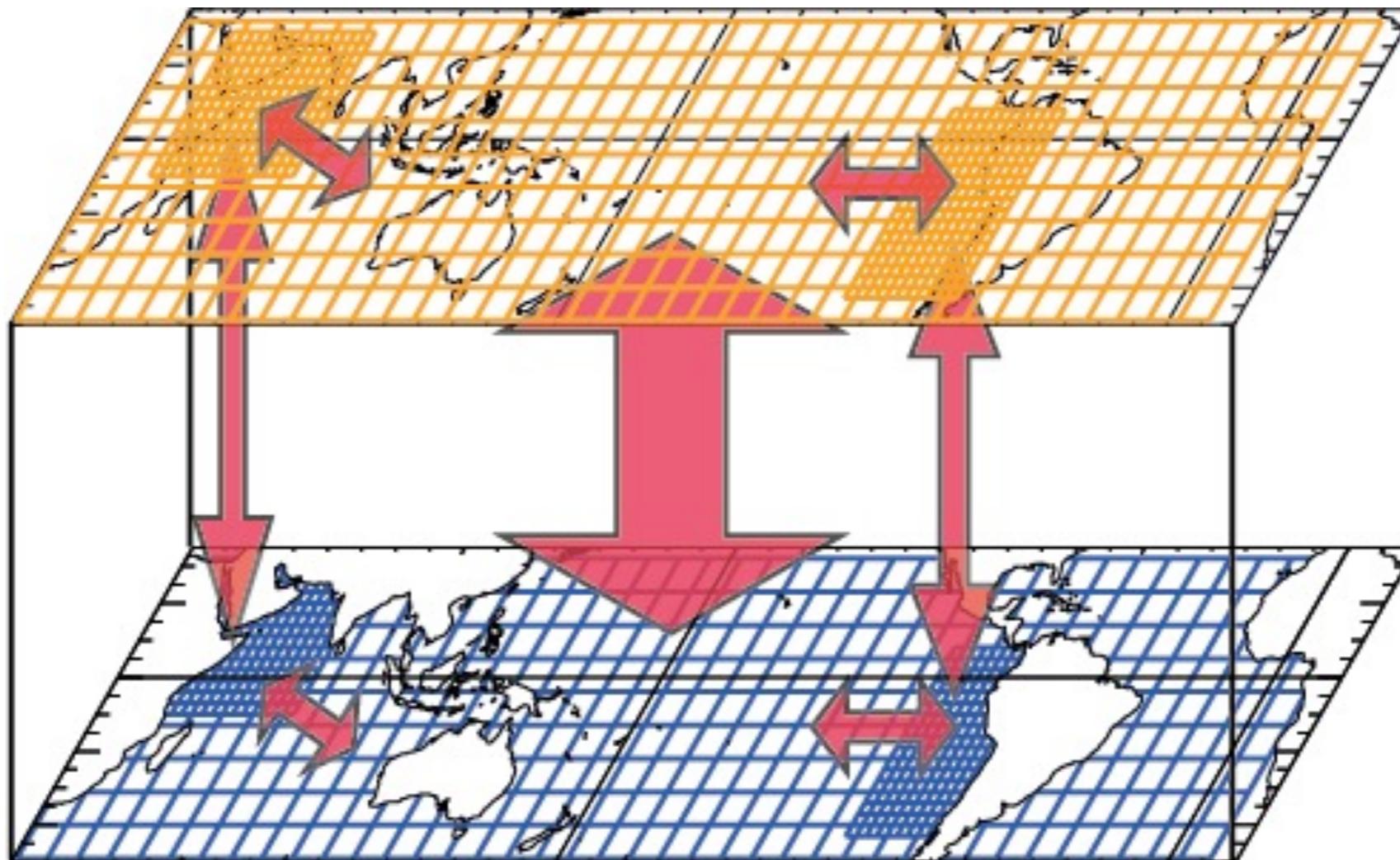


PULSATION



A few numbers

budget: 582 666€

start: 1 february 2012

length: 39 months

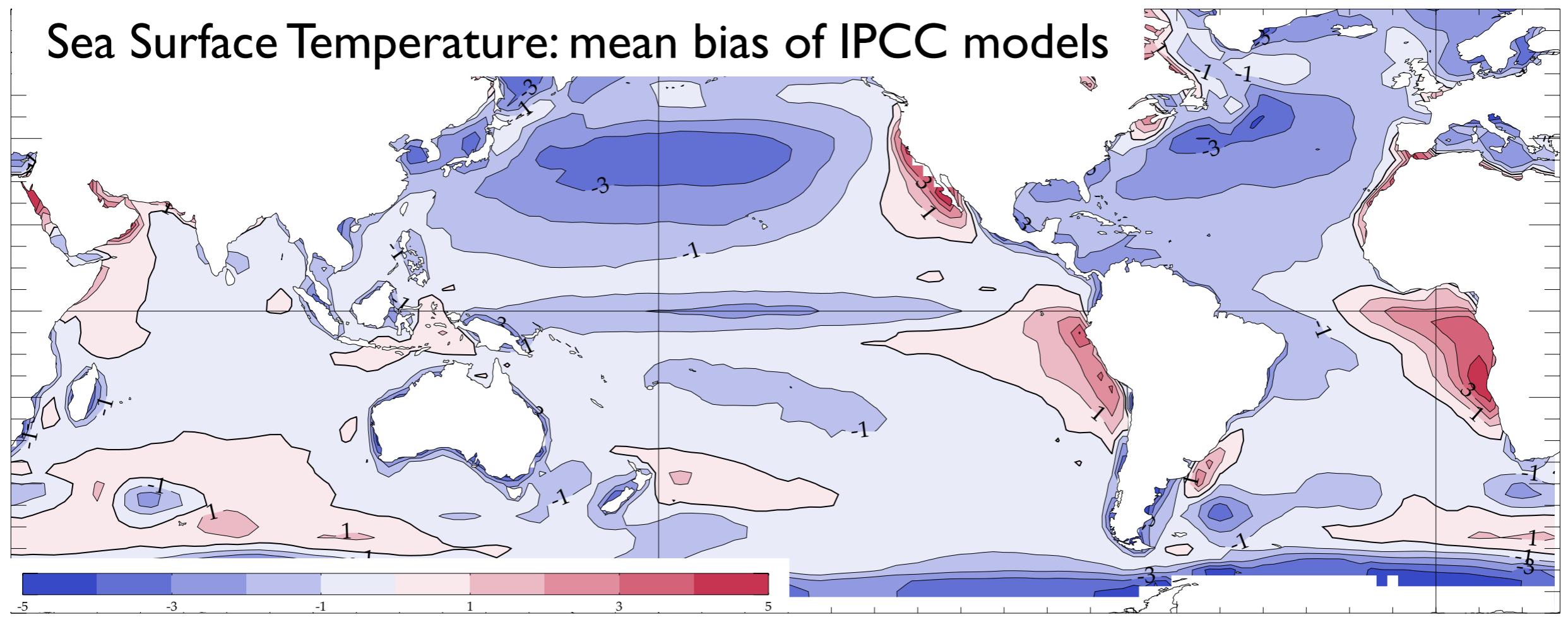
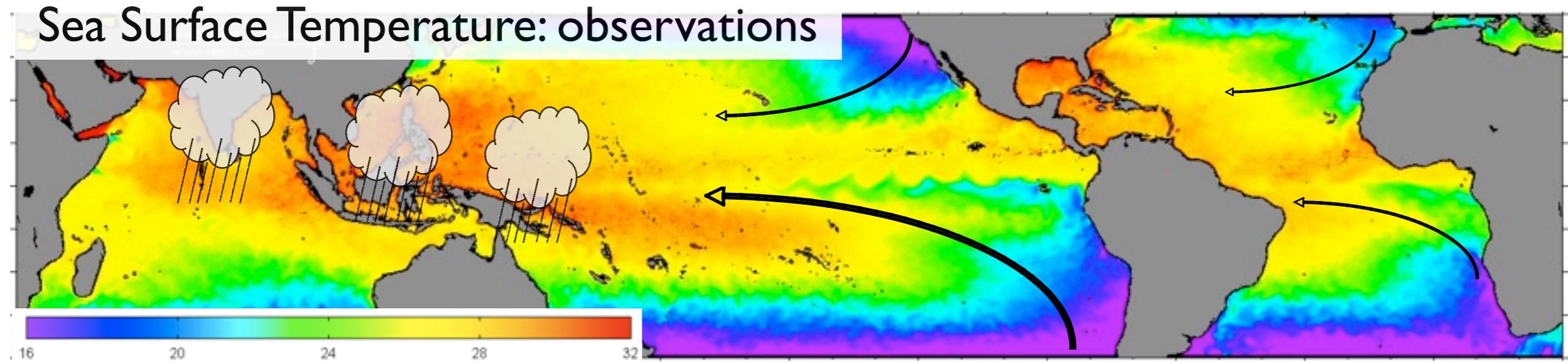
5 parters

6 persons full time

	Aide Demandée (€)	Coût Complet(€)	Aide allouée maxi hors pôle (€)	Personnel permanent (pers.mois)	Personnel non permanent (pers.mois)
LOCEAN (coord)	419640	1647130	419578	91	72
SUC	54496	159796	54496	9	9
BULL	25766,71	85894	25768	7	0
Mercator- Ocean	18347,54	40773	18348	4	0
LEGOS	64480	227009	64476	12	12
Total	582730,25	2160602	582666	123	93

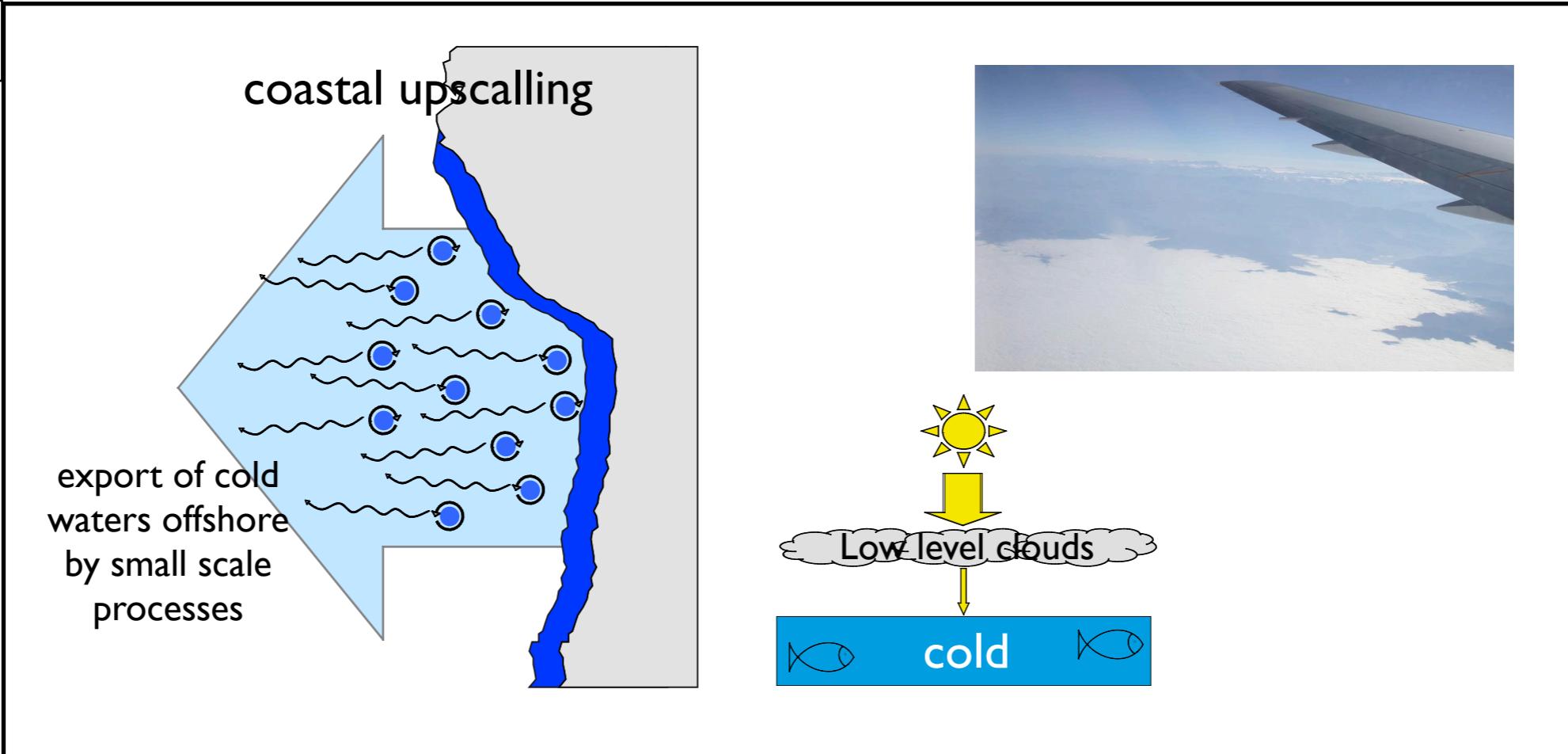
Scientific motivations

small scales \Leftrightarrow large scales

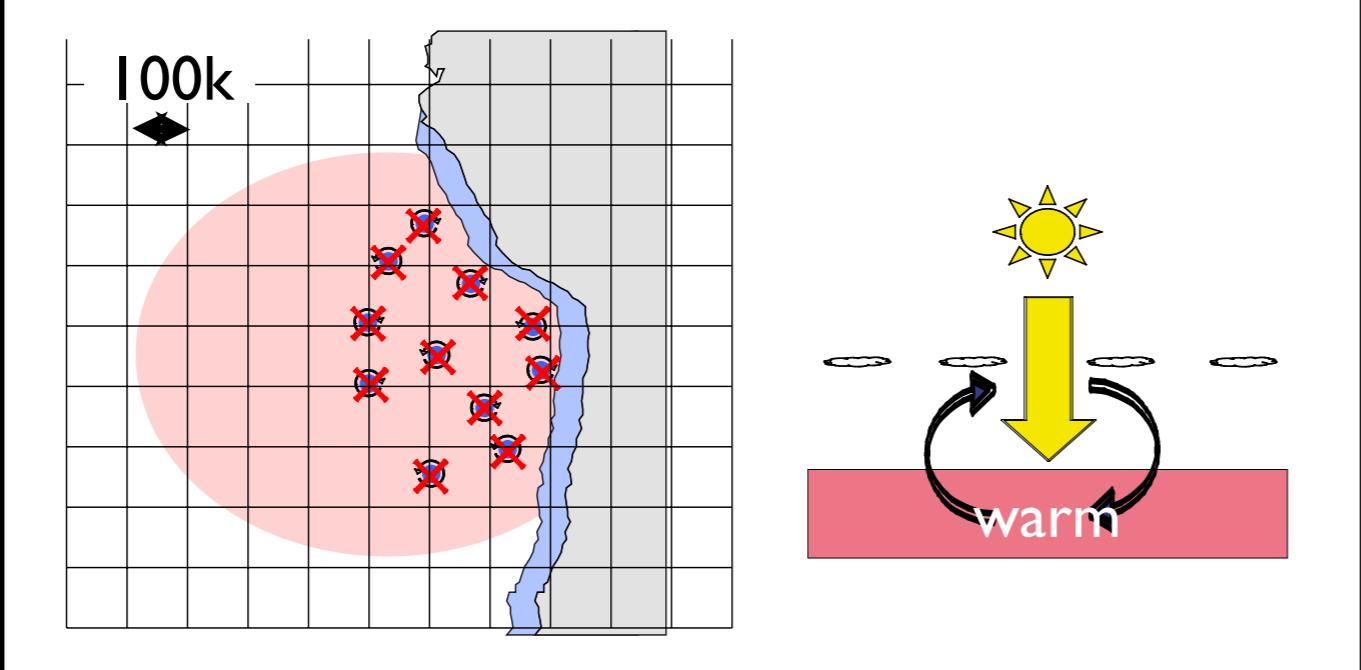


Main source of systematic large scale biases: Small scales processes

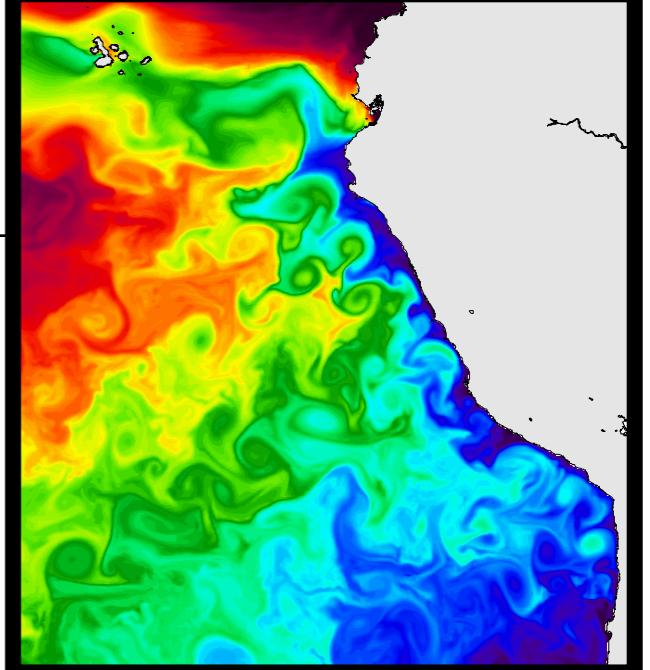
Real world



Global
climate
model



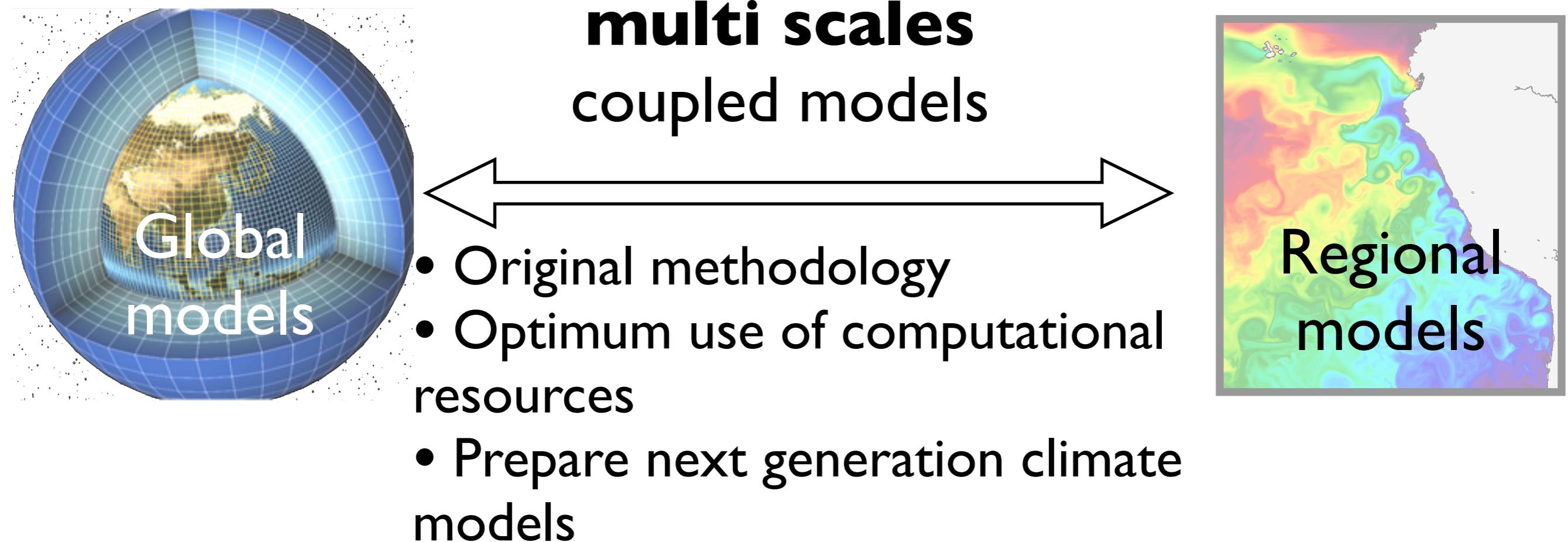
Regional
ocean
model



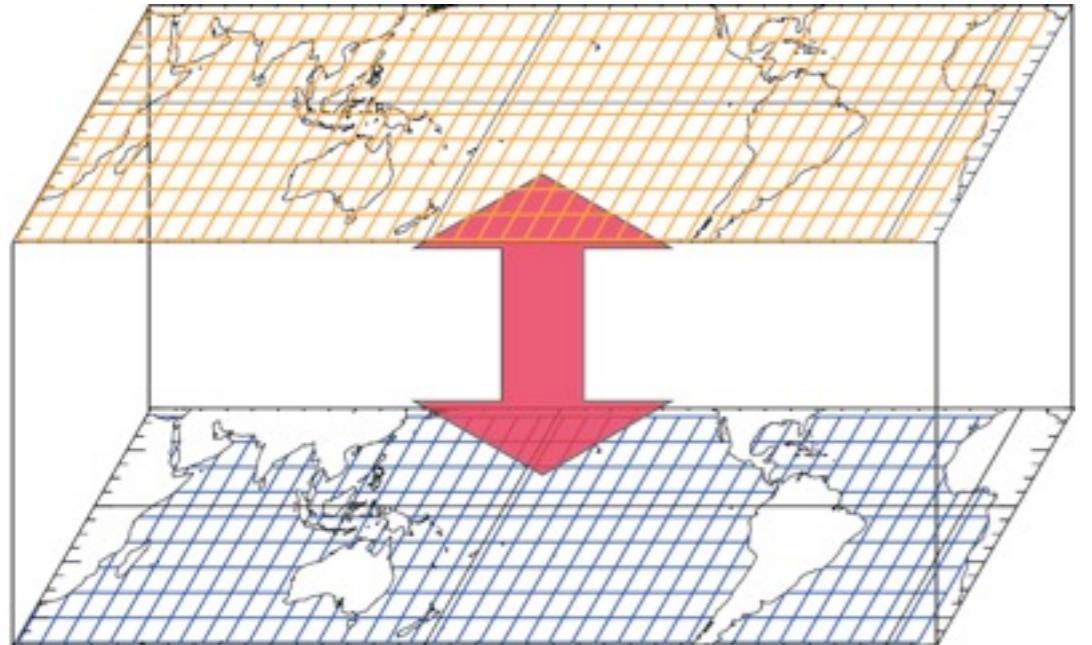
Combine the advantages of regional and global models

Upscaling processes un coastal upwelling aeras

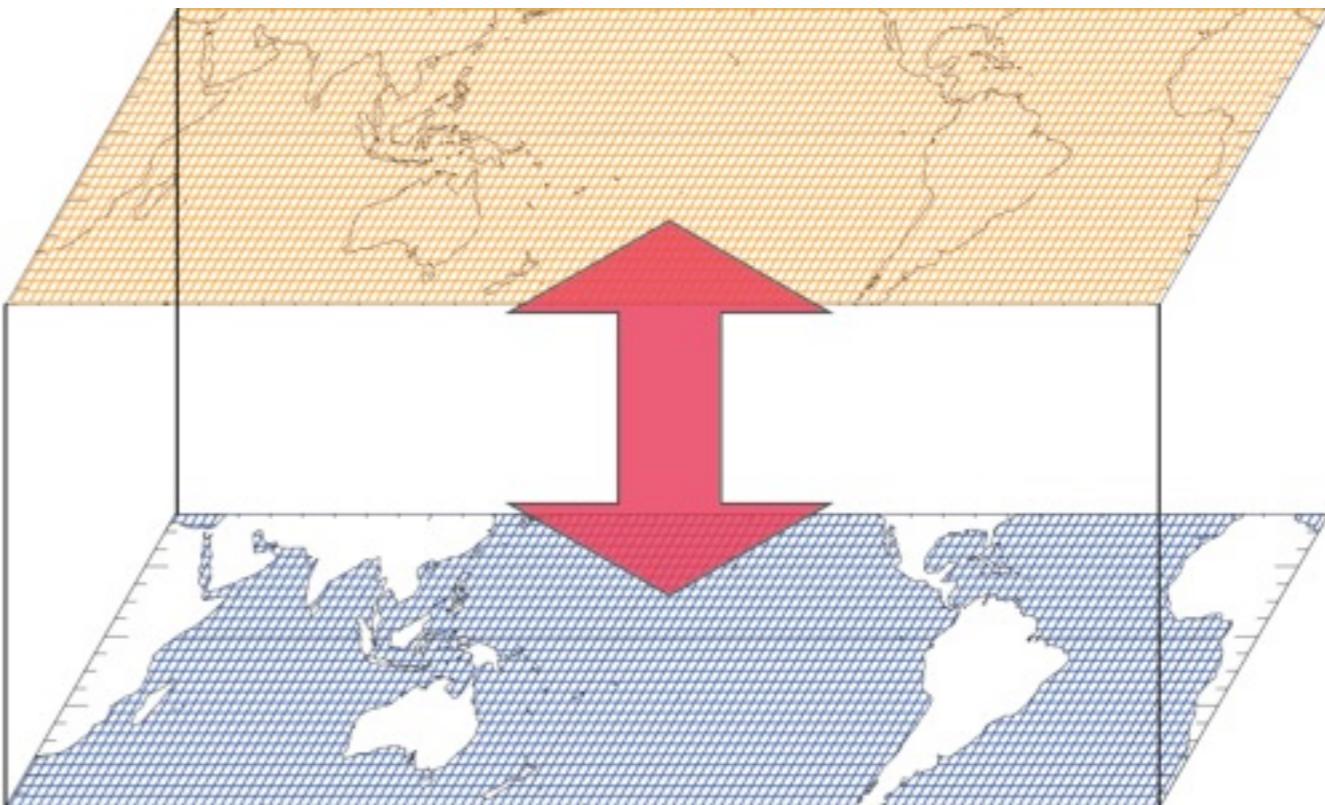
1. Quantify the impact of small scale processes on global climate
2. Reduce large scale and recurrent biases in climate simulations



The idea: multi-scale coupled model...

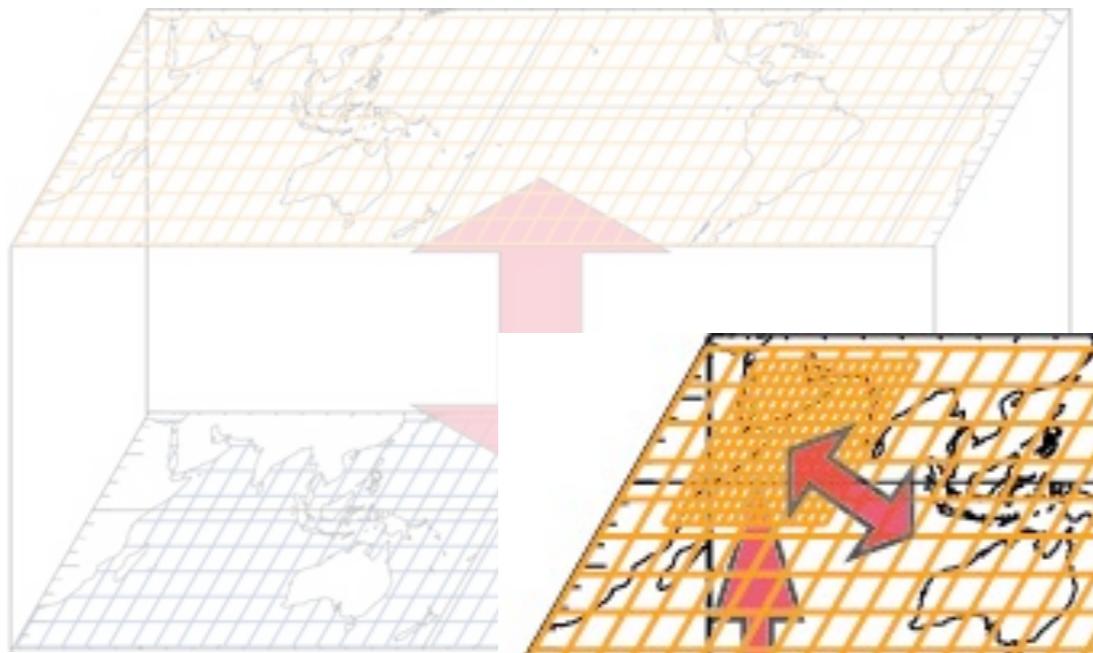


27km in both
ocean and
atmosphere

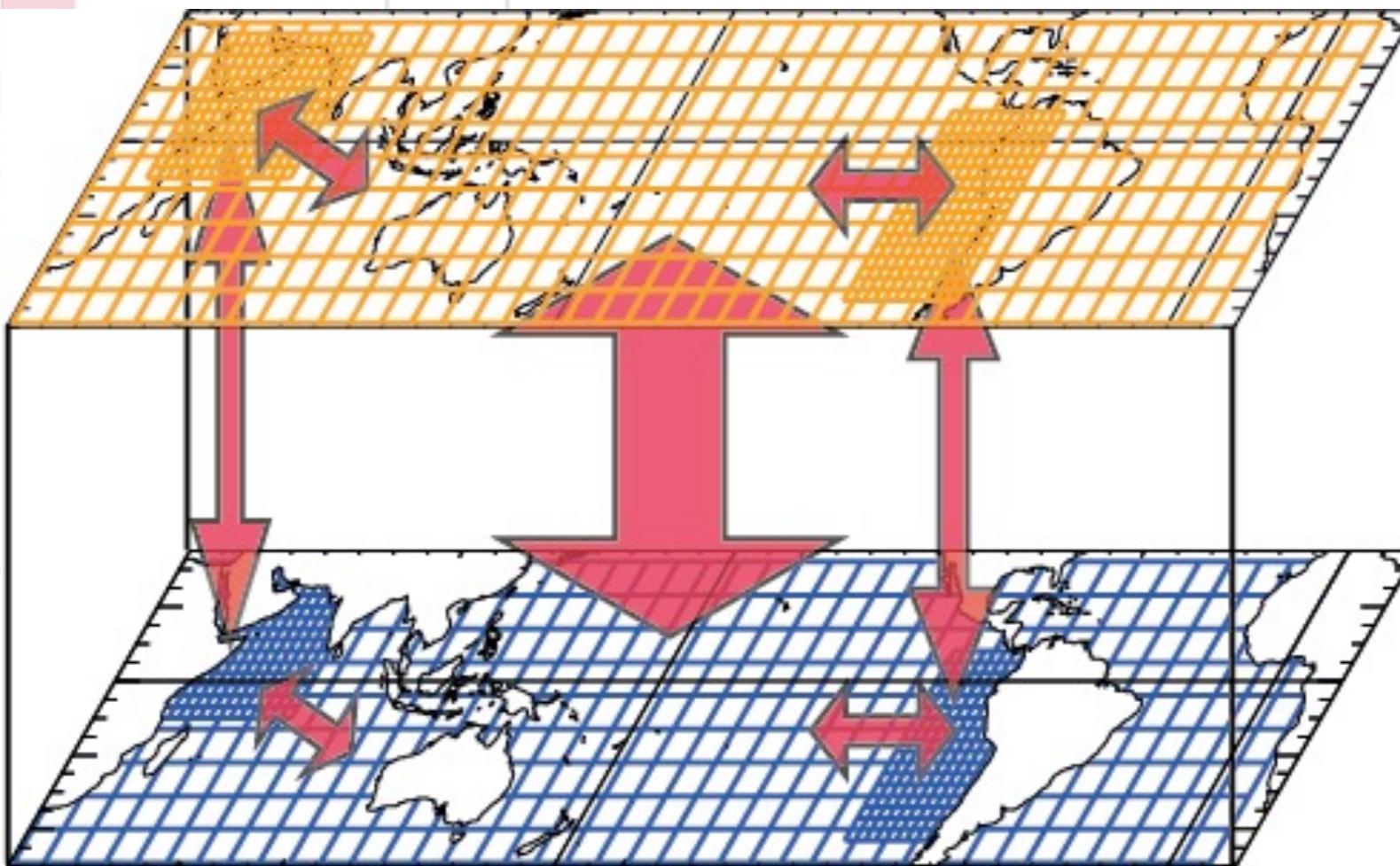


9km in both
ocean and
atmosphere

The idea: multi-scale coupled model...

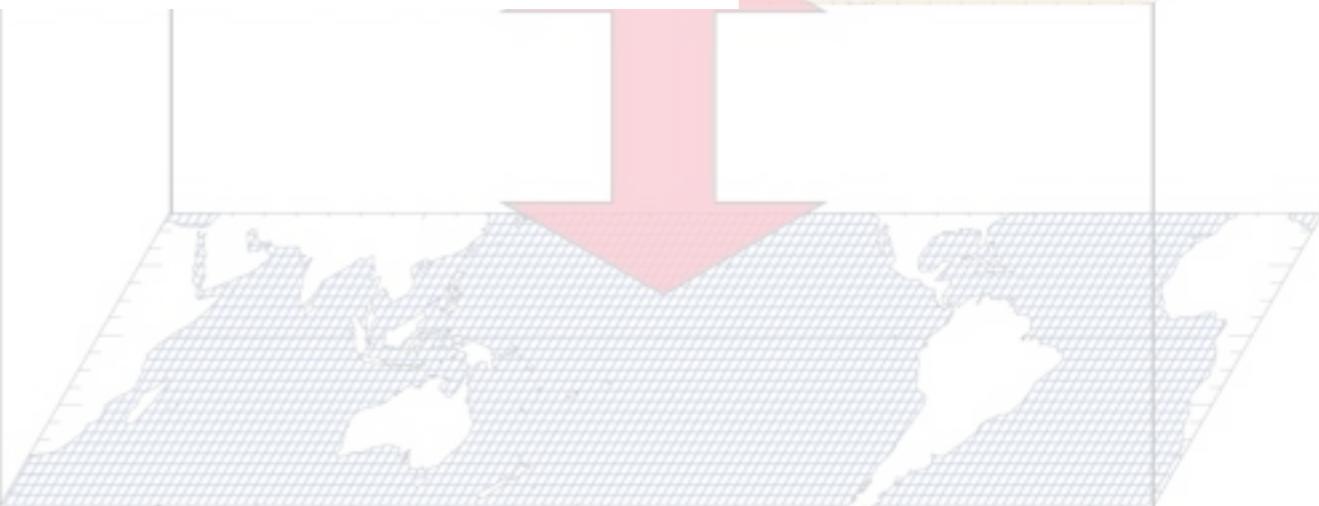


27km in
ocean
atmosp

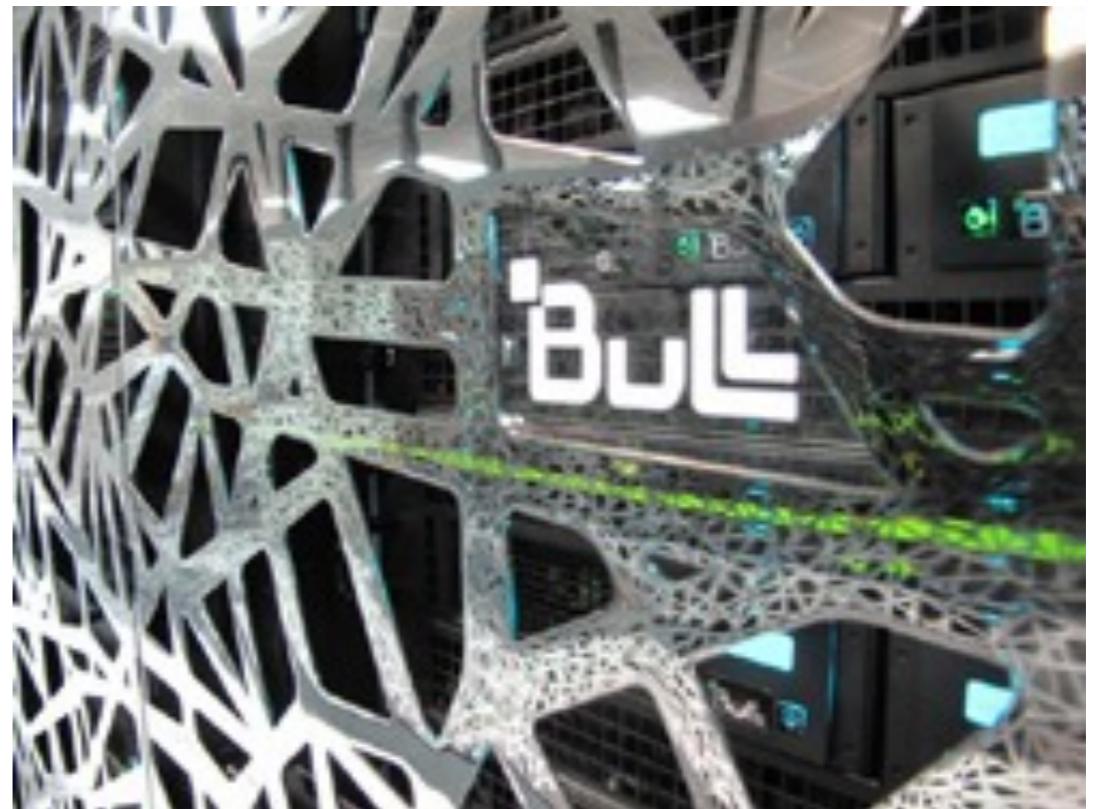


embedded zooms on both
ocean and atmosphere

9km in both
ocean and
atmosphere



Bullx
PRACE machine
processors Sandy Bridge
16 cores/node
80640 cores



What we done...

Tropical Channel (45°S - 45°N)
9km resolution in ocean and atmosphere

8188(+32) WRF
4322*1248*45

512 NEMO +
8XIOS
4322*1249*75



6h elapsed for 1 month of simulation.
Volume of outputs: 1.1To/months

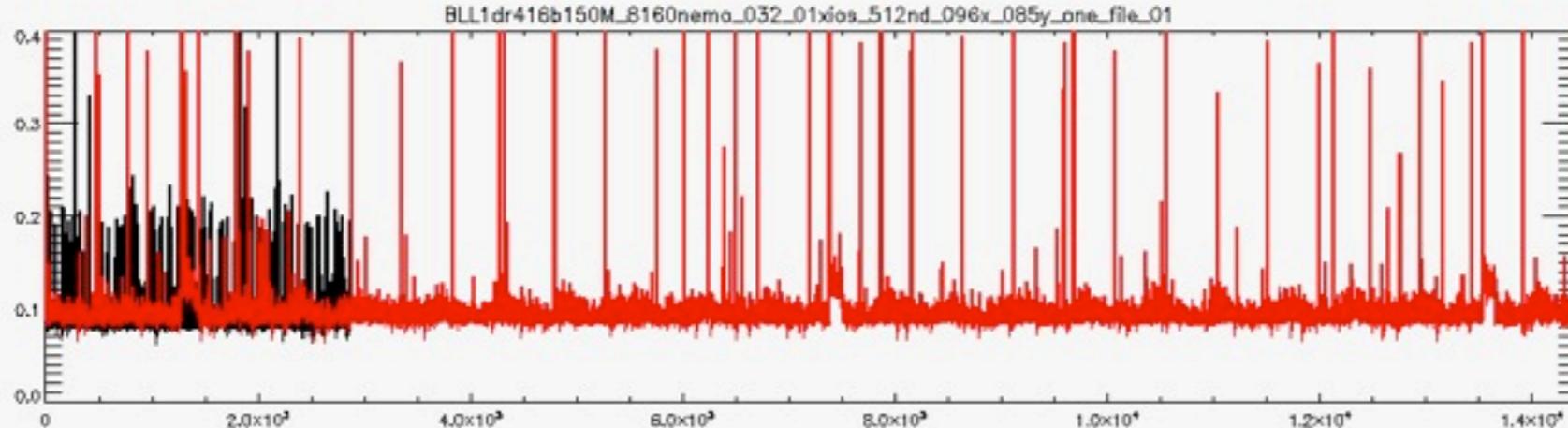
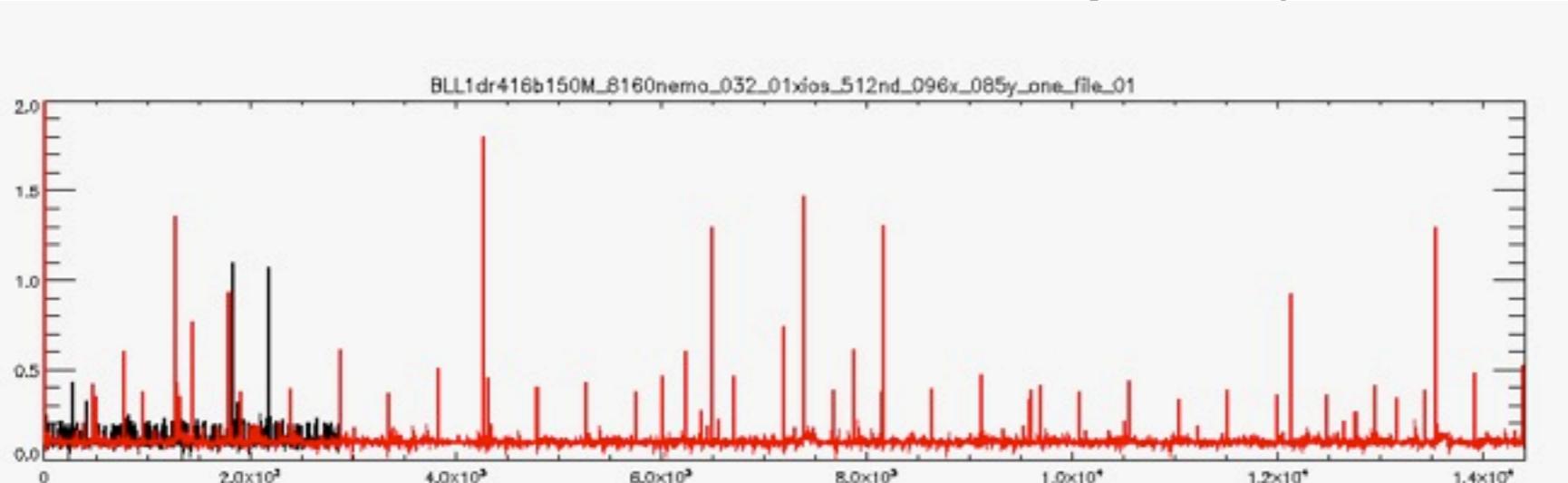
daily mean outputs

example: GYRE 144 (4322*2882*31)

30d simulation (14400 time steps):

in red: with daily outputs (every 480 step, total: 235G)

in black: no outputs (enable = false)



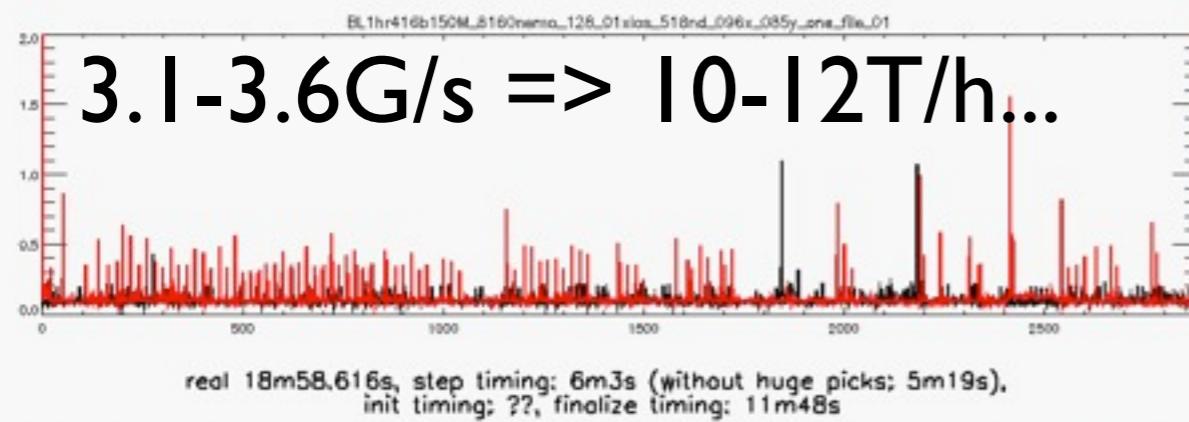
8160 nemo + 32 xios
+ 1.5% for IO

hourly mean outputs

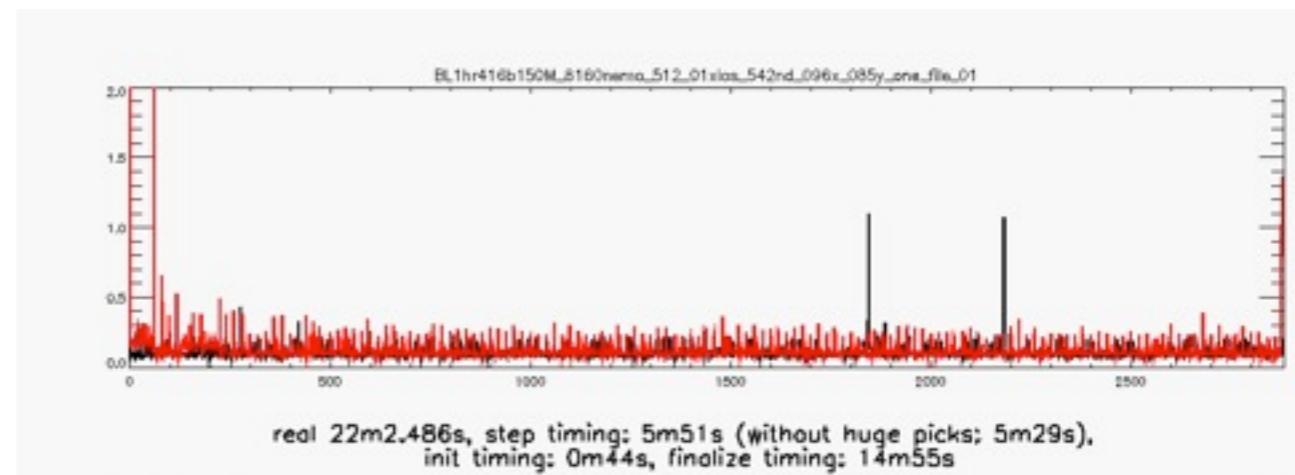
example: GYRE I44 (4322*2882*31)
6d simulation (2880 time steps):

in red: with hourly outputs (every 20 step, total: 1.1T)
in black: no outputs

8160 nemo + 128 xios

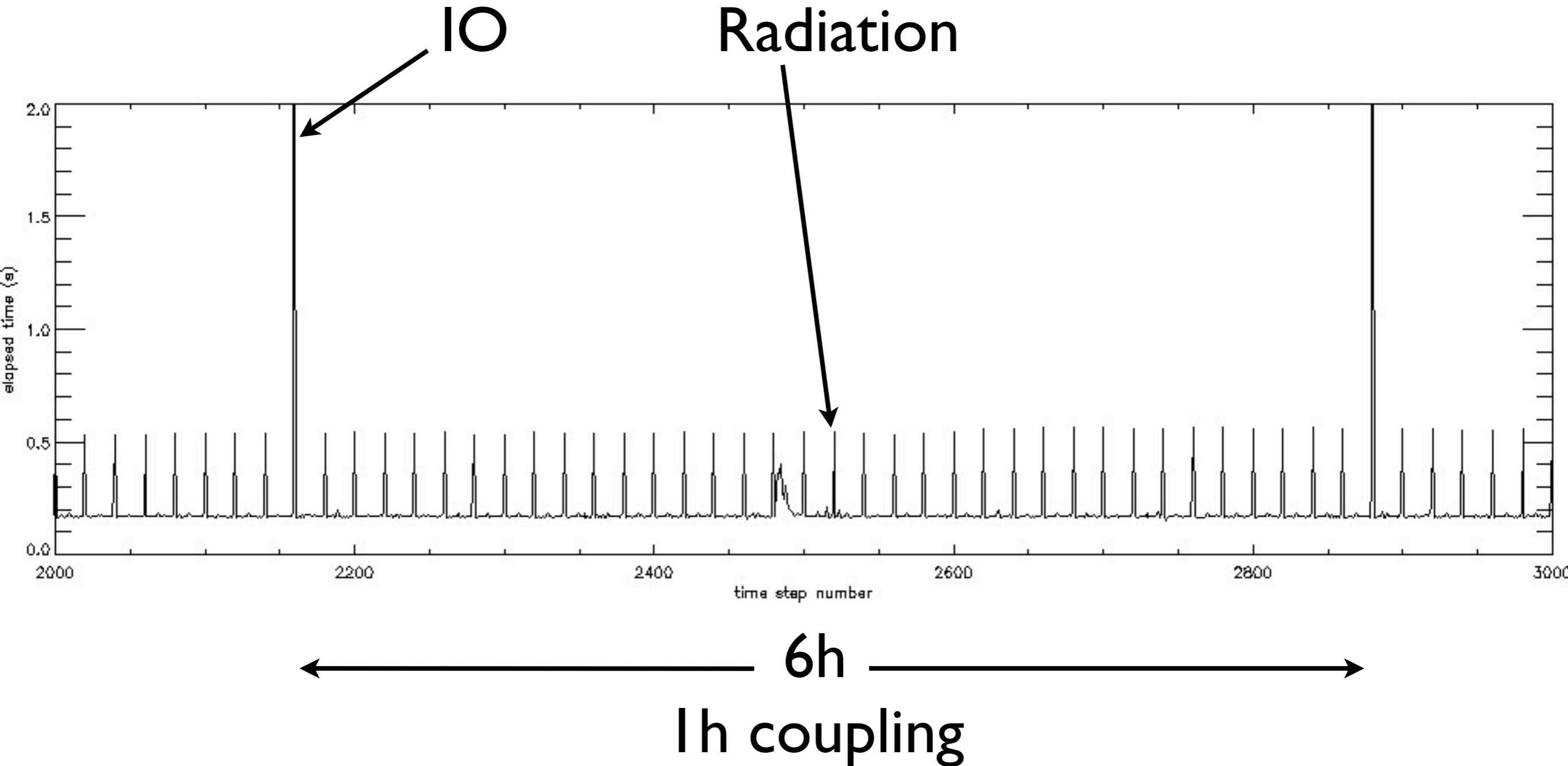


8160 nemo + 512 xios



8160 nemo: + 15~20% for IO

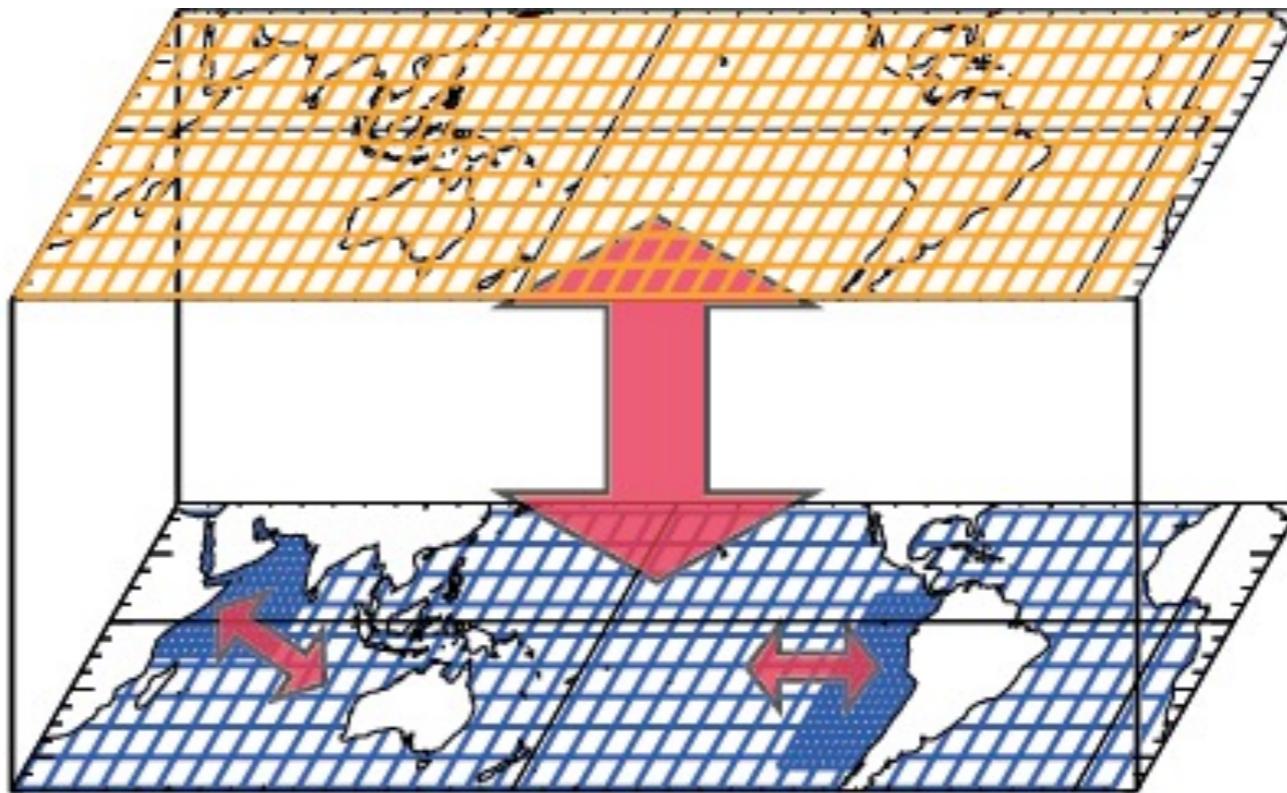
OASIS3-MCT performances...



OASIS3-MCT invisible!

What we done 2...

embedded zooms **only in the oceanic component** of the coupled model



test case configuration at 81km
including IO servers of NEMO and WRF

**Snowball effect:
the more you ask, the more you get...
strong incentive to do always more...**

higher is the resolution bigger and more difficult are the problems...
Very high resolution (9km) coupled simulation is a heavy investment in man power.
You have to review most of your models/tools/habits.

Do not let people think that a few months to get scientific results on a new computer, with a new configuration you never used before (because it is so big) and that you need to validate (implement, performance tests, physical tests) is possible...

Need a stronger link between engineers and scientists, but communication is harder and harder...

Difficulties to open position for developers. Difficulties to do sustain development with short term contracts

**difficult balance between science
and technical developments**

