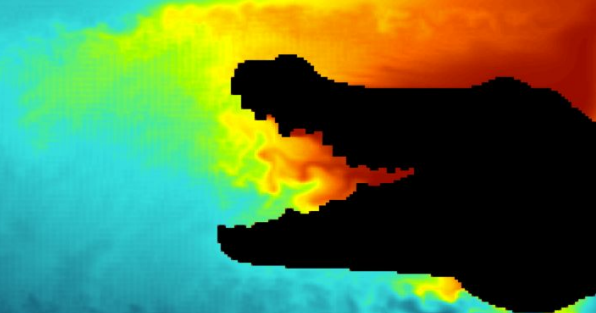
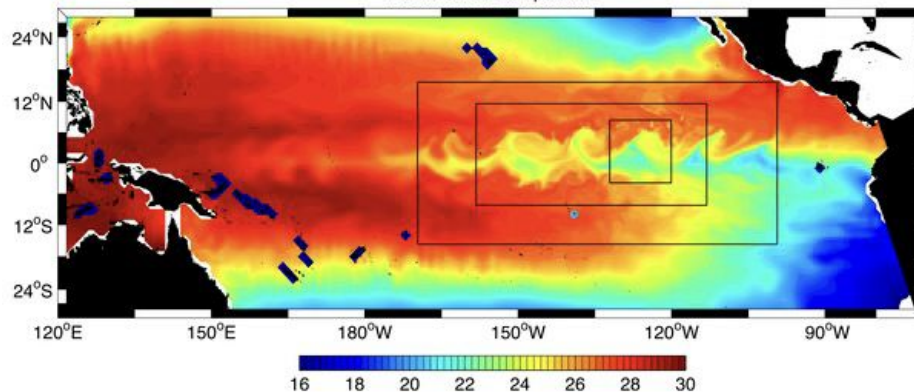


CROCO – training 2024 PSF Barcelonette



Introduction to zoom AGRIF

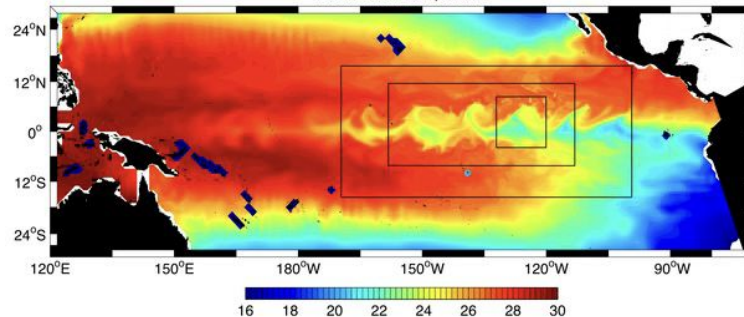


Nesting using AGRIF library (online nesting)

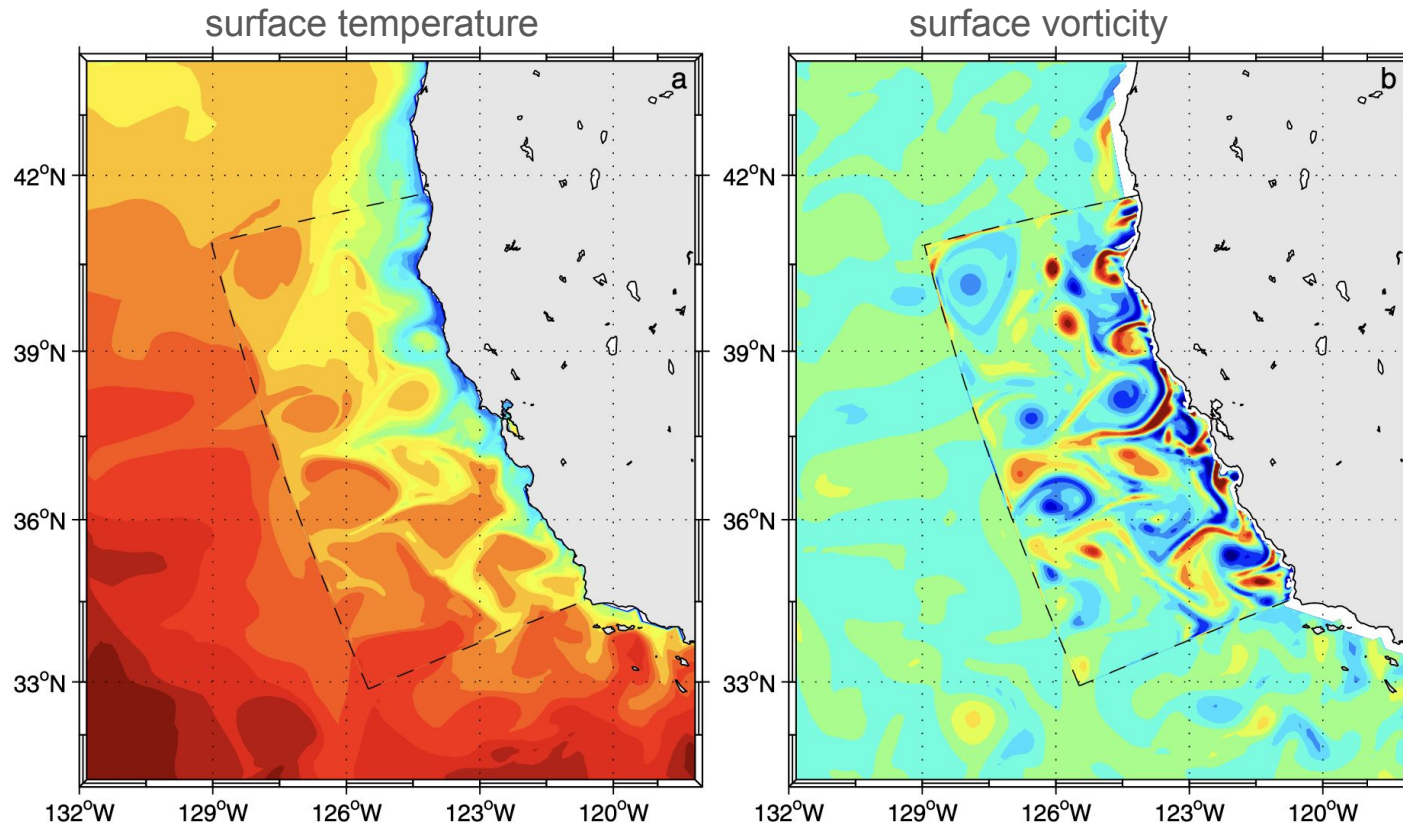
Purpose of the AGRIF library

- “to bring (fixed or adaptive) mesh refinement features to existing models that are written in the Fortran language and discretized on a structured grid
- bridging the gap between near-shore and offshore dynamics

AGRIF library is developed at INRIA, France.
It is a Fortran 95 package, that can be compiled with CROCO



Nesting with AGRIF



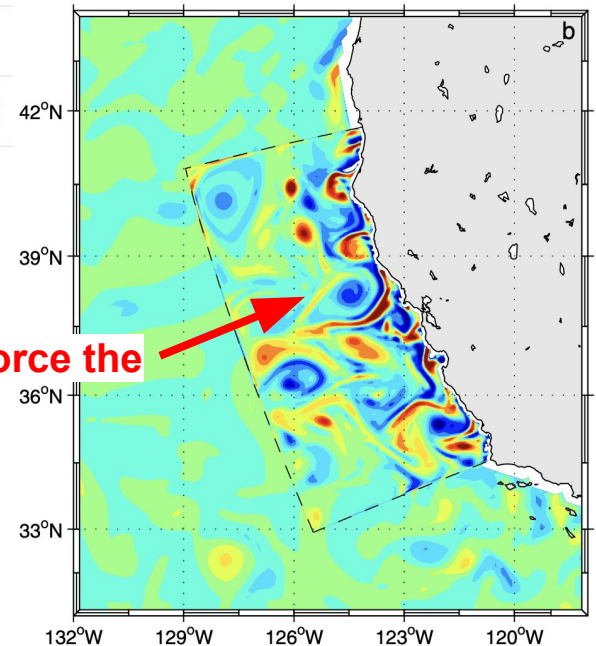
(Penven et al, 2006)

https://croco-ocean.gitlabpages.inria.fr/croco_doc/model/model.nesting.html

Exchange between parent and child grids

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

1-way (coarse grid force the finer grid)

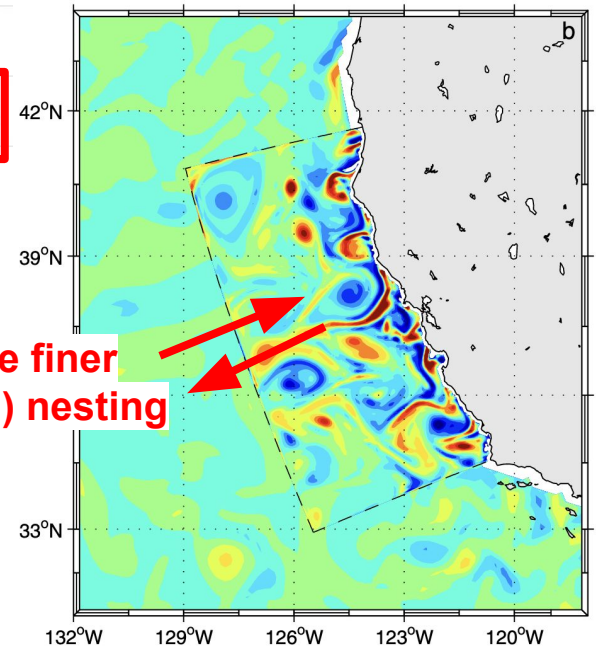


https://croco-ocean.gitlabpages.inria.fr/croco_doc/model/model.nesting.html

Exchange between parent and child grids

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

2- way (feedback of the finer grid to the coarse grid) nesting capabilities



https://croco-ocean.gitlabpages.inria.fr/croco_doc/model/model.nesting.html

Temporal coupling

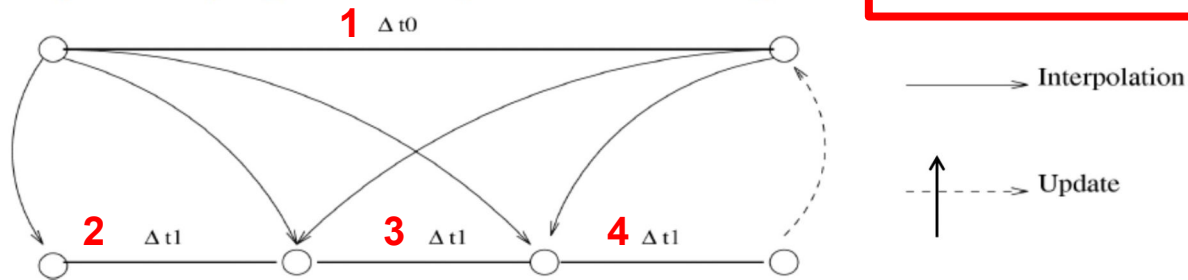
→ AGRIF package

→ Adaptive Mesh Refinement

→ Manage arbitrary number of fixed grid and embedding level

**temporal
refinement**

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

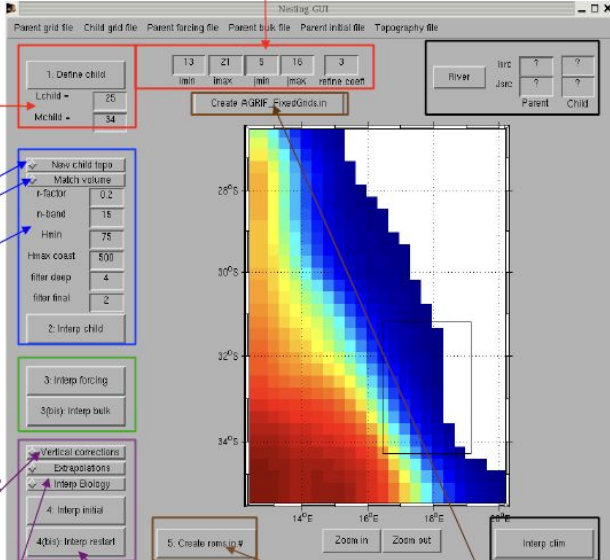


Needs to run an embedded model : Surface forcing and initial conditions datas files.

Nesting using AGRIF library (online nesting)

In the benguela test case, for the parent grid file, select in the entrance window of NestGUI
~/Run/ROMSFILES/roms_grd.nc and click 'open '

Follow the steps :



1- Tune the child domain

1- Define the child domain :
Size of the child grid

2- Create the child grid file :
What topography file?
Child grid volume
Parameters to change
--> roms_grd.nc.*

3- Create the surface forcing file:
Select roms_frc.nc or roms_blk.nc
--> roms_frc.nc.* or roms_blk.nc.*

4- Create the initial condition file:
Select roms_ini.nc
If different topography
Interpolate parent biological variables
--> roms_ini.nc.*

4- Select roms_rst.nc
--> roms_rst.nc.*

5- Generate roms.in.*
Create AGRIF_fixedGrids.in

Locate river on the coast

Generate boundary condition to test the child model alone

Nesting using AGRIF library (online nesting)

10. This will create:

```
CROCO_FILES/croco_grd.nc.1  
CROCO_FILES/croco_frc.nc.1 (or croco_blk.nc.1)  
CROCO_FILES/croco_ini.nc.1  
croco.in.1  
AGRIF_FixedGrids.in
```

- 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!]
```

Nesting zooms (3 embedded grids)

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

```
1
23 37 12 29 3 3 3 3
0
```

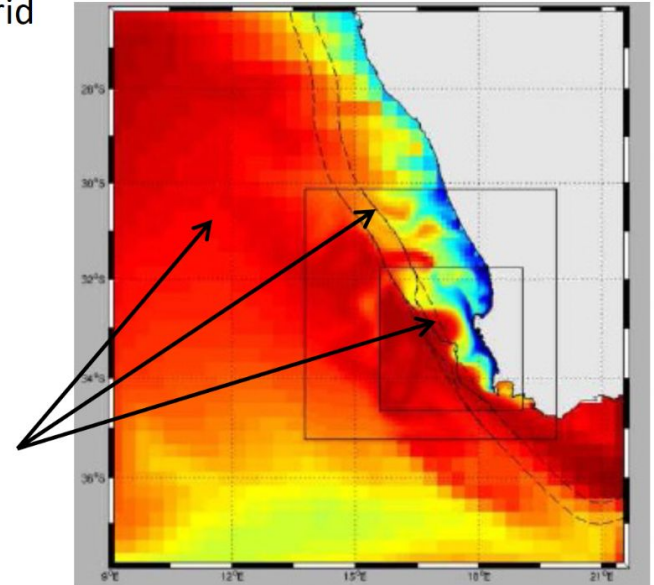
number of children per parent
imin imax jmin jmax spacerefx spacerefy timerefx timerefy
[all coordinates are relative to each parent grid!]

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:

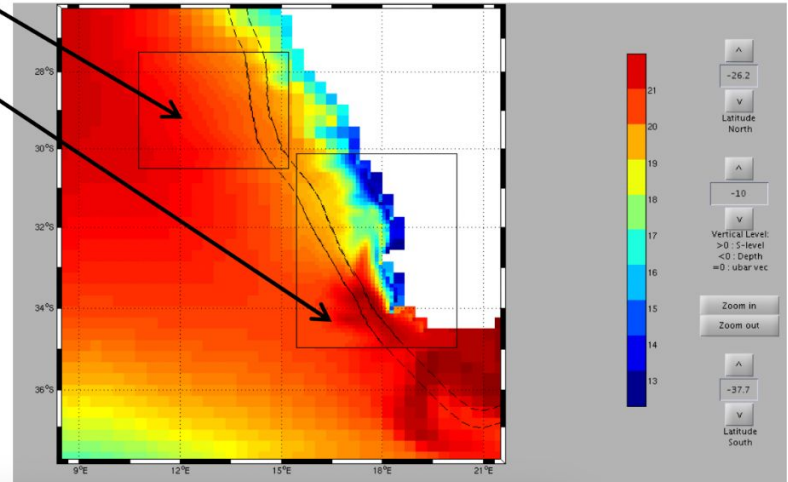
For grid #xx :

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

2 grids on 2 separate areas

```
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



Activation and use :

a. To compile :

add **#define AGRIF** in **cppdefs.h**

run **./jobcomp** as usual

b. To run :

launch croco as you are used to













for example:

`mpirun -n 4 ./croco croco.in` (for a MPI run 4 processus)

Help and references

Find some help in the CROCO forum

- ☰ Topics
- ⋮ More
- ▼ CATEGORIES
- announcements-job...
- biogeochemistry
- compilation-installat...
- coupling (ocean-wa...
- croco tools (pre/pos...
- dynamics-numerics...
- inputs-outputs
- **nesting**
- parallelization
- rivers
- run / config issues
- sediment
- ze miscellaneous
- ☰ All categories

Topic	Replies	Views	Activity
Dimension Error in Nesting Simulation nesting 	0	1	1h
STATIONS IN AGRIF nesting, agrif, station, stations   	2	158	Sep 19
AGRIF + MPI in nested applications  	1	133	Apr 22
Modified earth mask in nesting 	0	120	Apr 18
NTIMES should always be 1 in croco.in.1 (for AGRIF child)?  	2	197	Jan 8
Nested grid floats coupling 	0	148	Dec 2023
Nesting issue! Child grid begins with one day more than parent grid? Miscellaneous 	0	122	Dec 2023
How to pick imin imax jmin jmax compilation-installation, nesting 	0	180	Dec 2023

More informations: https://agrif.imag.fr/Gen_intro.html

Laurent Debreu, Christophe Vouland, and Eric Blayo. AGRIF: Adaptive grid refinement in Fortran. *Computers & Geosciences*, 34(1):8–13, January 2008. URL: <https://linkinghub.elsevier.com/retrieve/pii/S009830040700115X> (visited on 2023-06-08), [doi:10.1016/j.cageo.2007.01.009](https://doi.org/10.1016/j.cageo.2007.01.009).

Pierrick Penven, Laurent Debreu, Patrick Marchesiello, and James C. McWilliams. Evaluation and application of the ROMS 1-way embedding procedure to the central california upwelling system. *Ocean Modelling*, 12(1-2):157–187, January 2006. URL: <https://linkinghub.elsevier.com/retrieve/pii/S1463500305000491> (visited on 2023-06-08), [doi:10.1016/j.ocemod.2005.05.002](https://doi.org/10.1016/j.ocemod.2005.05.002).

Laurent Debreu, Patrick Marchesiello, Pierrick Penven, and Gildas Cambon. Two-way nesting in split-explicit ocean models: Algorithms, implementation and validation. *Ocean Modelling*, 49-50:1–21, June 2012. URL: <https://linkinghub.elsevier.com/retrieve/pii/S1463500312000480> (visited on 2023-06-06), [doi:10.1016/j.ocemod.2012.03.003](https://doi.org/10.1016/j.ocemod.2012.03.003).