

# CalVal LiDAR

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Speakers: Benoit Laignel & Nicolas Picot

Calval LiDAR

Project: SWOT COTEST

PI: B. Laignel

**LiDAR Flight over the Seine river estuary - October 15, 2017**

### Objectives




- Evaluate precision of the LiDAR measure on water
  - comparison with tidal-gauges on the estuary (in progress)
  - comparing the results with GPS points on the estuary taken by the boat campaign
- Improve the Seine estuary modeling by providing the precise topography of complex areas (small islands)
- Estimate roughness parameters on the Seine estuary
- Compare the LIDAR measures and the SWOT data of the simulator & improve the SWOT simulation

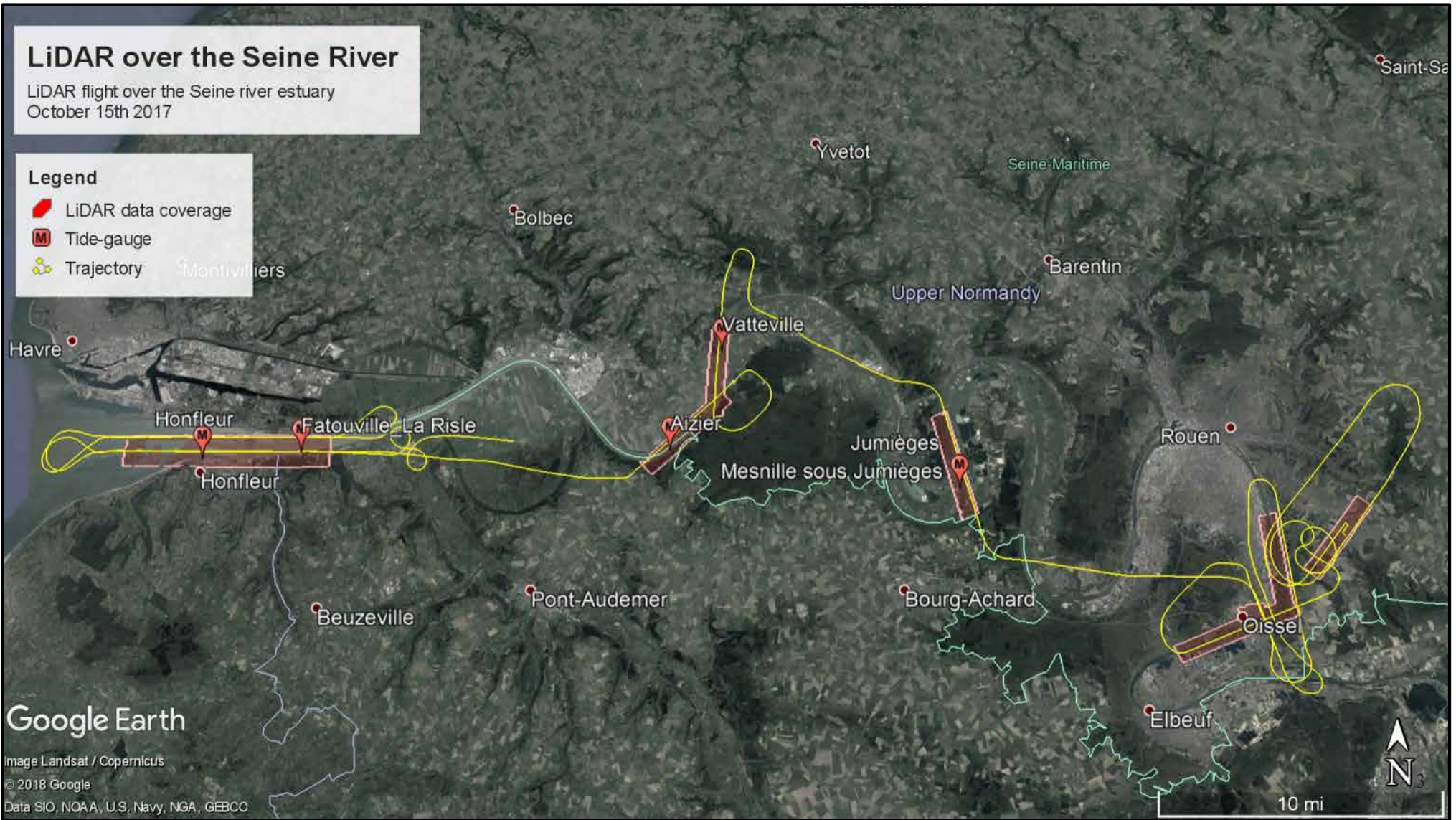


# LiDAR over the Seine River

LiDAR flight over the Seine river estuary  
October 15th 2017

## Legend

-  LiDAR data coverage
-  Tide-gauge
-  Trajectory





## Calval LiDAR

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### Flight

- Initially planned in June 2017 to acquire synchronous data with the GPS carpet boat campaign (INSU)
  - => postponed at the last minute due to change in weather conditions
- Flown in October 15, 2017 without the boat.
- Flight plan
  - Low altitude of 800 m to ensure accuracy of the sensor
  - Nadir centered on water to ensure maximum returns

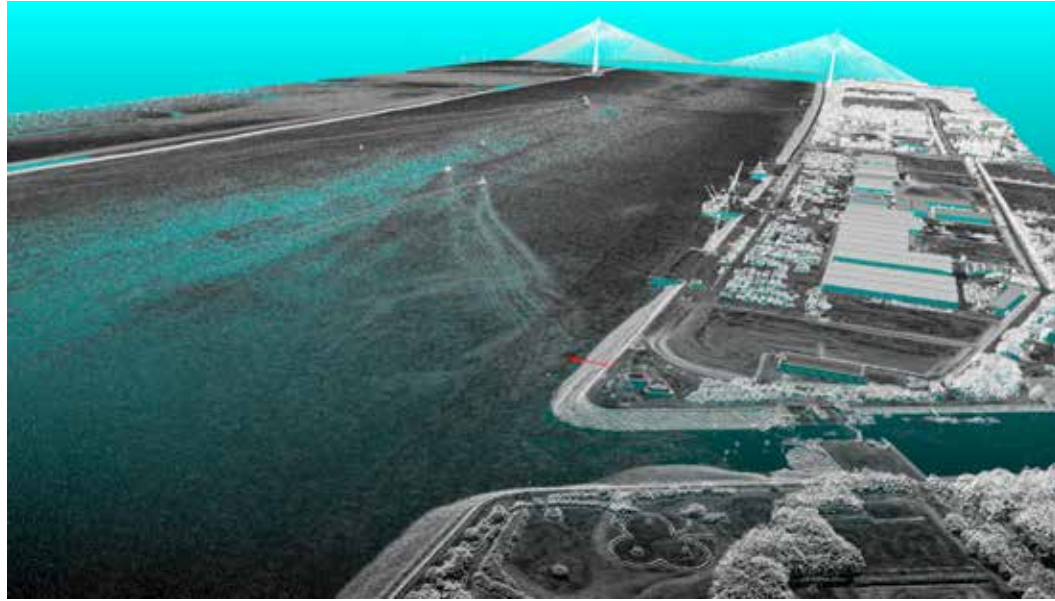
### Processing

- 150 million measured points / 30 million on water
- Trajectory computed was based on DGPS receivers deployed on the field for the campaign
- DGPS points were taken on the ground at 4 different locations
- absolute georeferencing error of 5.3 cm in RMS



Top view of the tidal gauge pier in Honfleur (in red)

- The comparison with tidal gauges is in progress
- Future work will be to compare the LIDAR measurements and the SWOT data of the simulator

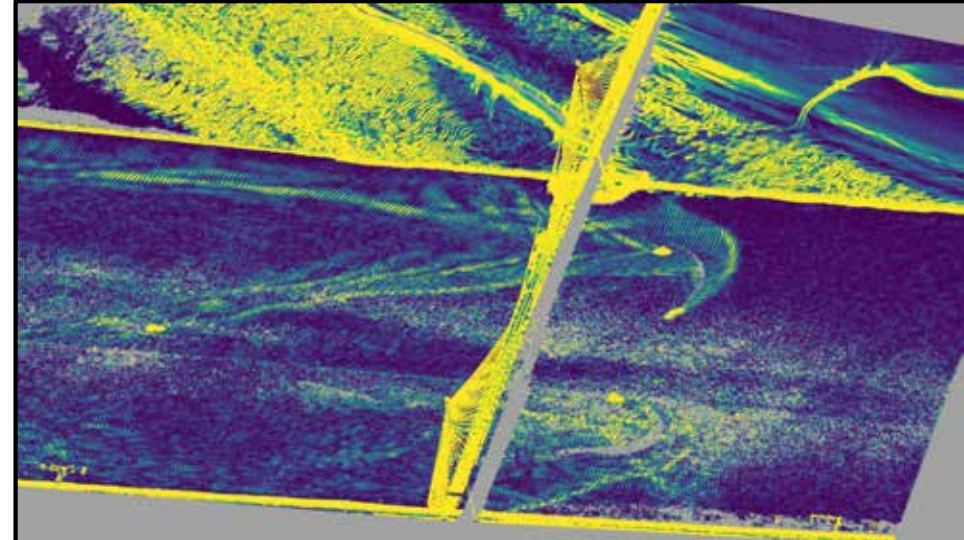
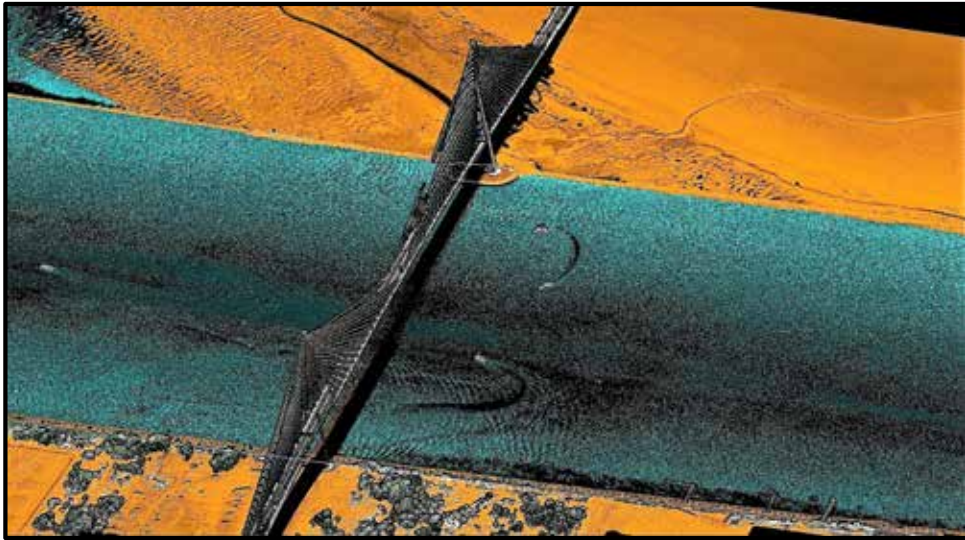


## Calval LiDAR - Seine Estuary: Some results

Top: View on the tidal gauge pier in red (Honfleur city)

Left: view by class (water, ground, building, vegetation)

Right: 2 meter surface normal amplitude



Calval LiDAR

Project: BIOSWOT

PI: F. d'Ovidio

### LiDAR / Hyperspectral flight over the Mediterranean

#### Objectives

- Evaluate the capacity of in-situ LiDAR data to measure SSH
- Improve 3D current modeling through in-situ sea surface topography
- Hyperspectral measure of the phytoplankton

#### Sensors

- LiDAR (Leica ALS60)  
of the M2C laboratory of the universities of Caen & Rouen  
coupled with a
- Hyperspectral camera (SPECIM AISA Eagle 1K / VNIR (400-970 nm))  
of the IETR laboratory of the University of Rennes  
(Hyperspectral team SHINE-TSI2M)



#### Top Left

Piper Navajo used for the LiDAR/Hyperspectral test flight on April 24, 2018

#### Top Right

LiDAR + Hyperspectral camera

#### Bottom Right

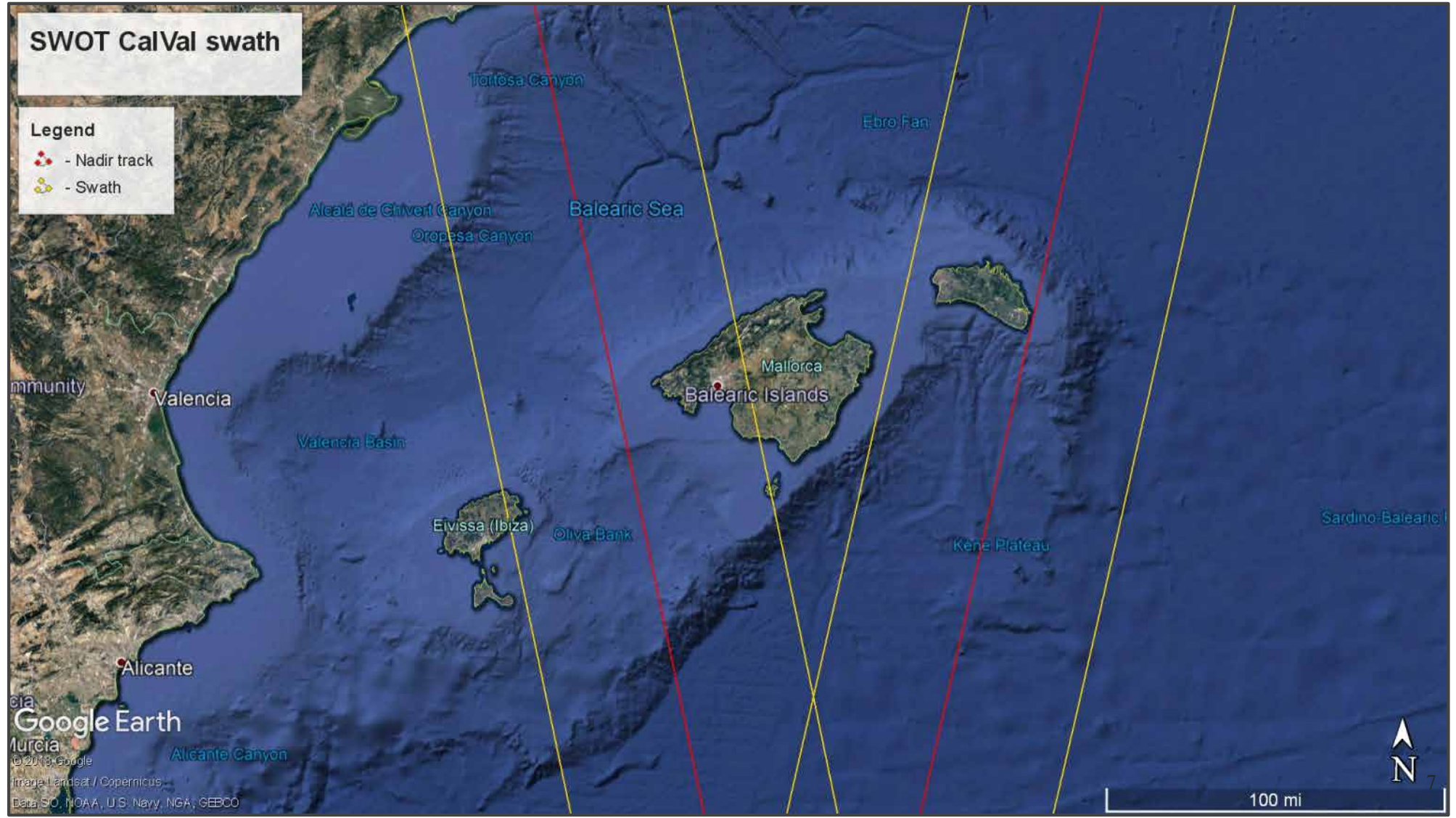
Sensors installed on the plane



# SWOT CalVal swath

**Legend**

- Nadir track
- Swath



Calval LiDAR

Project: BIOSWOT

PI: F. d'Ovidio

### LiDAR / Hyperspectral flight over the Mediterranean

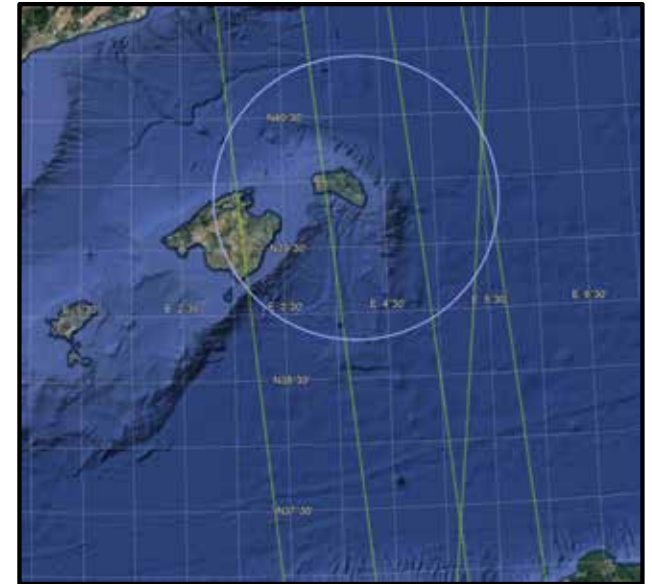
**Involved team: 7 persons**

**1 professor, 3 engineers, 1 assistant engineers & 2 pilots**

Josias Lefèvre (Research Engineer, IETR), Kacem Chedhi (Professor, IETR), Christophe Conessa (Engineer, CNRS), Laurent Benoit (Assistant Engineer, CNRS), Pixair Survey (2 pilots), Laurent Froideval (Research Engineer, CNRS)

### Flights

- 2 flights
  - Scientific calval: hyperspectral measure coupled with LiDAR data over area of interest
    - Flight plan in a “comb” shape over the boat sampling area
  - Technical calval: flight over altimeter tracks
    - Sentinel 3A, Jason 3 or Cryosat 2
    - Flight plan
    - 150 km in straight line over altimeter tracks, flown 4 times (2 round trips)



### Examples of groundtracks selection

**In green:** possible altimeter tracks for Cryosat 2 in the airport range (Port Mahon, Minorca)

**Blue circle:** Possible range for the local transit depending on the total flight time



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## LiDAR / Hyperspectral flight over the Mediterranean

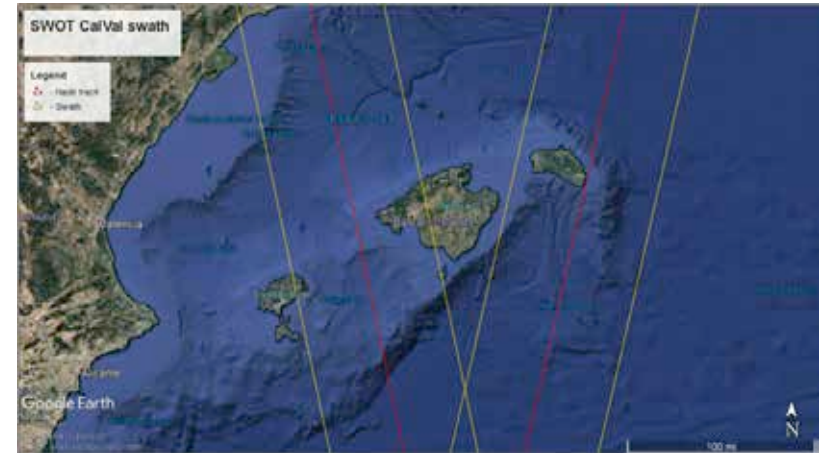
- Originally planned for beginning of May 2018, these flights were canceled due to weather forecast not compatible with LiDAR / Hyperspectral sensors
- First test flight of this coupled system in April 24, 2018, in Normandy in the Seine estuary & wetlands
  - flight was successful
  - fine processing of the coupled data is still in progress



## FUTURE

**New LIDAR/hyperspectral campaign to replace the Mediterranean campaign ?**

In the same or other location

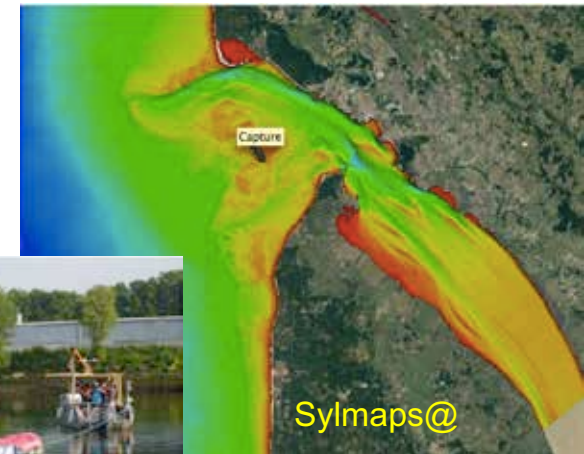


**Other LIDAR campaign in estuary ?**

Maybe in the same time of the GPS carpet  
boat campaign in the Gironde estuary...

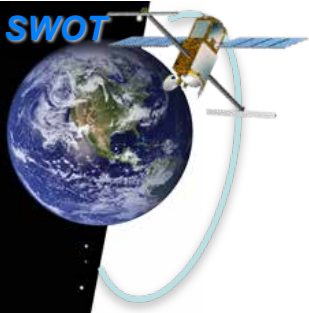
By LEGOS & INSU (COCTO project, N. Ayoub)

To plan





SWOT



Thanks

