

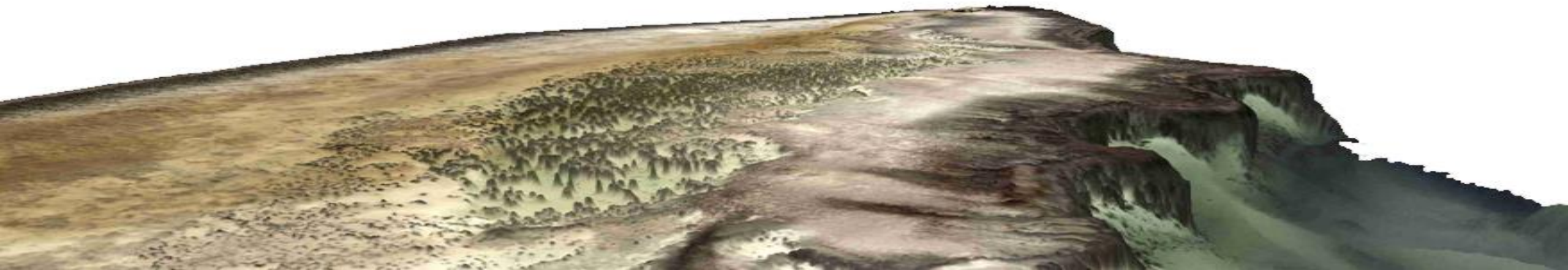
Satellite Derived Bathymetry

- *Irma* impact and integration with acoustic surveys -

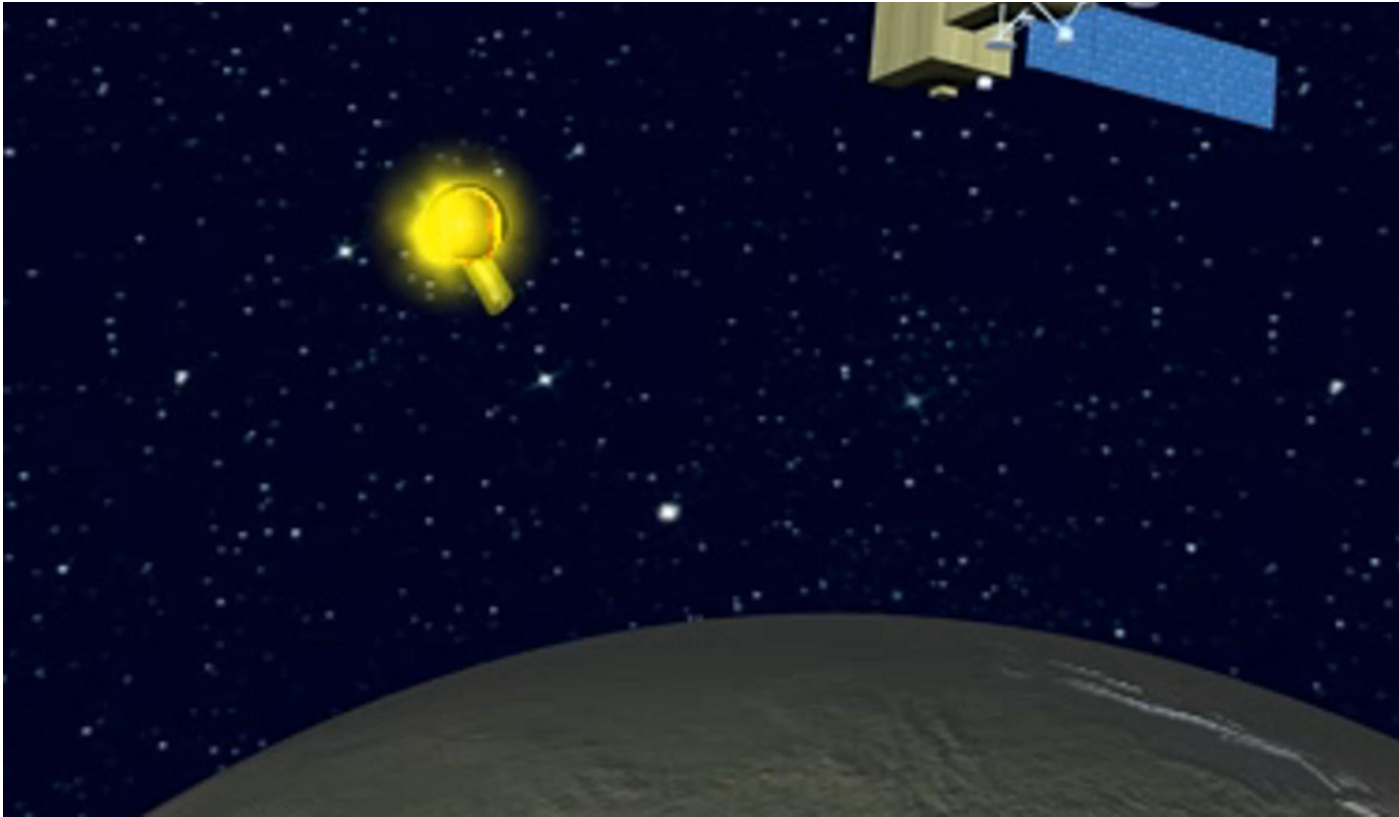
2017-12-01



Dr. Knut Hartmann
hartmann@eomap.de
EOMAP GmbH & Co.KG
Germany | Australia | USA
www.eomap.com



Satellite derived information

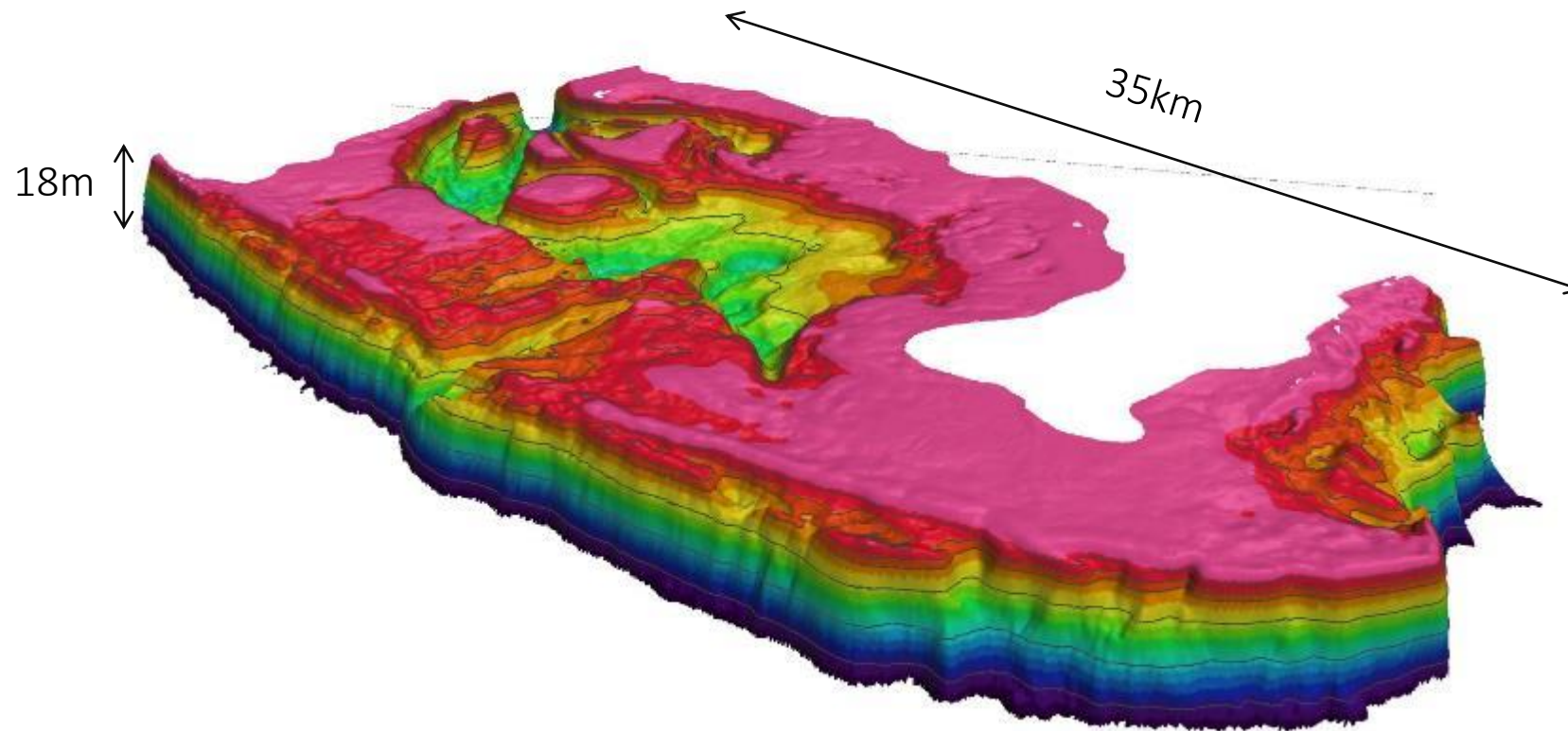
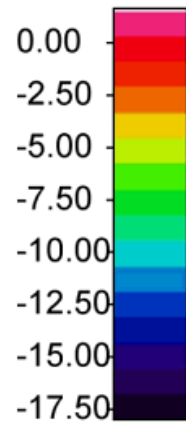


- Remote measure
- Global coverage of imagery
- Rapid access to data
- Satellite measure all parameters from sun to surface to satellite sensor (atmosphere, surface properties, etc)

Satellite Derived Bathymetry

Mtwarba region, Tanzania

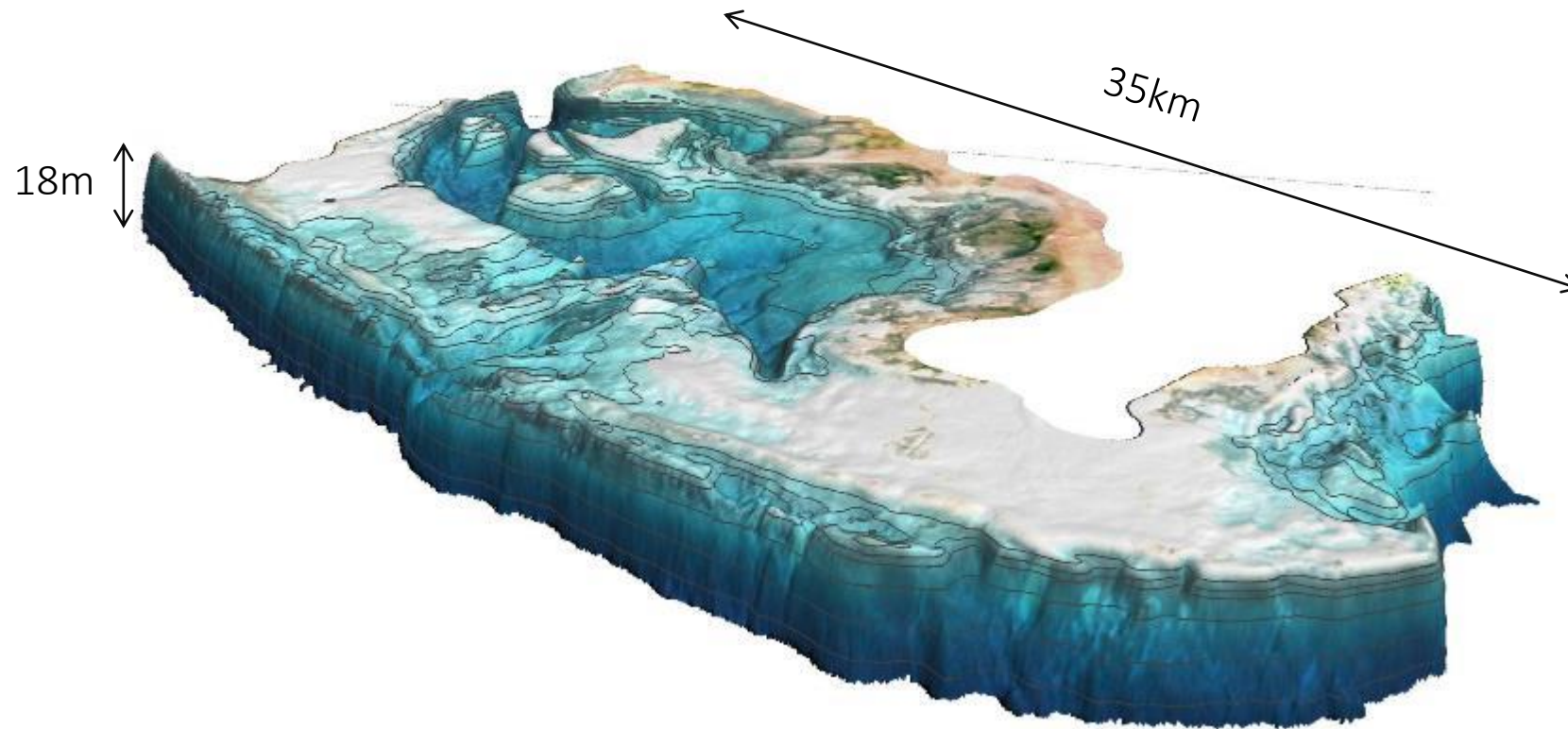
Satellite data = $f(\text{atm.}, \text{adjacency}, \text{water surface}, \text{absorbers and backscatterers of the water column}, \text{seafloor}, \textbf{water depth}, \text{seastate}, \text{sun and sensor geometry}, \text{SNR ratio})$



Seafloor reflectance

drapped over Satellite Derived Bathymetry

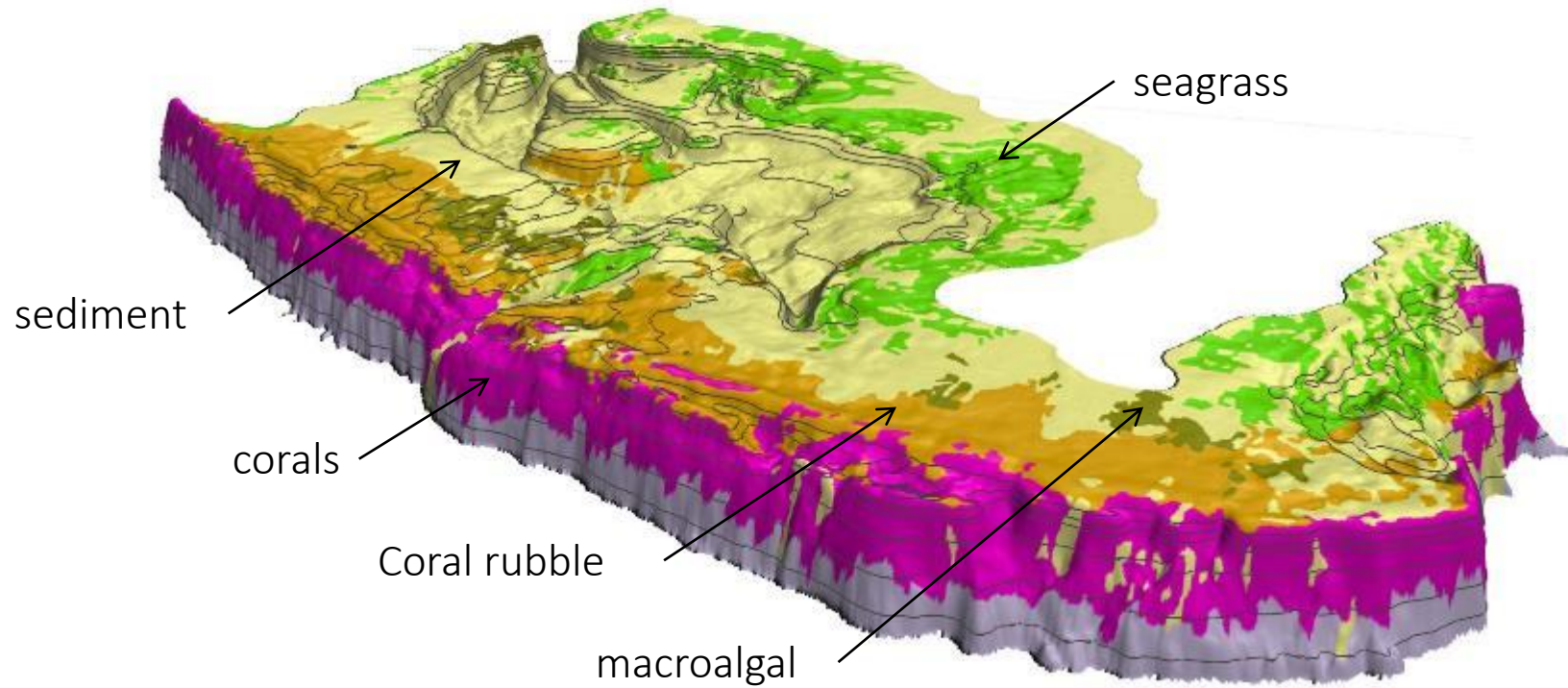
Satellite data = $f(\text{atm.}, \text{adjacency}, \text{water surface}, \text{aborbers and backscatterers of the water column}, \text{seafloor}, \text{water depth}, \text{seastate}, \text{sun and sensor geometry}, \text{SNR ratio})$



Seafloor habitat classification

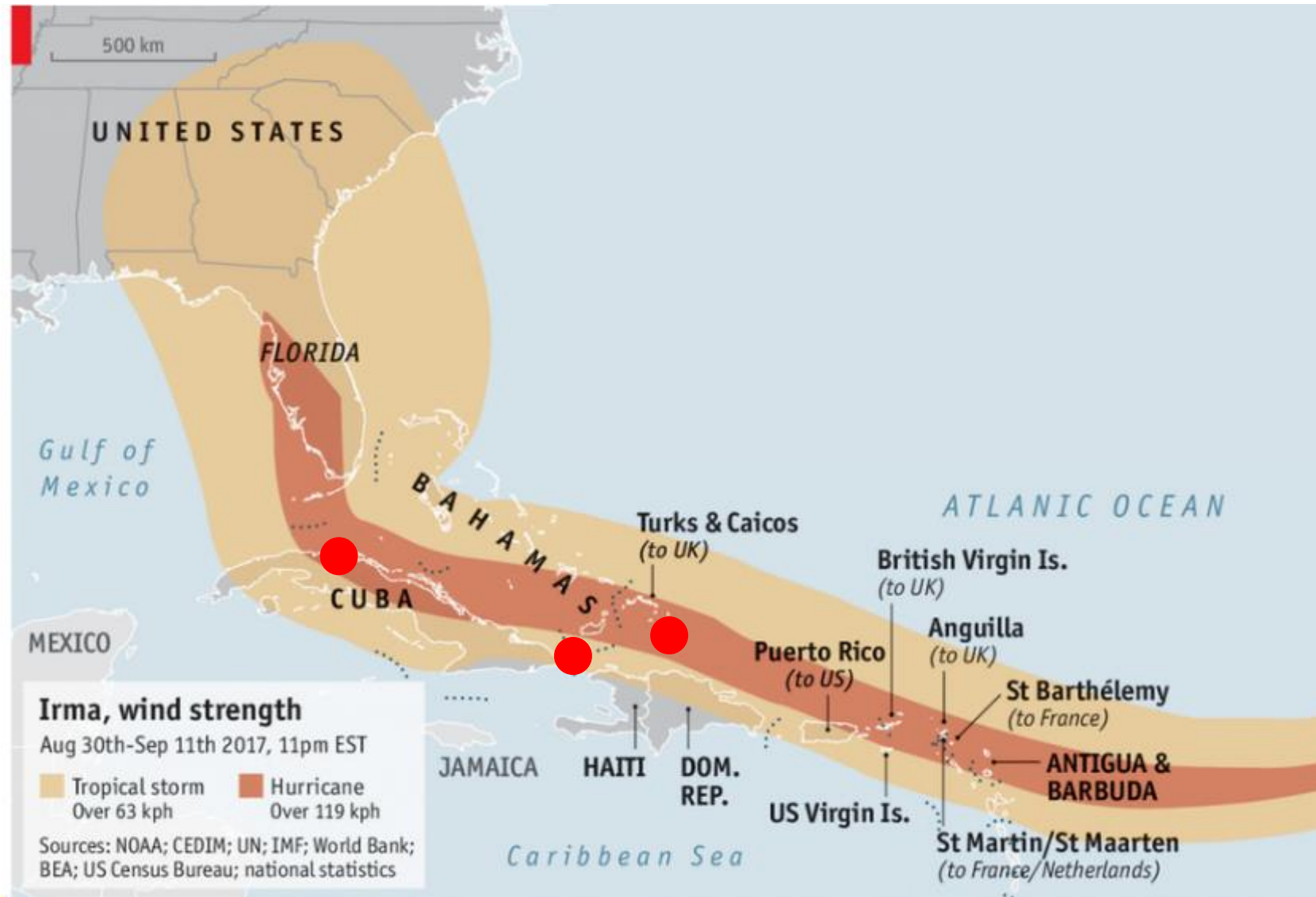
drapped over Satellite Derived Bathymetry

Object based classification considering texture, shape and spectra of seafloor reflectance in addition to seabed morphology.



Impact assessment of “Irma”
and satellite information as rapid response tool

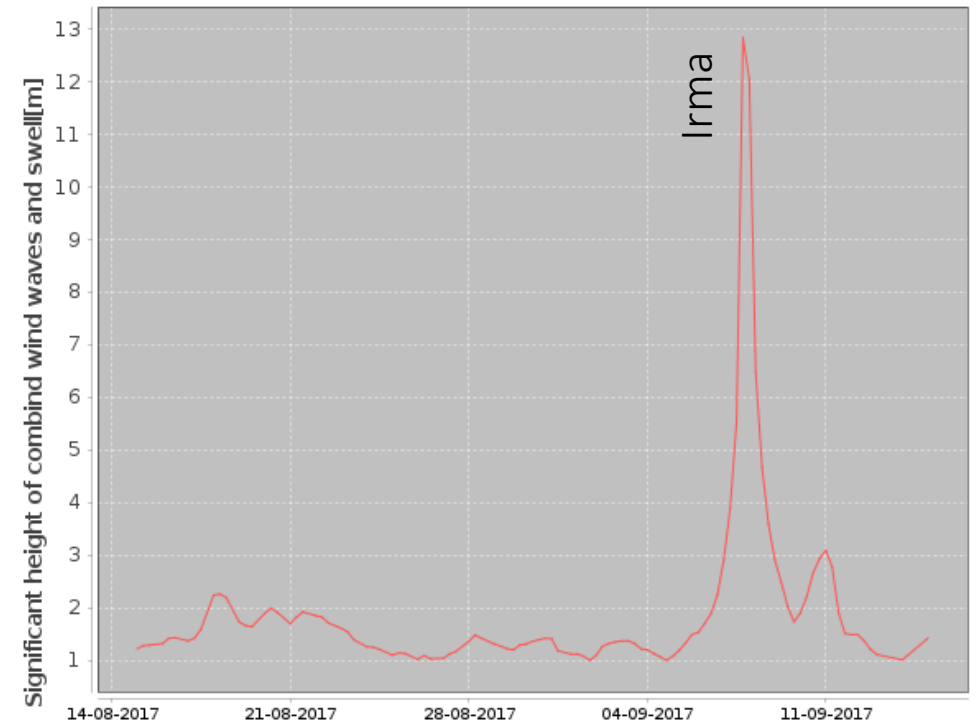
Irma, Sept 2017



Turks and Caicos, Big Sandy Cay

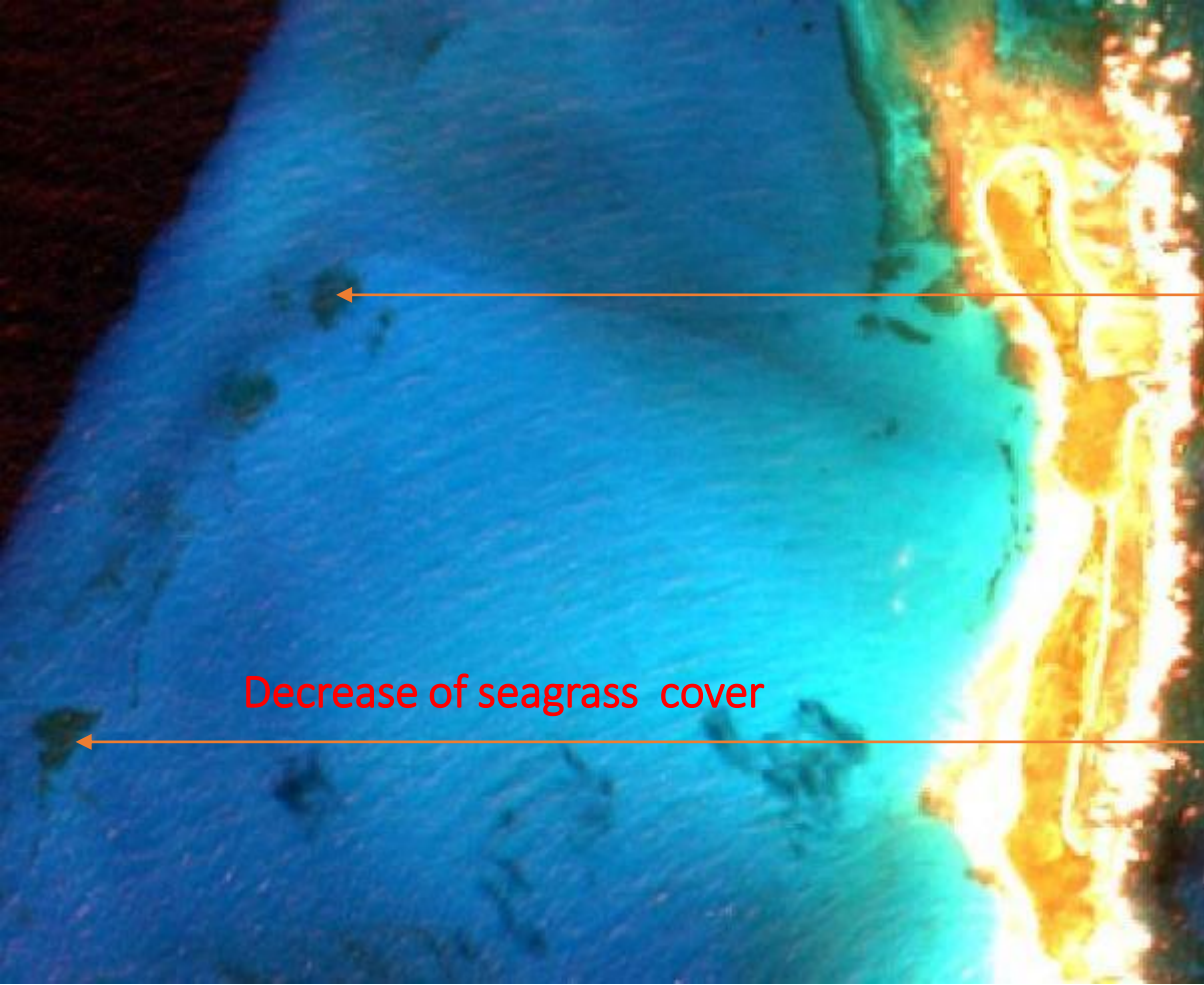


- Changes in very shallow water bathymetry with sandy bottom
- Changes in coastline
- Island was split into 2 parts now
- Coral structure and geomorphology not significantly impacted

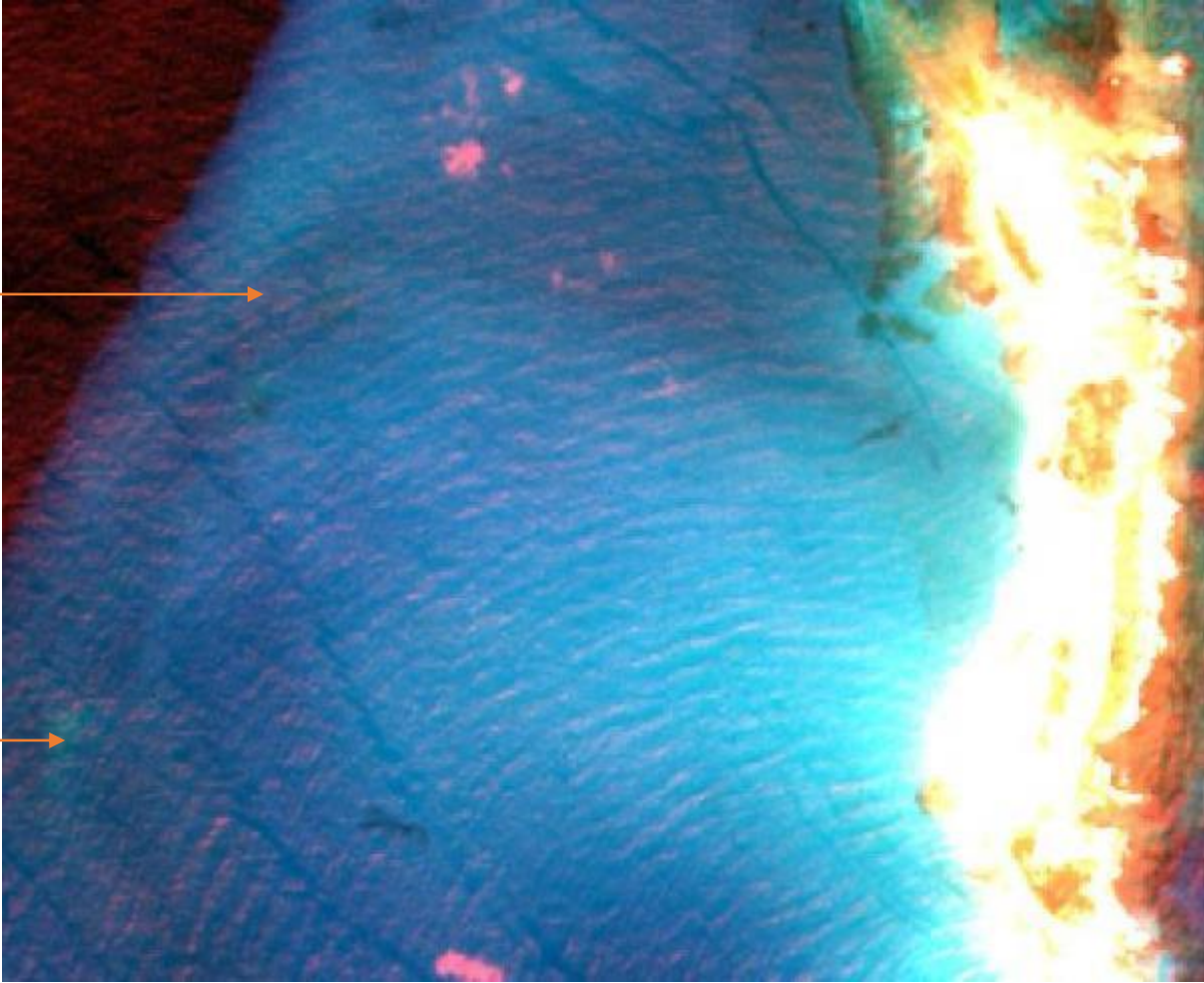


Turks and Caicos, Big Sandy Cay

Before Irma



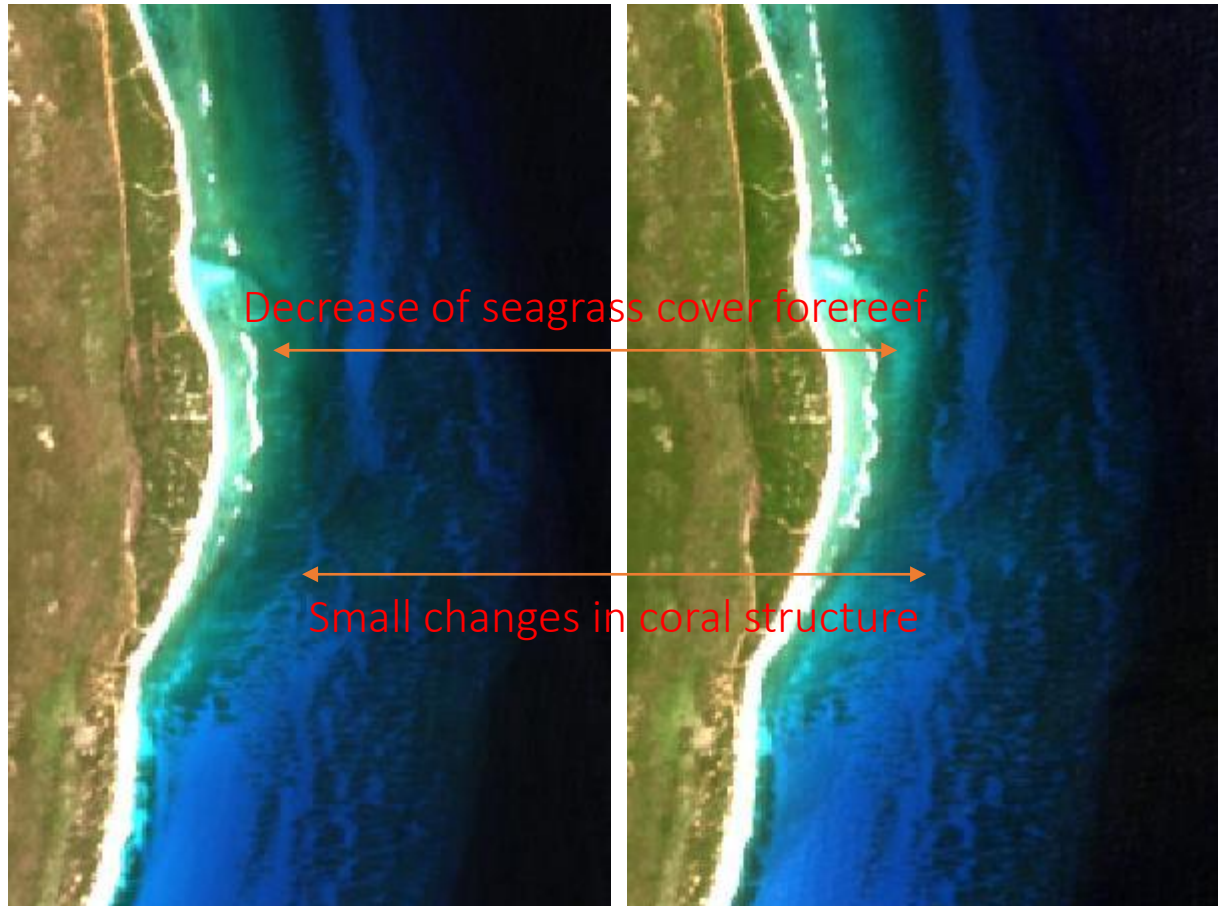
After Irma



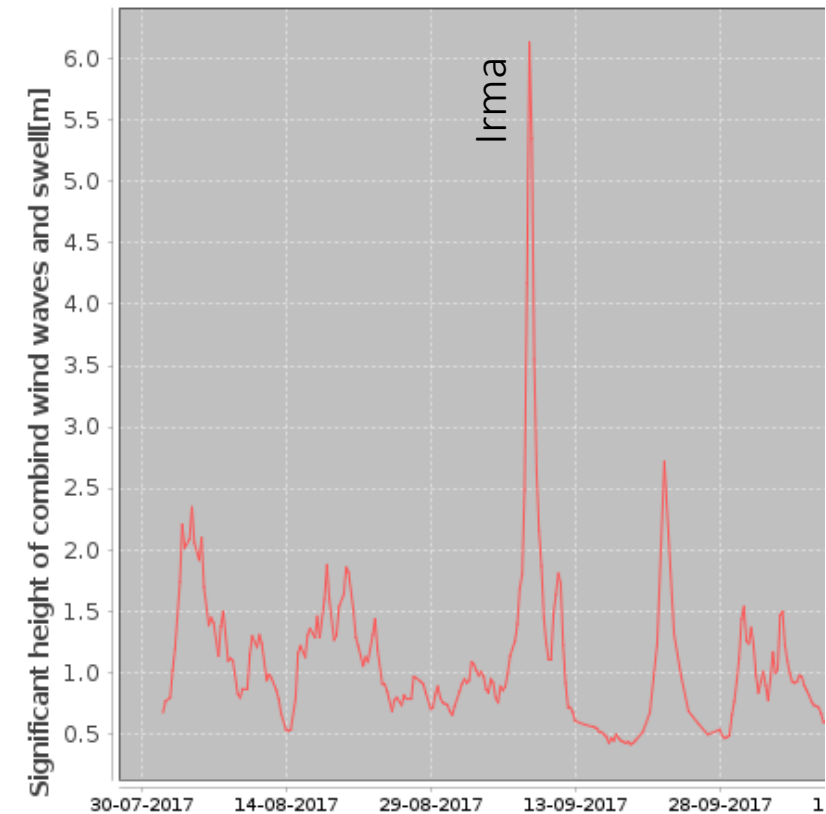
Punta de Maisi, East Cuba

before

after

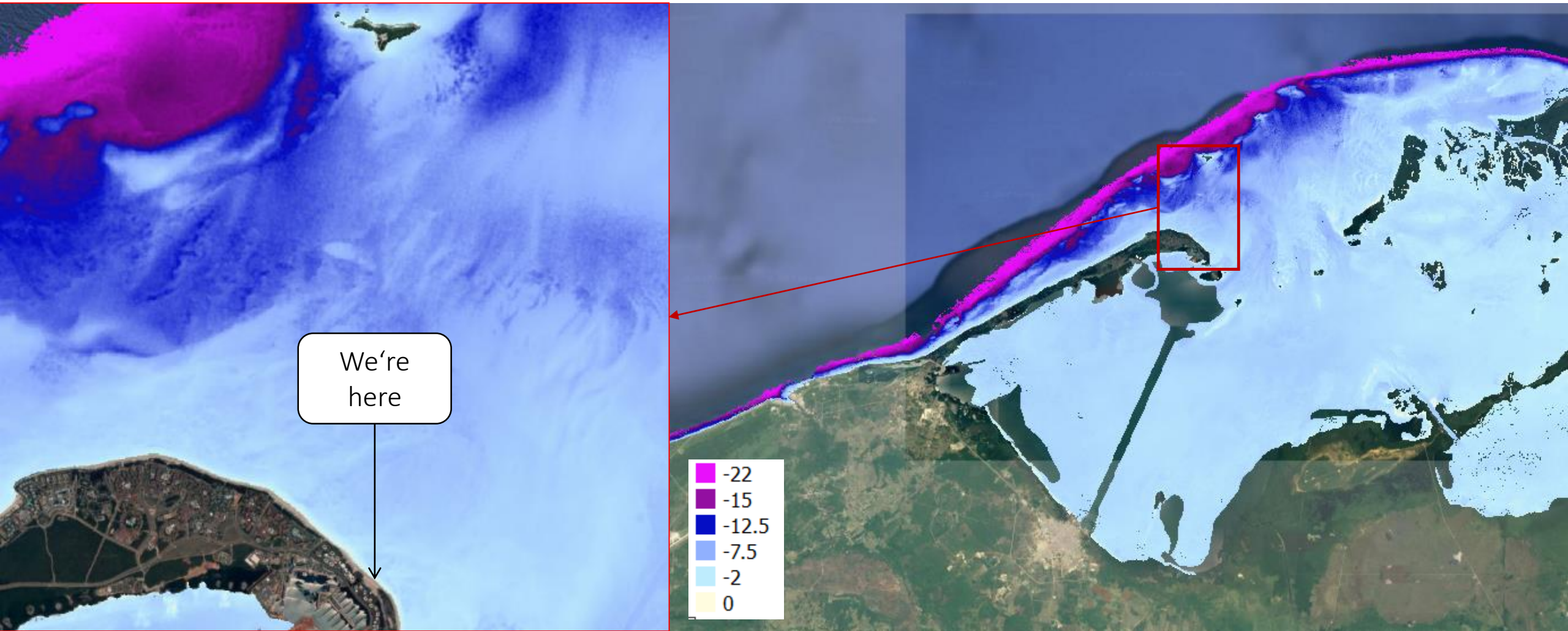


- Coral/hardbottom seafloor and bathymetry areas were not impacted by Irma
- Natural dynamic of seafloor dominates Irma impacts



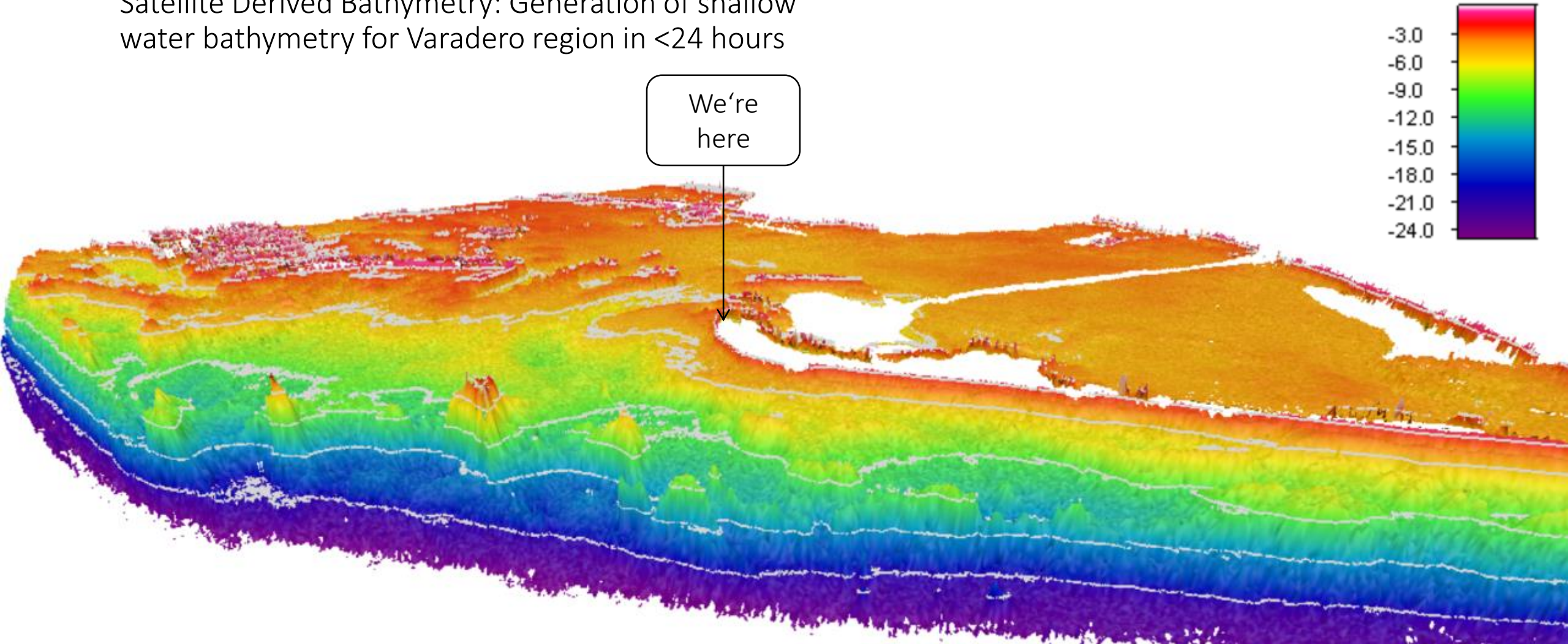
Varadero Peninsula, Cuba

Satellite Derived Bathymetry: Rapid provision of up-to date bathymetric data grids



Varadero Peninsula, Cuba

Satellite Derived Bathymetry: Generation of shallow water bathymetry for Varadero region in <24 hours



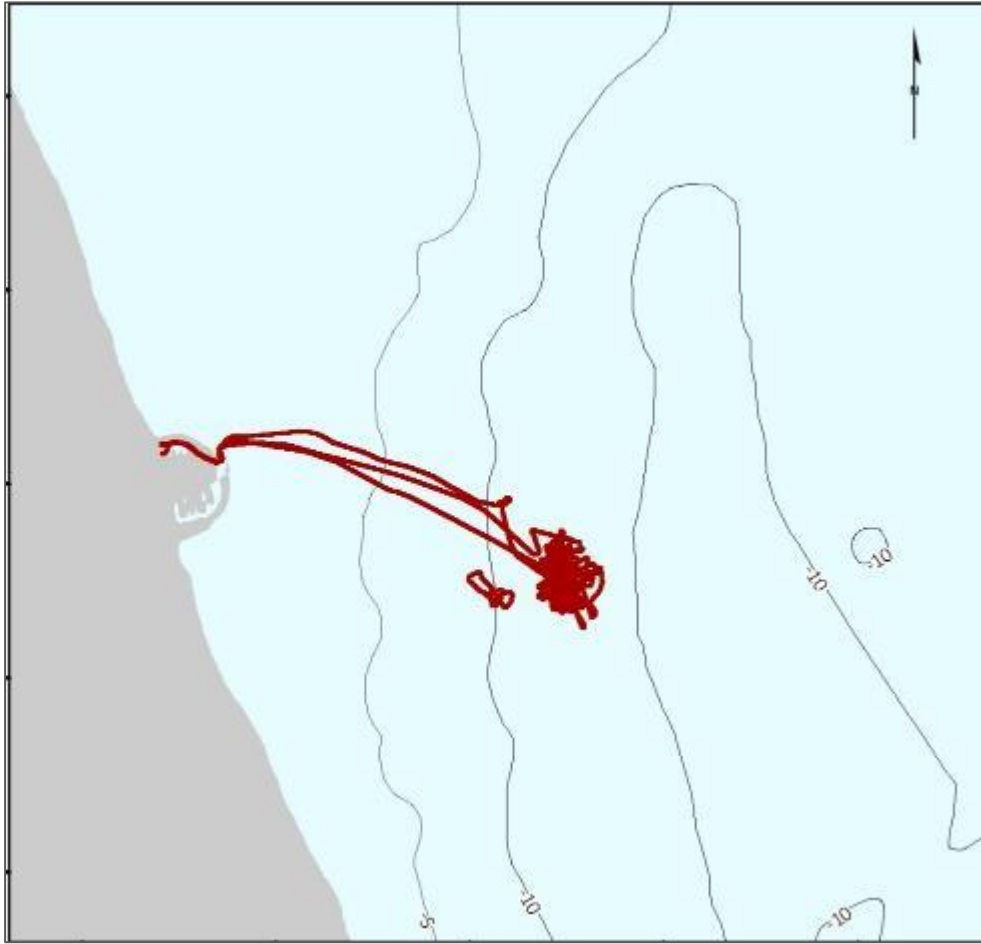
Key messages

- Satellite Derived Bathymetry allows rapid assessment of changes in coastline, seafloor cover / benthic habitats and shallow water bathymetry.
- Method can work remote as rapid assessment tool but can also be integrated in survey concepts with acoustic data -> next section

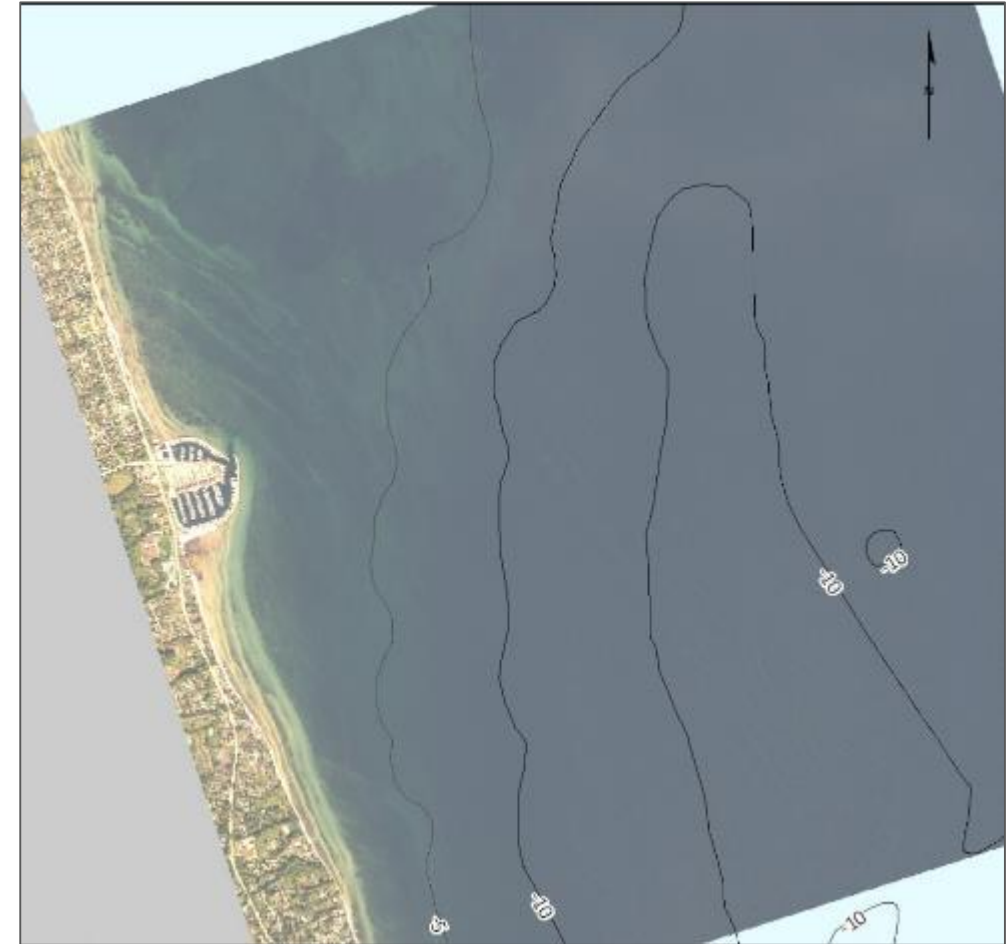
Integration of Satellite Derived Bathymetry with acoustic survey data

Integrated approach of using SDB and Single Beam

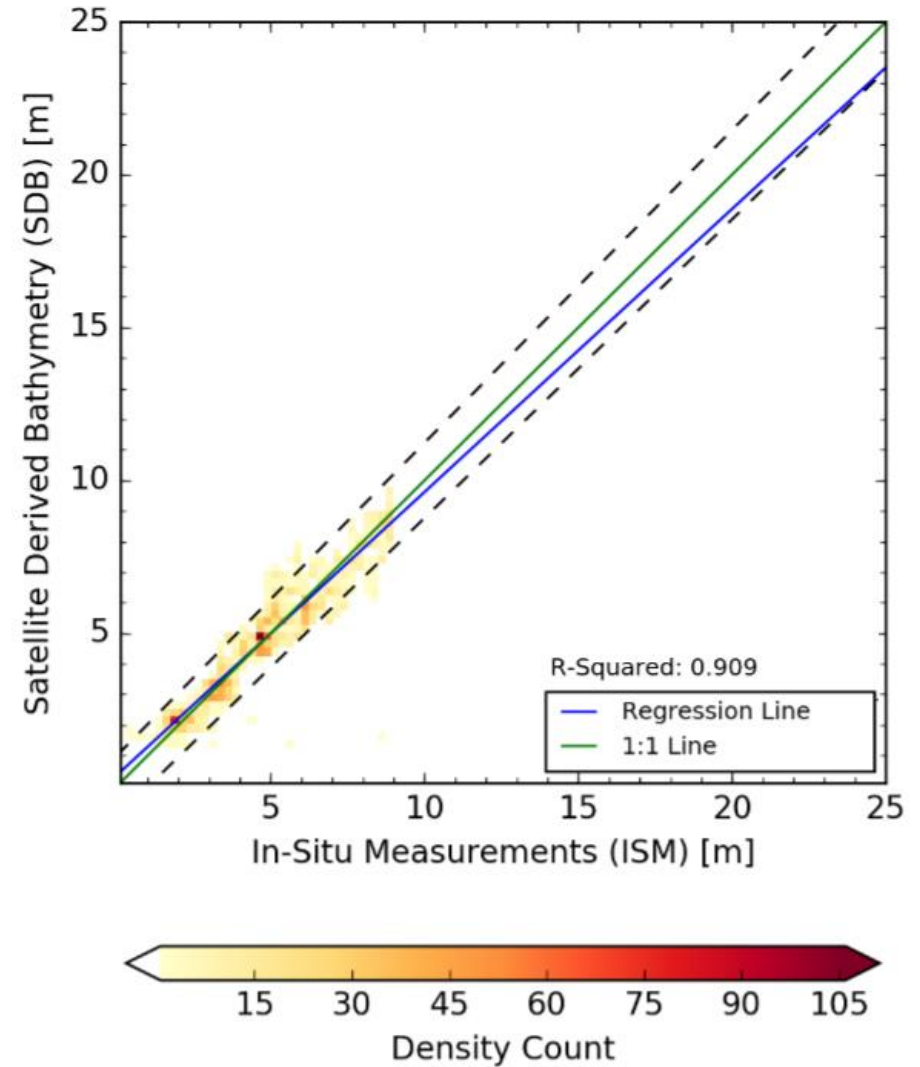
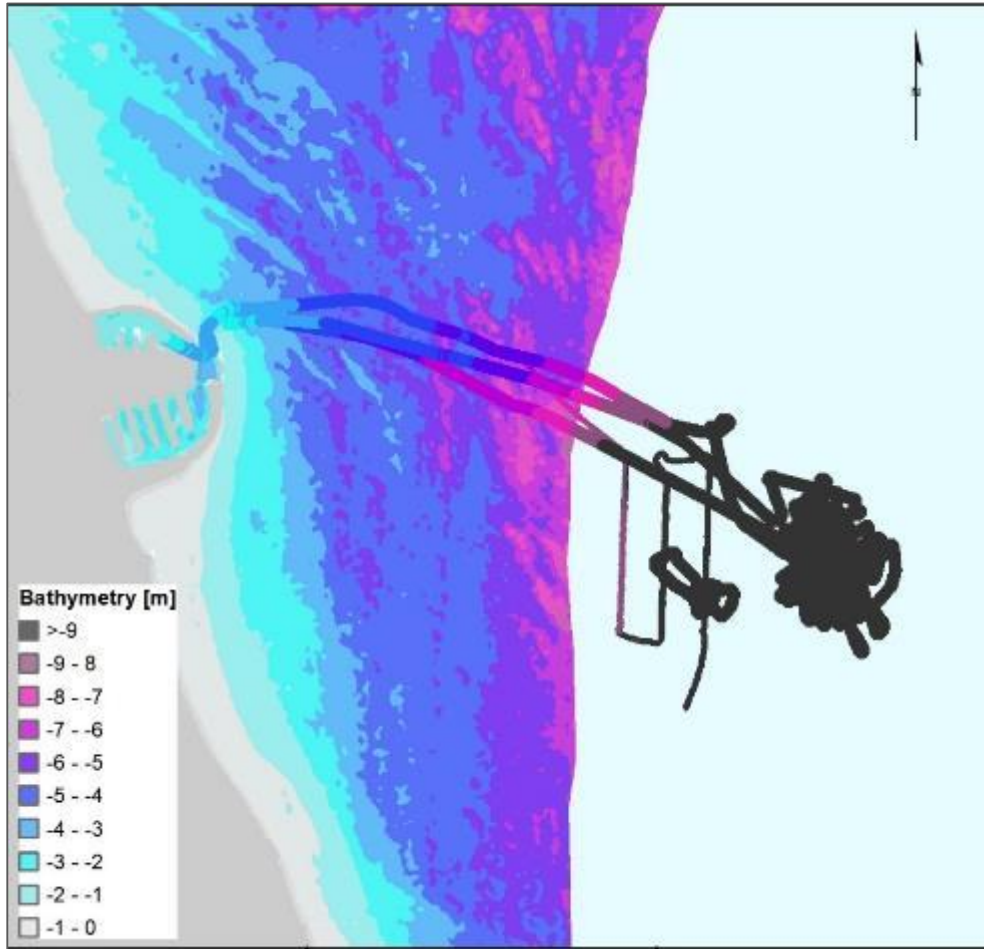
Single Beam transects (AUV)



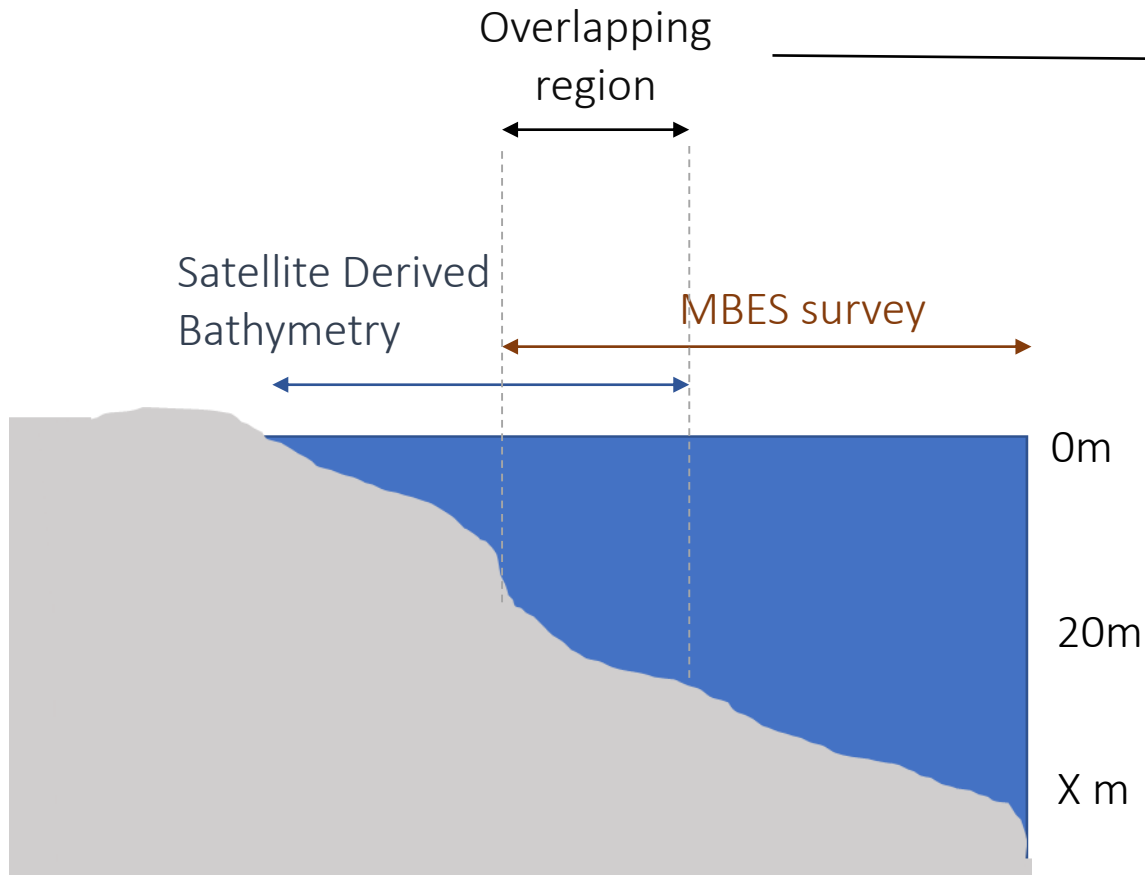
Very high resolution satellite image



Integrated approach of using SDB and Single Beam

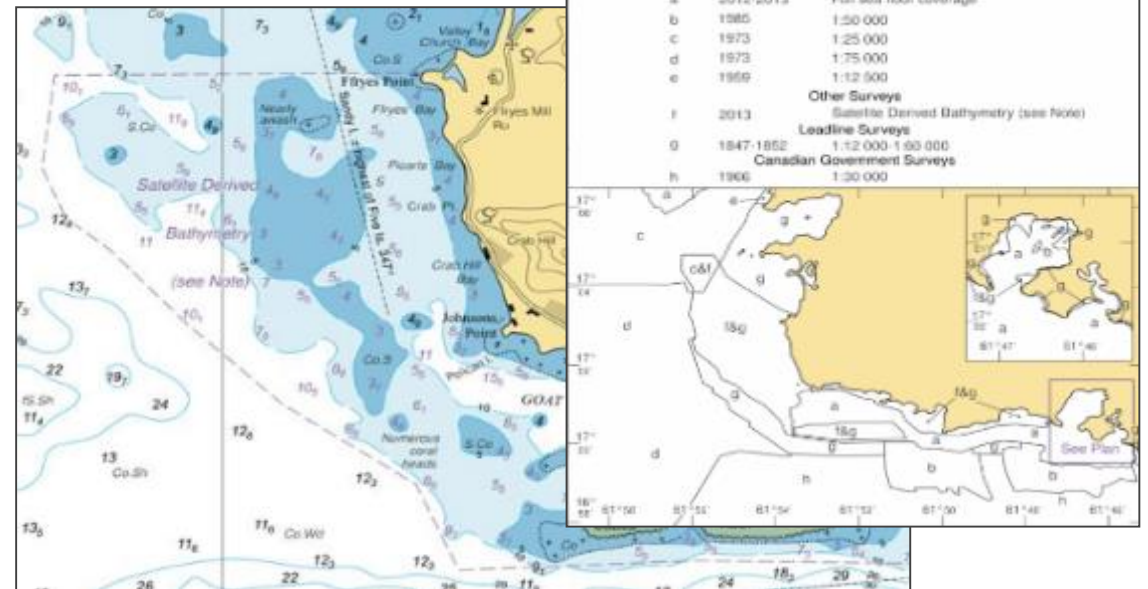


Integrated approach of using SDB and MBES



Calibration &
Validation area

British Admiralty Chart BA 2066
Southern Antigua



Key messages

- Combining **SDB and single beam** transects allows to provide a validated bathymetric dataset with full seafloor coverage, including very shallow waters.
 - This combination allows to minimize survey work while improving spatial coverage. High potential for rapid response surveys.
- Combining **SDB and MBES** surveys allows to calibrate and validate SDB in the overlapping regions and results in a validated bathymetric dataset from deep waters to shoreline
 - This combination allows to minimize cost intensive very shallow water surveys, reduces HSE risks while generating seamless bathymetric datasets from deep waters to shoreline

A satellite image of the Varadero area in Cuba, showing a long, narrow peninsula with a beach and a town. The water is a deep blue, and the land is a mix of green and brown. The text is overlaid on the image.

Muchas gracias!

Dr. Knut Hartmann
hartmann@eomap.de
www.eomap.com

Satellite data recorded Nov. 2017, Varadero area, Cuba