

Activity 5 – Set up and run a realistic configuration

1. Download the croco tools and datasets

- get the CROCO_TOOLS package from:

https://gitlab.inria.fr/croco-ocean/croco_tools/-/releases/v2.0.0

- We are going to use the Matlab version. Copy the files `croco_tools-v2.0.0/start.m` and `croco_tools-v2.0.0/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-v2.0.0` 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:

`DATADIR='/net/krypton/data0/project/vortex/gula/ModNum/Data/'`

if you are in a IUEM computing rooms:

`DATADIR='/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: ***module load matlab/R2022b; 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_bulk*** to generate surface forcings used to compute wind stress, surface heat flux, surface freshwater flux [CROCO_FILES/croco_blk.nc]
- ***make_clim*** to generate initial conditions T, S, currents , SSH [CROCO_FILES/croco_ini.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

Download and untar the croco code if you don't have it. See (<https://github.com/quentinjamet/Tuto/blob/main/ModNum/Activity1.md>)

- Copy the following files in your working folder (e.g. *~/ModNum/case_regional*)

croco/OCEAN/jobcomp

croco/OCEAN/croco.in

croco/OCEAN/param.h

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
```

You can check the output of the simulation in CROCO_FILES

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.*)