

Regional tidal correction

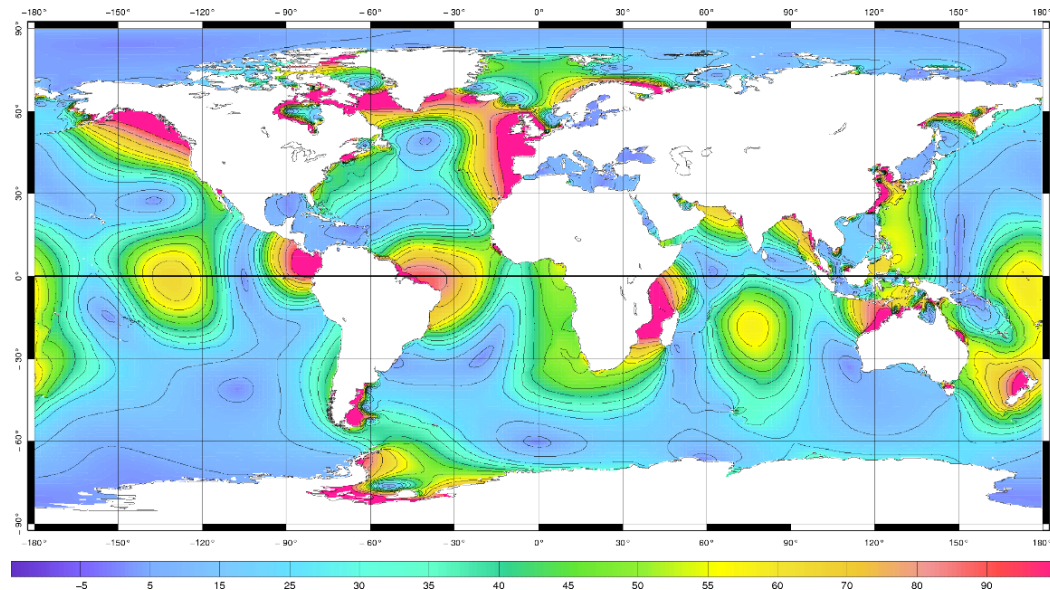
CP40 final meeting

02/07/2014



- Tides repartition over the global ocean
 - ▶ In the open ocean
 - Low amplitudes, large spatial scales (several hundreds/thousands of km)
 - Not the main oceanic process
 - ▶ On the continental shelf
 - Tidal amplitudes increase (up to meters), small spatial scales (a few tens of km)
 - Often prevails over the rest of the ocean dynamics

FES2012 M2 wave amplitude (cm)

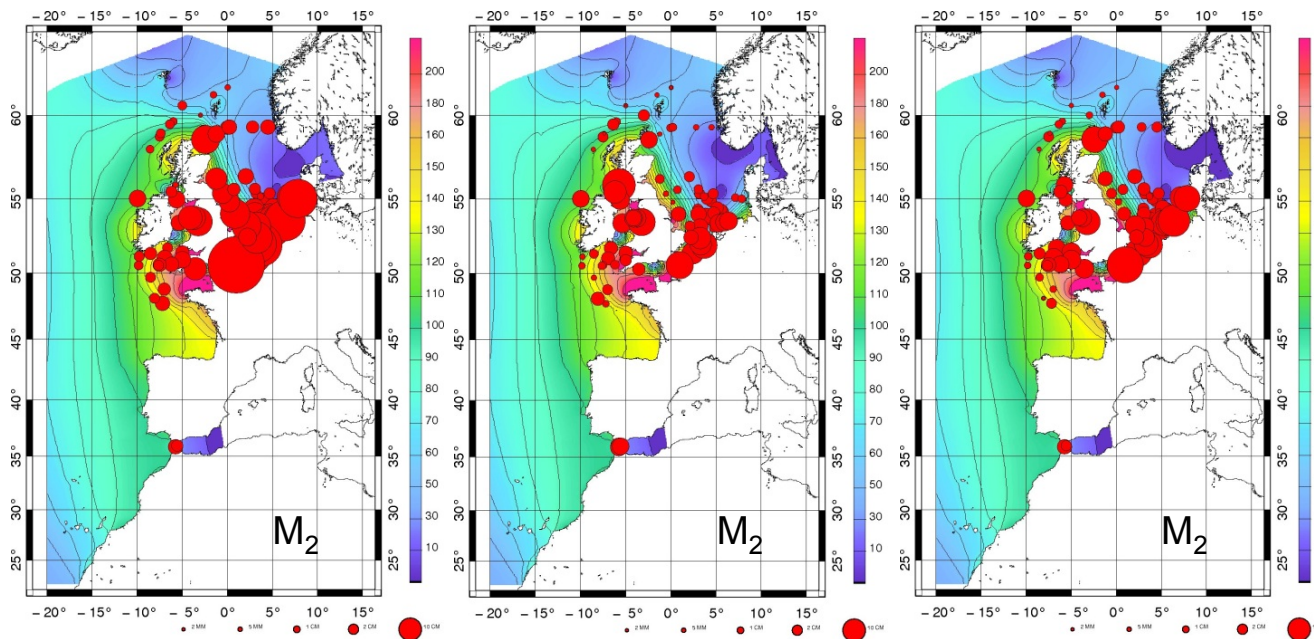


- Tidal corrections for altimetry data
 - ▶ Global models
 - Distributed in the altimeter products:
 - FES2004, FES2012, (FES2014, coming soon)
 - GOT4.7
 - Other models, not distributed in the L2/GDR altimeter products:
 - DTU10, EOT11a, TPX07.2...
 - ▶ Grid resolution
 - From 1/2 degree ($\sim 50\text{km}$) for GOT to 1/16 degree ($\sim 7\text{km}$) for FES2012
 - Too coarse to catch the non-linear tidal processes on the shelves
 - ▶ Errors
 - About 1-2cm in the open ocean
 - Locally up to several tens of centimeters in the coastal zones

- Motivations for regional tidal modelling

- ▶ Bathymetry

- Badly known in some regions
 - “Global” implies impossible to check everywhere carefully



NEA (hydrodynamic)

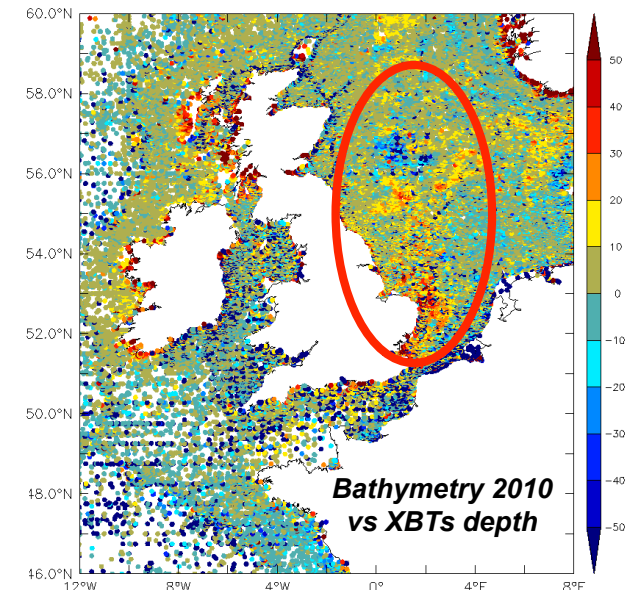
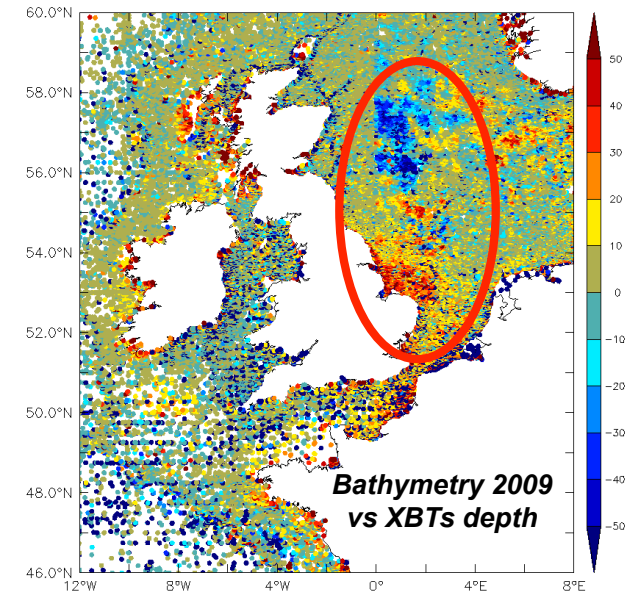
NEA (optimal) COMAPI

NEA (hydrodynamic)

Bathymetry Version-2009

Bathymetry Version-2009

Bathymetry Version-2010



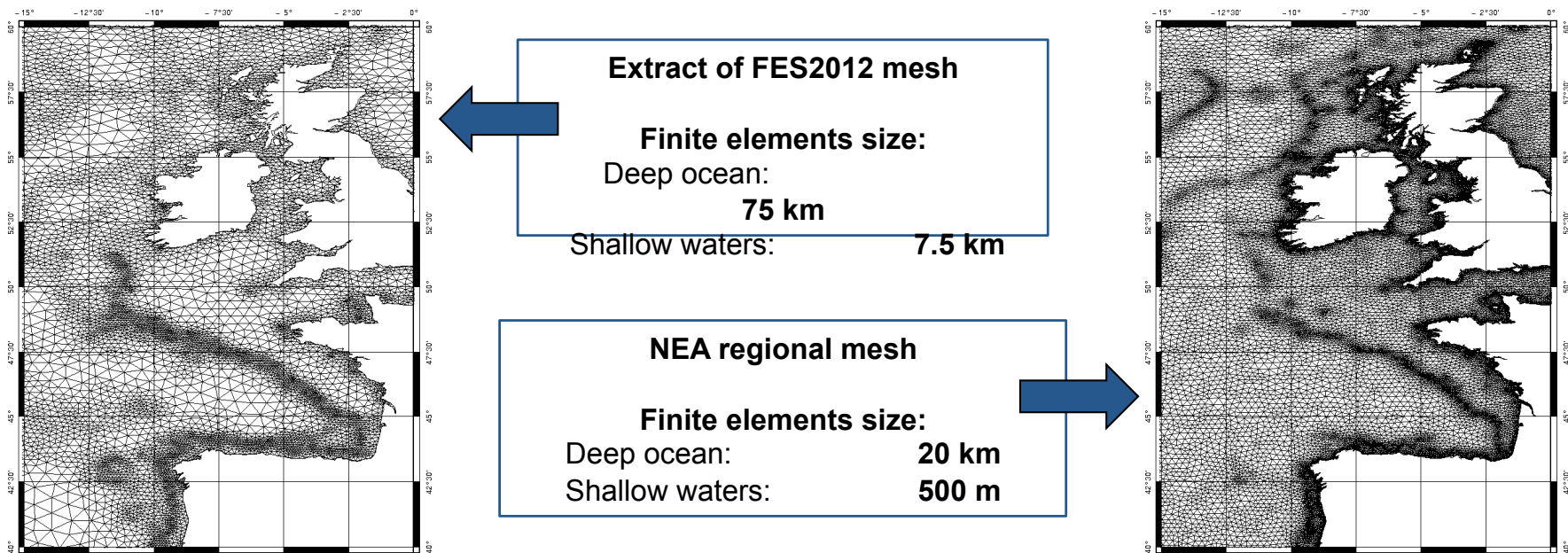
- Motivations for regional tidal modelling

- ▶ Higher spatial resolution to catch the small-scale tidal structures

- Global models: $1/2^\circ$ (~50km), $1/4^\circ$ (~25km), $1/8^\circ$ (~12,5km)

- Typical size of M4 structures : a few tens of kilometers

- ➔ Not accurate enough to well represent the complex tidal dynamics and the high spatial variability of the process in the coastal zones



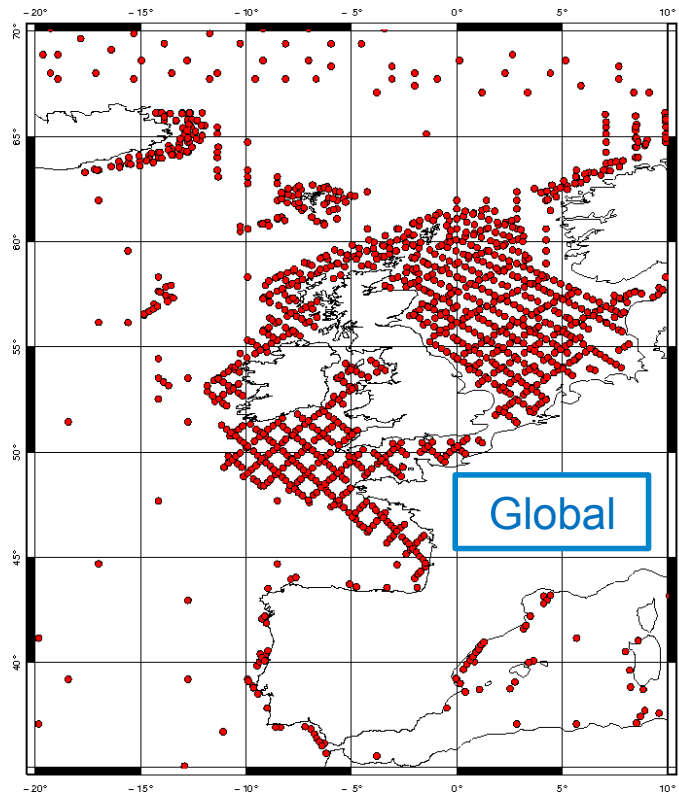
- Motivations for regional tidal modelling
 - ▶ Regional tuning of the hydrodynamic model
 - Global model: one global value for each parameter (ex: bottom friction coeff.)
 - Regional model: one value adapted to the zone
 - ➔ Better modelling of the local physics

 - ▶ Direct compatibility with global models via the boundary conditions
 - ➔ Regional models can be “patched” in compatible global models

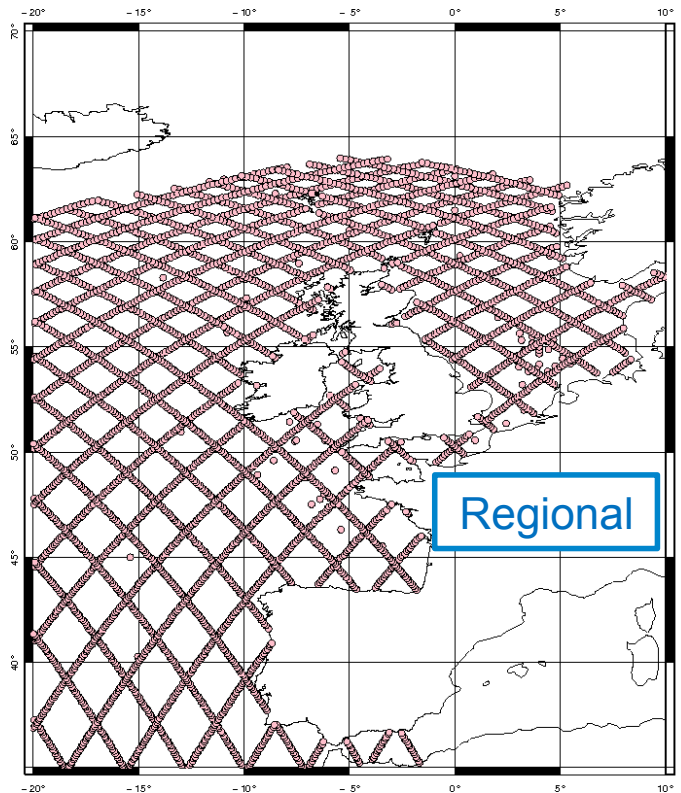
- Motivations for regional tidal modelling

- ▶ Regionally tailored assimilation experiments

- Number of assimilated observations directly linked to computing limitations (RAM)

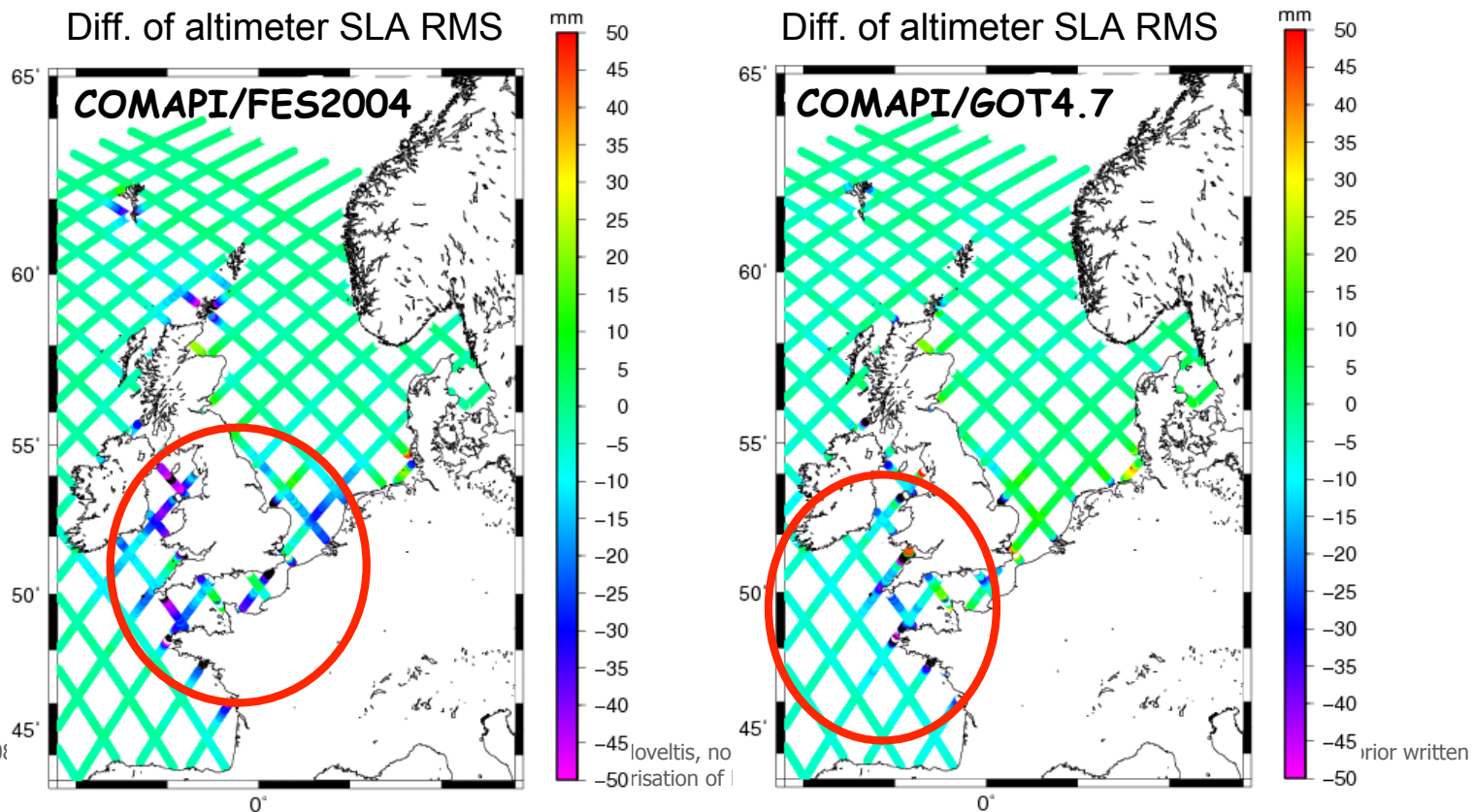


Assimilated observations in FES2012
 → AVISO data: crossover points offshore
 + alongtrack data in the coastal areas



Assimilated observations in the NEA model
 → TP/J1 CTOH coastal data
 + Tide gauges

- Regional tidal modelling applications
 - ▶ COMAPI regional tidal models (NEA and MED) for coastal altimetry
 - CNES/NOVELTIS/LEGOS project (2009-2010)
 - Main improvements (RMS reduction): Celtic Sea, Irish Sea, English Channel

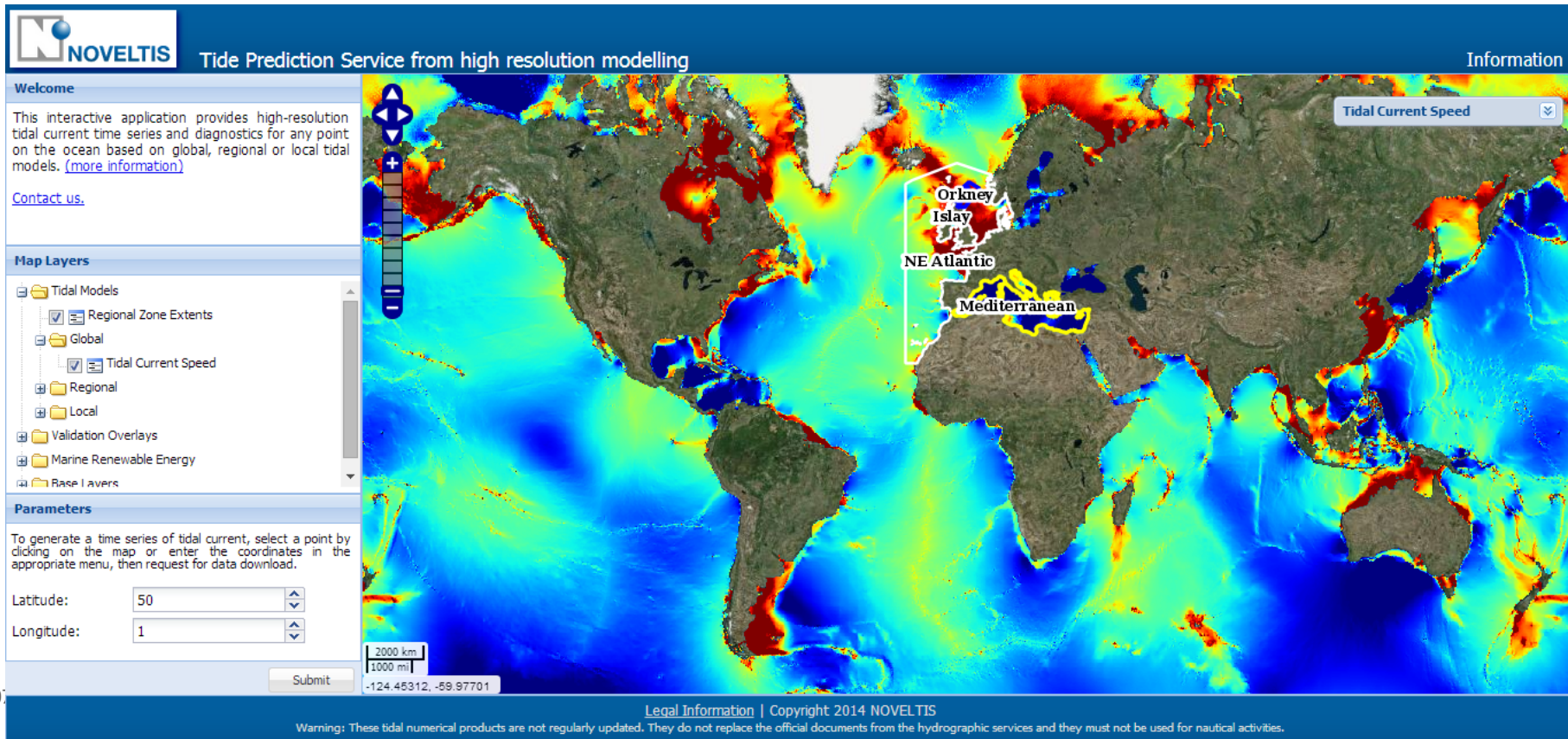


- Specific processing for CP40
 - ▶ Computation of the COMAPI tidal correction over NEA for CryoSat-2
 - Prediction of the tide at each location and date of the CryoSat-2 measurements
 - From January 2011 to January 2013
 - Compatible with FES2004 ocean tide and loading tide.
- Evaluation performed by CLS, in collaboration with NOVELTIS (see T. Moreau's presentation).

- Other applications

- ▶ TIPS: Tidal Prediction Service - <http://tips.noveltis.com/>

- Maintained and developed on NOVELTIS funds
 - Global and regional tidal modelling: elevations and currents



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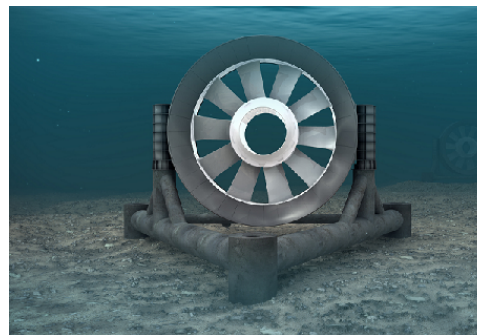
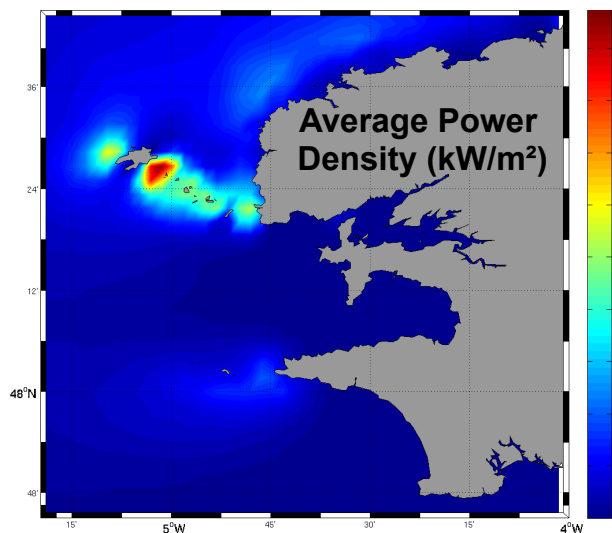
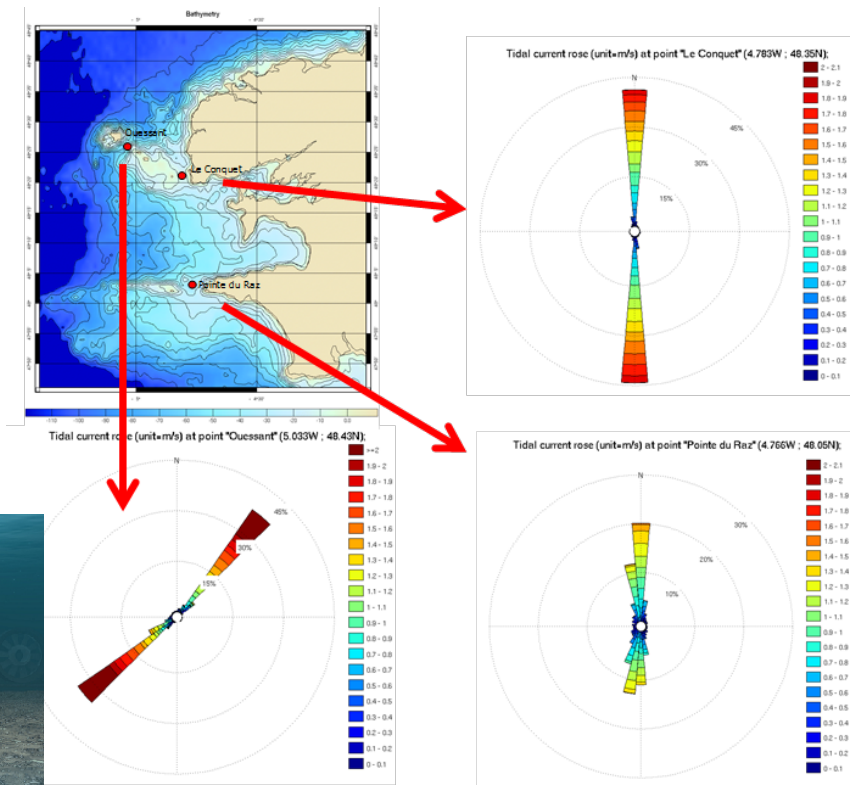
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- Other applications

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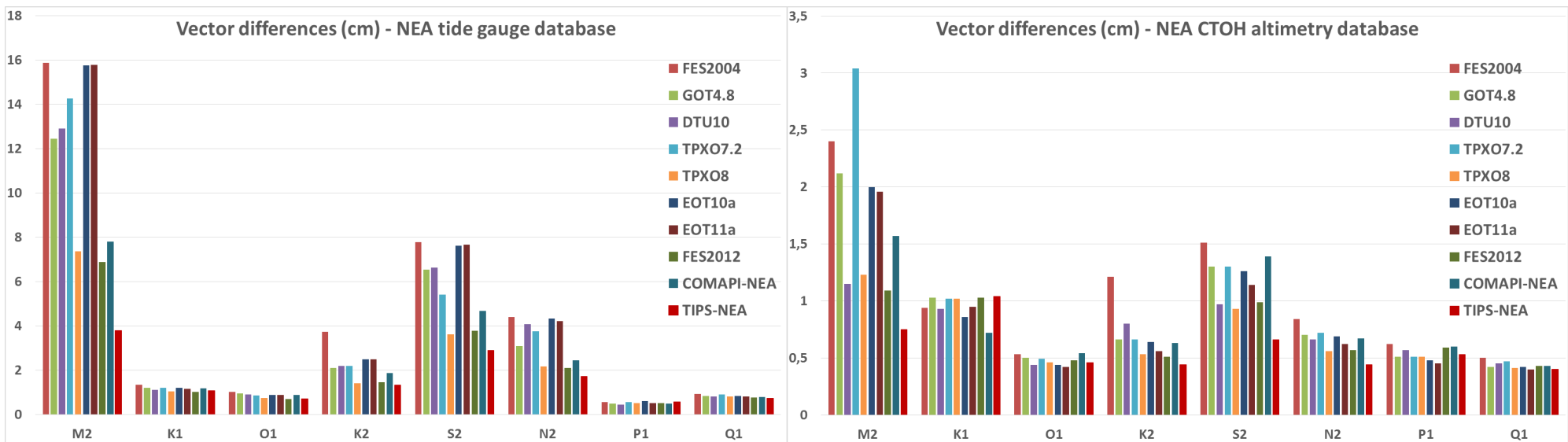
- Various applications and end-users:

- Boundary conditions for ocean modelling
 - Ocean model validation
 - Offshore activities
 - Marine energy site assessment...



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- New developments and Perspectives
 - ▶ Continuous update/development of tidal atlases
 - TIPS-NEA, TIPS-Orkney & TIPS-Islay in 2013



- FES2014 global model under development (CNES project)
- “CP40 follow up” : proposition for a regional tidal model in the Arctic (with DTU)

➔ Same methodology can be applied over any continental shelf