Activity 4 – Set up and run a realistic configuration

1. Download the croco tools and datasets

- copy the CROCO_TOOLS package from:

if you are logged in a LOPS computer:

/net/krypton/data0/project/vortex/gula/ModNum/Data/croco_tools-v1.1.tar.gz

if you are in one of the IUEM computing rooms:

/forums/public/pub/Data/ croco_tools-v1.1.tar.gz

Otherwise you need to download it from

https://www.croco-ocean.org/download/croco-project/

or

http://jgula.fr/ModNum/croco_tools-v1.1.tar.gz

- We are going to use the Matlab version. Untar the folder (tar xf croco_tools-v1.1.tar.gz) and copy the files croco_tools-v1.1/start.m and croco_tools-v1.1/ crocotools_param.m in your working folder (e.g. *~/ModNum/case_regional*)

- edit the start.m and modify the path to the croco_tools routines if needed (tools_path needs to point to the croco_tools-v1.1 folder)

- Edit the crocotools_param.m to and modify the path to the data files (variable DATADIR). It should point to:

if you are logged in a LOPS computer:

/net/krypton/data0/project/vortex/gula/ModNum/Data/

if you are in a IUEM computing rooms:

/forums/public/pub/Data/

Otherwise you need to download datasets (COADS + WOA + Topo) from

https://www.croco-ocean.org/download/datasets/

2. Create files for the Benguela test-case

See* https://croco-ocean.gitlabpages.inria.fr/croco_doc/ *for a detailed tutorial

In brief you need to :

- start matlab:

On IUEM computers: ***matlab***
On LOPS computers: ***module load matlab/2014a***; ***matlab -nodesktop***

and run start.m to load all path *(just type "start" in the matlab window/terminal)*

- run the following scripts (just type their name in matlab)

- make_grid to create your grid file [CROCO_FILES/croco_grd.nc]
- make_forcing to generate surface_forcing: wind stress, surface heat flux, surface freshwater flux [CROCO_FILES/croco_frc.nc]
- make_clim to generate initial conditions T, S, currents , SSH [CROCO_FILES/croco_ini.nc and CROCO_FILES/croco_clm.nc]
- make_bry to generate oceanic boundary conditions : T, S, currents , SSH [CROCO_FILES/croco_bry.nc]

3. Compile and run the BENGUELA_LR case

Redownload and untar the code croco if you don't have it:

cd .. (wherever you want to have your croco routines)

wget https://www.jgula.fr/ModNum/croco.tar.gz
tar xf croco.tar.gz
cd *~/ModNum/case_regional* (the folder containing your latest configuration)

- Copy the jobcomp locally: **cp -rf ../croco/OCEAN/jobcomp ./**
- Copy the croco.in locally: **cp -rf ../croco/OCEAN/croco.in ./**
- Copy the param.h locally: **cp -rf ../croco/OCEAN/param.h ./**
- Copy the cppdefs.h locally: **cp -rf ../croco/OCEAN/cppdefs.h ./**

On LOPS/IUEM computers:

- Load the fortran/netcdf modules:

```
module purge
module load intel/12.1 netcdf/c-4.4.1.1-intel12 netcdf/fortran-4.4.4-intel12
```

- eventually change the SOURCE location in the jobcomp to point to the croco routines:

```
SOURCE=../croco/OCEAN
```

Add OPEN_MP parallelization (see Activity1.pdf)

Then Compile and run :

./jobcomp
croco croco.in

4. Create files for your own configuration

- edit the crocotools_param.m to choose all parameters for your configuration (name, grid location and size, time and duration, path to forcing files, etc.)

5. Compile and run your simulation

- Edit the param.h to define the size of your grid (and parameters for your parallelization) according to the ones you have chosen in crocotools_param.m
- Edit the cppdefs.h to choose your numerical options
- Edit the croco.in to choose the run time parameters. Choose the parameters to have at least 2 years of simulation with monthly averages (every 30 days).

6. Check your simulation

- Check the circulation:
  - *you can use a python gui in python, see https://croco-ocean.gitlabpages.inria.fr/croco_doc/tutos/tutos.14.visu.python.html*
  - *you can use the croco_gui.m in with matlab, see https://croco-ocean.gitlabpages.inria.fr/croco_doc/tutos/tutos.14.visu.matlab.html*
  - *or various examples in python (see example_croco_xarray.ipynb, or example_croco.ipynb on http://jgula.fr/ModNum)*

- Try to find a paper documenting the circulation in this region and check if it is (at least qualitatively) well reproduced in the simulation.

- Average the simulation over the last year only (*you will consider only the last year of your simulation to minimize the effects of the spin-up.*)

- Plot the mean currents (surface and barotropic) and vertical sections of stratification for your simulation and for observations *(you can use WOA2009 data – or directly use the croco_clm.nc file which contains monthly climatology from WOA2009 data interpolated on the model grid).*