

TUTORIAL 06:


CREATE MY CROCO CLIM CONFIG WITH NESTING

In this tutorial, we do all the steps to run a CROCO configuration with a zoom. We will connect to the LENGAU cluster and run Matlab to create climatological CROCO input files using CROCO tools. We will then run the nested simulation on the CHPC cluster.

STEP 1: Logging onto the Lengau HPC cluster and go into your CROCO working directory

→ From a terminal/konsole, execute the following instruction:

```
ssh -X login@lengau.chpc.ac.za
```

 Replace **login** with your corresponding account number.

→ Reserve one interactive processor to do the pre-processing steps (STEP 4 from #TUTORIAL01):

```
[login@login2 ~]$ qsubil  
[login@cnode0220 ~]$
```



→ Go into your **croco** directory (**lustre/CROCO/croco-v2.0.1**):

```
[login@cnode0220 ~]$ cd lustre/CROCO/croco-v2.0.1  
[login@cnode0220 croco-v2.0.0]$
```

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→ Go into your **Run_Clim** working directory. If it does not exist (or if you want to recreate your grid), repeat the STEP 2 from #TUTORIAL02 (edit **create_config.bash** and execute it):

```
[login@cnode0220 ~]$ cd Run_Clim  
[login@cnode0220 Run_Clim]$  
[login@cnode0220 Run_Clim]$
```

OR

```
[login@cnode0220 ~]$ ./create_config.bash  
[login@cnode0220 ~]$ cd Run_Clim  
[login@cnode0220 Run_Clim]$
```

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STEP 2: Creating CROCO input files for the parent grid

→ It is done with **MATLAB** 

→ Launch **MATLAB** with the command **matlab -nodesktop** (or the alias **mat**):

```
[login@cnode0220 Run_Clim]$ matlab -nodesktop  
[login@cnode0220 Run_Clim]$
```

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→ Execute the command **start** and open **crocotools_param.m**:

```
>> start  
>> edit crocotools_param
```



→ Activate the creation of graphics after each pre-processing step by changing **makeplot=0** to **makeplot=1** at line 130.

→ Create your Parent CROCO grid, initial conditions, surface and lateral forcings by repeating the steps detailed in STEP 2 from #TUTORIAL03):

```
>> make_grid  
>> make_forcing; (optional) make_QSCAT_clim; make_bulk;  
>> make_clim; (optional) make_bry; make_ini;  
>>
```



→ Parameters for these scripts can be found in **crocotools_param.m**

→ Remember **LLm**, **MMm**, and **N**

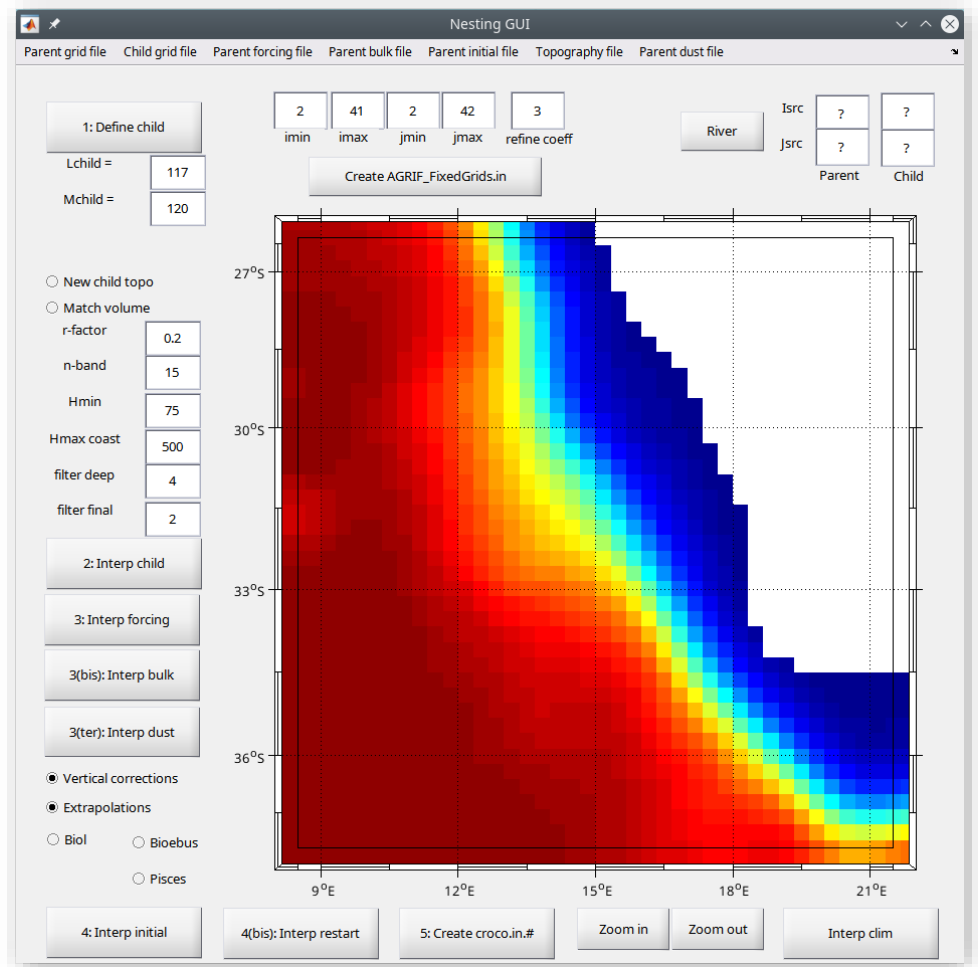
STEP 3: Creating CROCO input files for the nested domain

→ It is done in **MATLAB** with the **nestgui** tool:

```
>> nestgui  
>>
```

① Load your CROCO parent grid stored in **CROCO_FILES/croco_grd.nc**.

① Click on **Define child**: it allows you to draw a rectangle on the map to define the position of your zoom. You can choose to use the same topography as for the parent or use a new topography interpolated from etopo2 (New child topo checkbox).



②a Click on **Interp child**: it will create the child grid that will be stored in **CROCO_FILES/croco_grd.nc.1**.

②b Click on **Create AGRIF Fixed grid.in** to create the CROCO nesting parameters (position of the nested grid).

③ Click on **Interp forcing**: it will create the child forcing file that will be stored in **CROCO_FILES/croco_frc.nc.1**.

③(bis) Click on **Interp bulk**: it will create the child bulk forcing file that will be stored in **CROCO_FILES/croco_blk.nc.1**.

④ Click on **Interp initial**: it will create the child initial conditions that will be stored in **CROCO_FILES/croco_ini.nc.1**.

⑤ Click on **Create croco.in.#** to create the child parameter file **croco_inter.in.1**.

→ **exit** Matab, you are finished with **STEPS 2 & 3**:

```
>> exit  
>>
```

→ You can inspect all your input files stored in **CROCO_FILES** using the **ncdump** or **ncview** tools:

```
[login@cnode0220 Run_Clim]$ cd CROCO_FILES/  
[login@cnode0220 CROCO_FILES]$ ls  
croco_bry.nc  croco_clm.nc  croco_frc.nc  croco_grd.nc  croco_ini.nc  
croco_bry.nc.1 croco_clm.nc.1 croco_frc.nc.1 croco_grd.nc.1 croco_ini.nc.1  
[login@cnode0220 Run_Clim]$ cd ..
```

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STEP 4: Compiling CROCO with Nesting capability

→ To compile CROCO, you need to copy my `jobcomp_lengau` file into your `Run_Clim` directory:

```
cp /home/apps/chpc/earth/CROCCO_Workshop/CROCO_TRAINING_Basic/3_Some_files/jobcomp_lengau .
```



→ You can check the differences between `jobcomp` and `jobcomp_lengau`:

```
[login@cnode0220 Run_Clim]$ meld jobcomp jobcomp_lengau
```

→ Edit the CROCO parameter file `param.h` using `vi` or `nedit`:

```
[login@cnode0220 Run_Clim]$ nedit param.h &
[login@cnode0220 Run_Clim]$
```

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→ Define your configuration with the appropriate values for `LLm0`, `MMm0` and `N` (line 199)
You can get these values by checking the size of your grid with `ncdump -h CROCO_FILES/croco_grd.nc` and removing two ghost points from `xi_rho` and `eta_rho`

→ Check the parameters for the **parallelisation** (`NP_XI, NP_ETA=4` line 251)

→ Edit the `cppdefs.h` file using `vi` or `nedit`:

```
[login@cnode0220 Run_Clim]$ nedit cppdefs.h &
[login@cnode0220 Run_Clim]$
```

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→ As in #TUTORIAL04, activate your config, MPI parallelization, define which of your **parent** boundaries are open or closed, chose the surface and boundary forcing formulation.

→ Activate the **Nesting capability** (`#define AGRIF` line 79) and if you want 2 ways interaction between the parent and the child, also activate `#define AGRIF_2WAY` (line 80).

→ Compile CROCO using the `jobcomp_lengau` script:

```
[login@cnode0220 Run_Clim]$ ./jobcomp_lengau
[login@cnode0220 Run_Clim]$
```

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STEP 5: Running CROCO

→ To launch your simulation on the Lengau cluster using the PBS Pro job scheduler, you need to copy my `run_croco.pbs` file into your `Run_Clim` directory:

```
cp /home/apps/chpc/earth/CROCCO_Workshop/CROCO_TRAINING_Basic/3_Some_files/run_croco.pbs .
```



→ Edit the script `run_croco.pbs` using `vi` or `nedit`:

```
[login@cnode0220 Run_Clim]$ nedit run_croco.pbs &
[login@cnode0220 Run_Clim]$
```

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→ Check the PBS scheduler parameters (`mpiprocs` consistent with `param.h`) and email.

→ Check the path of your `Run_Clim` working directory.

→ Check the user configurable section: Choose the time step (`DT`, line 56), adjust `NBPROCS` (line 37, consistent with `param.h`), and put `NLEVEL=2` (at line 61).

→ Edit the CROCO parameter files `croco_inter.in` and `croco_inter.in.1`:

```
[login@cnode0220 Run_Clim]$ diff croco_inter.in croco_inter.in.1
[login@cnode0220 Run_Clim]$
```

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→ Fix your grid parameters at line 8: `THETA_S`, `THETA_B`, `Hc` (m)

→ Check the outputs requested.

→ Launch the nested simulation using the PBS command `qsub`:

```
[login@cnode0220 Run_Clim]$ qsub run_croco.pbs
[login@cnode0220 Run_Clim]$
```

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→ Your simulation will start soon. You will receive an email.

→ CROCO outputs (`avg/hist.nc[.1]`) will be stored in the directory: `./SCRATCH`



→ Debug:

- Output and error files from the **PBS** job are in **Run_Clim/run_croco.pbs. (o/e)xxxxxxx**
- The model log files (**croco_Y---M--.out**) are in **Run_Clim/SCRATCH**

STEP 6: Visualising model outputs

→ This can be done with **MATLAB**

→ Launch **matlab -nodesktop** (or the alias **mat**) to use the crocotools **croco_gui**:

```
>> croco_gui  
>>
```



↪ Have fun !

→ You can concatenate model outputs to visualize them easily in **croco_gui**:

```
[login@cnode0220 Run_Clim]$ cd SCRATCH  
[login@cnode0220 SCRATCH]$ nccat croco_avg_Y2M[1-9].nc.1  
croco_avg_Y2M1[0-2].nc.1 croco_avg_Y2.nc.1
```

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STEP 7: Exiting

→ When you are done, exit Matlab:

```
>> exit
```



→ Give back the interactive node and logout from the cluster:

```
[login@cnode0220 Run_Clim]$ exit  
logout  
qsub: job 4416950.sched01 completed  
[login@login2 ~]$ exit
```

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STEP 8: Check List

→ Here is the list of the essential commands that you must execute during this hands-on session. The following table can help you confirm that you have executed all of them:

Commands



STEP 1	1	ssh -X login@lengau.chpc.ac.za	
	2	qsub1	
	3	cd lustre/CROCO/croco-v2.0.1	
	4	cd Run_Clim (or redo STEP 2 from Tutorial 02)	
STEP 2	1	matlab -nodesktop	
	2	start	
	3	edit crocotools_param	
	4	make_grid; make_forcing; make_bulk; make_clim; make_bry	
STEP 3	5	nestgui	
	6	exit	
	7	cd CROCO_FILES; ls; cd ..	
STEP 4	1	cp /home/apps/chpc/earth/CROCCO_Workshop/CROCO_TRAINING_Basic/3_Some_files/jobcomp_lengau .	
	2	nedit param.h &	
	3	nedit cppdef.h &	
	4	./jobcomp_lengau	
STEP 5	1	cp /home/apps/chpc/earth/CROCCO_Workshop/CROCO_TRAINING_Basic/3_Some_files/run_croco.pbs	
	2	nedit run_croco.pbs &	
	3	nedit croco_inter.in croco_inter.in.1 &	
	4	qsub run_croco.pbs	
STEP 6	1	matlab -nodesktop	
	2	start	
	3	croco_gui	
STEP 7	1	exit	
	2	exit	
	3	exit	