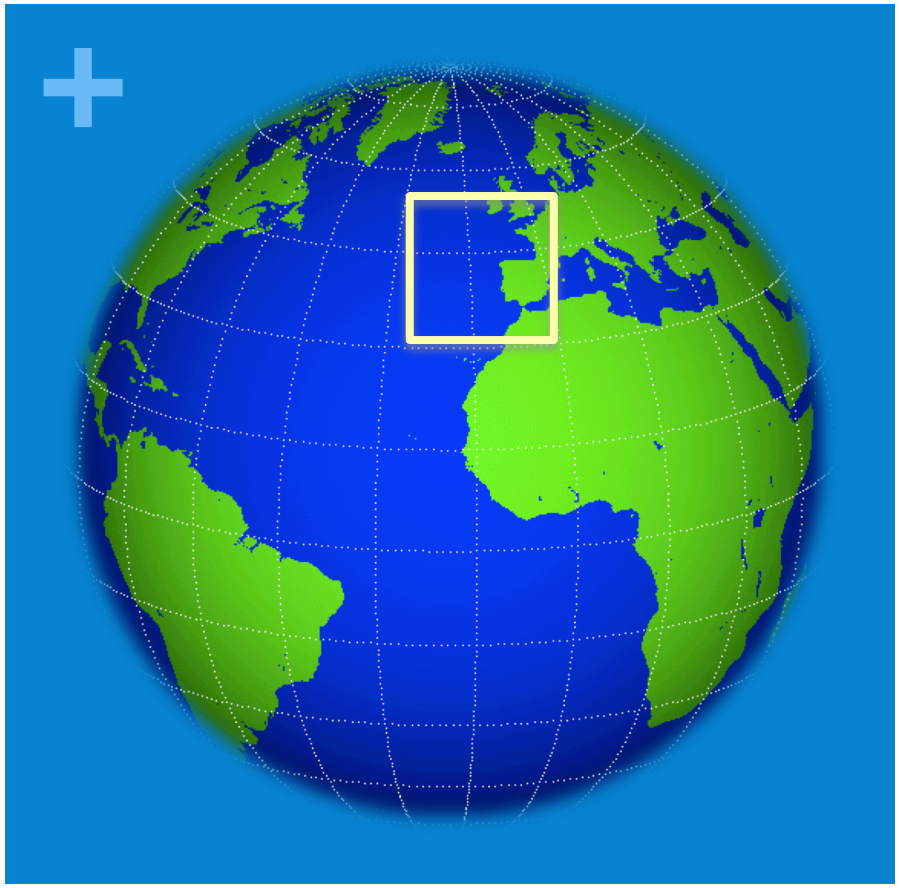


MODELLING THE INTERNAL TIDE OVER THE WEST-IBERIAN MARGIN (MITIC)

Luis QUARESMA (HIDROGRÁFICO)

A. PICHON, Y. MOREL (SHOM)

MODELLING THE NORTH-EASTERN ATLANTIC SHELF WITH HYCOM

Object:

To model EUROPE's SW coastal-margin:

Channel, Bay of Biscay,

West Portugal and gulf of Cadiz.

Sub-domains division:

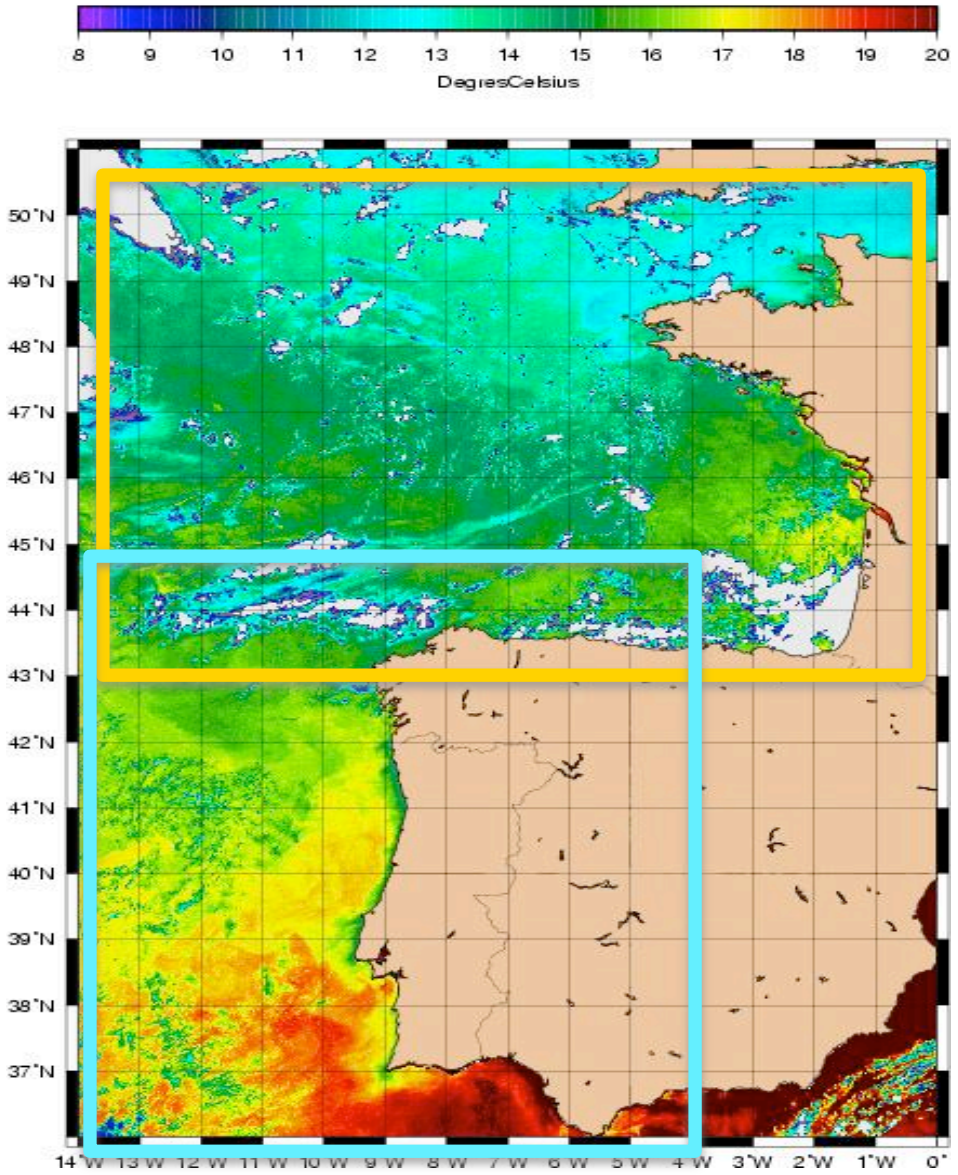
1. Bay of Biscay
2. West-Iberian

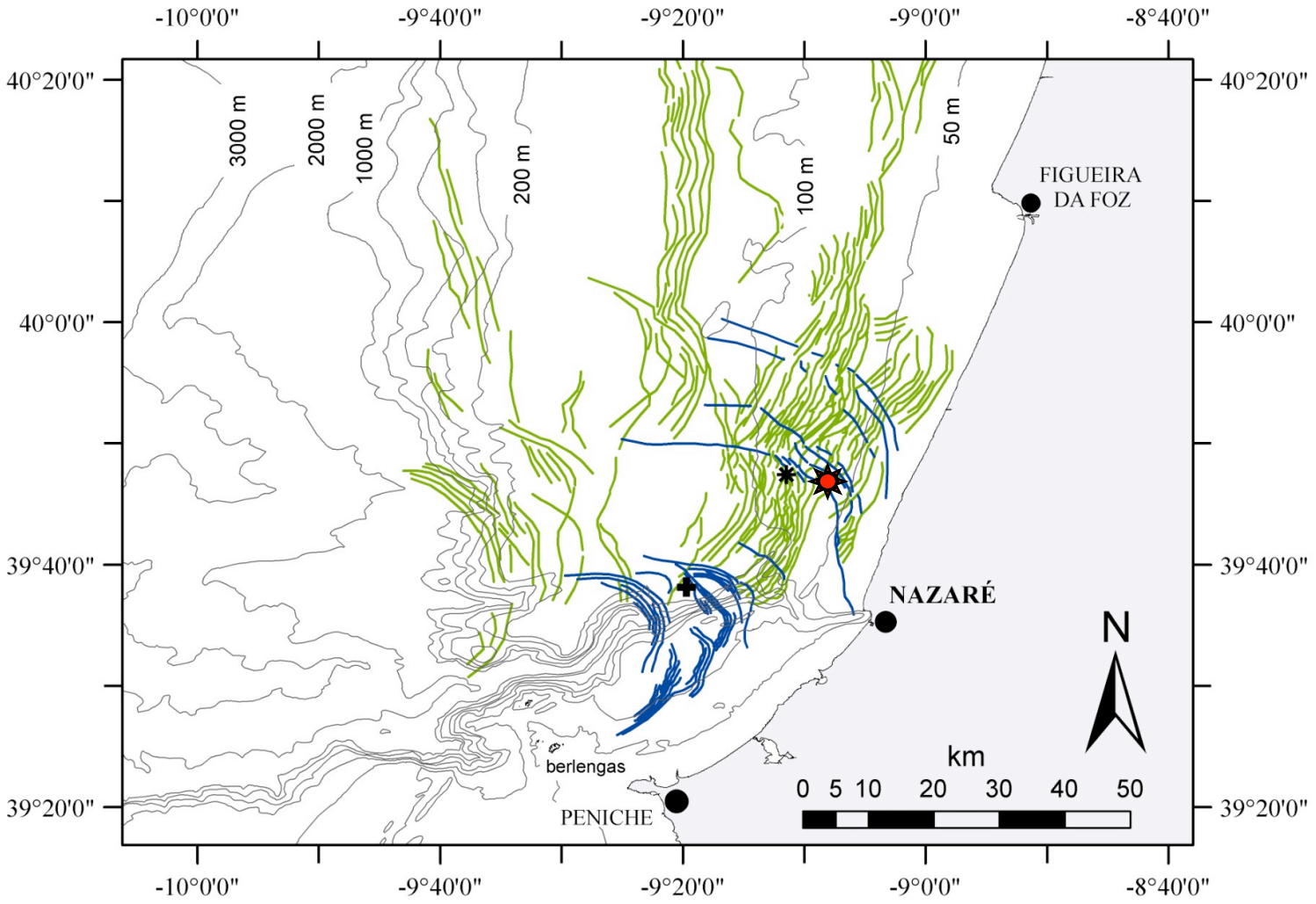
Project:

Started as a **SHOM** operation program MOUTON (2001-2008) PROTEVS (2009-2017) EPIGRAM(2008-2012);

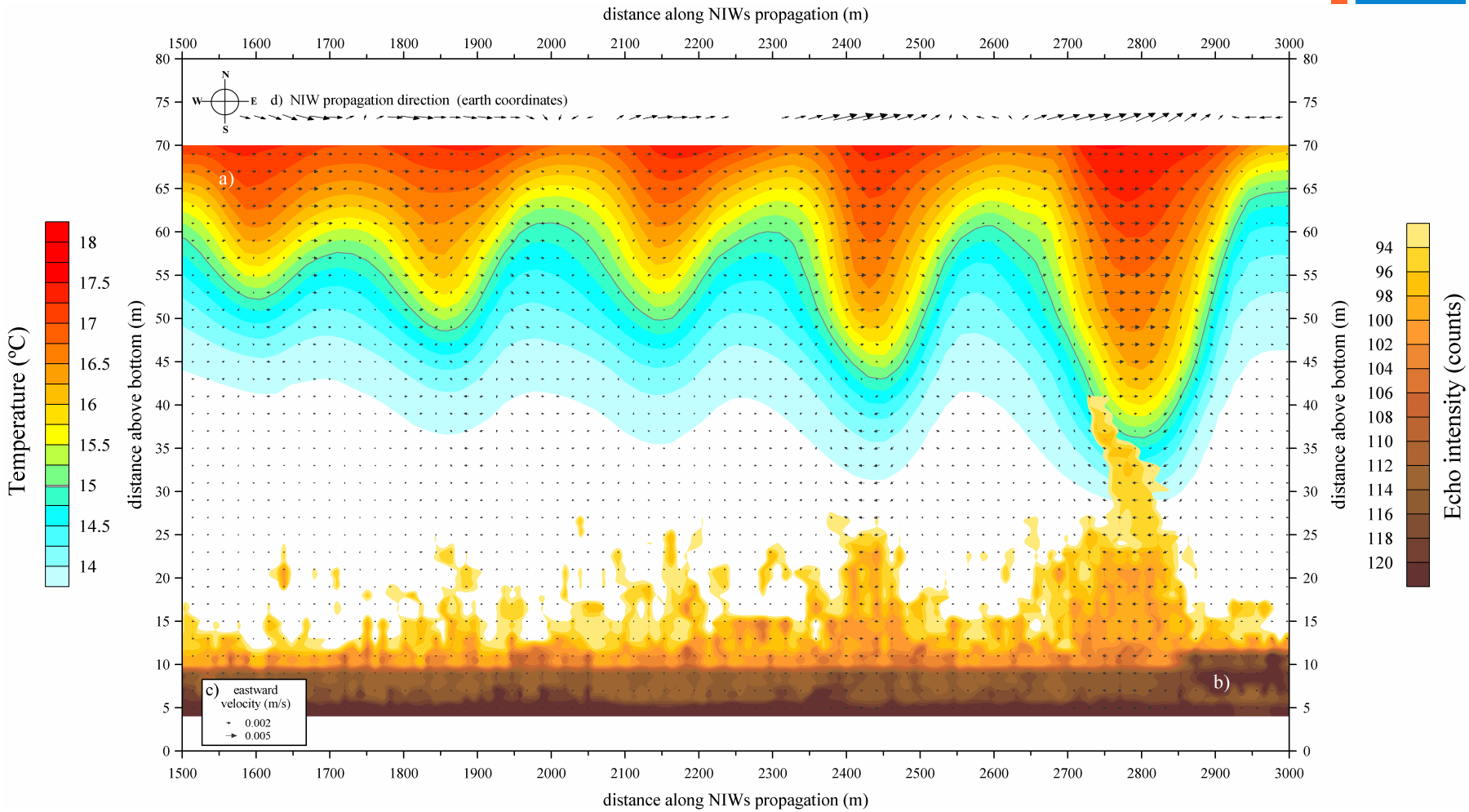
Partnership with **HIDROGRAFICO**

at the south Sub-domain (MITIC 2009-2011)

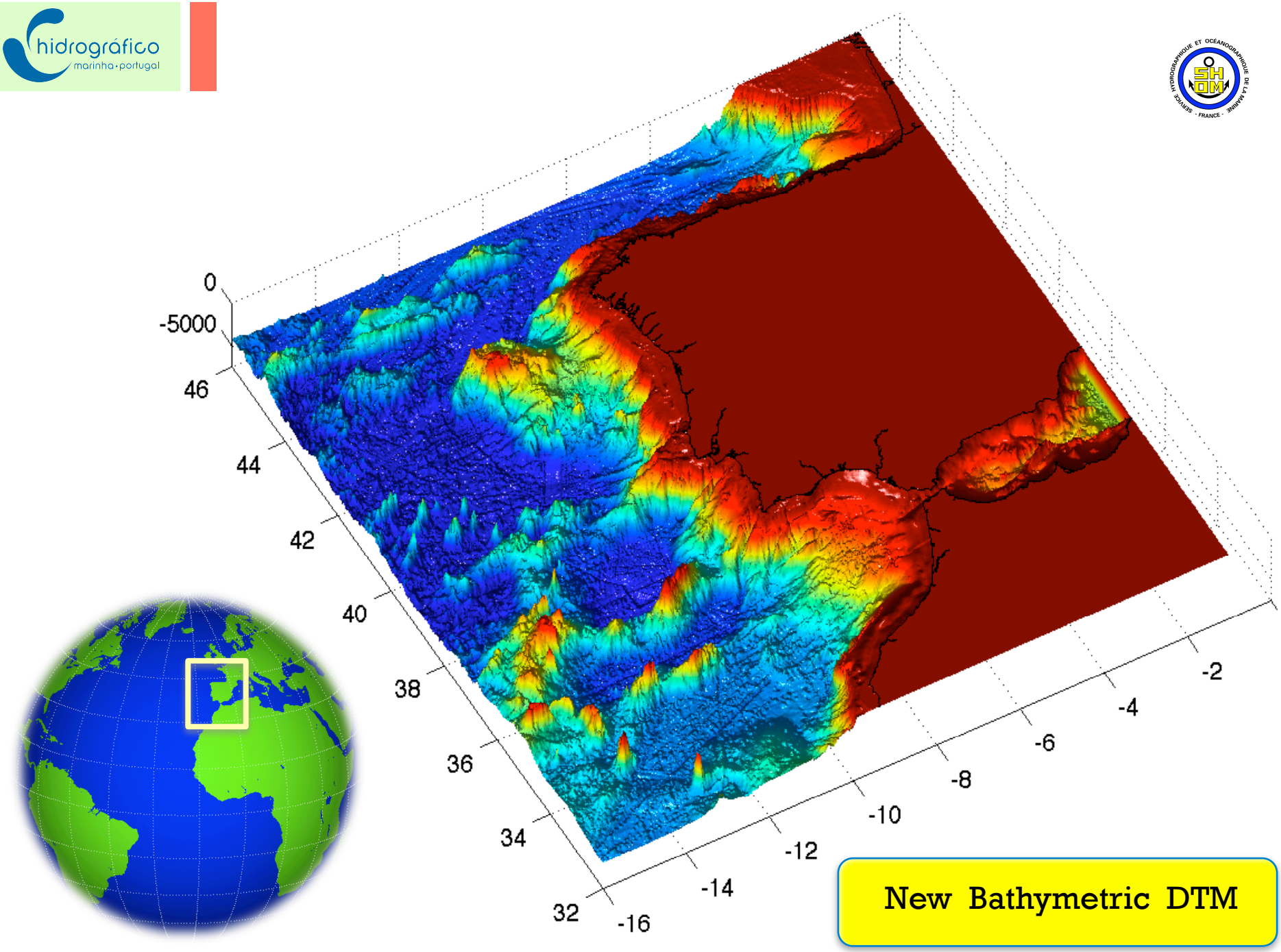



-10°0'0"
-9°40'0"
-9°20'0"
-9°0'0"
-8°40'0"
40°20'0"
40°0'0"
39°40'0"
39°20'0"
3000 m
2000 m
1000 m
200 m
100 m
50 m
FIGUEIRA
DA FOZ
NAZARÉ
berlengas
PENICHE
N
km
0 5 10 20 30 40 50

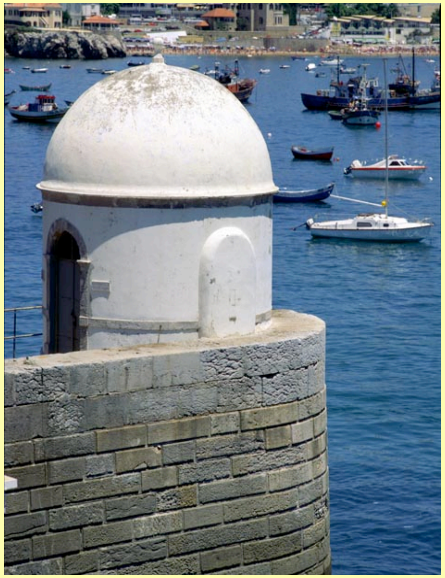
Internal tidal solitons over the shelf (observations)



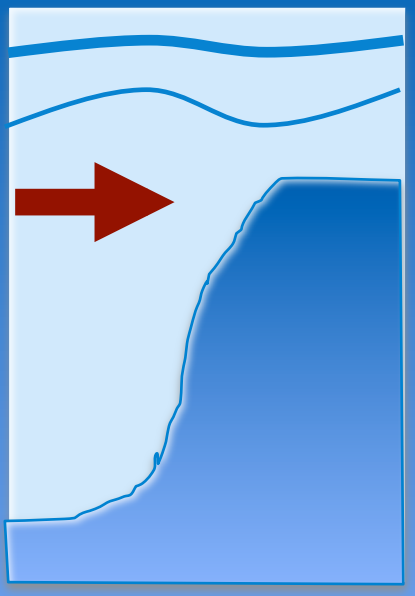
Quaresma 2007, Evidence of sediment resuspension by non-linear internal waves on the western Portuguese mid-shelf, ***Marine Geology*** 246, 123-143.


0
-5000
46
44
42
40
38
36
34
32
-16
-14
-12
-10
-8
-6
-4
-2
New Bathymetric DTM

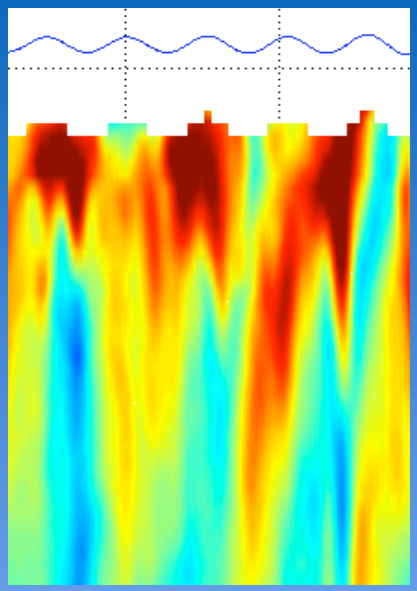
Working perspective



BAROTROPIC TIDE
validation



FORCING TERM
barotropic



INTERNAL TIDE
solutions

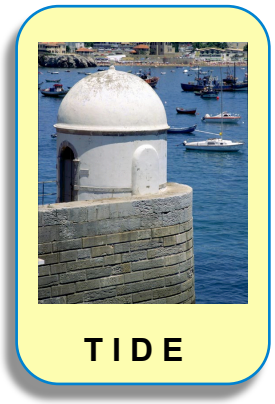
HYCOM SETUP

1. Vertical structure: **Barotropic (1 homogeneous level)**

2. Spatial resolution: **~ 1.8 km (Mercator projection)**

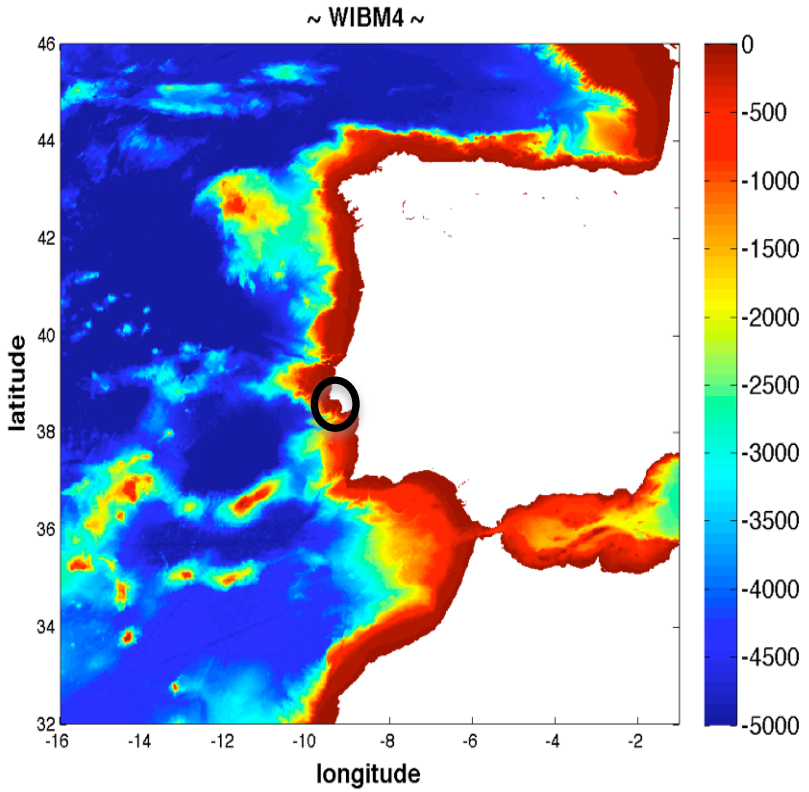
3. Initial state and boundary conditions forced by:

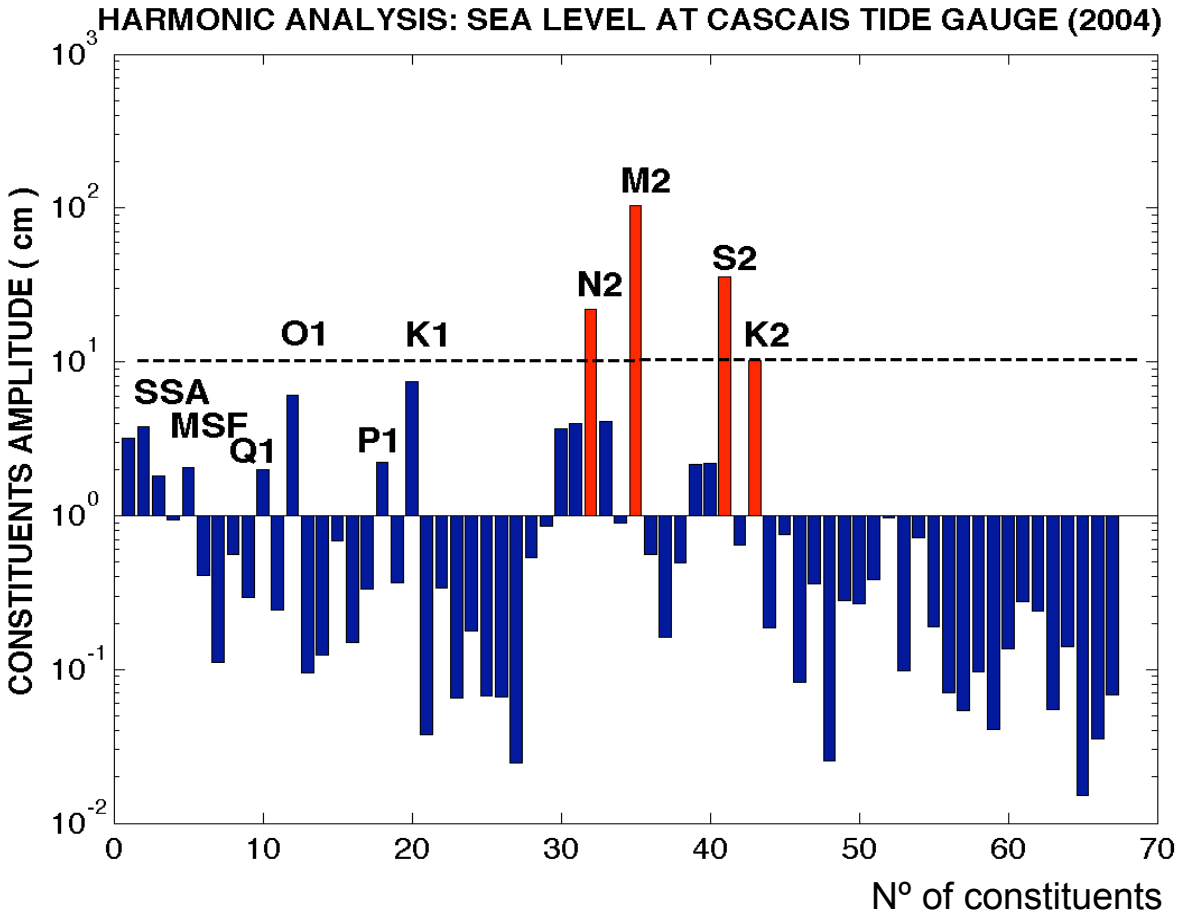
   Tide: **MOG2D** (LEGI spectral model), by the main semi-diurnal tidal harmonics (M2, S2,N2,K2).

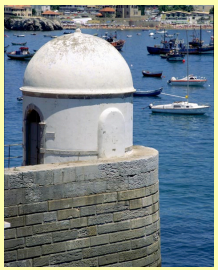


4. **Free run** (no assimilation),

5. Time period : **2004**



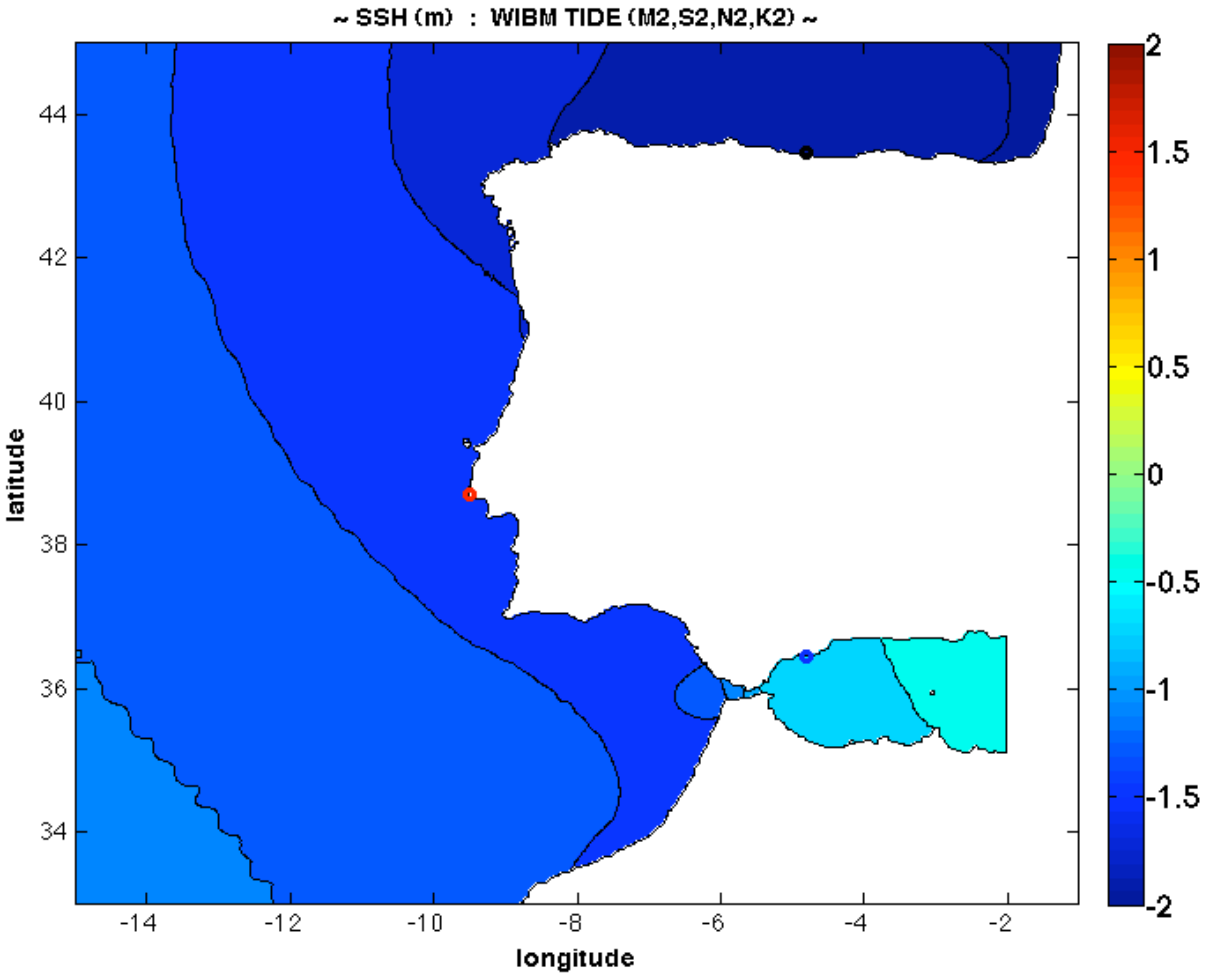


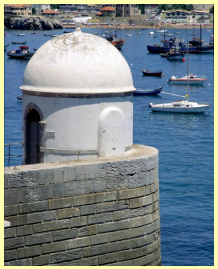


T I D E

The 4 main semi-diurne constituents represent more than **75%** of the Tidal amplitude

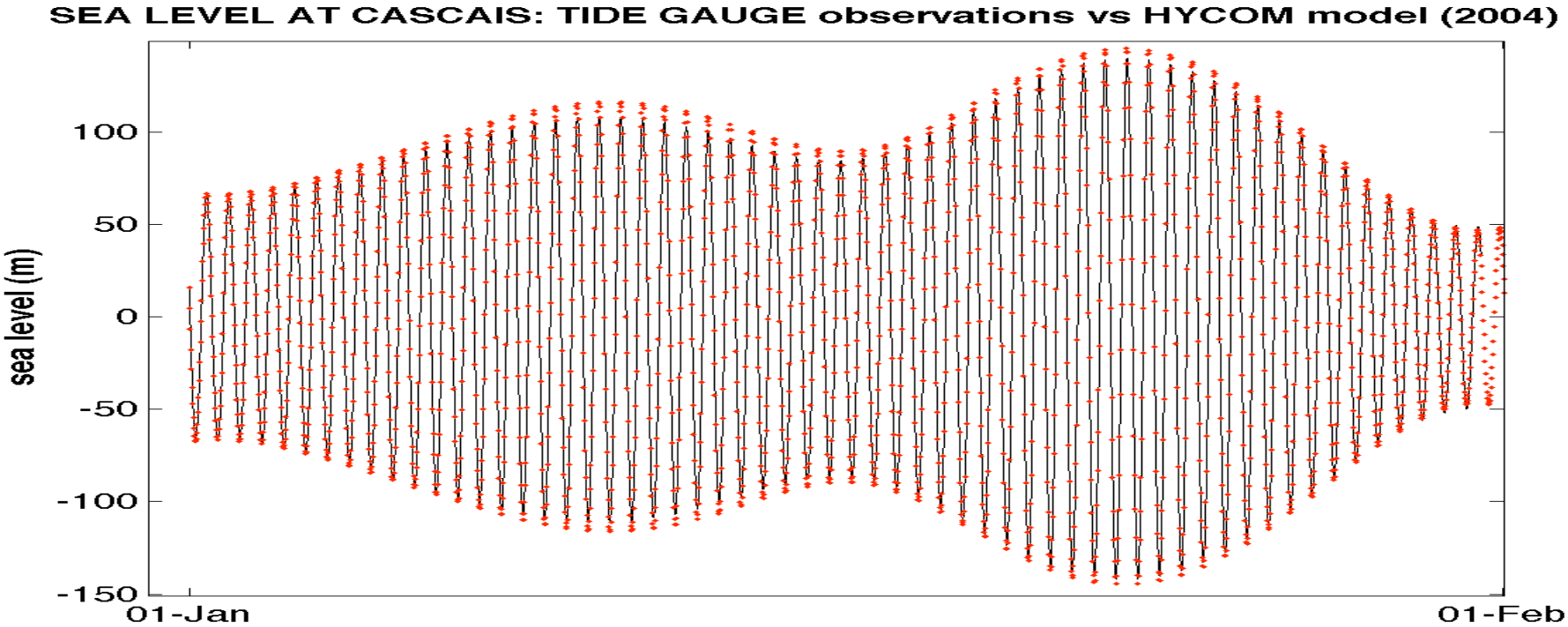
The 4 main semi-diurne **+** 4 main diurne constituents represent more than **82%** of the Tidal amplitude

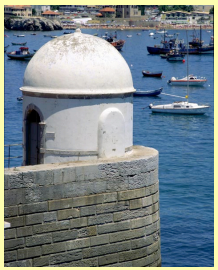

~ SSH (m) : WIBM TIDE (M2,S2,N2,K2) ~
latitude
longitude
sea-level
hours



TIDE

Semi-diurne tidal wave modelling



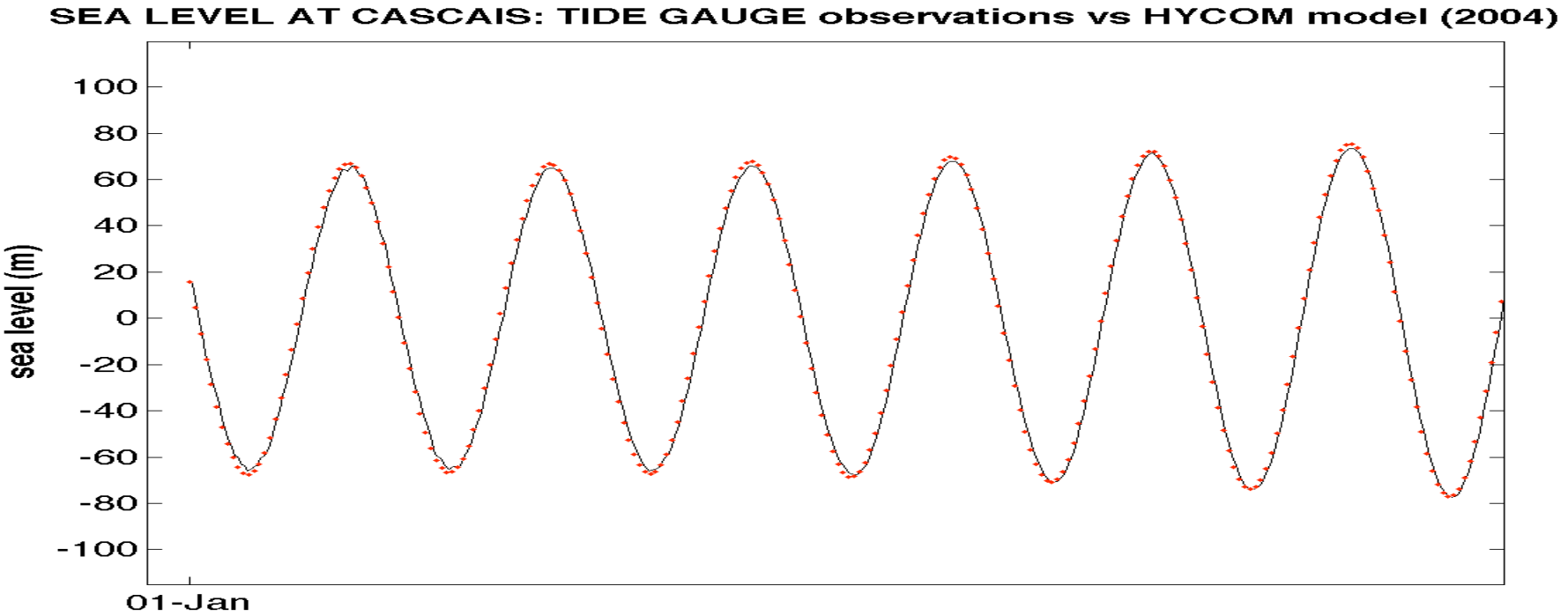


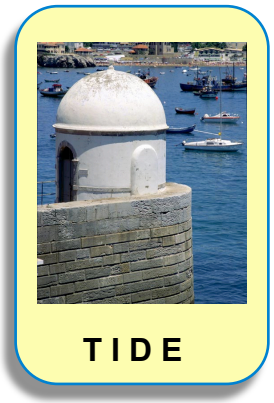
T I D E

Line = HYCOM model (M2, S2, N2, K2)

Dots = TIDAL FORECAST (M2, S2, N2, K2) from harmonic analysis of Tide gauge data

Neap tide phase

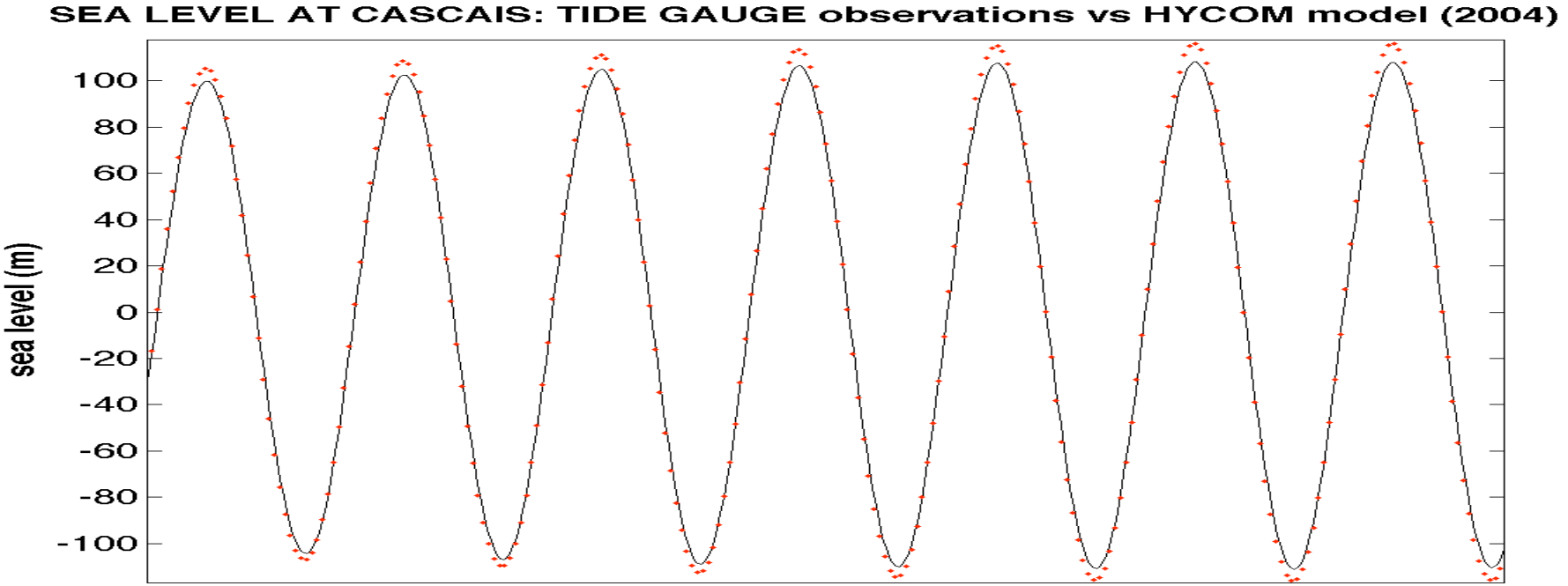


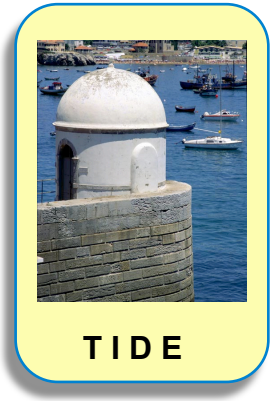


Line = HYCOM model (M2, S2, N2, K2)

Dots = TIDAL FORECAST (M2, S2, N2, K2) from harmonic analysis of Tide gauge data

Spring tide phase

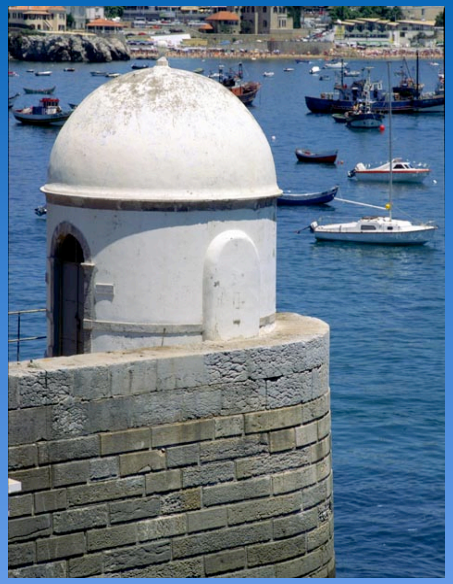




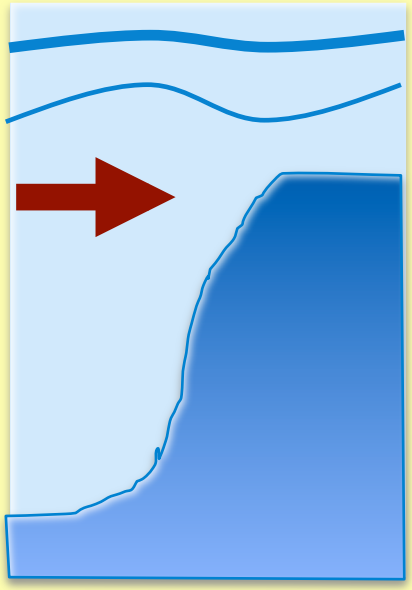
Line = HYCOM model (M2, S2, N2, K2)

Dots = TIDAL FORECAST (M2, S2, N2, K2) from harmonic analysis of Tide gauge data

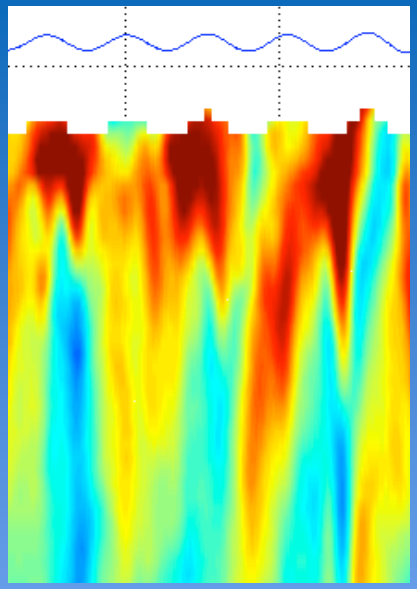
Working prespective



BAROTROPIC TIDE
validation

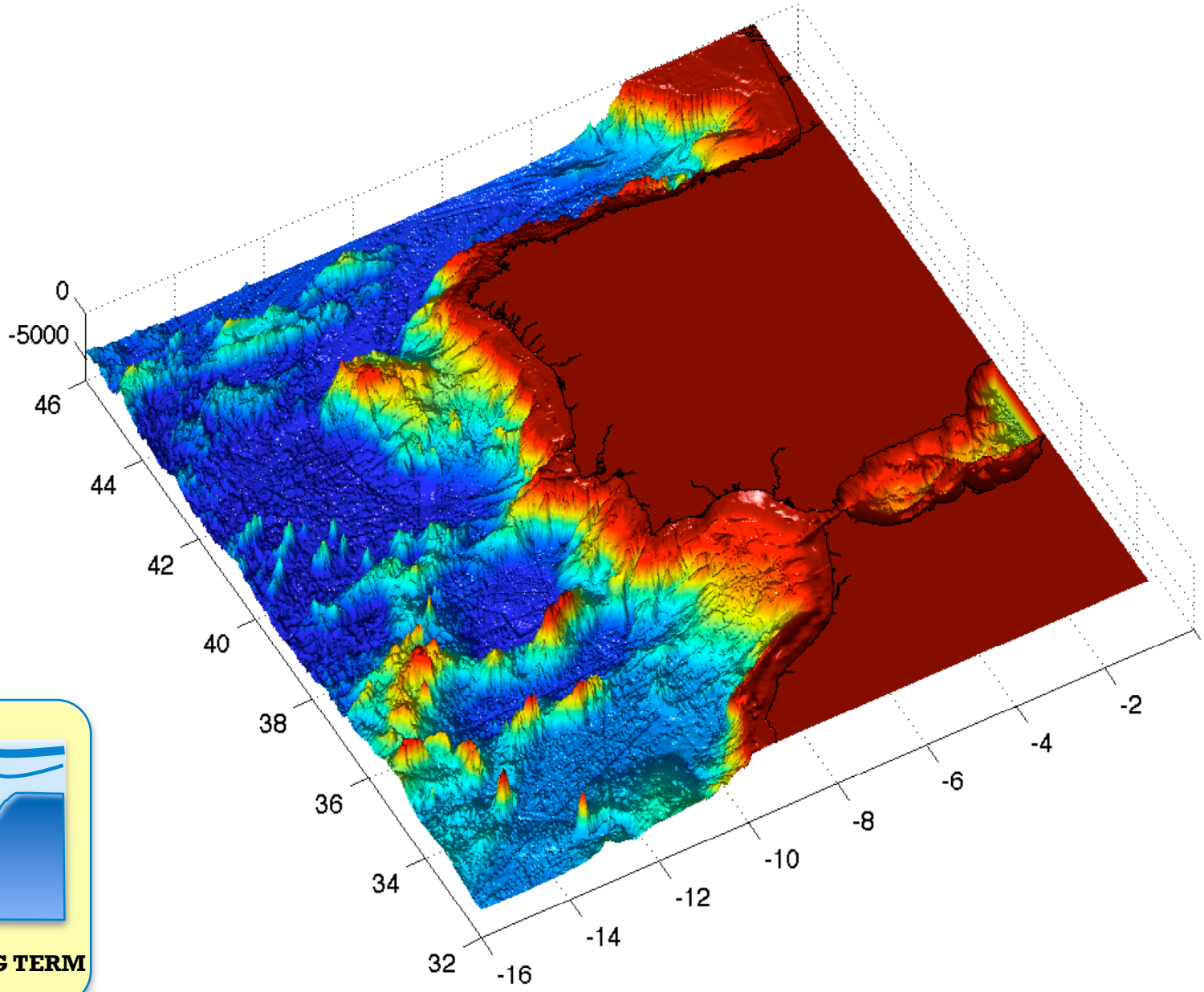


FORCING TERM
barotropic

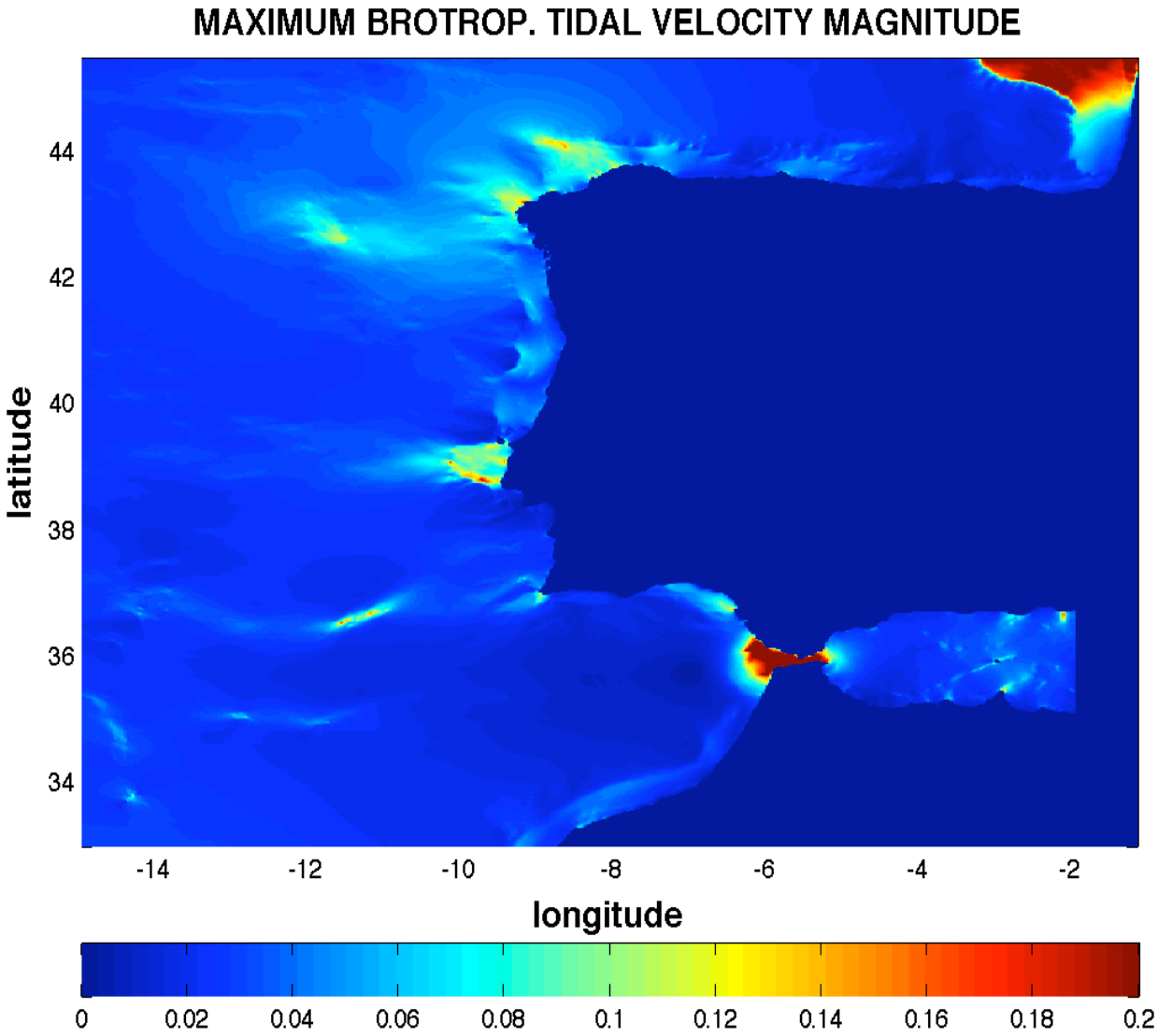


INTERNAL TIDE
solutions

FORCING TERM

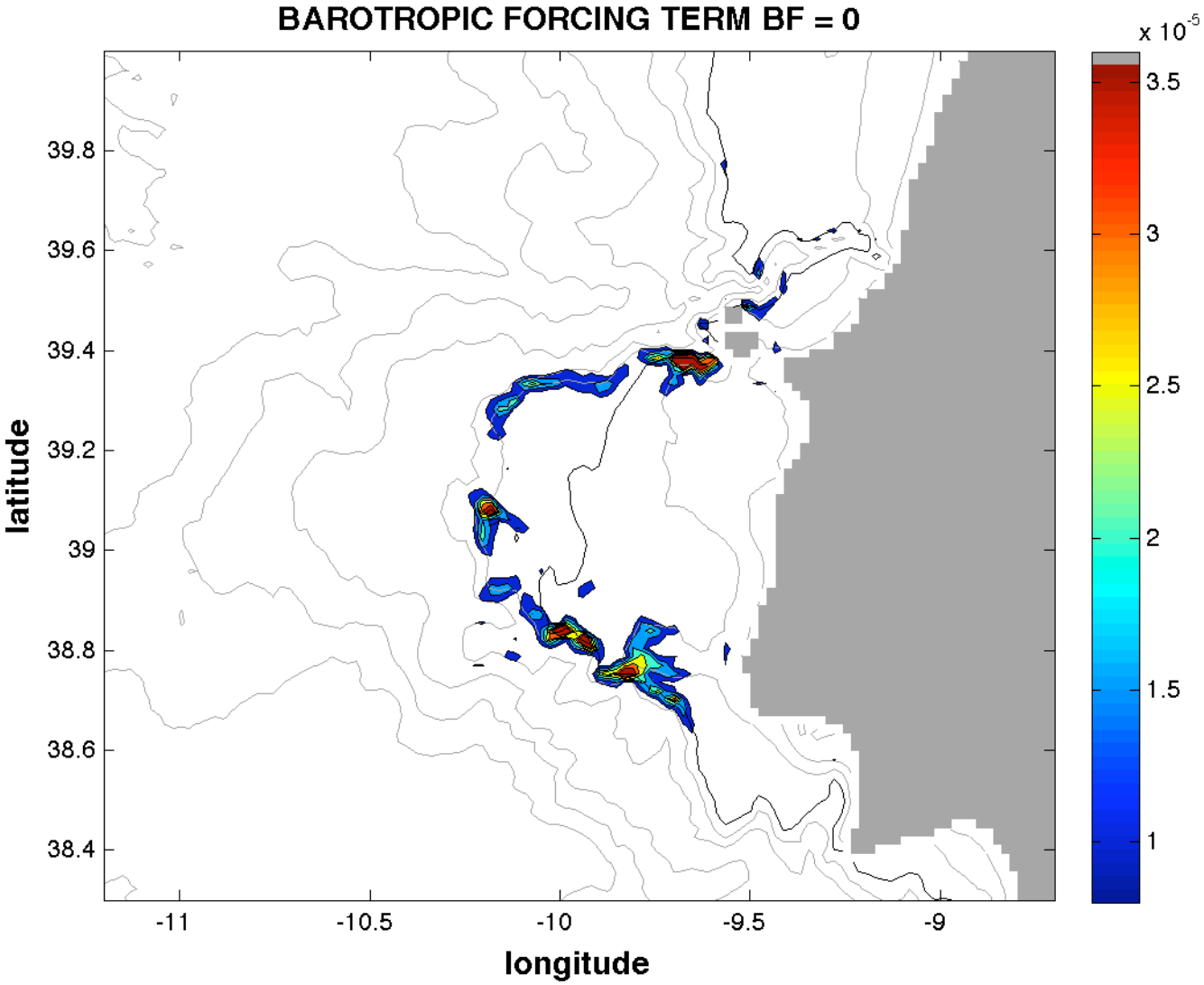


FORCING TERM



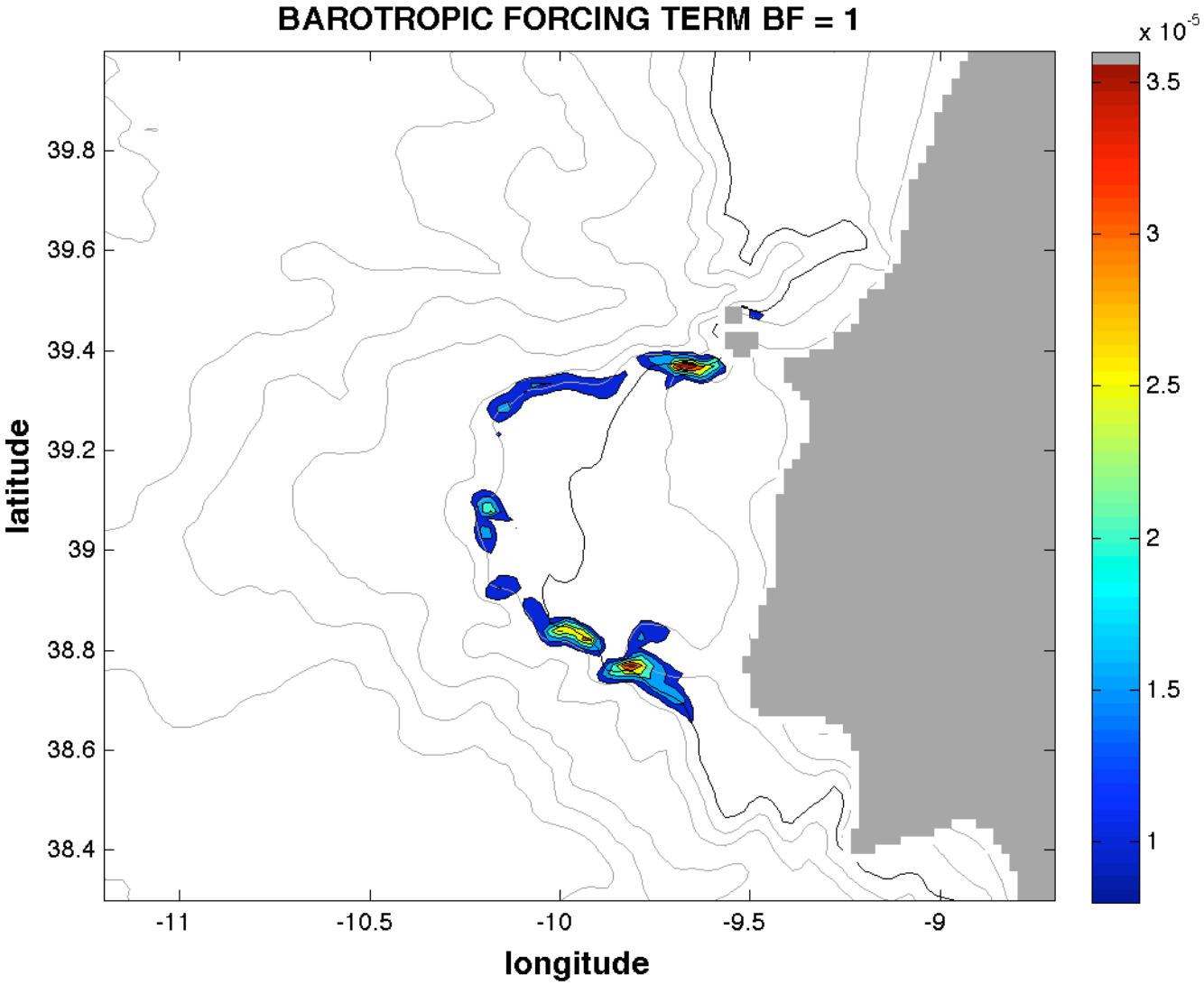
FORCING TERM

$$\frac{U_{\max}}{H}\frac{dH}{dx} + \frac{V_{\max}}{H}\frac{dH}{dy}$$



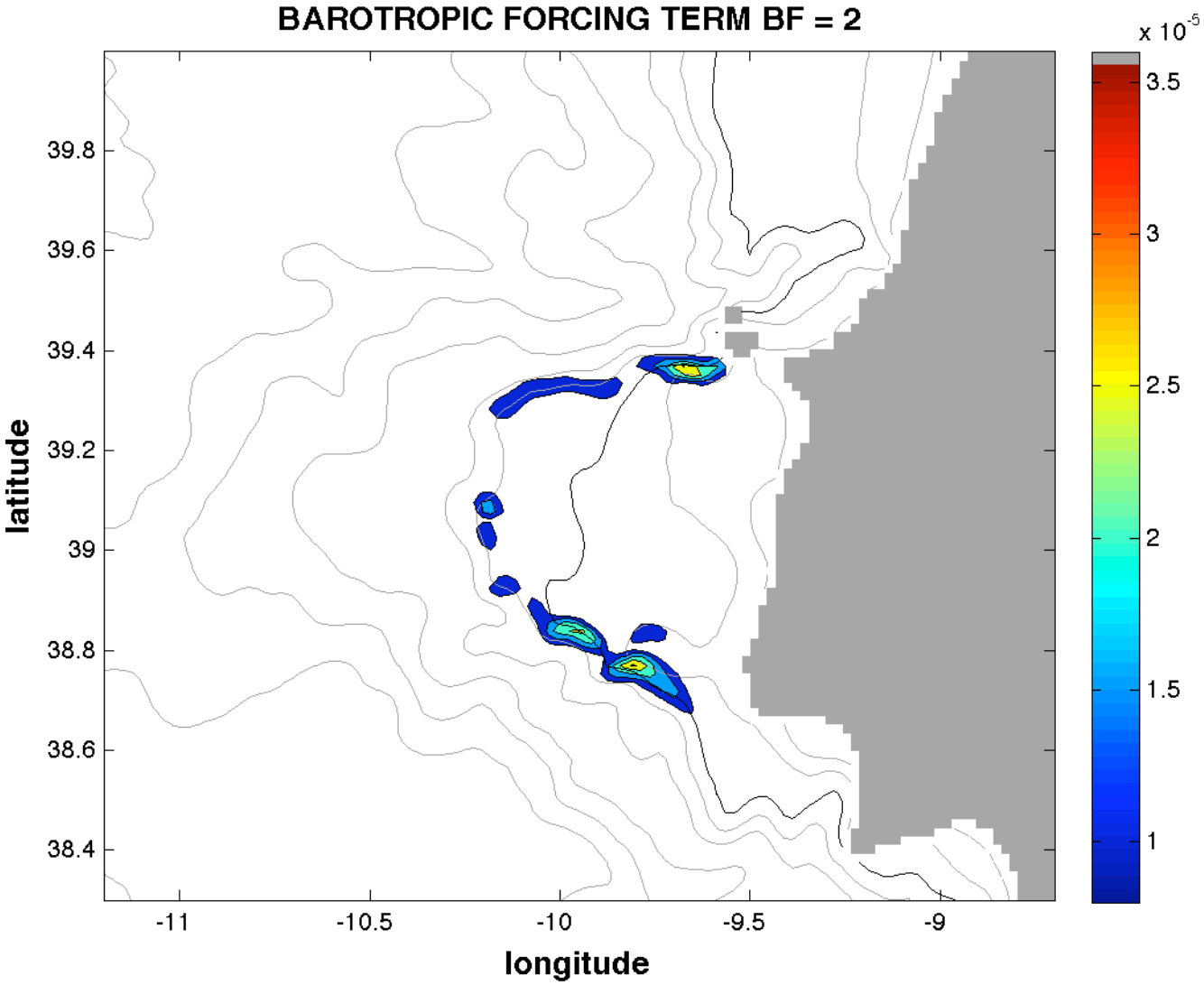
FORCING TERM

$$\frac{U_{\max}}{H}\frac{dH}{dx} + \frac{V_{\max}}{H}\frac{dH}{dy}$$

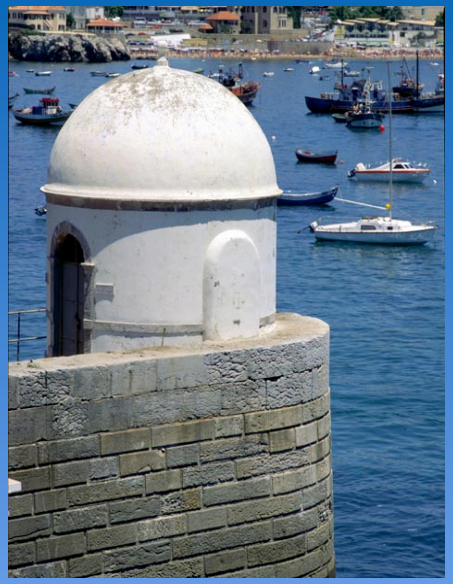


FORCING TERM

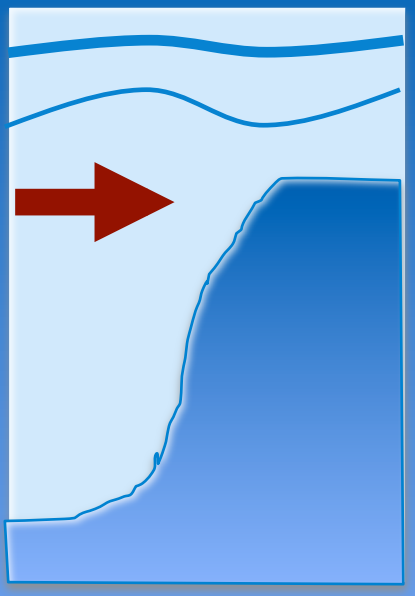
$$\frac{U_{max}}{H}\frac{dH}{dx} + \frac{V_{max}}{H}\frac{dH}{dy}$$



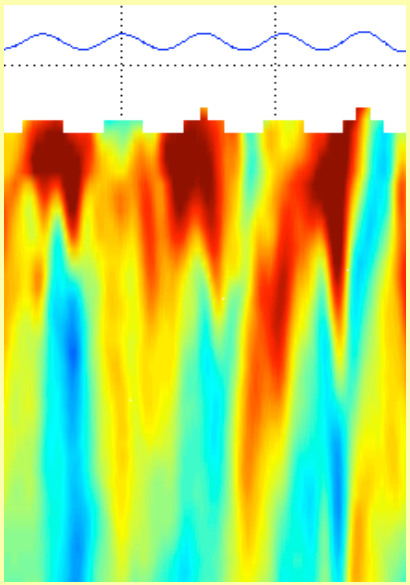
Working prespective



BAROTROPIC TIDE
validation

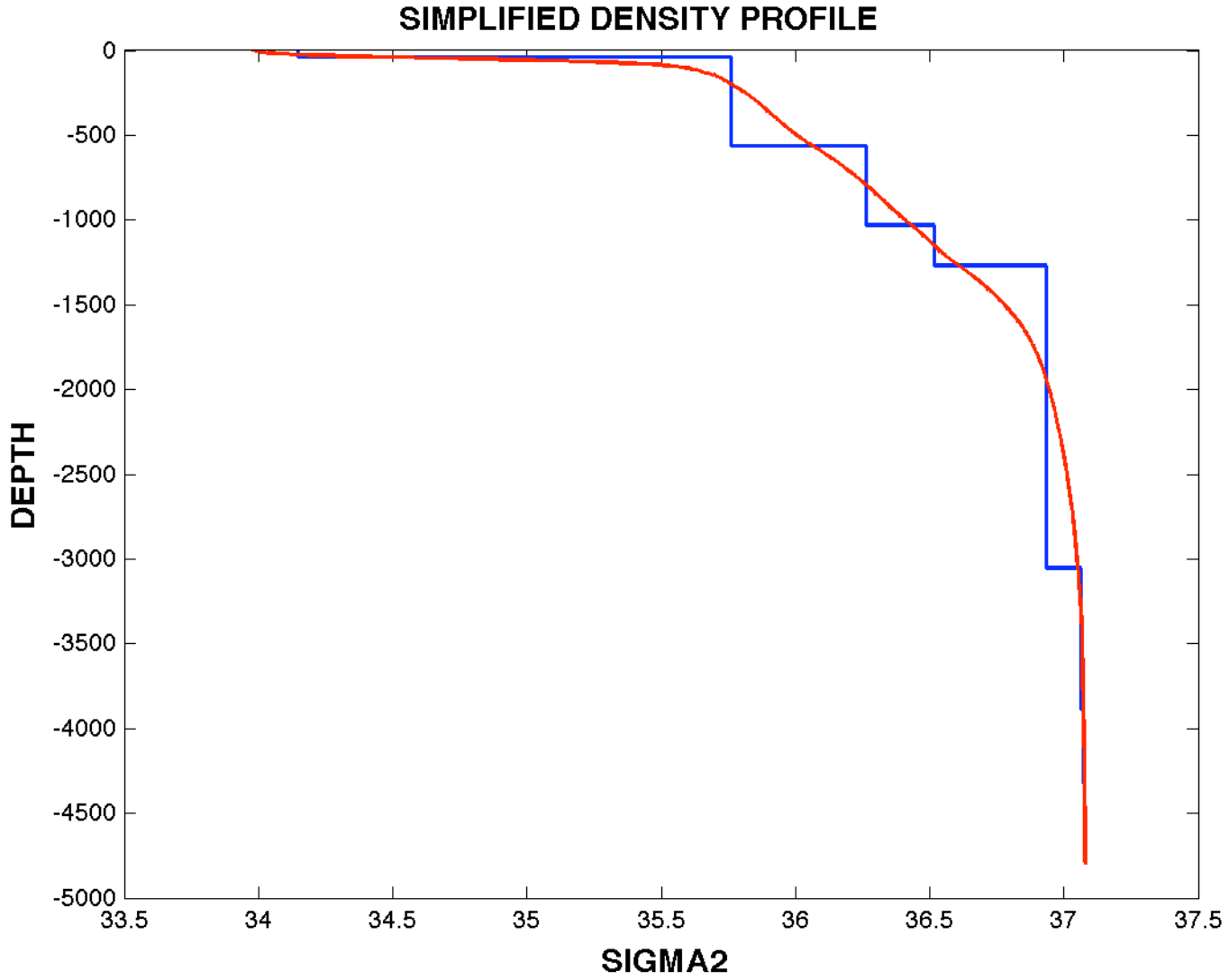


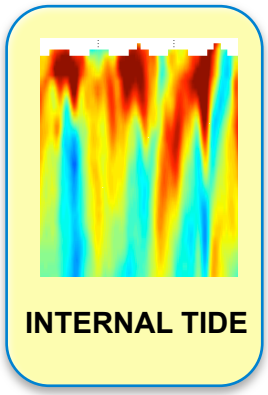
FORCING TERM
barotropic



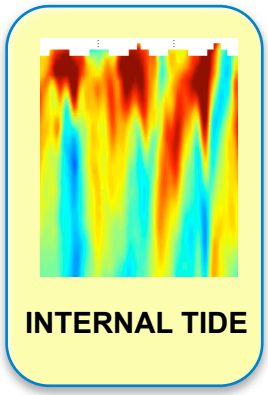
INTERNAL TIDE
solutions

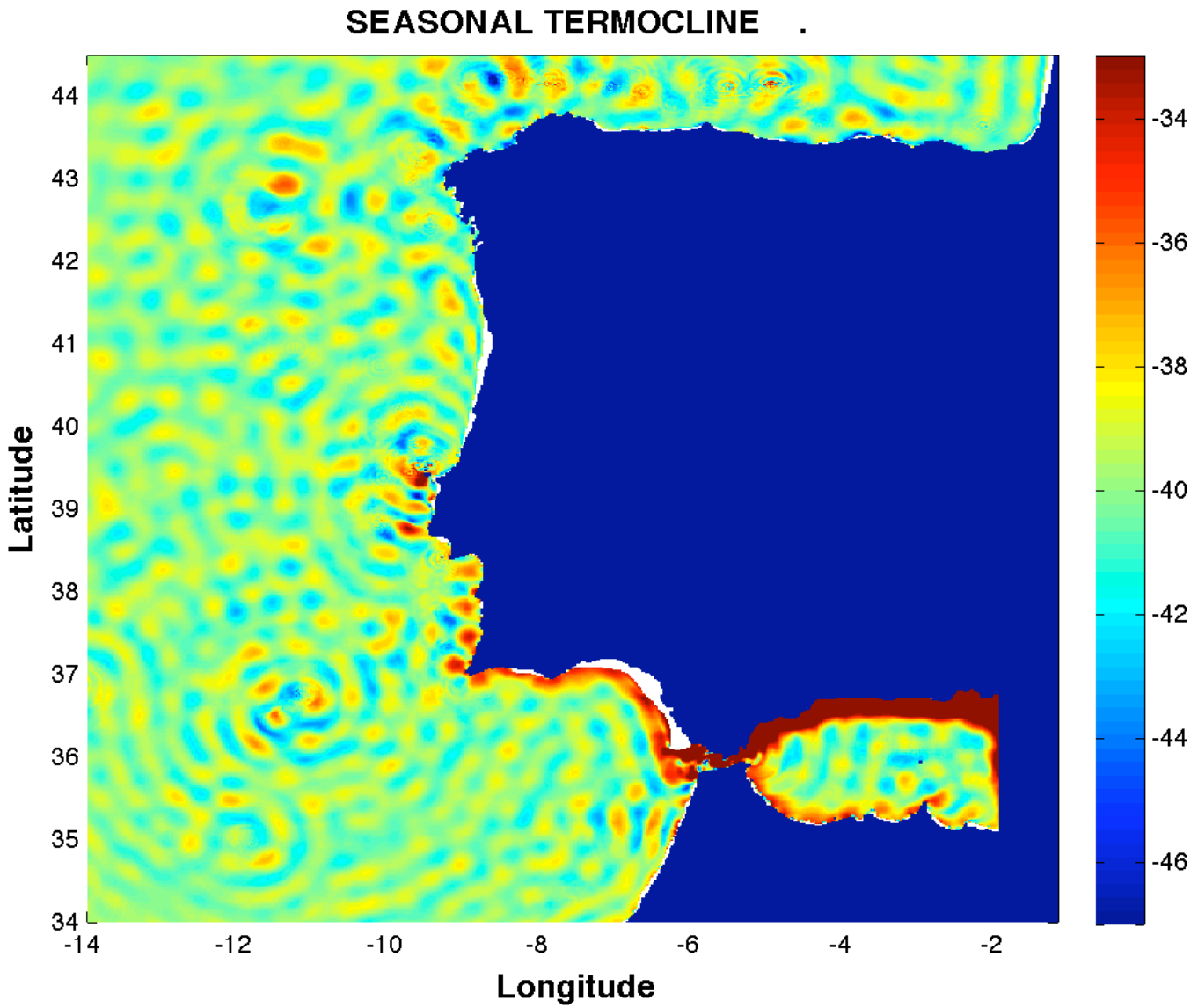
Internal Tide



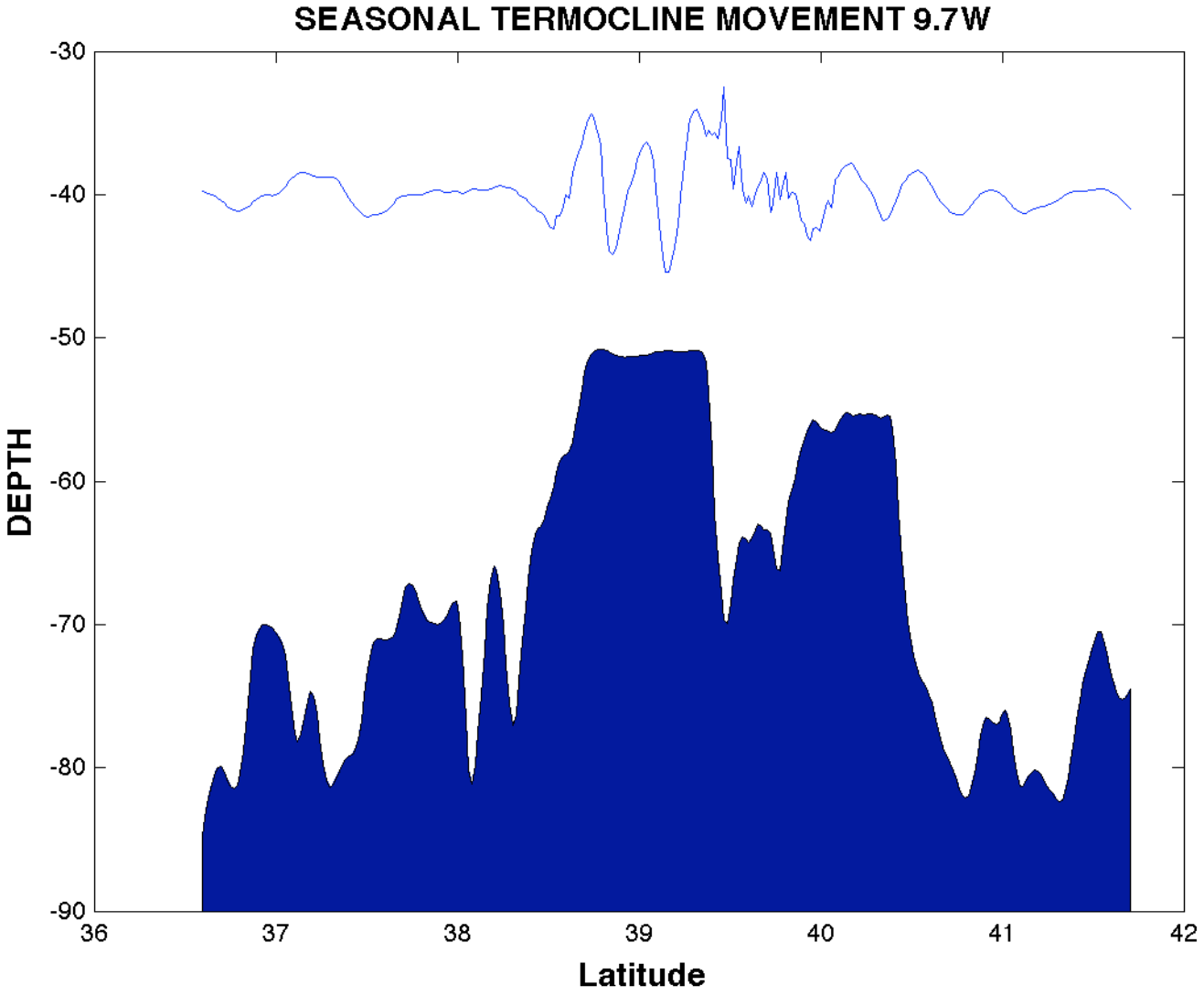


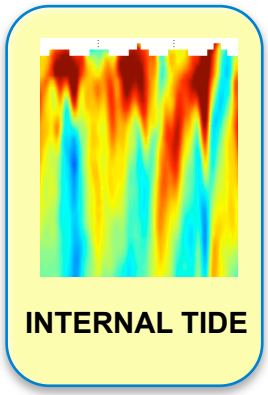
Internal Tide



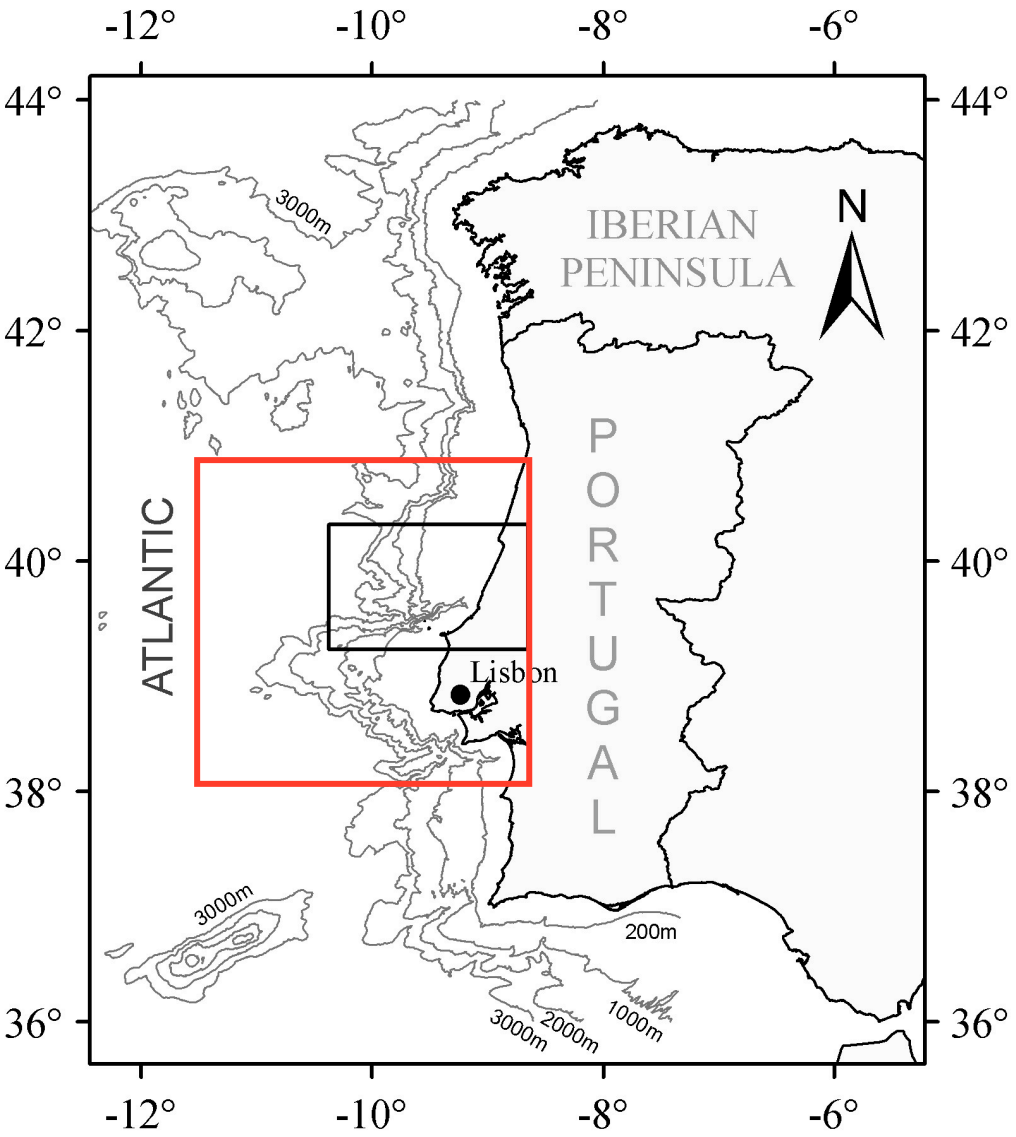


Internal Tide

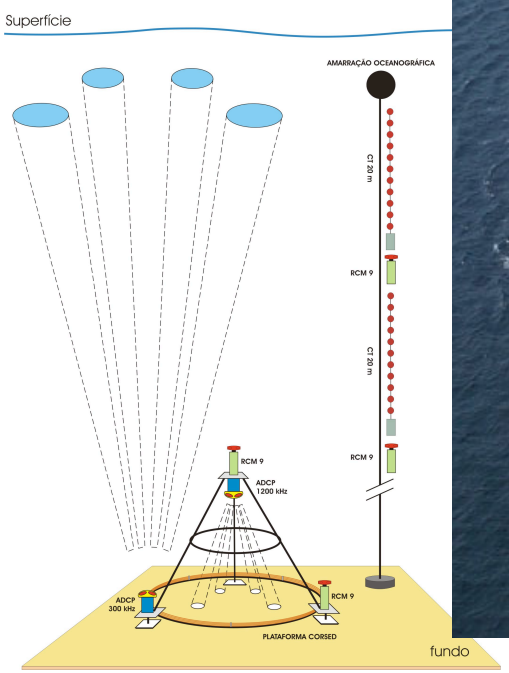




Future work: High resolution coastal model



Observation campaigns at sea to validate and improve numerical results



Regional sea surveys