CROCO – training 2023

Nesting

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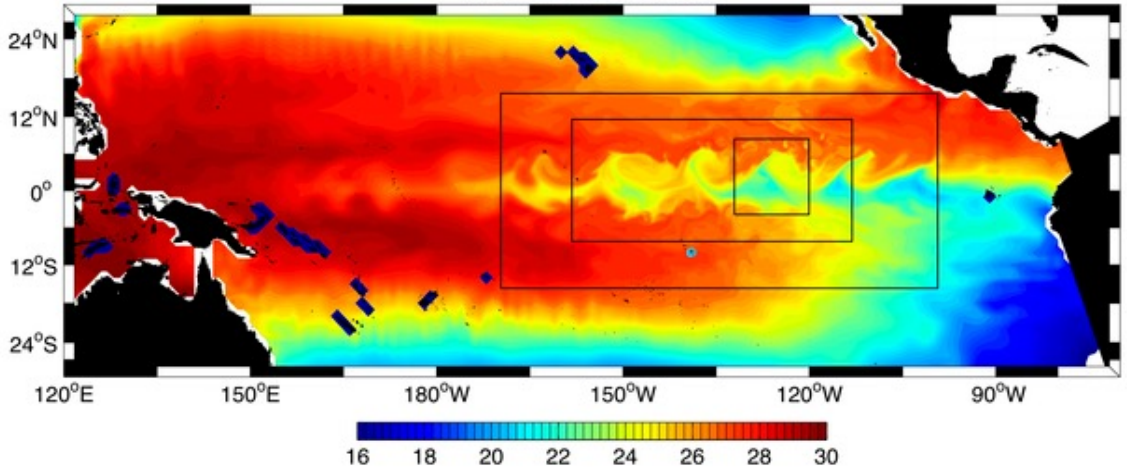
Coastal and Regional Ocean COmmunity model



Nesting using AGRIF library (online nesting)

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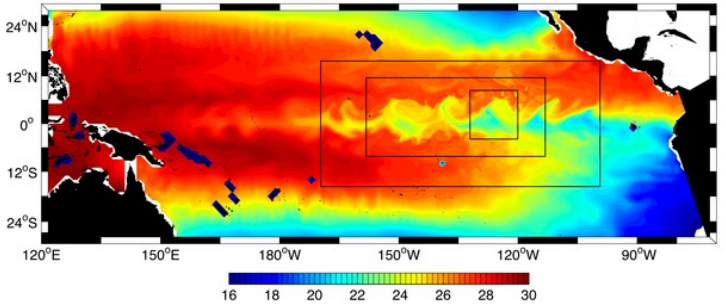
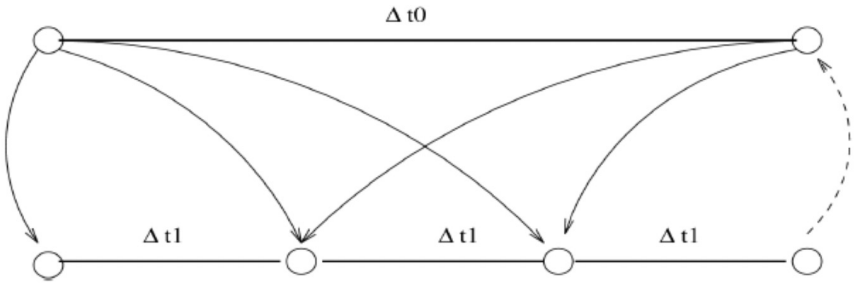
Agrif Nesting

AGRIF	Activate nesting capabilities (1-WAY by default)
AGRIF_2WAY	Activate 2-WAY nesting (update parent solution by child solution)



- AGRIF package
  - Adaptive Mesh Refinement
  - Manage arbitrary number of fixed grid and embedding level

Temporal coupling between a parent and a child grid for a refinement factor of 3 :



Interpolation of variables at the child grid boundaries

Update of variables on the parent domain

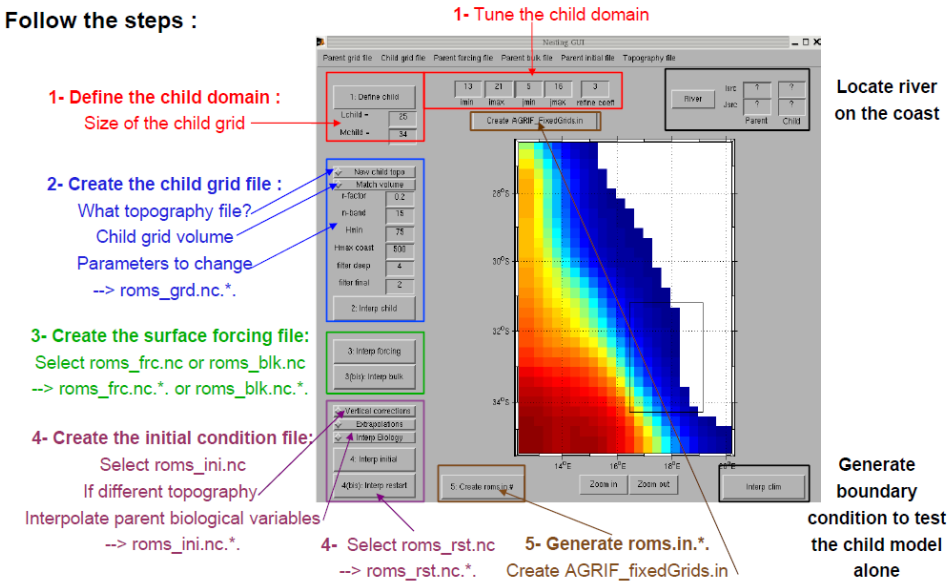
Needs to run an embedded model : Surface forcing and initial conditions datas files.

Nesting using AGRIF library (online nesting)

AGRIF provides :

- generic interpolation libraries
- a code transformation and automatic re-writing

Nest Gui



Activation and use :

1. define your zooms(s) in Agrif_FixedGrids
2. Create your input files for all grids
3. To compile : just define #defione AGRIF in cppdefs.h and run ./jobcomp as usual
4. To run :launch croco as you are uded to

Nesting using AGRIF library (online nesting)

- To run a simulation with nesting, define the CPP keys (AGRIF + AGRIF2W) and compile (./jobcomp)

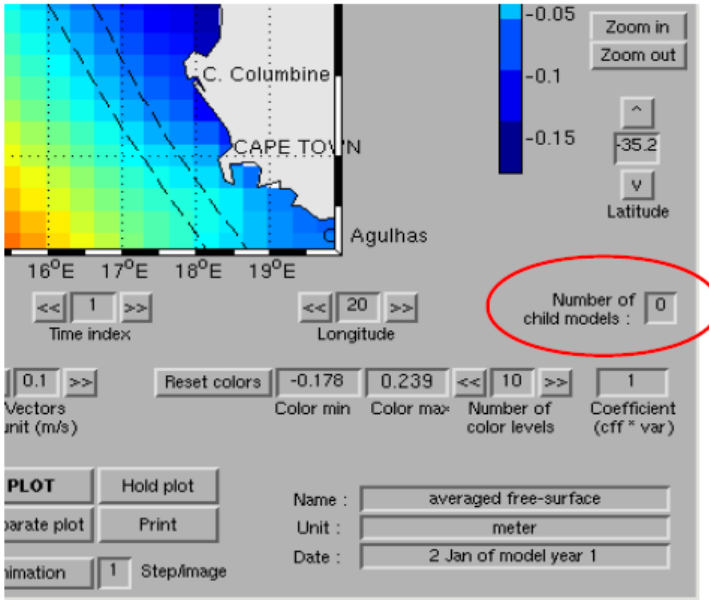
- Position of the different grid in AGRIF_FixedGrids.in file

```
  1
  23   37   12   29   3   3   3   3
  0
# number of children per parent
# imin imax jmin jmax spacerefx spacerefy timerefx timerefy
# [all coordinates are relative to each parent grid!]
```

- Namelist relative to the different nest level#1 croco.in.1, #2 (croco.in.2) etc …

- Visualization (in Matlab) :

>>matlab
>>croco_gui



Nesting using AGRIF library (online nesting)

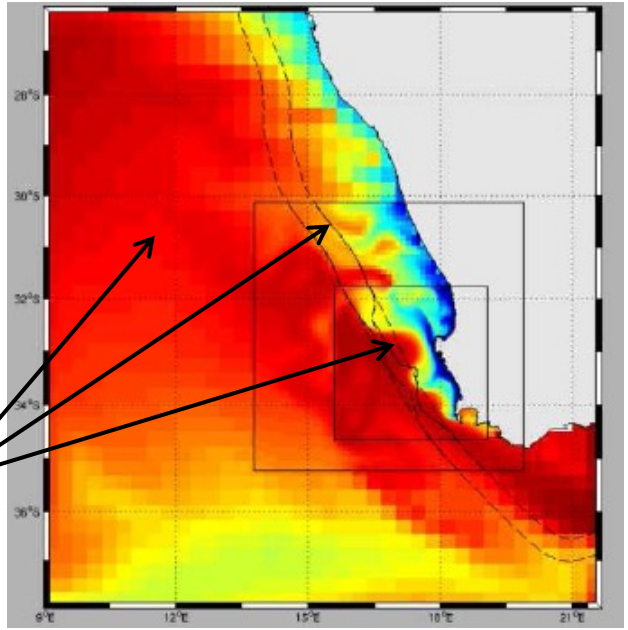
The file Agrif_FixedGrids.in define the position of the nested grid

```
  1
  23   37   12   29   3   3   3   3
  0
# number of children per parent
# imin imax jmin jmax spacerefx spacerefy timerefx timerefy
# [all coordinates are relative to each parent grid!]
```

2 grids : #0 and #1
#1 is embedded in #0

```
  1
  23   37   12   29   3   3   3   3
  1
  12   28   15   33   3   3   3   3
  0
# number of children per parent
# imin imax jmin jmax spacerefx spacerefy timerefx timerefy
# [all coordinates are relative to each parent grid!]
```

3 grids : #0,#1 and #2
#1 embedded in #0 ;
#2 is embedded in the #1



Need to run an embedded model:

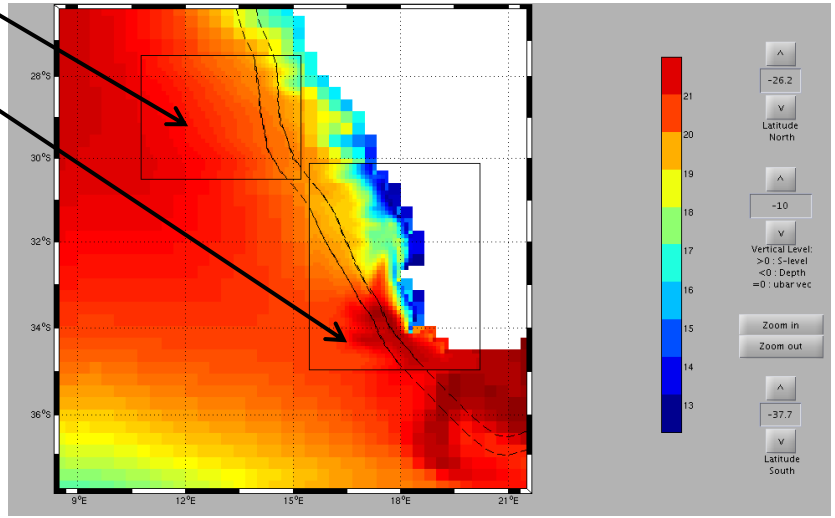
For grid #xx :

- croco_grd.nc.xx
- croco_frc.nc.xx
- croco_blk.nc.xx
- croco.ini.nc.xx
- croco.in.xx

Nesting using AGRIF library (online nesting)

```
   2
   23   37   12   29   3   3   3   3
   9    22   28   38   3   3   3   3
   0
   0
#number of children per parent
# ...
```

3 grids : #0,#1 and #2
- #1 embedded in #0 ;
- #2 is embedded in #0 : independent grids

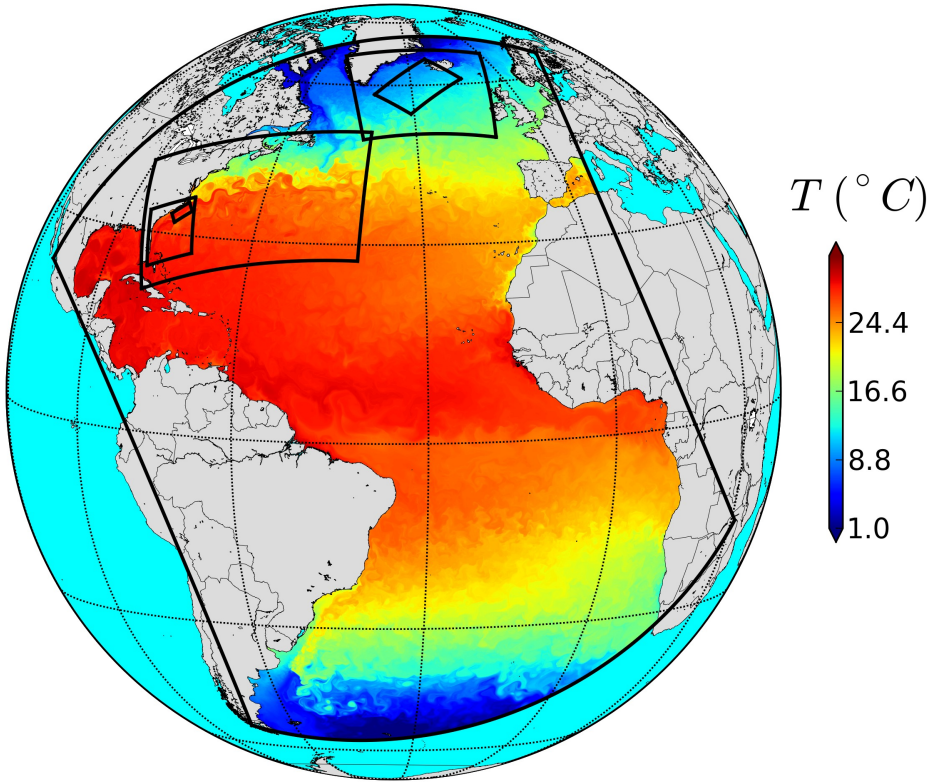


Offline Nesting

- “**Offline” nesting Roms2Roms** (*Evan et al, 2010, Ocean Modeling*):
    - Fortran scripts to prepare boundary conditions are available

- Processing of croco OBC using the output of a larger croco simulation.

- Enable offline oceanic downscalling



Offline Nesting

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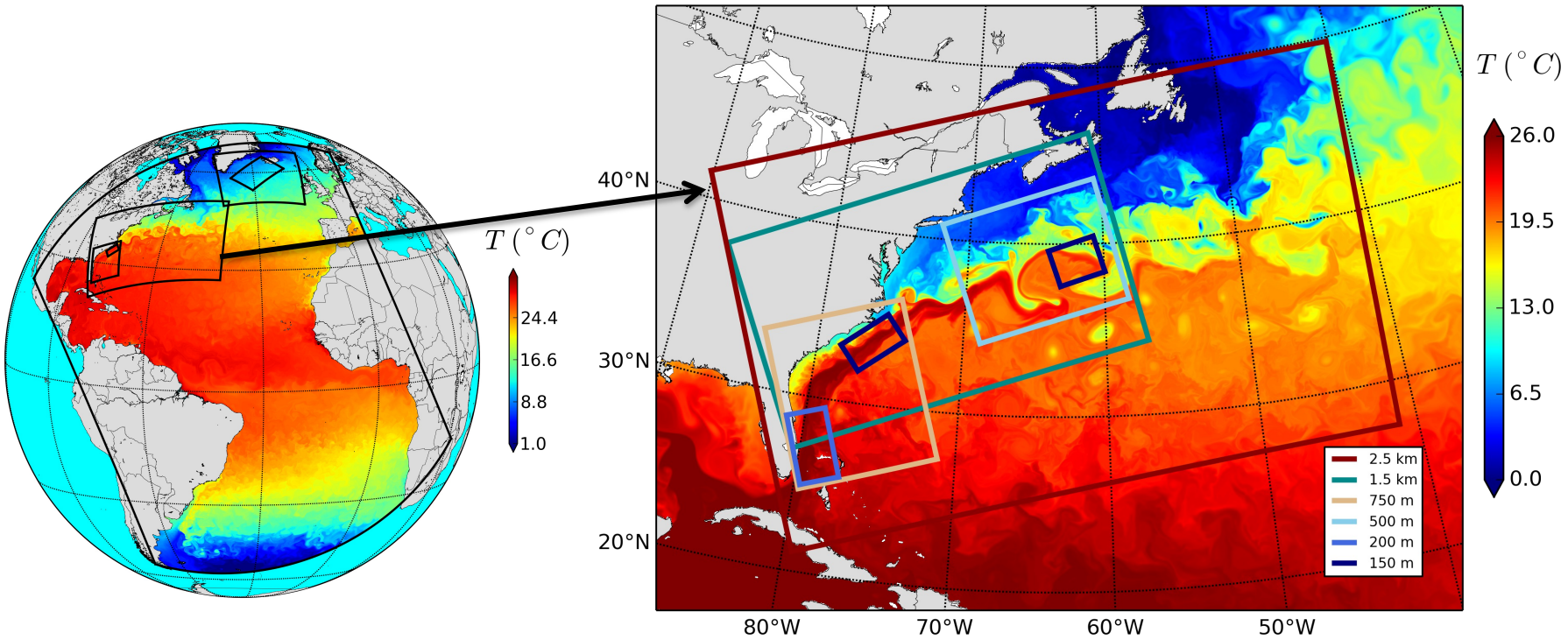
$$\Delta x = 6 \rightarrow 0.15 \text{ km}$$



A portion of the Atlantic domain showing mean SST and several (1-way) nested grids:
Forced by repeating “typical” year with QuikSCAT and SODA at open boundaries.