Tropical Channel NEMO-OASIS-WRF Coupled simulations at very high resolution

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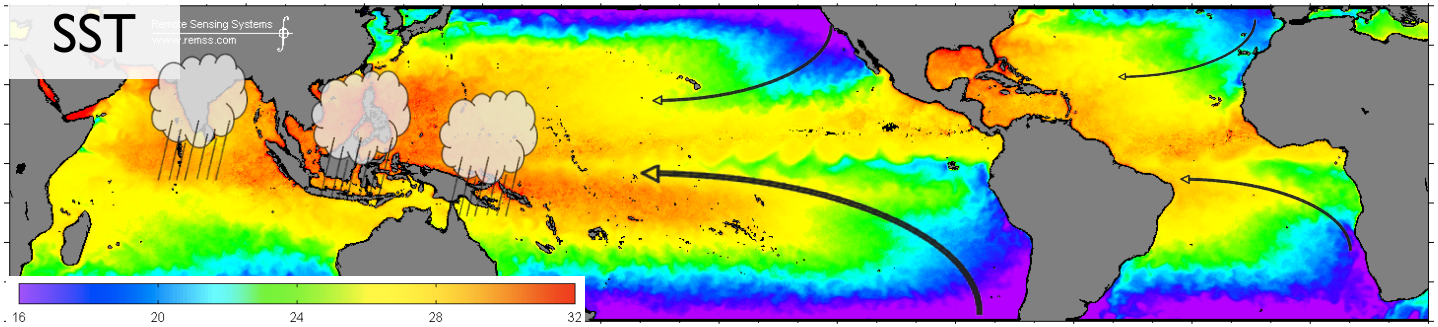
started: 1 february 2012

length: 39 months

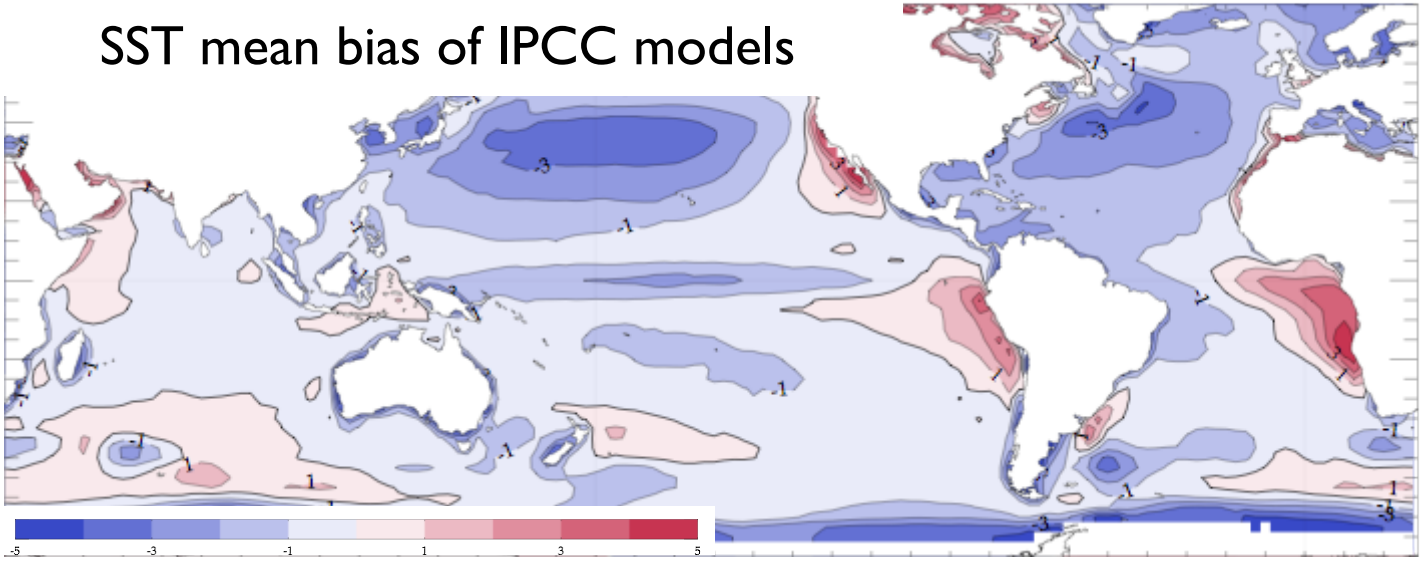
equivalent of 6 persons full time

Our project

small scales ⇔ large scales



SST mean bias of IPCC models

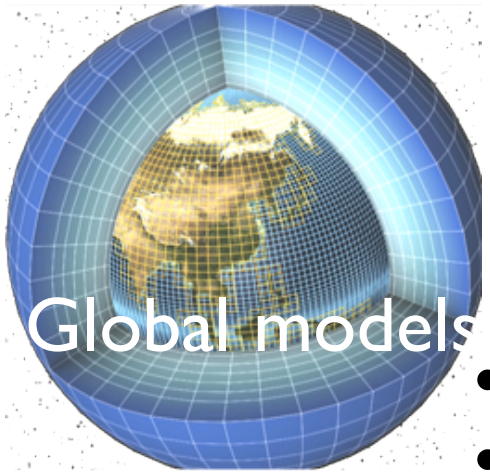


- identify, quantify upscalling processes
- propose an original solution...

Combine the advantages of regional and global models

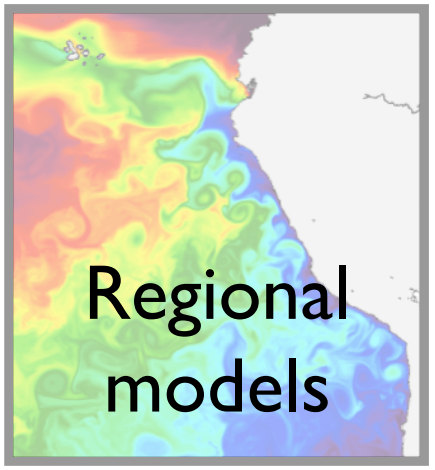
Upscalling processes in coastal upwelling aeras

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



multi scales

coupled models



- Original methodology
- Optimum use of resources
- Prepare future climate models

Our models

- **Atmosphere** : The Weather Research and Forecasting (**WRF**)

- **Ocean**: **NEMO** (Consortium of 6 European patterns) is a state-of-the-art modeling framework for oceanographic research, operational oceanography seasonal forecast and climate studies.

- **Coupler**: **OASIS3-MCT** software is allowing synchronized exchanges of coupling information between numerical codes representing different components of the climate system. Portability and flexibility are OASIS key design concepts and the reason of its success (Meteo France, IPSL, ECMWF, Met-Office, EC-Earth community, CMCC, MPI-Met…).

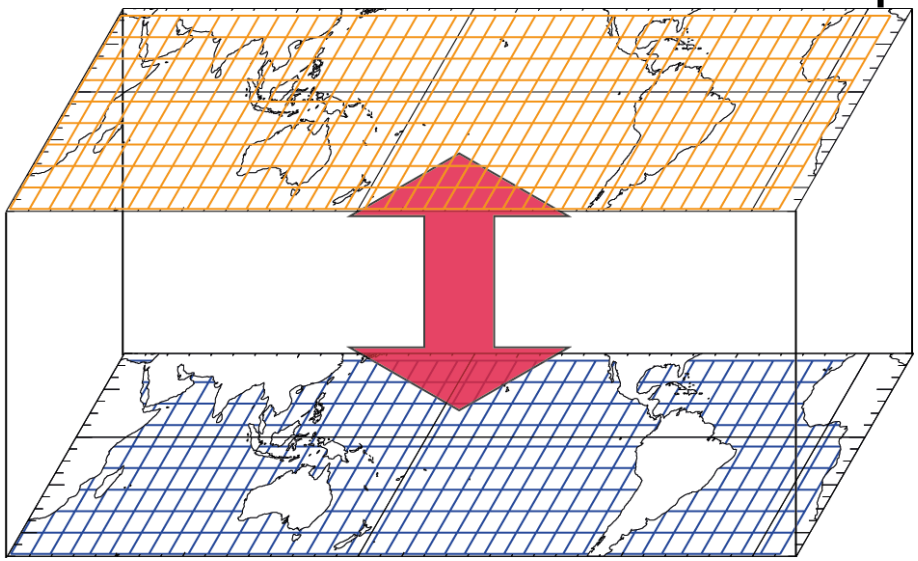
Our methodology

Compare the climate mean sate, variability and biases in a set of coupled experiments with resolutions of 27km to 9km (in zooms or at global scale).

step 1:

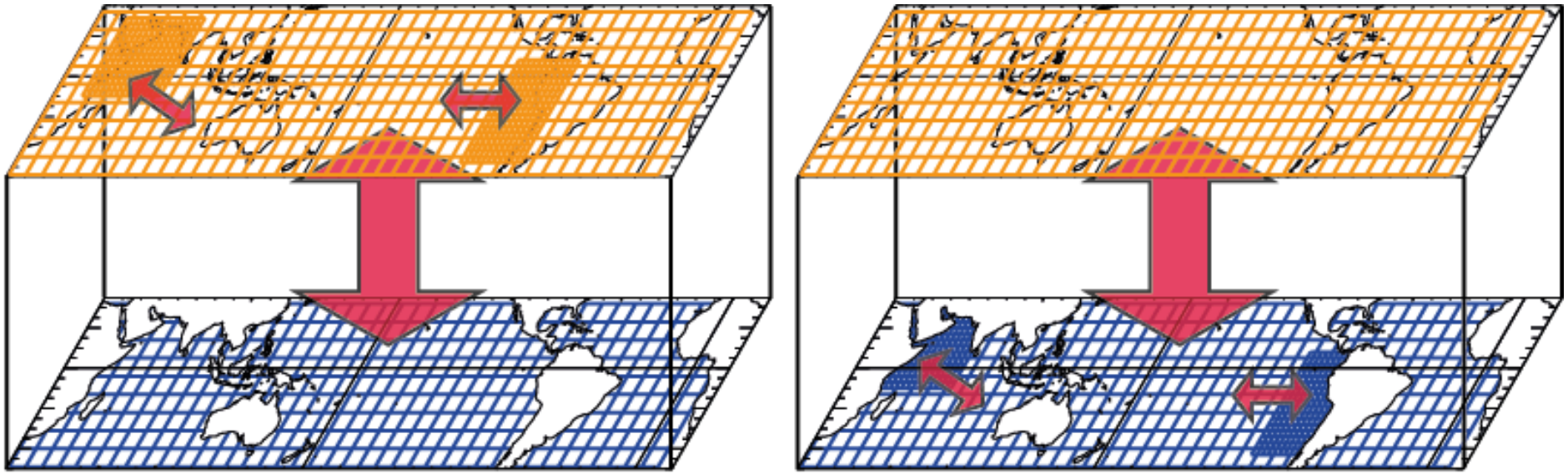
Tropical Channel (45°S - 45°N)

27km resolution in ocean and atmosphere



step 2:

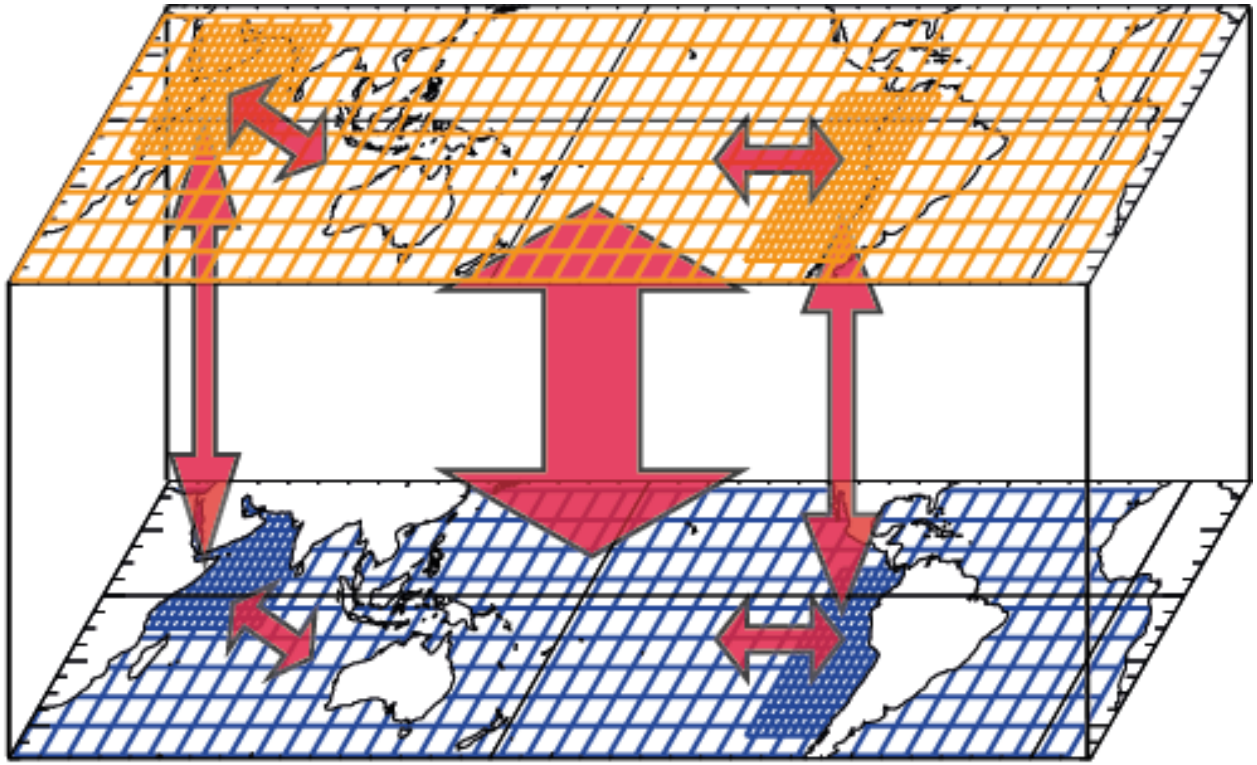
embedded zooms **only in 1 component** (ocean or atmosphere) of the coupled model



27km tropical channel + 9km zooms

step 3:

embedded zooms on **both components** (ocean and atmosphere) of the coupled model.

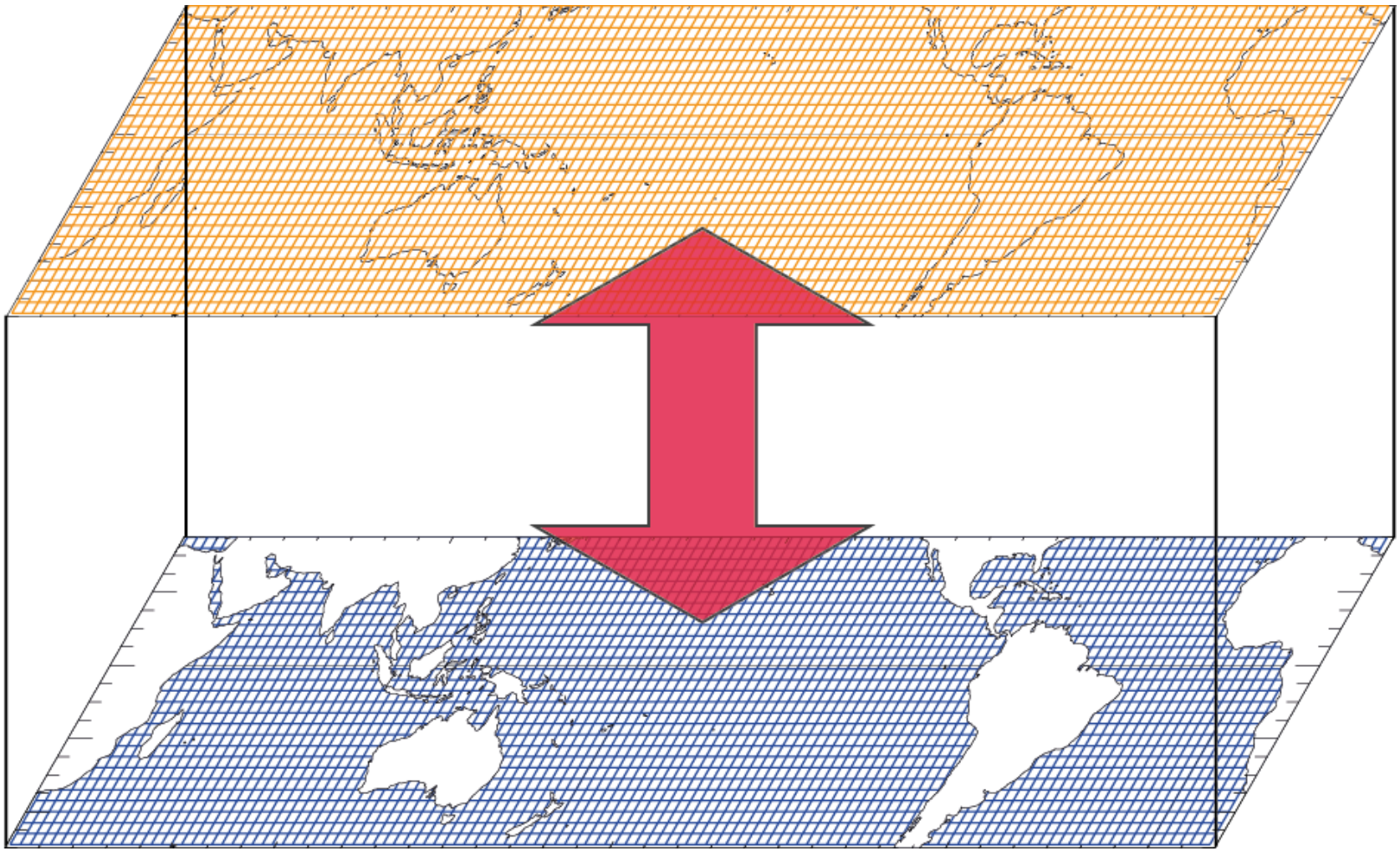


27km tropical grid + 9km zooms

Step 4:

Tropical Channel (45°S - 45°N)

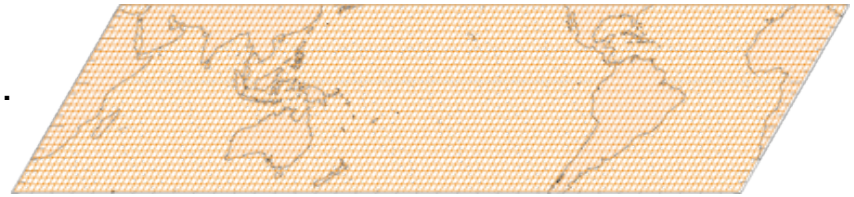
9km resolution in ocean and atmosphere



Where are we now?

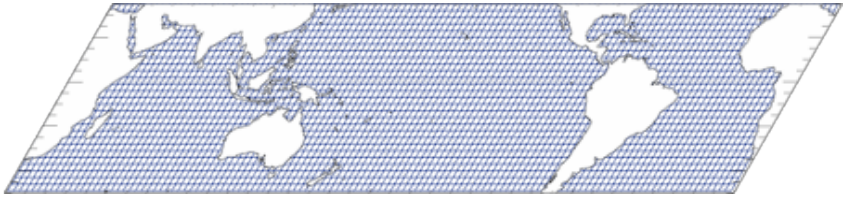
9km tropical Channel (45°S-45°N)

8204 WRF
6h elapsed /1 month.
1.1To/months
2 × 2 years

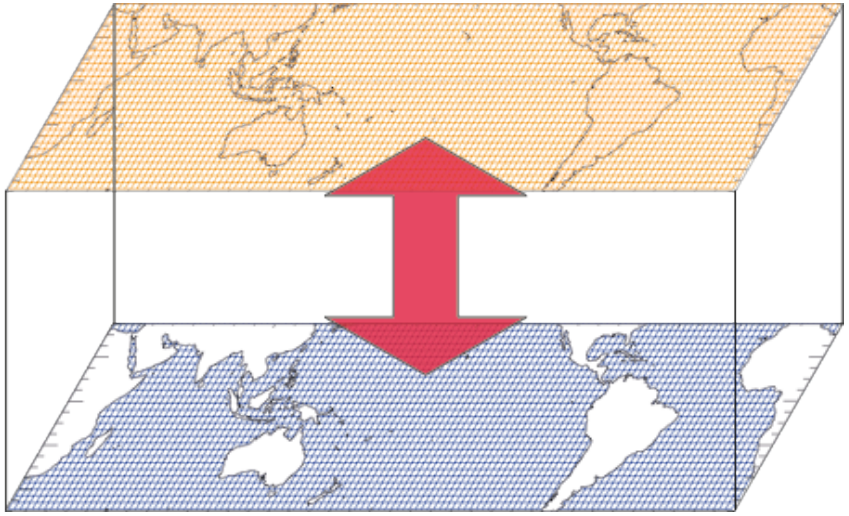


- WRF Single-Moment 6-Class Microphysics
- longwave Rapid Radiative Transfer Model
- Dudhia shortwave radiation
- MM5 Monin-Obukhov scheme
- unified Noah land-surface model
- Yonsei University PBL
- Kain-Fritsch (new Eta) scheme
- **or** Betts-Miller-Janjic scheme

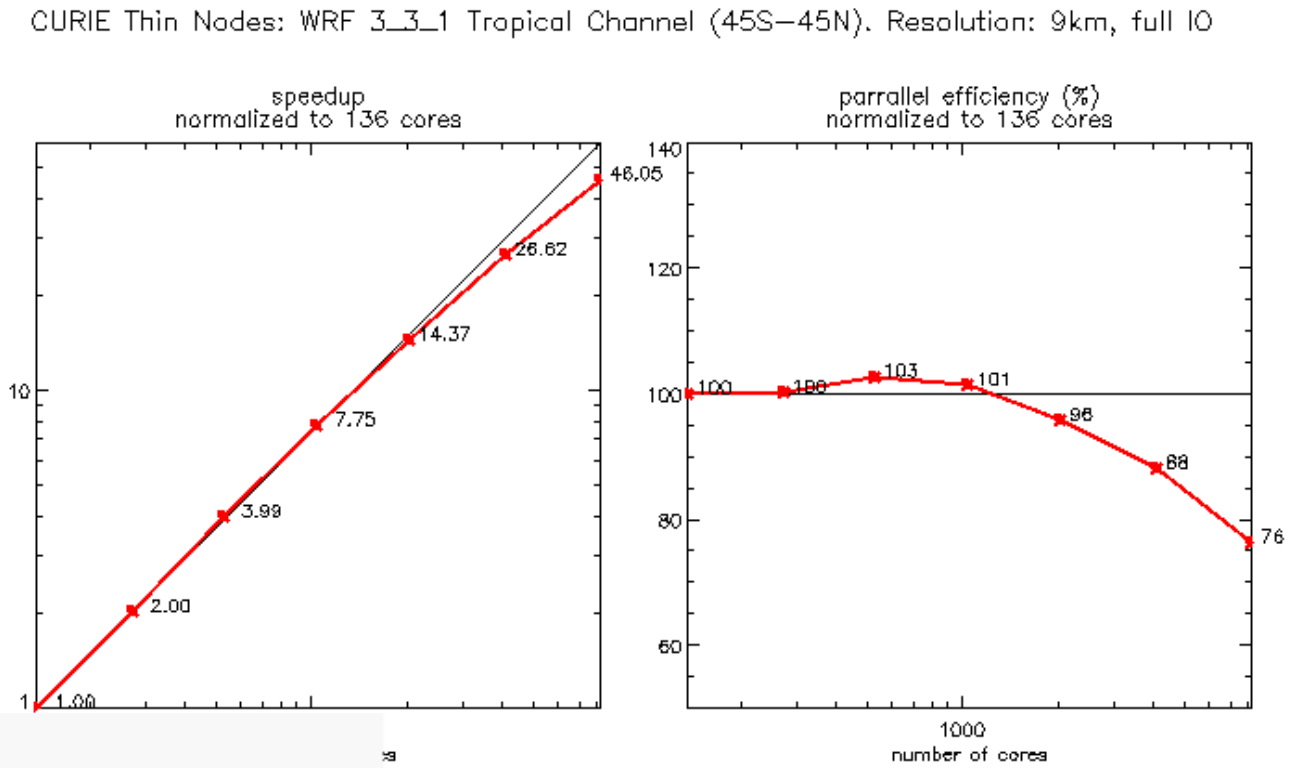
1024 NEMO
3 years of spin-up

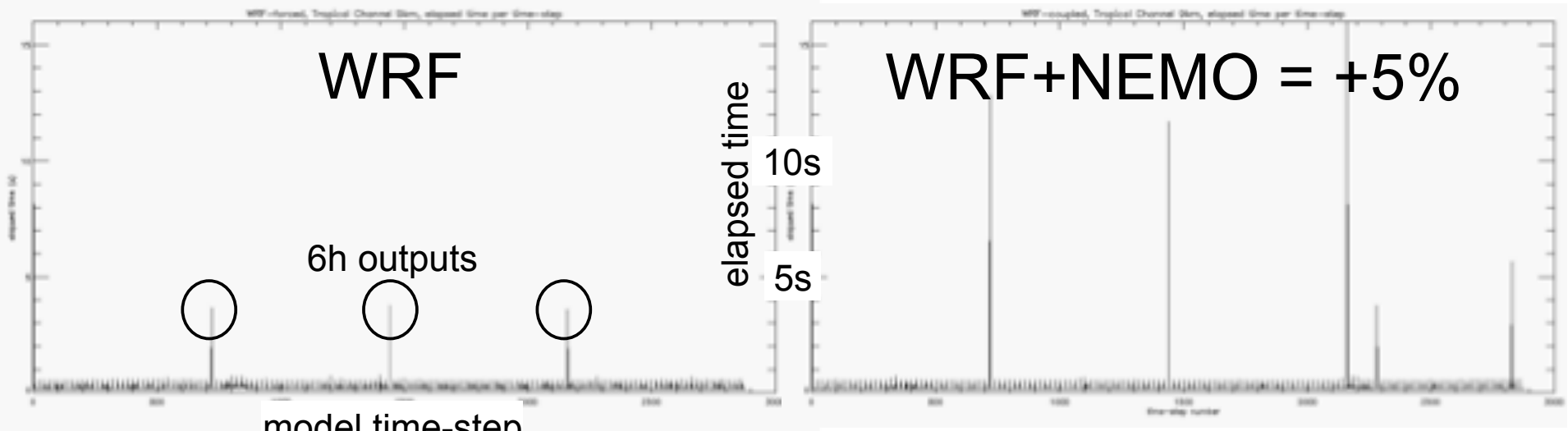


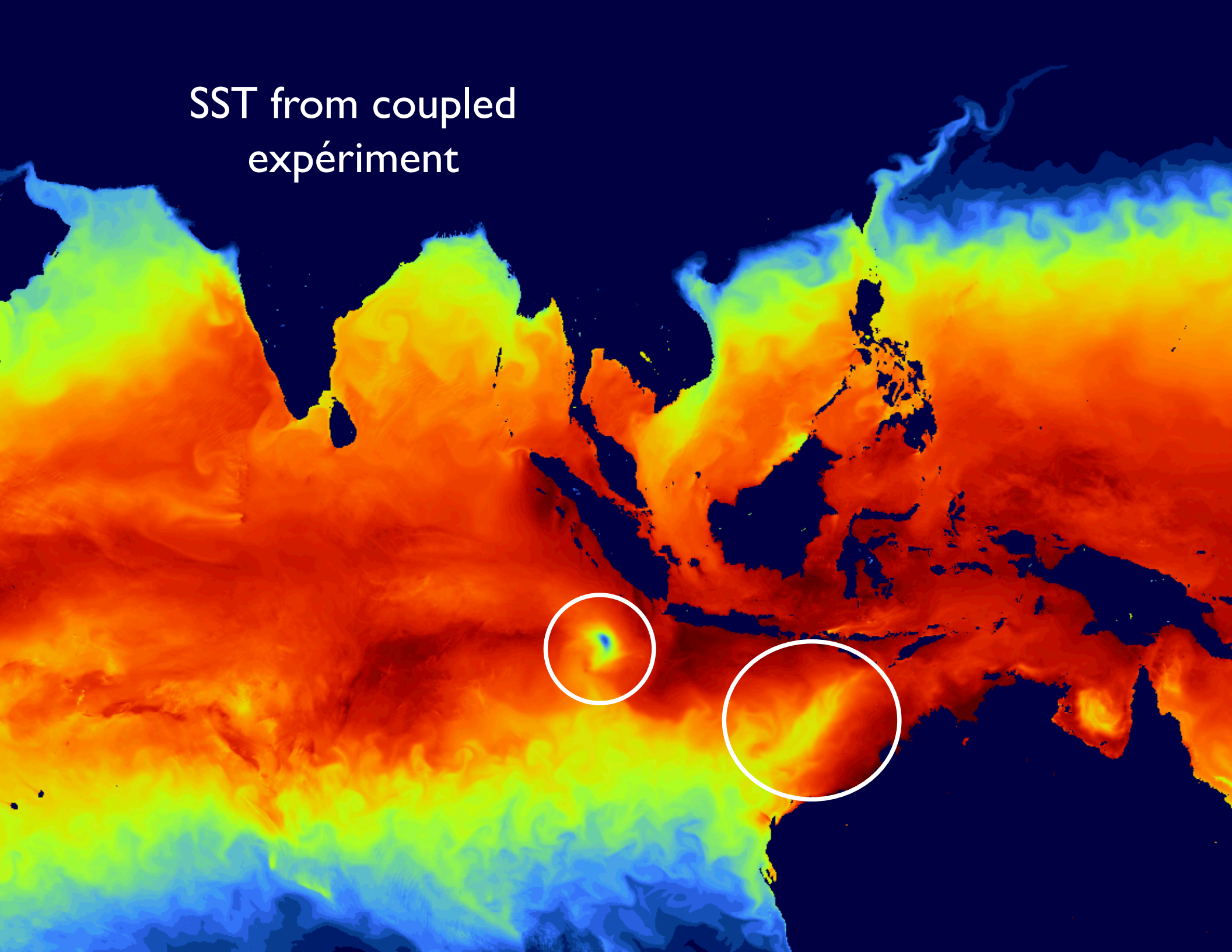
8204 WRF
512 NEMO
first tests: 1 month



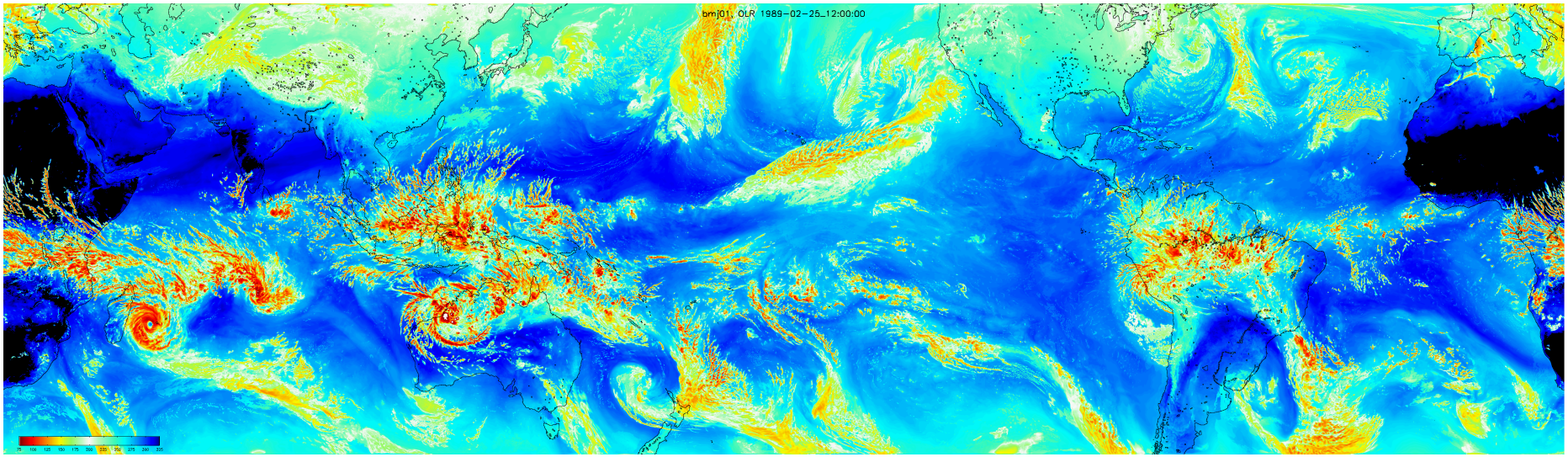
numerical performances

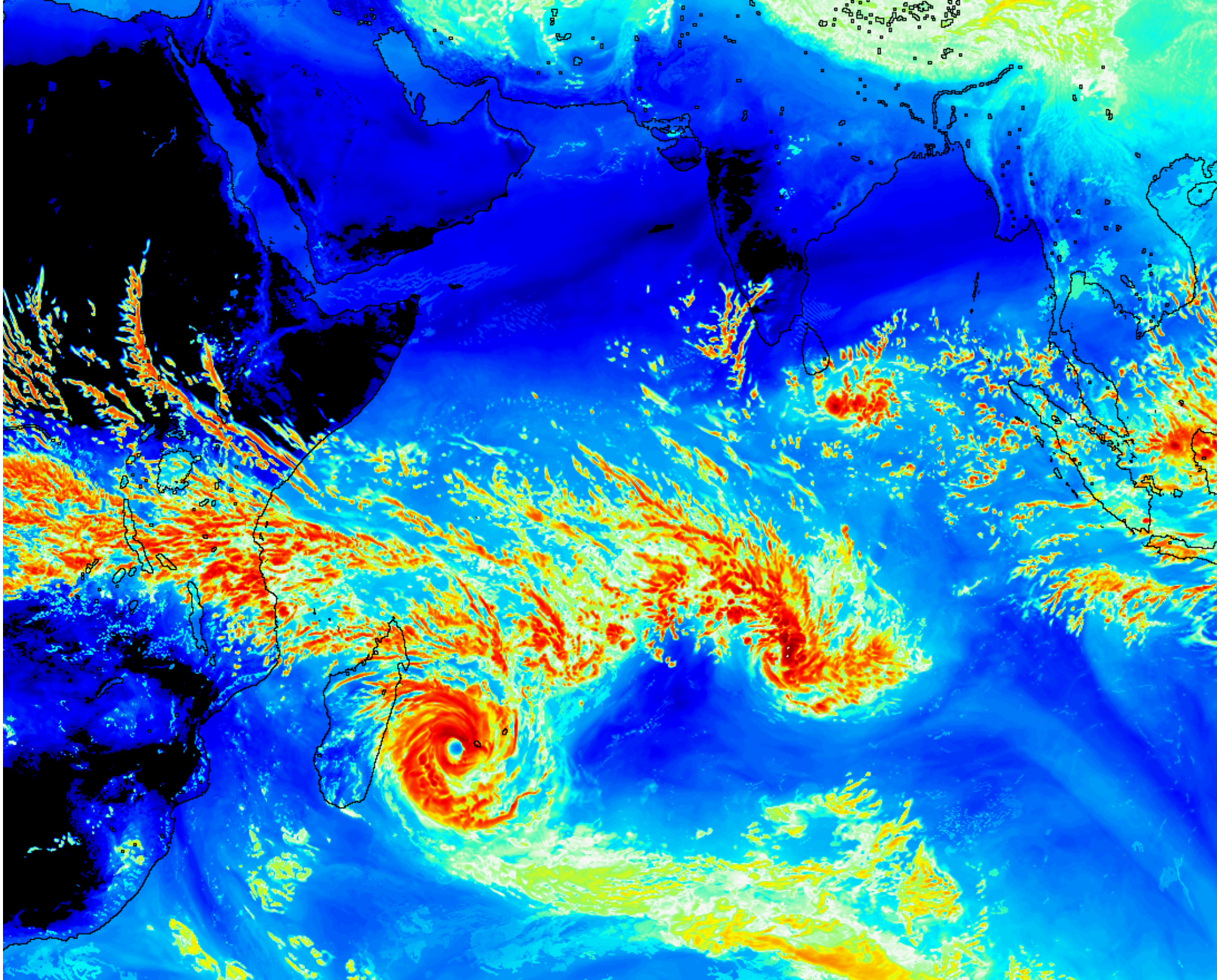




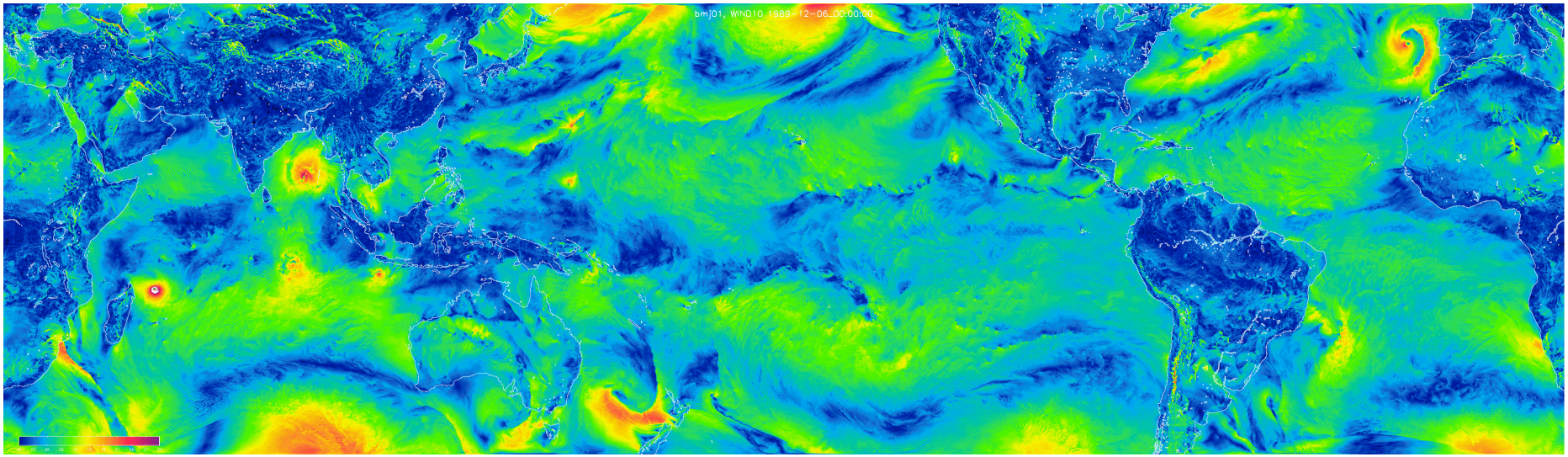

SST from coupled
expériment

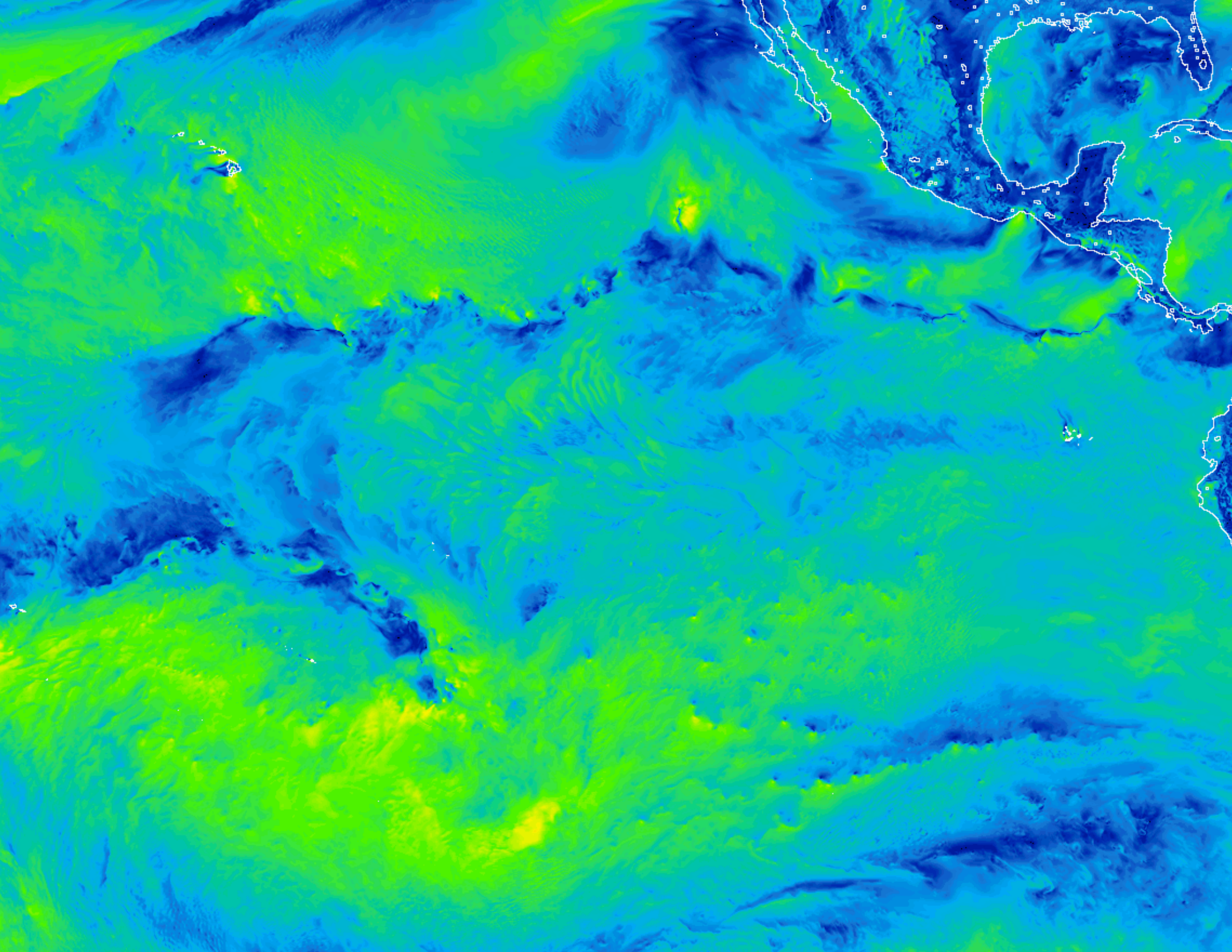
OLR





10m wind speed





OLR