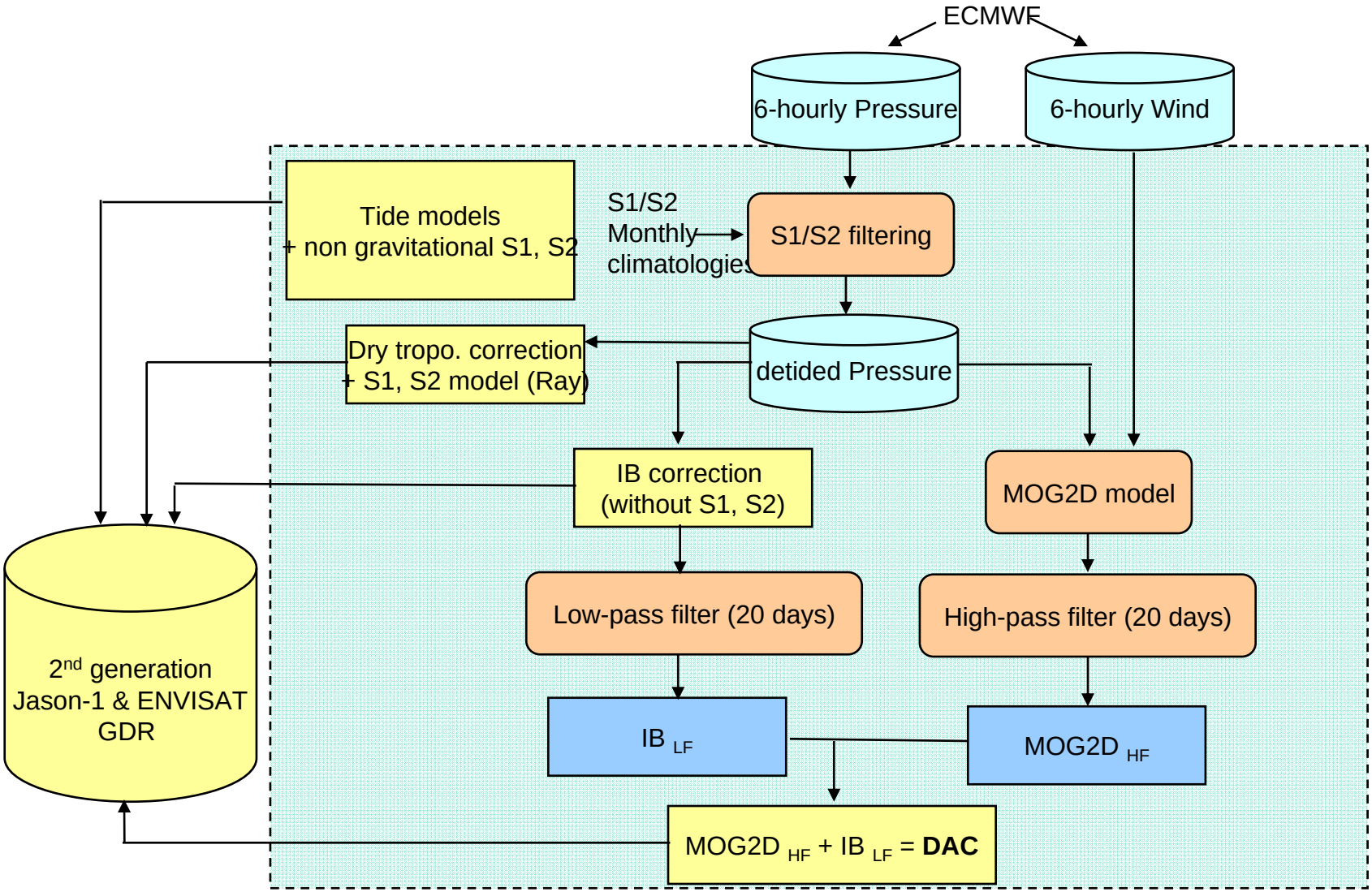
Dealiasing high frequency ocean response to atmospheric forcing

Laurent ROBLOU (LEGOS)
In collaboration with:
Florent LYARD, Joël DORANDEU, Julien LAMOUROUX, Jérôme BOUFFARD

Outline

- Global correction improvements
  - ✓ Processing overview
  - ✓ Model v IB improvements
  - ✓ LR v HR improvements
- Regional correction perspectives
  - ✓ Regional platforms
  - ✓ Performances
- Summary

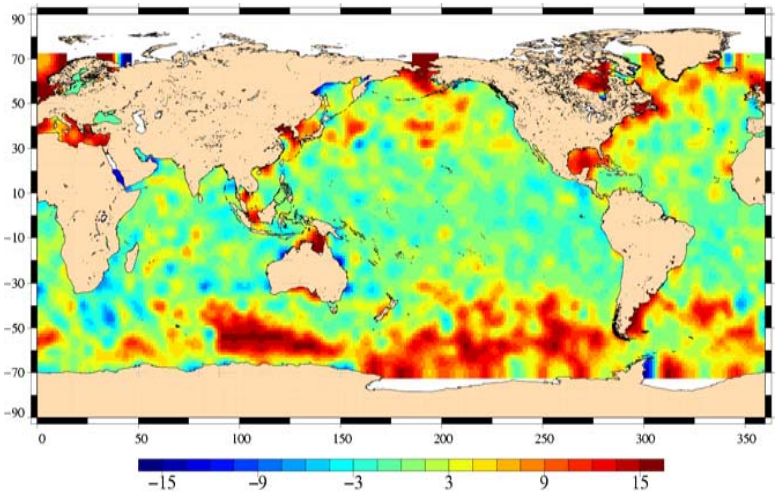
Processing chain to filter HF signal (de-aliasing)



Jason-1

- Computation from cycles 1 to 21

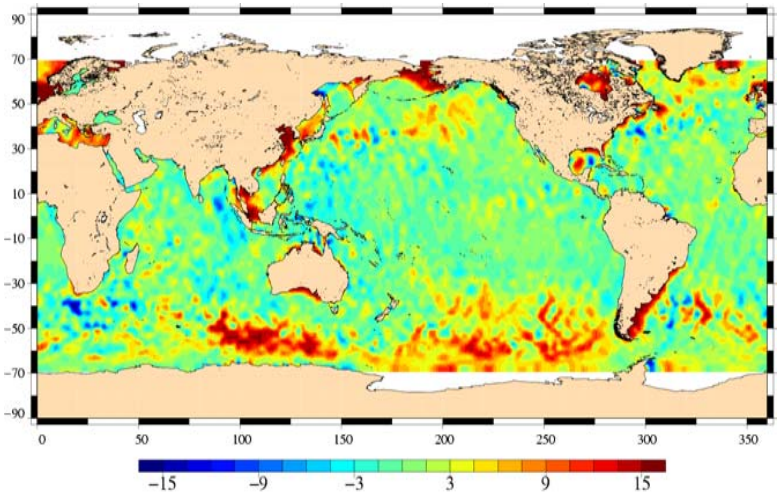
Crossovers



Crossover variance differences (cm²): SSH with IB – SSH with Mog2D

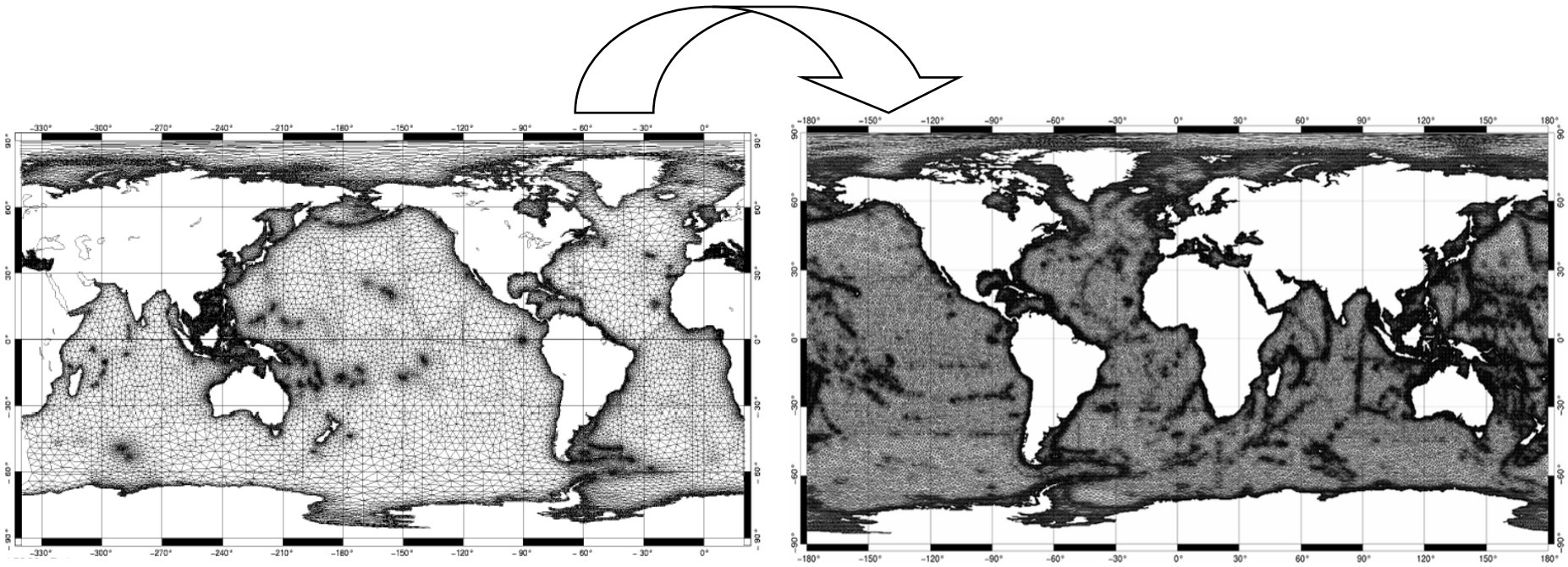
- Crossover differences:
  - ✓ With IB: std = 7.04 cm
  - ✓ With DAC: std = 6.41 cm
  - ✓ **Variance reduction:**
    - ➢ **8.47 cm² (2.91 cm RMS)**
    - ➢ **17%**

SLA



SLA variance differences (cm2)

From Low resolution to High resolution global correction



Dynamic Atmospheric Correction (DAC) HR / LR

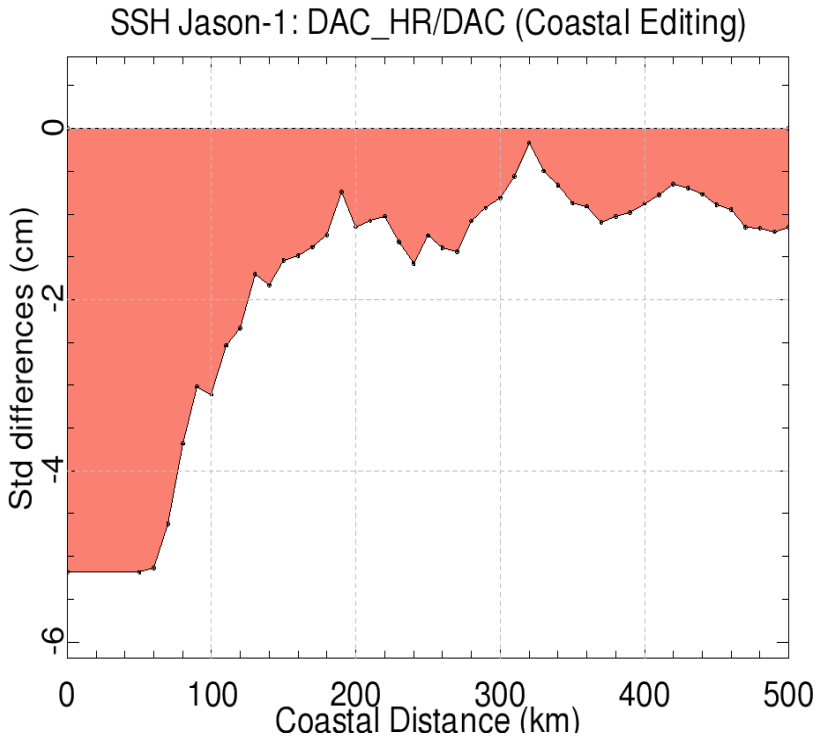
Gain / IB (%)	CO-**DAC_BR**	CO-**DAC_HR**
Global ocean	16.56	20.24
High Latitudes	18.5	22.56
Low Latitudes	5.3	6.04
Deep ocean	12.5	15.73
Shallow waters	28.28	32.94

Gain in altimeter crossover variance relative to IB

Variance (cm^2)	Obs	Obs-IB	Obs-MOG2D_HR	**MOG2D_HR (% /IB)**	**MOG2D_BR (%/IB)**
Global ocean	32.37	17.54	8.22	**53.1%**	**51.26%**
High Latitudes	57.22	28.71	12.24	**57.4%**	**55.35%**
Low Latitudes	8.38	6.75	4.35	**35.6%**	**34.51%**

Residual variance at Tide Gauges, in the 2-20 day period band (3 left columns)
Gain in variance at tide gauges, relative to IB (2 right comulns)

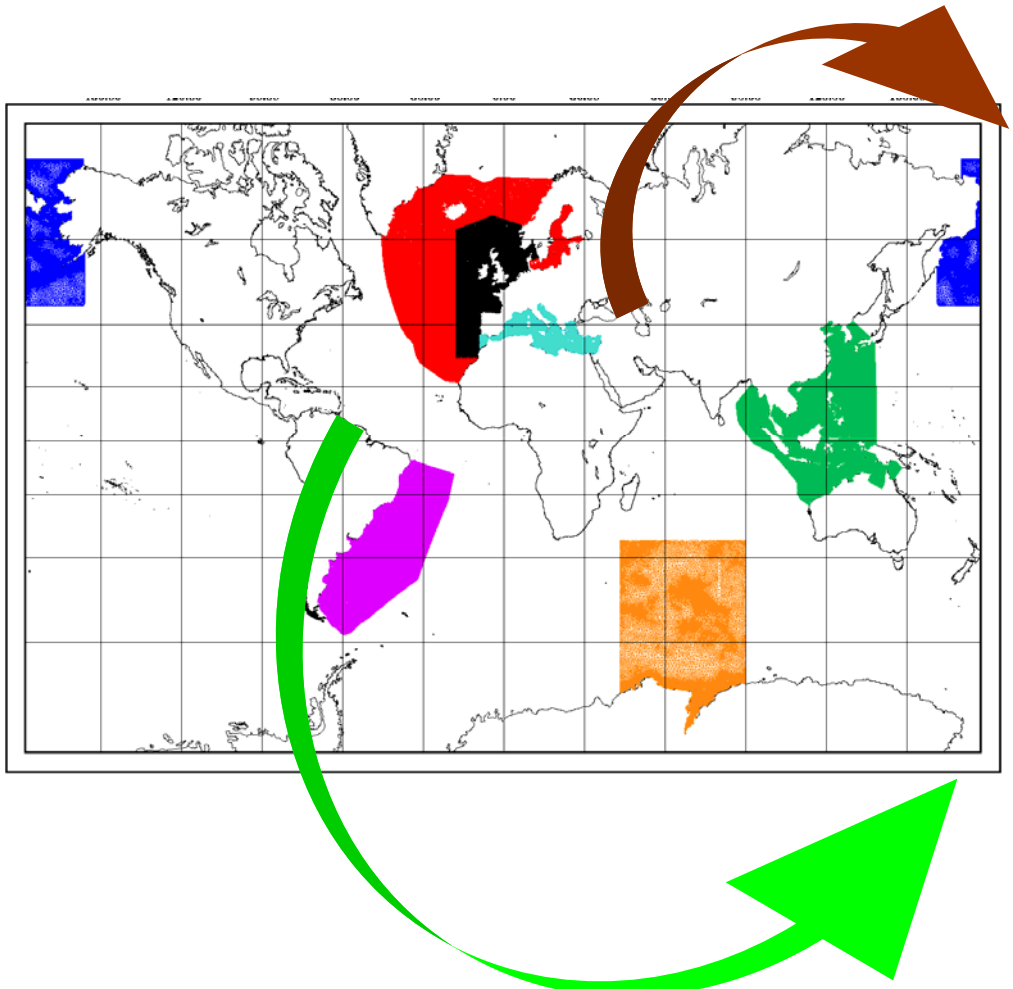
High Resolution DAC / Low Resolution DAC

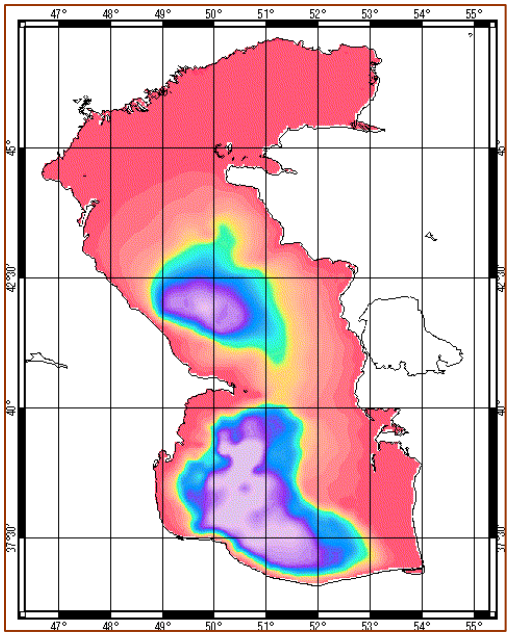


Preliminary results from the PISTACH coastal altimetry project:

- **dedicated editing applied to coastal regions**
- **gain in variance of HR DAC relative to LR DAC, as a function of distance to shore**

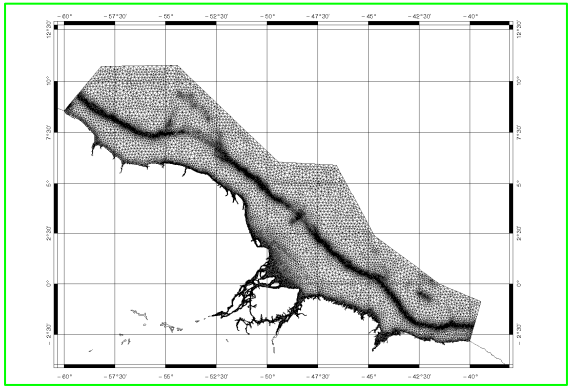
Mog2D/T-UGO 2D regional modelling platfoms (LEGOS)





Caspian Sea

Amazonian shelf

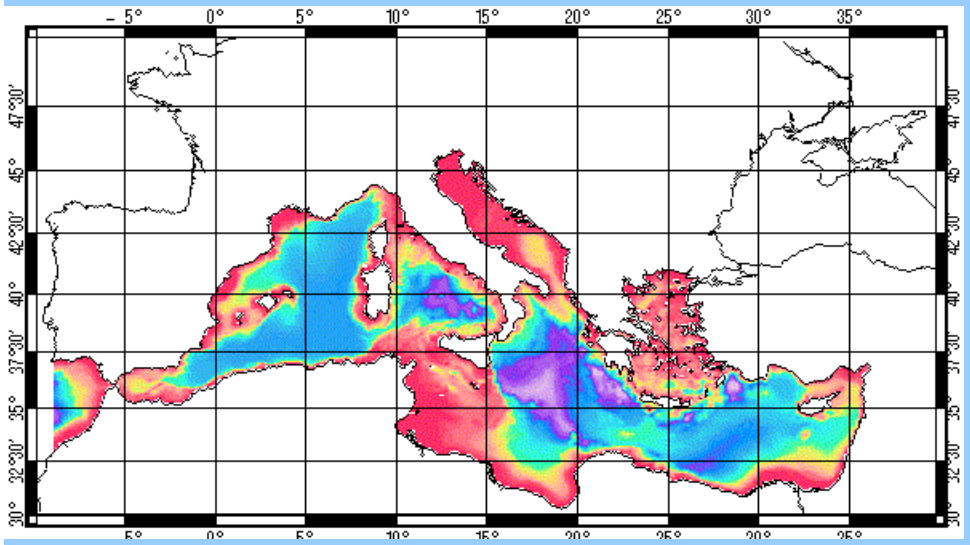


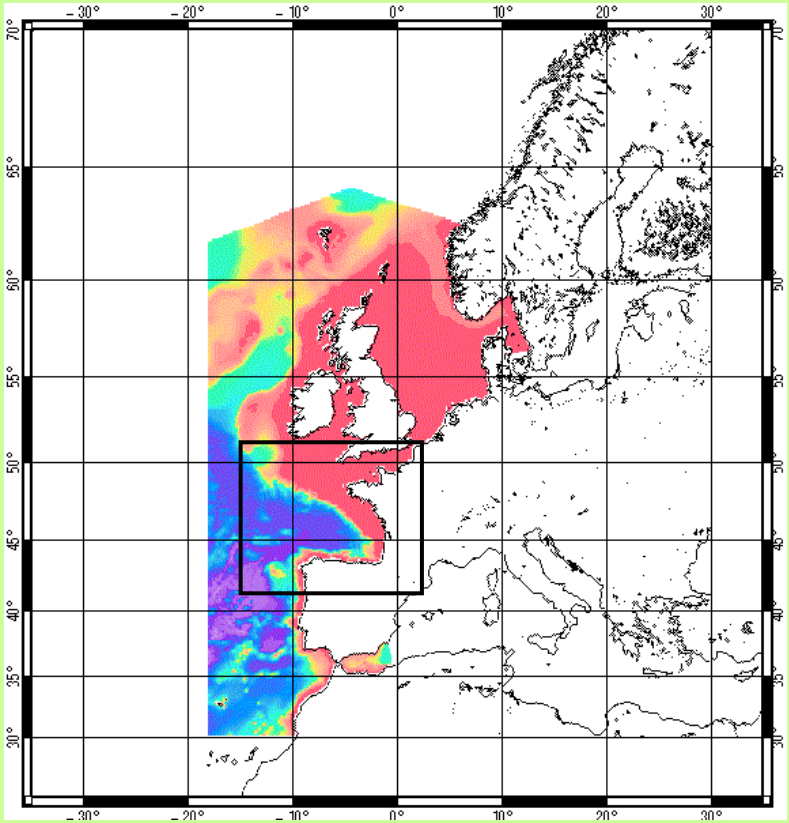
Regional models performances

- Regional mesh
- Mog2D Global model forcing (OBC)
- Regional atmospheric forcing (Meteo-France)

Residual bias: 5.6 cm rms (TG), 5.2 cm rms (T/P) (0<T<20 days)

Roblou (2003)

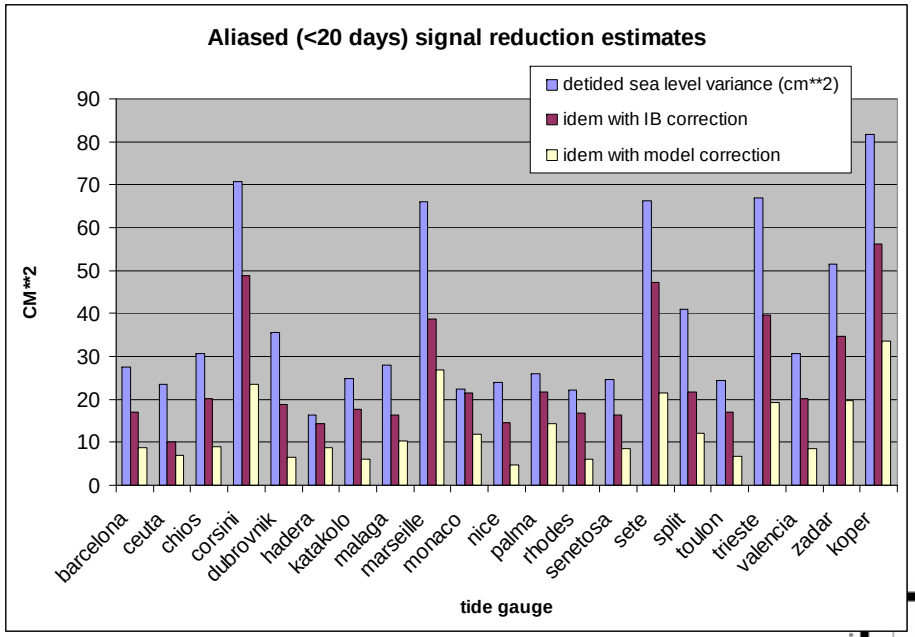




Residual bias at TG: 5 cm rms (0<T<20 days)

Lamouroux (2004)

Med model comparisons to tide gauges and altimetry

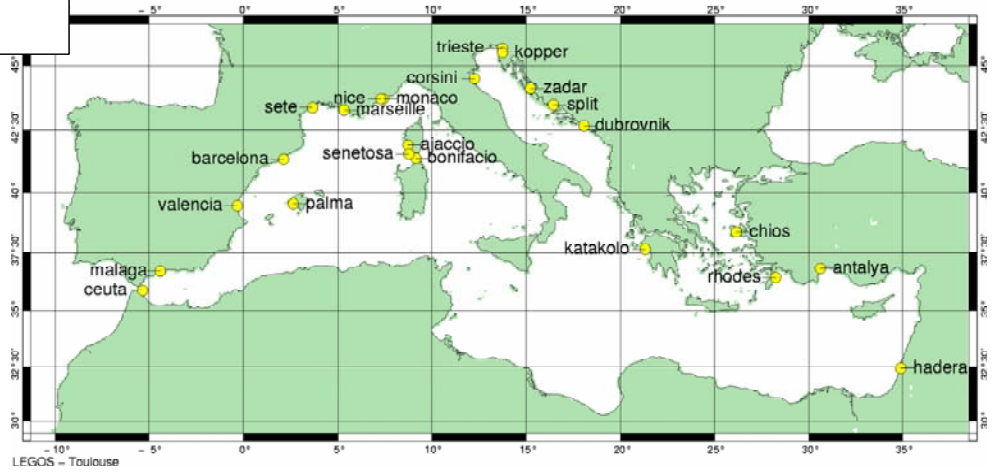


Lyard and Roblou (2004)

Comparisons to tide gauges data:

- ✓ Gain vs IB: 46%
- ✓ Gain vs Mog2D-G correction: 5%

Similar results w.r.t T/P altimetry (Bouffard)



Application to in situ Cal/Val activities (T/P, J-1, J-2, ENVISAT-RA-2)

Summary

- New global, high resolution Mog2D/DAC correction has led to improvements over continental shelves
- But we need to develop regional barotropic models for significant improvements!
- Routine production/distribution and operational systems applications will need financial supports (CNES/ESA/GMES programs? Operational centres?)
- Integration in AVISO products in the future?
- Perspectives: investigate HF baroclinic effects