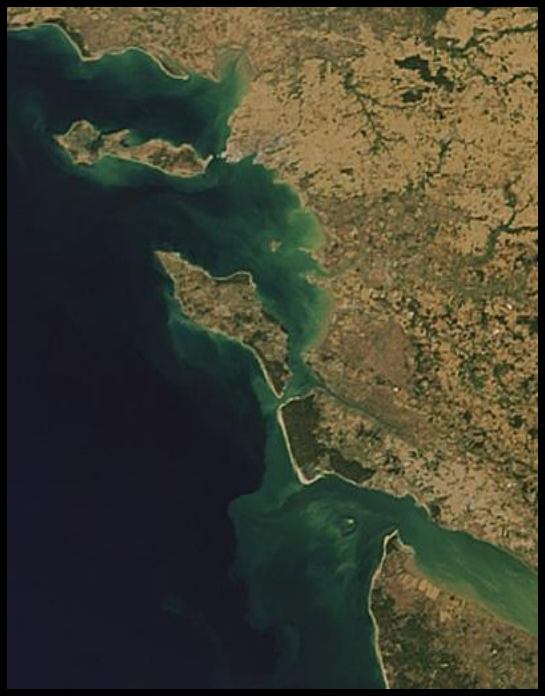
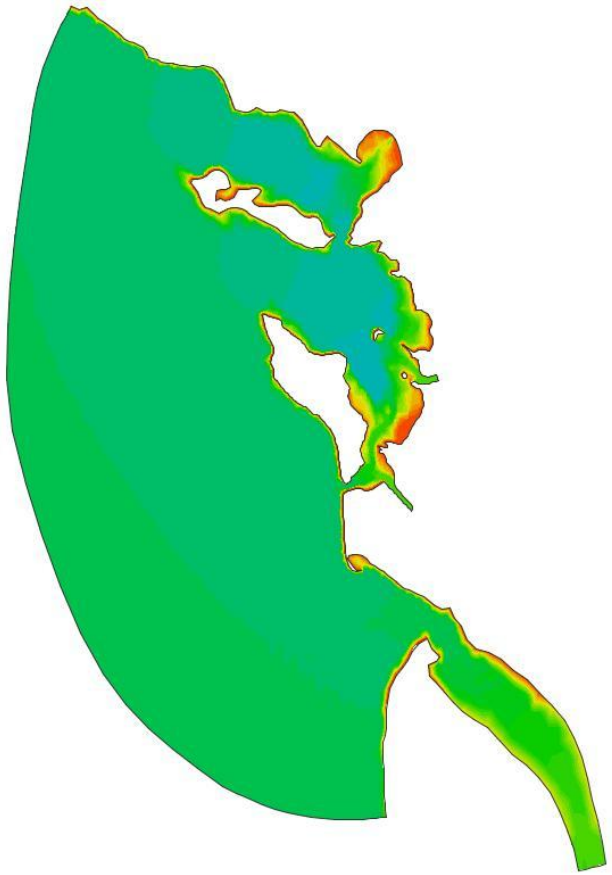
JONSMOD 2010



Coastal Tidal Model Calibration by Satellite Imagery

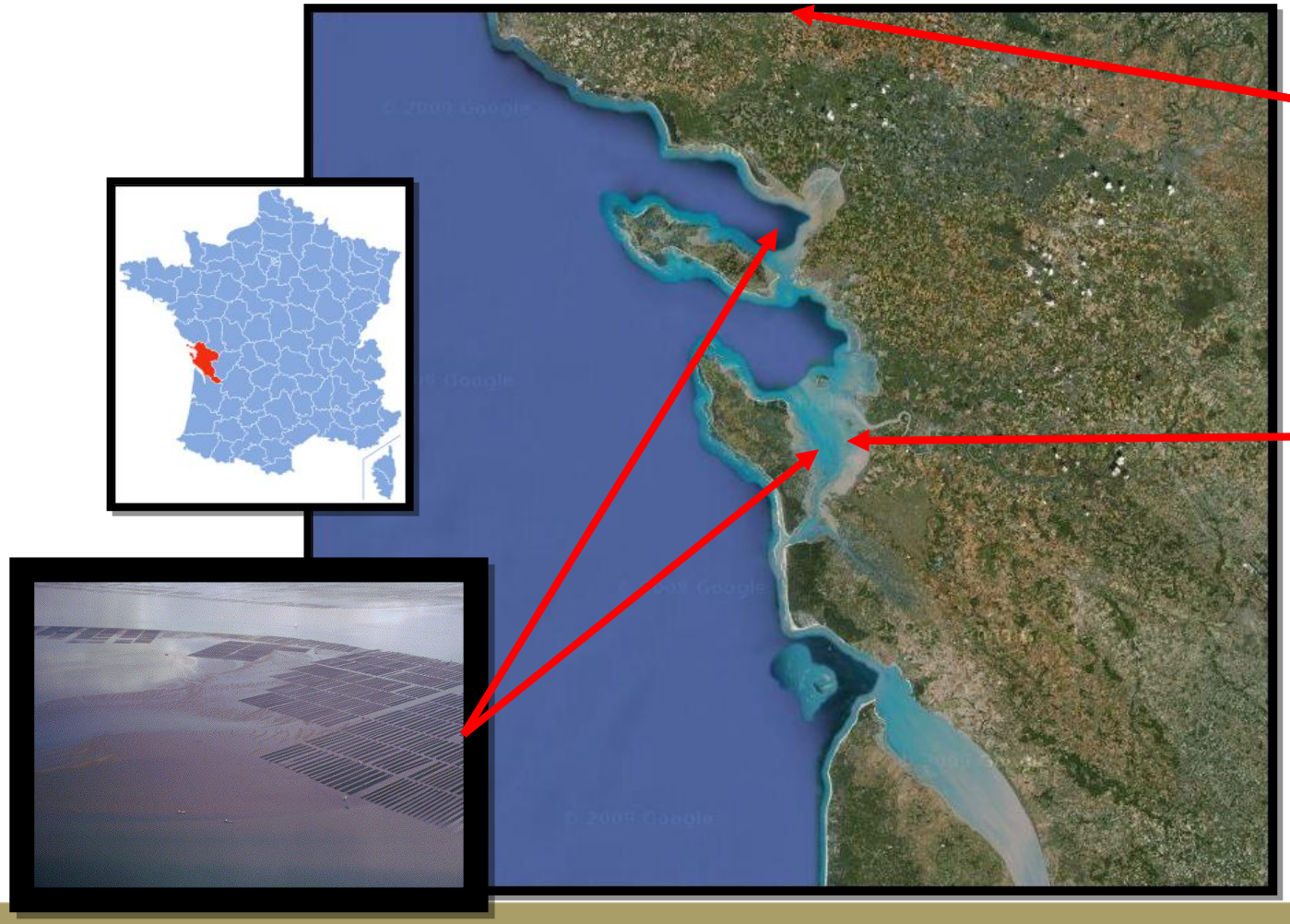
J. CHALUMEAU, M. KARPYTCHEV, F. POUGET, A. NICOLLE

Content of the Presentation



- Context of the Study
- Satellite Imagery
- Model
- Results
- Conclusions and Perspectives

Study Area



Pertuis Breton and Pertuis d'Antioche

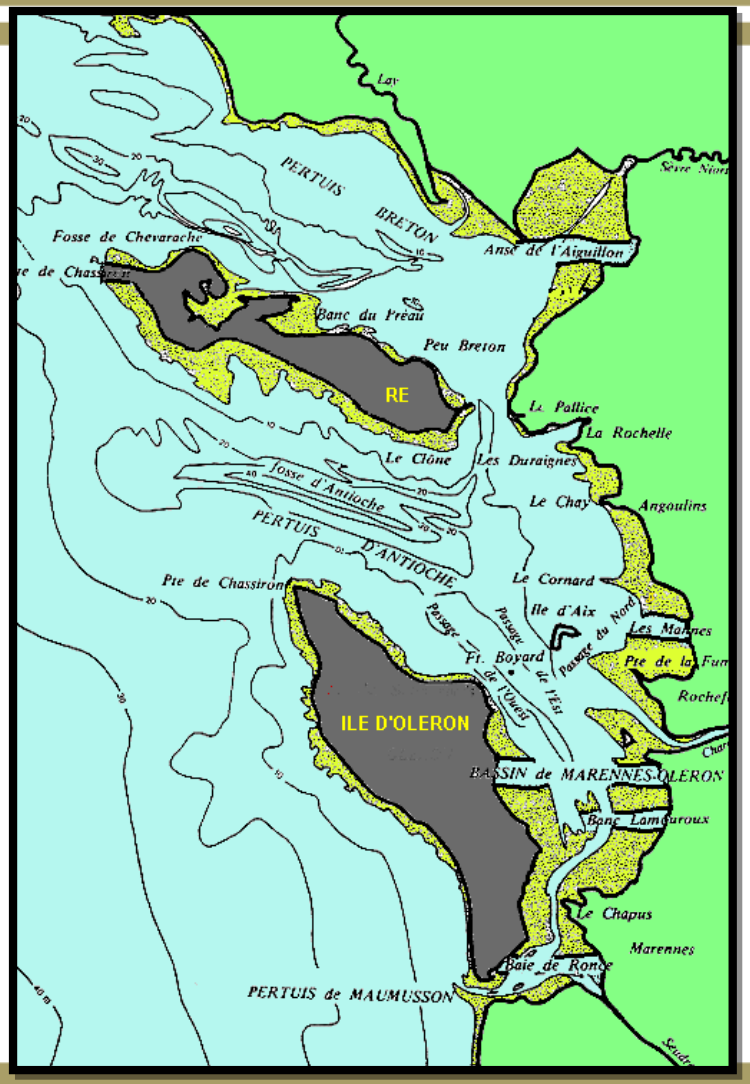
Marennes Oleron's Bay

Oyster farming

Surges

- Storm Surge of 1999
- Xynthia (Febuary 2010)

Biologist Activities

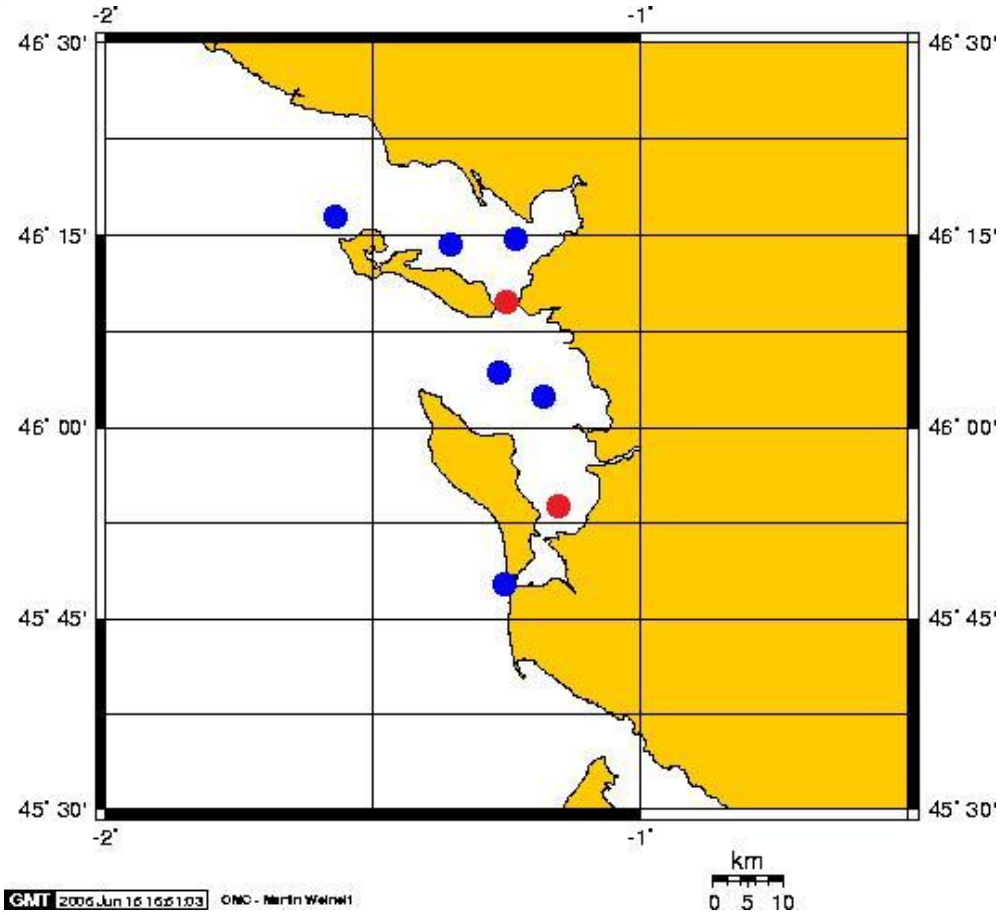


- MudFlat Ecosystems
- Birds Feeding Behaviour
- Crab's Zoe Dispersal
- Algae transport

Model goal

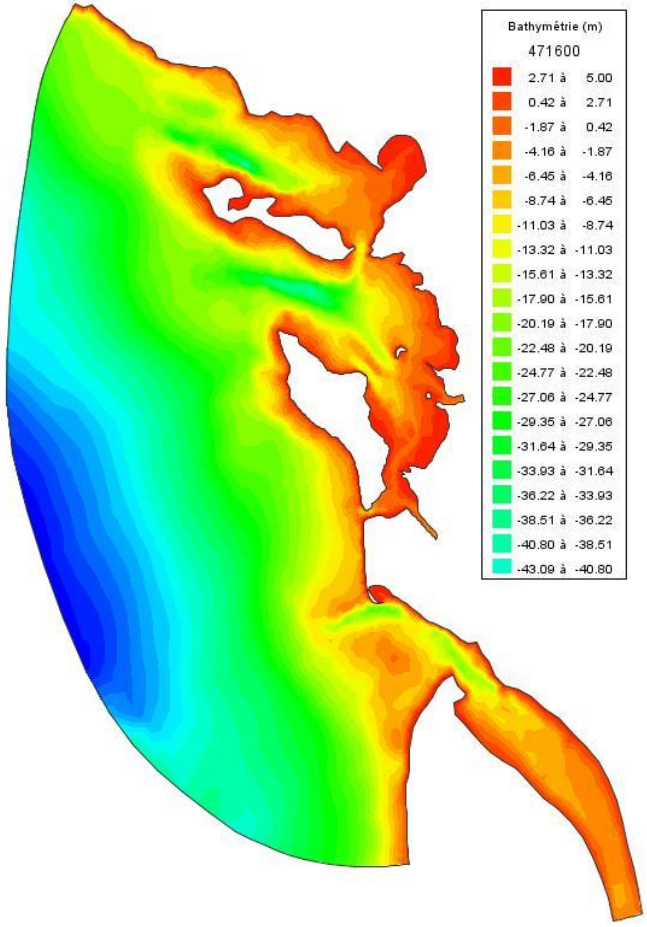
- High precision for the tide propagation on mudflats
- High resolution on Mudflats
- Passive Tracer Transport
- Impact of the Bottom friction
- Constraining the dynamics of storm surges

Tide Gauges



Station	Start	End	Days
Pallice			-
Chapus	01/01/1971	22/12/1971	355
Ile d'aix	27/04/1973	28/11/1973	215
Gatseau	01/10/1971	31/12/1971	91
Pointe aiguillon	11/12/1996	15/01/1997	35
Baleineaux	12/12/1996	11/01/1997	30
Balise	13/12/1996	14/01/1997	32
St Martin en Ré	13/12/1996	11/01/1997	29

Bathymetry



-Rapidly Shallowing bathymetry

-Two straits = the Pertuis Charentais H = 30m

- Coastal region = H = 5m

- Large (1-5 km) tidal flats

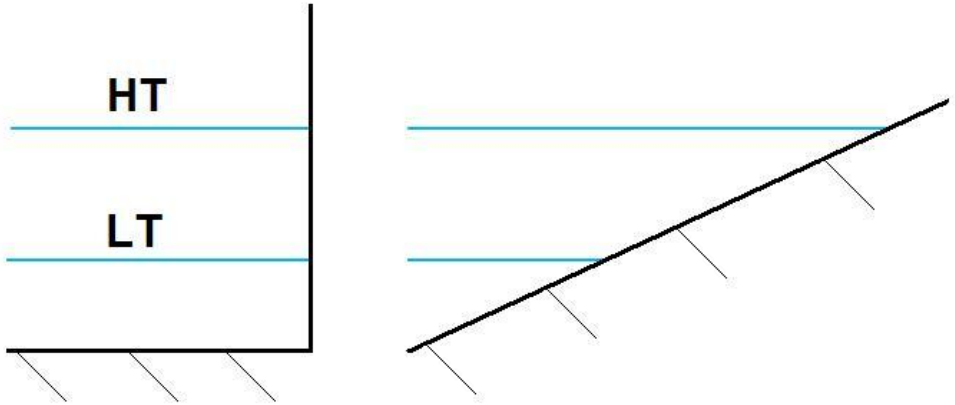
Why using satellite imagery ?

The Pertuis Charentais :

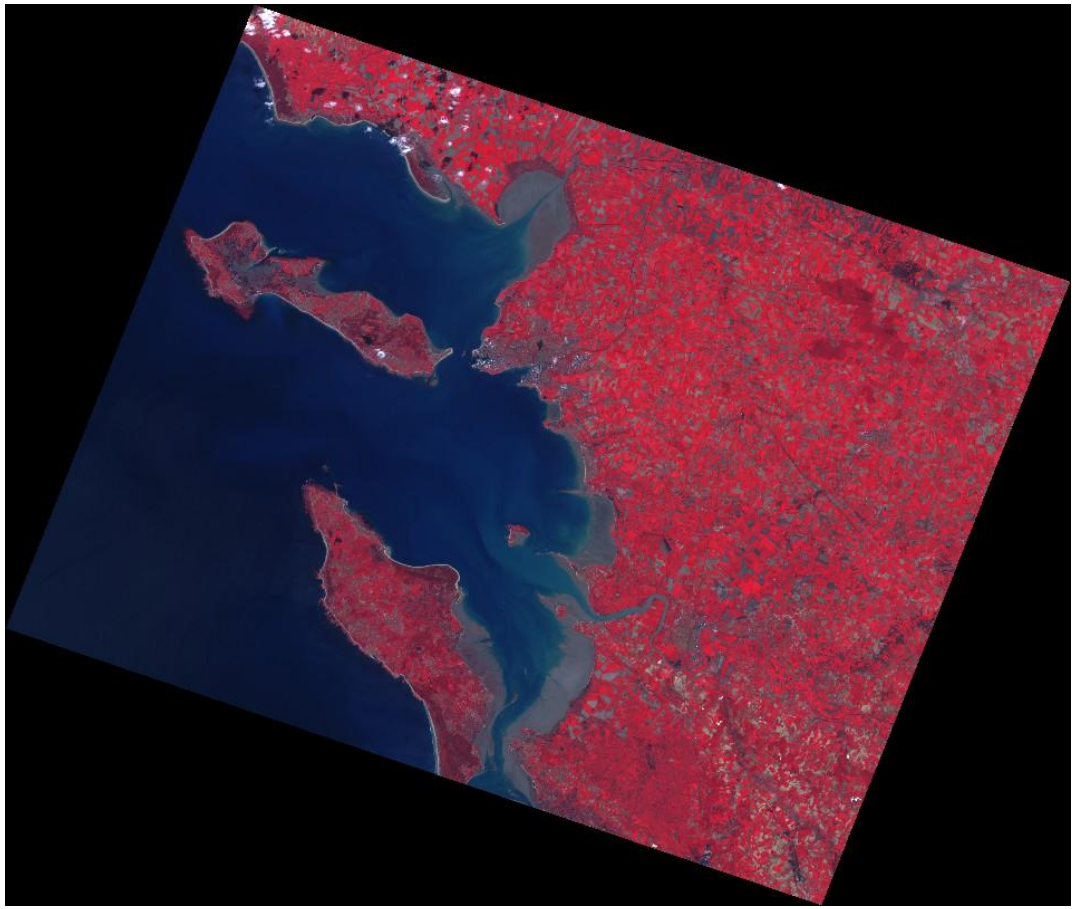
- Large Tidal *flats with the* slope < 1:1000
- Tidal Range > 5 m

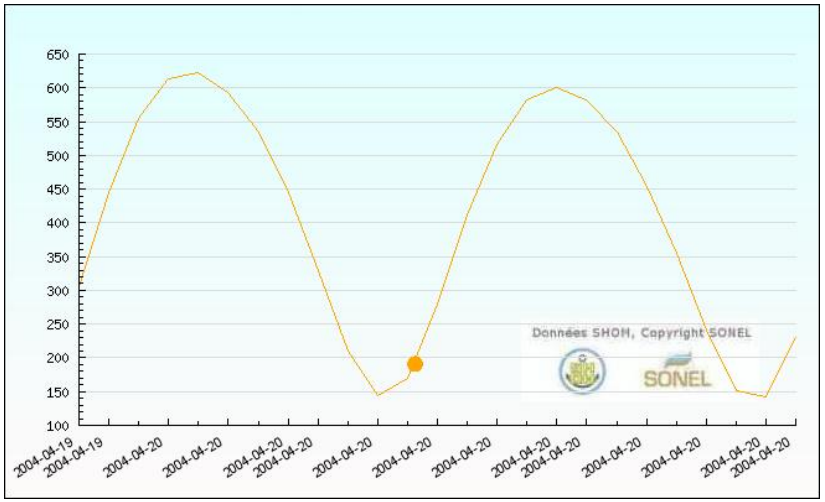
- Consequently : the boundary betwen sea and land moves up and dow on a tidal flat with a range of > 5 km

- The satellite images can give the position of *the sea-land line*



Tracking the Sea-Land Line (SLL) position





20 may 2004 11:31
Spring Tide
Low Water

Sattelite Imagery

SPOT 1 caracteristics:

60km x 60 km

Color Raster

Resolution : 20m

Theoretical views :

- 3 days (slanted)
- 26 days revolution (vertical)

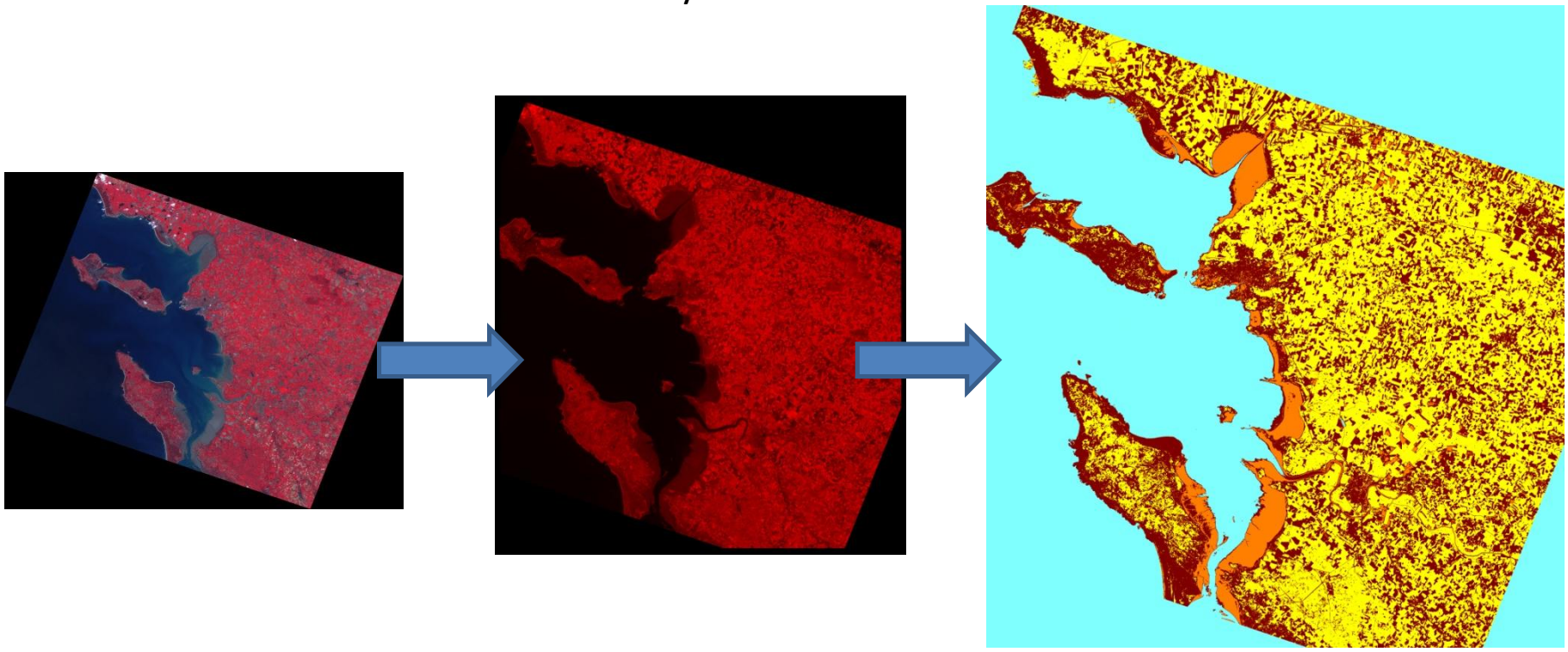
10 shooting per year, with good weather

SLL Extraction Steps

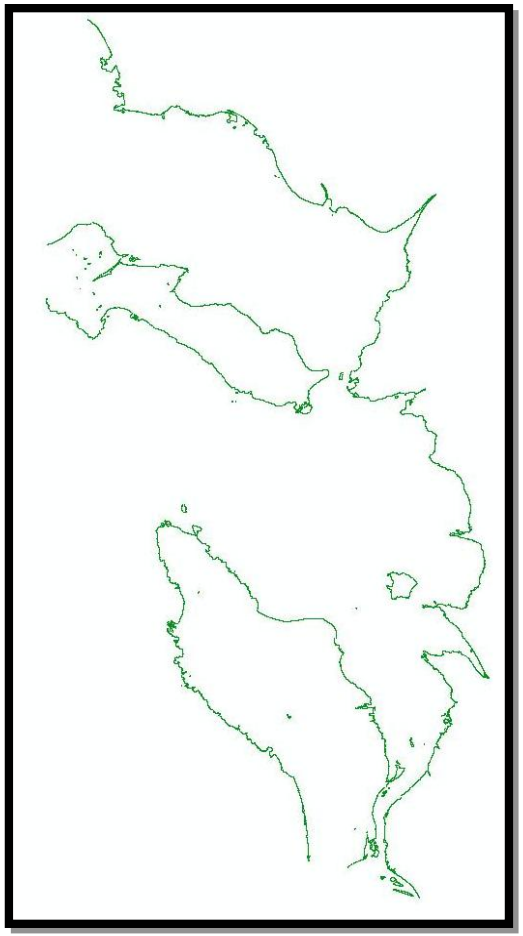
Initial Spot Picture

Infrared frequency:
0.76 – 1.1 µm
Electromagnetic radiation
absorbed by water

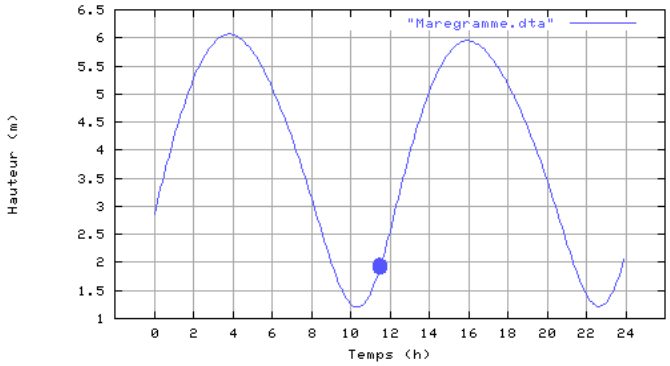
Area Classification

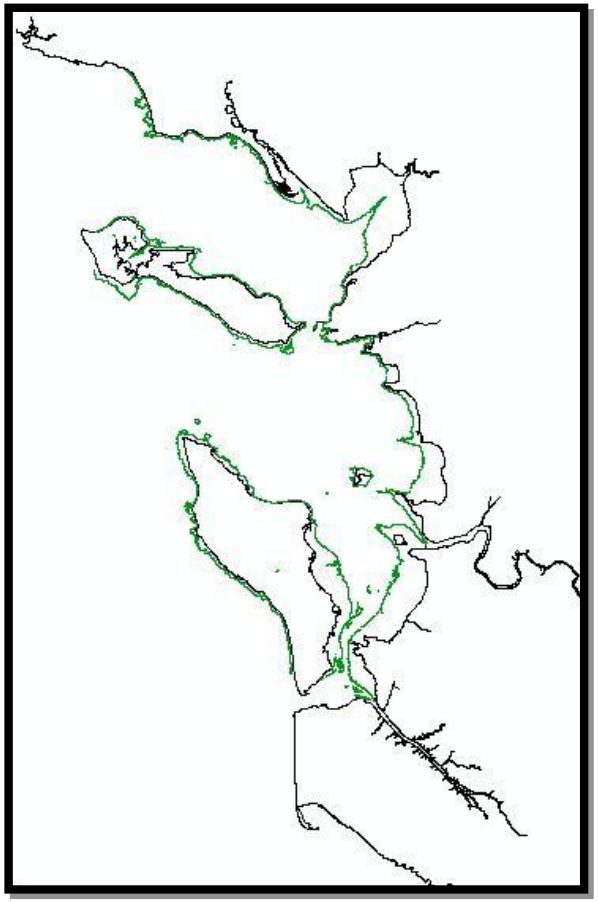


SLL Results form Spot 1

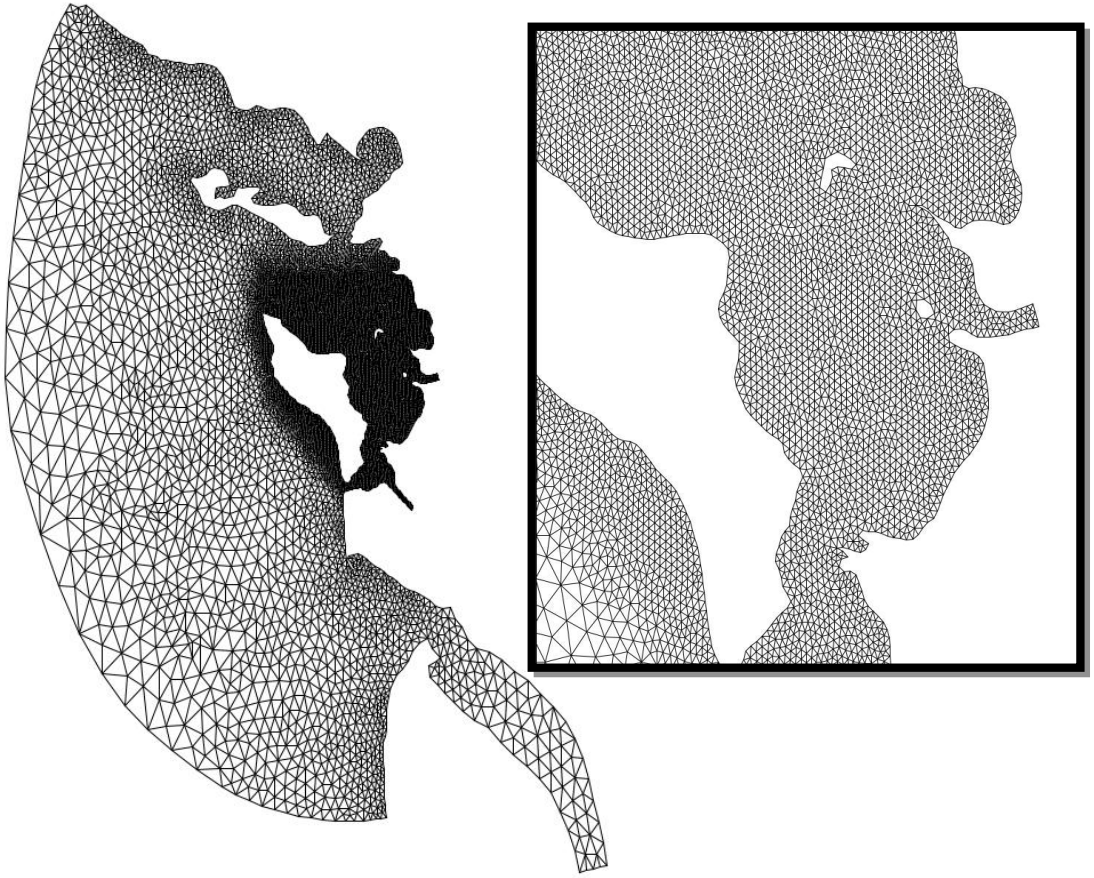


- Sea-Level Line on 20.04.2004
- Coastline IGN (National Geographic Institute)





Tidal Model : TELEMAC 2D



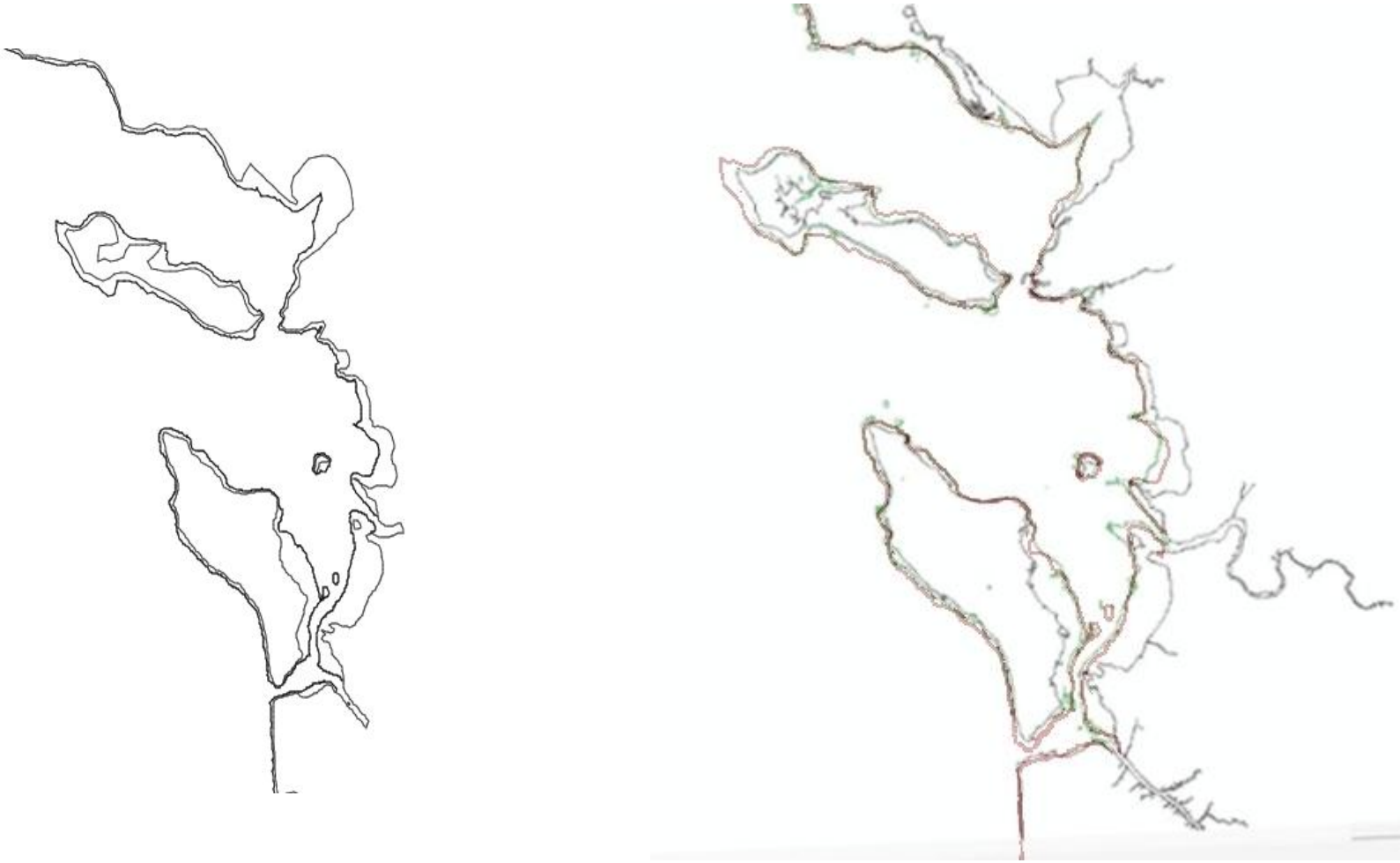
Mesh :

- 16402 elements
- Spatial resolution : 100 m in the Bay of Marennes-Oleron

Opened boundary forcing :

- European continental shelf model of SHOM (French Navy)
- 17 Constituants

Model results



Conclusions and perspectives

- The satellite images is an effective constraint on the *total volume of water* in the Pertuis Charentais.

- Hence, it is a good constraint on the tide and surges dynamics, complementary to the TG spatially localized data

- A possibility for better understanding of the wind-wave-surge interactions (Nicolle et al, 2009) in the Pertuis.

Satellite images:

- indicators of the quality of the bathymetry data

- helpful for constraining the bottom friction (*work in progress*)

- *Calibration of the model is still in progress*