1999

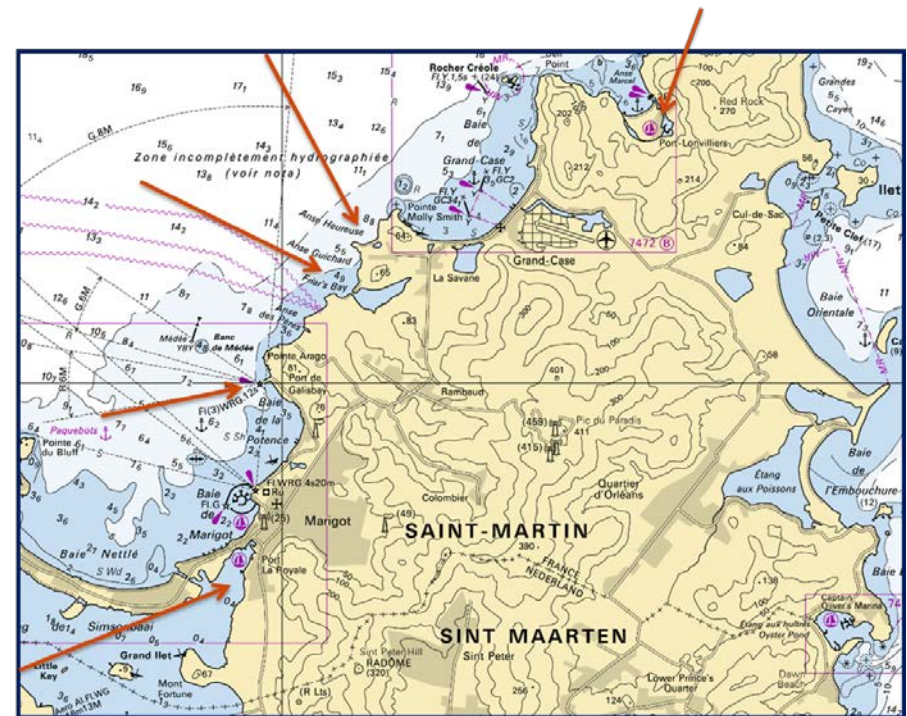
# IRMA'S IMPACT ON SAFETY OF NAVIGATION

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.**



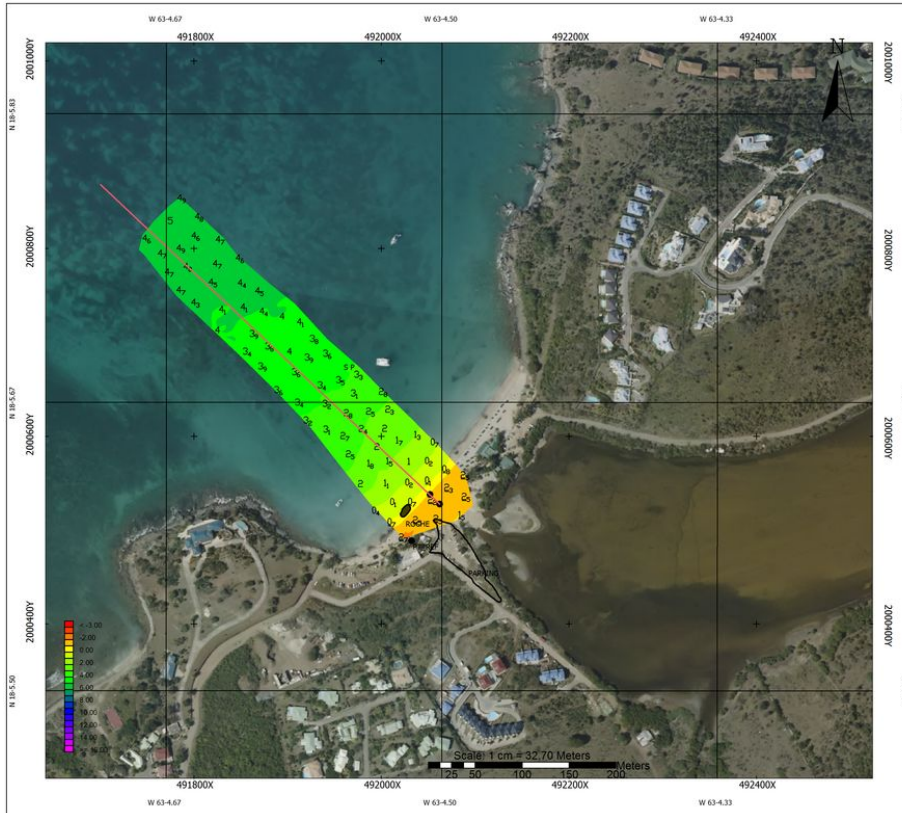
# IRMA'S IMPACT ON SAFETY OF NAVIGATION

EXPEDITIONARY SURVEY – RESPONSE PHASE



## Survey conducted from the BPC *Tonnerre* (Navy ship - Landing Helicopter Dock (LHD))

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



SYSTÈME DÉPLOYABLE  
D'HYDROGRAPHIE MILITAIRE

MER DES CARAÏBES  
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, LA7)

**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.



Access to *Friar's Bay* beach

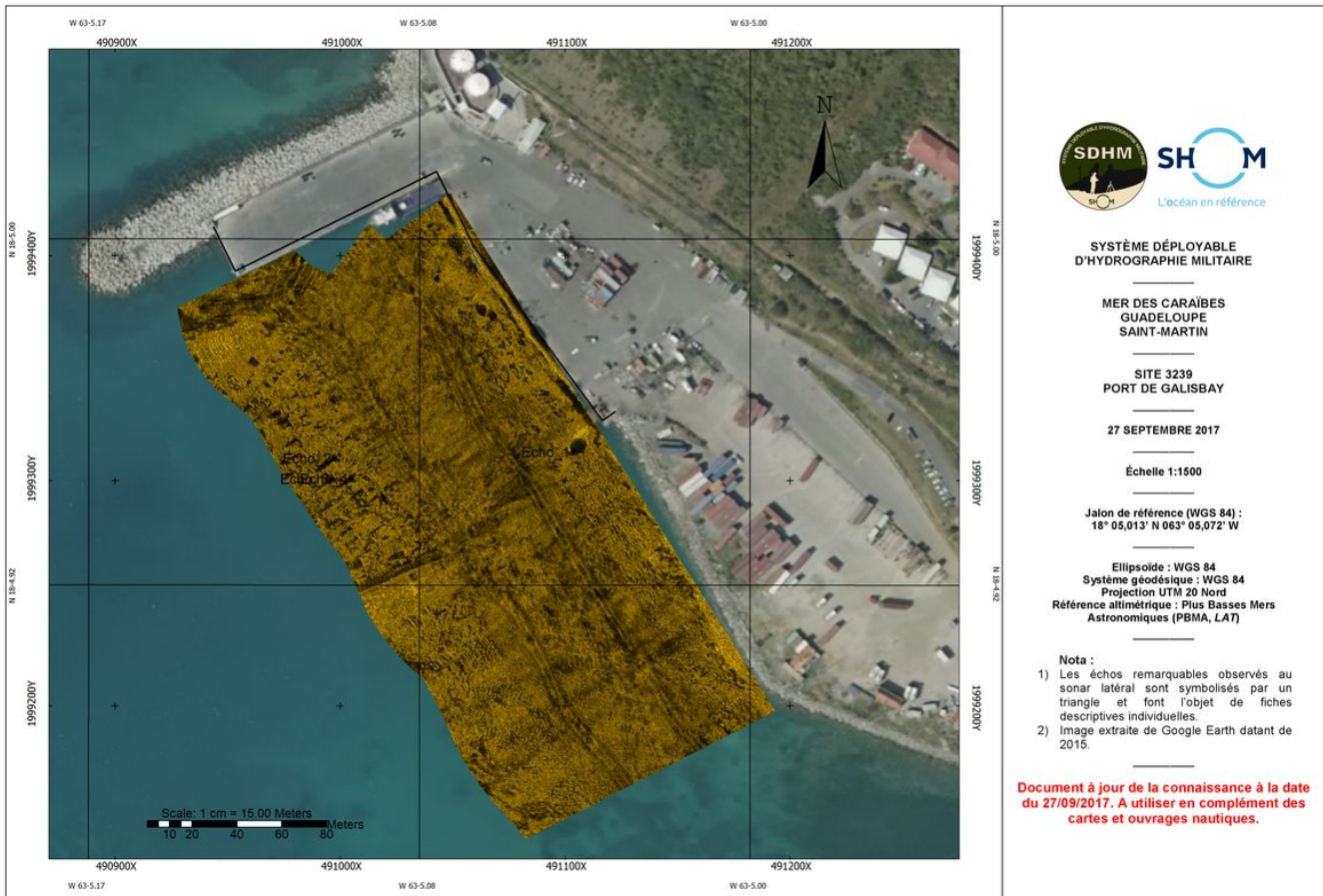


# IRMA'S IMPACT ON SAFETY OF NAVIGATION

EXPEDITIONARY SURVEY – RESPONSE PHASE



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





# 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
- Note : 2 systems in Pacific (no duty)



*SDHM packed, ready to go !*



*SDHM fitted on Army pirogue*



*SDHM fitted on Navy RHIB*



*St Martin : SDHM and inflatable boat offload*

- **Surge forecast and real-time sea level observation**

Globally satisfactory. On-going *Homonim* program / some improvements needed to improve the resiliency of some tide gauges in the area

- **Immediate cartographic actions - warnings**

- **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 (not always easy)

# COMPARED CAPABILITIES IN SW PACIFIC



- **Real-time sea level observation : OK (maintained by Shom in New Caledonia \*6, Wallis & Futuna\*2 and French Polynesia\*6 + IOC + PTWC)**
- **Surge forecast : no such model yet**
- **Tsunami models : being implemented in NC (IRD)**
- **Immediate assessment of damages (response phase) OK**
  - IHO - SWPHC coordination : important role
  - Data sharing (charts, databases, imagery, SDB)
  - Cooperation & exercises : e.g. Croix du Sud 2018 (incl. many nations) , SPC (Kea Trader 2017)
  - Hydrographic deployable capability in Nouméa + Tahiti (SBES and MBES)
  - Capability embedded in the global operation (good coordination with French MOD assets – deployed on Ships/Aircrafts)
- **Immediate warning OK**
  - Coordination with MSI (MRCC, JRCC)
  - Cartographic actions by Shom

## Reference : France National report

France **may have Navy ships** in the SWPHC region ready to provide support in case of an emergency.

France (Shom) also provides technical support and has a **rapid response capacity for environmental data** in case of a disaster.

The point of contact at Shom in case of a marine disaster is the head of the maritime safety information division. This division **can be reached 24/7 by fax +33 298 221 665 or email coord.navarea2@shom.fr**

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**Copy to Head of Shom survey unit in the pacific (GOP director)**

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