Tutorial 03 CROCO: Ocean Atmosphere Wave Coupling

1. Purpose

In this tutorial we will learn to use the new framework for CROCO that is very useful to run CROCO coupled with the atmospheric model WRF and/or the wave model WaveWatchIII (WW3).

We will use the default **BENGUELA**, for which **WRF** and **WW3** were already configured and compiled.

1.1. Installation

```
mkdir CONFIG
cd CONFIG
cp ~/../instructor01/CONFIG/create_config.bash .
nano create_config.bash
```

to edit the file and modify the following lines

```
MACHINE="LEFTRARU"

CROCO_DIR=/home/courses/instructor01/MODEL_git/croco/croco
TOOLS_DIR=/home/courses/instructor01/MODEL_git/croco/croco_tools

MY_CONFIG_NAME=BENG

# Home and Work configuration directories
# ---------------------------------------
MY_CONFIG_HOME=${PWD}
MY_CONFIG_WORK=${PWD}

options=( all-prod-cpl )
```

Now type

```
./create_config.bash
```

and this will show up

```
oce-prod is defined. architecture for production and/or coupled run

Your choices :
 - CROCO_DIR        : /home/courses/instructor01/MODEL_git/croco/croco
 - TOOLS_DIR        : /home/courses/instructor01/MODEL_git/croco/croco_tools
 - CONFIG_HOME_DIR  : /home/courses/student60/CONFIG/
 - CONFIG_WORK_DIR  : /home/courses/student60/CONFIG/
 - CONFIG_NAME      : BENG
 - OPTIONS          : oce-prod xios test_cases agrif pisces sediment mustang oanalysis prepro cpl wav atm
 Do you want to proceed ? [Y/n]
```

press **Y** and you will get

```
 Creating configuration ...

Copy CROCO useful scripts and input files
-----------------------------------------
Copy OASIS useful scripts and input files
-----------------------------------------
Copy WW3 useful scripts and input files
---------------------------------------
Copy WRF useful scripts and input files
---------------------------------------
Copy TOY sources, useful scripts and input files
------------------------------------------------
Copy scripts production runs
----------------------------
```

Now do

```
cp ~/../instructor01/create_useful_links.sh .
./create_useful_links.sh
```

and ignore the warnings, they appear because you already have those files. What is new is in your **HOME** directory

```
CONFIG  INPUTS  OASIS  WRF  WW3  croco
```

So we are all set to start.

2. CROCO solo Run

2.1. Configuration

To do a CROCO-ony (or *forced*) run do

```
cd BENG
source myenv_mypath.sh
```

In **myjob.sh** check the configuration of your run and set it to run for 2 days only

```
# Start date of the first Job
export YEAR_BEGIN_JOB=2005
export MONTH_BEGIN_JOB=1
export DAY_BEGIN_JOB=1

# Duration of each Job
export JOB_DUR_MTH=0
export JOB_DUR_DAY=2

# How many jobs do you want to launch?
export NBJOB=1

# Do we start from a restart?
export RESTART_FLAG="FALSE"
```

The variable

```
export TIMEJOB=1800
```

will tell the computer this job is short, half an hour at most, so it will receive priority to be processed.

Then in **mynamelist.sh** edit to use a **CROCO**-only run

```
nano mynamelist.sh
```

You can define the name of your experiment in the line

```
export CEXPER=BENG_exp1_frc
export RUNtype=frc
```

Now define the models to use, first only **CROCO**

```
export USE_OCE=1
```

and set all the other models to 0. Change

```
export ONLINE_COMP=1
```

so the executable file for **CROCO** is compiled. Here we keep

```
export surfrc_flag="TRUE"
```

and change

```
export interponline=1
export frc_ext='CFSR'
```

Now to run the simulation, CROCO only with forcing from SODA and CFSR do.

```
./submitjob.sh
```

which will give you something like

```
/home/courses/student60/CONFIG/BENG
LEFTRARU
/home/courses/student60/CONFIG/BENG

  HOSTNAME: leftraru1
     =>    COMPUTER: LEFTRARU

  CONFIG: BENG
  CEXPER: BENG_exp1_frc

  jobname: job_BENG_exp1_frc_20050101_20050102.sh

  ROOT_NAME_1: BENG_exp1_frc_20050101_20050102
  ROOT_NAME_2: 20050101_20050102
  ROOT_NAME_3: 20050102
  EXEDIR: /home/courses/student60/CONFIG/BENG/rundir/BENG_exp1_frc_execute
  OUTPUTDIR: /home/courses/student60/CONFIG/BENG/rundir/BENG_exp1_frc_outputs
  RESTDIR_OUT: /home/courses/student60/CONFIG/BENG/rundir/BENG_exp1_frc_restarts
  JOBDIR: /home/courses/student60/CONFIG/BENG/jobs_BENG_exp1_frc
Submitted batch job 23780733
```

and check the status with

```
squeue
```

The run will take about 5 minutes to finish and will create the directories

```
CROCO_IN
rundir
jobs_BENG_exp1_frc
```

The directory **CROCO_IN** contains the compilation of the CROCO model, file **croco.frc**.

```
Compile         croco.frc          kRGB61.txt          namelist_pisces_cfg    param.h       TEST_CASES
cppdefs_dev.h   croco.in.1         kRGB61.txt.1        namelist_pisces_cfg.1  param.h.base
cppdefs.h       croco.in.base      log.compil          namelist_pisces_ref    param.h.frc
cppdefs.h.base  croco_stations.in  MUSTANG_NAMELIST    namelist_pisces_ref.1  partit
cppdefs.h.frc   jobcomp            NAMELIST_OANALYSIS  ncjoin                 sediment.in
```

The directory **rundir** contains all the input and output results for all runs

```

```

in particular
BENG_exp1_frc_execute contains the directory **20050101_20050102** with

```
app.conf      Downward_Long-Wave_Rad_Flux_Y2005M01.nc           Temperature_height_above_ground_Y2005M01.
croco_bry.nc  Downward_Short-Wave_Rad_Flux_surface_Y2005M01.nc  U-component_of_wind_Y2005M01.nc
croco_grd.nc  job_BENG_exp1_frc_20050101_20050102.sh            Upward_Long-Wave_Rad_Flux_surface_Y2005M0
croco.in      ls_l                                              Upward_Short-Wave_Rad_Flux_surface_Y2005M
croco_ini.nc  out_run.txt                                       V-component_of_wind_Y2005M01.nc
croco.log     Precipitation_rate_Y2005M01.nc
crocox        Specific_humidity_Y2005M01.nc
```

and the results are in **BENG_exp1_frc_outputs** contains the directory **20050101_20050102** with

```
croco_avg_20050101_20050102.nc  croco_his_20050101_20050102.nc
```

while the restart files are in
BENG_exp1_frc_restarts/20050102

```
croco_rst_20050102.nc
```

Notice that your file **myjob.sh** is automatically updated to run the next month, as it now says

```
# Start date of the first Job
export YEAR_BEGIN_JOB=2005
export MONTH_BEGIN_JOB=0
export DAY_BEGIN_JOB=3

# How many jobs do you want to launch?
export NBJOB=0

# Do we start from a restart?
export RESTART_FLAG="TRUE"
```

and we will have to change this for the next runs. This was a typical CROCO run, for only two days. Before you continue copy the script **mynamelist.sh** file for this configuration

```
cp mynamelist.sh mynamelist.sh.frc
```

Now let's couple the model CROCO to other models.

3. CROCO-WW3 Run

WW3 is already precompiled and all the input files for WW3 are in the system

3.1. Configuration

In **myjob.sh** check the configuration of your run and set it to

```
# Start date of the first Job
export YEAR_BEGIN_JOB=2005
export MONTH_BEGIN_JOB=1
export DAY_BEGIN_JOB=1

# Duration of each Job
export JOB_DUR_MTH=0
export JOB_DUR_DAY=2

# How many jobs do you want to launch?
export NBJOB=1

# Do we start from a restart?
export RESTART_FLAG="FALSE"
```

Now in **mynamelist.sh** edit to use a **CROCO-WW3** run

```
nano mynamelist.sh
```

You can define the name of your experiment in the lines

```
export CEXPER=BENG_exp2_ow
export RUNtype=ow
```

Now define the models to use

```
export USE_ATM=0
export USE_OCE=1
export USE_WAV=1
```

and check that

```
export ONLINE_COMP=1
export surfrc_flag="TRUE"
export interponline=1
export frc_ext='CFSR'
```

as since we are only coupling the waves, we still need the atmospheric forcing from **CFSR**. We also need to change

```
export forcin=(CFSR_wind)
export forcww3=(wind)
```

Now to run the simulation, CROCO only with forcing from SODA and CFSR, coupled to WW3. WW3 itself will be forced by **CFSR** winds.

```
./submitjob.sh
```

which will give you something like

```
/home/courses/student60/CONFIG/BENG
LEFTRARU
/home/courses/student60/CONFIG/BENG

  HOSTNAME: leftraru1
     =>    COMPUTER: LEFTRARU

  CONFIG: BENG
  CEXPER: BENG_exp2_ow

  jobname: job_BENG_exp2_ow_20050101_20050102.sh

  ROOT_NAME_1: BENG_exp2_ow_20050101_20050102
  ROOT_NAME_2: 20050101_20050102
  ROOT_NAME_3: 20050102
  EXEDIR: /home/courses/student60/CONFIG/BENG/rundir/BENG_exp2_ow_execute
  OUTPUTDIR: /home/courses/student60/CONFIG/BENG/rundir/BENG_exp2_ow_outputs
  RESTDIR_OUT: /home/courses/student60/CONFIG/BENG/rundir/BENG_exp2_ow_restarts
  JOBDIR: /home/courses/student60/CONFIG/BENG/jobs_BENG_exp2_ow
Submitted batch job 23780837
```

and check the status with

```
squeue
```

The run will take about 5 minutes to finish and will create the directories

```
CROCO_IN
rundir
jobs_BENG_exp2_ow
```

You can check the advance of the simulation if you check the file

```
 tail -f jobs_BENG_exp2_ow/BENG_exp2_ow_20050101_20050102.out
```

The directory **CROCO_IN** contains the compilation of the new CROCO executable file **croco.ow**.
The directory **rundir** contains all the input and output results for all runs

```
drwxr-xr-x 3 student60 courses 4096 Jan 19 09:39 BENG_exp1_frc_execute
drwxr-xr-x 3 student60 courses 4096 Jan 19 09:42 BENG_exp1_frc_outputs
drwxr-xr-x 3 student60 courses 4096 Jan 19 09:42 BENG_exp1_frc_restarts
drwxr-xr-x 3 student60 courses 4096 Jan 19 10:24 BENG_exp2_ow_execute
drwxr-xr-x 3 student60 courses 4096 Jan 19 10:28 BENG_exp2_ow_outputs
drwxr-xr-x 3 student60 courses 4096 Jan 19 10:28 BENG_exp2_ow_restarts
```

in particular the results are in **BENG_exp2_ow_outputs** contains the directory **20050101_20050102**

```
-rw-r--r-- 1 student60 courses 171M Jan 19 10:28 croco_avg_20050101_20050102.nc
-rw-r--r-- 1 student60 courses 160M Jan 19 10:28 croco_his_20050101_20050102.nc
-rw-r--r-- 1 student60 courses 1.3M Jan 19 10:28 out_grd_20050101_20050102.ww3
-rw-r--r-- 1 student60 courses 996K Jan 19 10:28 ww3_20050101_20050102.nc
```

while the restart files are in
BENG_exp2_ow_restarts/20050102

```
-rw-r--r-- 1 student60 courses  61K Jan 19 10:28 areas.nc
-rw-r--r-- 1 student60 courses 2.4M Jan 19 10:28 croco_rst_20050102.nc
-rw-r--r-- 1 student60 courses 604K Jan 19 10:28 grids.nc
-rw-r--r-- 1 student60 courses  31K Jan 19 10:28 masks.nc
-rw-r--r-- 1 student60 courses  27M Jan 19 10:28 mod_def.ww3_20050102
-rw-r--r-- 1 student60 courses  63K Jan 19 10:28 oce_BENG_exp2_ow_20050102.nc
-rw-r--r-- 1 student60 courses 4.4M Jan 19 10:28 restart.ww3_20050102
-rw-r--r-- 1 student60 courses 282K Jan 19 10:28 rmp_ocnt_to_ww3t_DISTWGT.nc
-rw-r--r-- 1 student60 courses 282K Jan 19 10:28 rmp_ww3t_to_ocnt_DISTWGT.nc
-rw-r--r-- 1 student60 courses 143K Jan 19 10:28 wav_BENG_exp2_ow_20050102.nc
-rw-r--r-- 1 student60 courses 1.9M Jan 19 10:28 wind.ww3_20050102
```

Before you continue copy the script **mynamelist.sh** file for this configuration

```
cp mynamelist.sh mynamelist.sh.ow
```

Now let's couple the model CROCO to other models.

4. CROCO-WRF Run

WRF is already precompiled and all the input files for WRF are in the system

4.1. Configuration

In **myjob.sh** check the configuration of your run and set it to

```
# Start date of the first Job
export YEAR_BEGIN_JOB=2005
export MONTH_BEGIN_JOB=1
export DAY_BEGIN_JOB=1

# Duration of each Job
export JOB_DUR_MTH=0
export JOB_DUR_DAY=2

# How many jobs do you want to launch?
export NBJOB=1

# Do we start from a restart?
export RESTART_FLAG="FALSE"
```

Now in **mynamelist.sh** edit to use a **CROCO-WW3** run

```
nano mynamelist.sh
```

You can define the name of your experiment in the lines

```
export CEXPER=BENG_exp3_oa
export RUNtype=oa
```

Now define the models to use

```
export USE_ATM=1
export USE_OCE=1
export USE_WAV=0
```

and check that

```
export ONLINE_COMP=1
export surfrc_flag="FALSE"
```

as since we are coupling the atmosphere, we do not need the atmospheric forcing from **CFSR**. Change also

```
# Time steps
export DT_ATM=100
```

Now to run the simulation, CROCO only with forcing from WRF.

```
./submitjob.sh
```

which will give you something like

```
/home/courses/student60/CONFIG/BENG
LEFTRARU
/home/courses/student60/CONFIG/BENG

  HOSTNAME: leftraru1
     =>    COMPUTER: LEFTRARU

  CONFIG: BENG
  CEXPER: BENG_exp3_oa

  jobname: job_BENG_exp3_oa_20050101_20050102.sh

  ROOT_NAME_1: BENG_exp3_oa_20050101_20050102
  ROOT_NAME_2: 20050101_20050102
  ROOT_NAME_3: 20050102
  EXEDIR: /home/courses/student60/CONFIG/BENG/rundir/BENG_exp3_oa_execute
  OUTPUTDIR: /home/courses/student60/CONFIG/BENG/rundir/BENG_exp3_oa_outputs
  RESTDIR_OUT: /home/courses/student60/CONFIG/BENG/rundir/BENG_exp3_oa_restarts
  JOBDIR: /home/courses/student60/CONFIG/BENG/jobs_BENG_exp3_oa
Submitted batch job 23780844
```

and check the status with

```
squeue
```

The run will take about 5 minutes to finish and will create the directories

```
CROCO_IN
rundir
jobs_BENG_exp3_oa
```

You can check the advance of the simulation if you check the file

```
 tail -f jobs_BENG_exp3_oa/BENG_exp3_oa_20050101_20050102.out
```

The directory **CROCO_IN** contains the compilation of the new CROCO executable file **croco.oa**.
The directory **rundir** contains all the input and output results for all runs

```
drwxr-xr-x 3 student60 courses 4096 Jan 19 09:39 BENG_exp1_frc_execute
drwxr-xr-x 3 student60 courses 4096 Jan 19 09:42 BENG_exp1_frc_outputs
drwxr-xr-x 3 student60 courses 4096 Jan 19 09:42 BENG_exp1_frc_restarts
drwxr-xr-x 3 student60 courses 4096 Jan 19 10:55 BENG_exp2_oa_execute
drwxr-xr-x 3 student60 courses 4096 Jan 19 11:01 BENG_exp2_oa_outputs
drwxr-xr-x 3 student60 courses 4096 Jan 19 11:01 BENG_exp2_oa_restarts
drwxr-xr-x 3 student60 courses 4096 Jan 19 10:24 BENG_exp3_oa_execute
drwxr-xr-x 3 student60 courses 4096 Jan 19 10:28 BENG_exp3_oa_outputs
drwxr-xr-x 3 student60 courses 4096 Jan 19 10:28 BENG_exp3_oa_restarts
```

in particular the results are in **BENG_exp3_oa_outputs** contains the directory **20050101_20050102**

```
-rw-r--r-- 1 student60 courses  92M Jan 19 11:01 croco_avg_20050101_20050102.nc
-rw-r--r-- 1 student60 courses  79M Jan 19 11:01 croco_his_20050101_20050102.nc
-rw-r--r-- 1 student60 courses  32M Jan 19 11:01 wrfout_d01_20050101_20050102.nc
-rw-r--r-- 1 student60 courses 3.0M Jan 19 11:01 wrfxtrm_d01_20050101_20050102.nc
```

while the restart files are in
BENG_exp3_oa_restarts/20050102

```
-rw-r--r-- 1 student60 courses  68K Jan 19 11:01 areas.nc
-rw-r--r-- 1 student60 courses 129K Jan 19 11:01 atm_BENG_exp2_oa_20050102.nc
-rw-r--r-- 1 student60 courses 2.4M Jan 19 11:01 croco_rst_20050102.nc
-rw-r--r-- 1 student60 courses 672K Jan 19 11:01 grids.nc
-rw-r--r-- 1 student60 courses  34K Jan 19 11:01 masks.nc
-rw-r--r-- 1 student60 courses  63K Jan 19 11:01 oce_BENG_exp2_oa_20050102.nc
-rw-r--r-- 1 student60 courses 331K Jan 19 11:01 rmp_atmt_to_ocnt_DISTWGT.nc
-rw-r--r-- 1 student60 courses 371K Jan 19 11:01 rmp_ocnt_to_atmt_DISTWGT.nc
-rw-r--r-- 1 student60 courses  24M Jan 19 11:01 wrfrst_d01_2005-01-03_00:00:00
```

Before you continue copy the script **mynamelist.sh** file for this configuration

```
cp mynamelist.sh mynamelist.sh.oa
```

Now let's couple the model CROCO to both models.

5. CROCO-WRF-WW3 Run

WRF and WW3 are already precompiled and all the input files for WRF and WW3 are in the system

5.1. Configuration

In **myjob.sh** check the configuration of your run and set it to

```
# Start date of the first Job
export YEAR_BEGIN_JOB=2005
export MONTH_BEGIN_JOB=1
export DAY_BEGIN_JOB=1

# Duration of each Job
export JOB_DUR_MTH=0
export JOB_DUR_DAY=2

# How many jobs do you want to launch?
export NBJOB=1

# Do we start from a restart?
export RESTART_FLAG="FALSE"
```

Now in **mynamelist.sh** edit to use a **CROCO-WW3-WRF** run

```
nano mynamelist.sh
```

You can define the name of your experiment in the lines

```
export CEXPER=BENG_exp4_owa
export RUNtype=owa
```

Now define the models to use

```
export USE_ATM=1
export USE_OCE=1
export USE_WAV=1
```

and check that

```
export ONLINE_COMP=1
export surfrc_flag="FALSE"
```

as since we are coupling the atmosphere, we do not need the atmospheric forcing from **CFSR**. Change also

```
# physics
export isftcflx=5
```

since now we are coupling WRF and WW3 also. Finally change

```
export forcin=()
export forcww3=()
```

Now to run the simulation, CROCO with forcing from WRF and WW3.

```
./submitjob.sh
```

which will give you something like

```
LEFTRARU
/home/courses/student60/CONFIG/BENG

  HOSTNAME: leftraru2
     =>    COMPUTER: LEFTRARU

  CONFIG: BENG
  CEXPER: BENG_exp4_owa

  jobname: job_BENG_exp4_owa_20050101_20050102.sh

  ROOT_NAME_1: BENG_exp4_owa_20050101_20050102
  ROOT_NAME_2: 20050101_20050102
  ROOT_NAME_3: 20050102
  EXEDIR: /home/courses/student60/CONFIG/BENG/rundir/BENG_exp4_owa_execute
  OUTPUTDIR: /home/courses/student60/CONFIG/BENG/rundir/BENG_exp4_owa_outputs
  RESTDIR_OUT: /home/courses/student60/CONFIG/BENG/rundir/BENG_exp4_owa_restarts
  JOBDIR: /home/courses/student60/CONFIG/BENG/jobs_BENG_exp4_owa
Submitted batch job 23780853
```

and check the status with

```
squeue
```

The run will take about 5 minutes to finish and will create the directories

```
CROCO_IN
rundir
jobs_BENG_exp4_owa
```

You can check the advance of the simulation if you check the file

```
 tail -f jobs_BENG_exp4_owa/BENG_exp4_owa_20050101_20050102.out
```

The directory **CROCO_IN** contains the compilation of the new CROCO executable file **croco.owa**.
The directory **rundir** contains all the input and output results for all runs

```
drwxr-xr-x 3 student60 courses 4096 Jan 19 09:39 BENG_exp1_frc_execute
drwxr-xr-x 3 student60 courses 4096 Jan 19 09:42 BENG_exp1_frc_outputs
drwxr-xr-x 3 student60 courses 4096 Jan 19 09:42 BENG_exp1_frc_restarts
drwxr-xr-x 3 student60 courses 4096 Jan 19 10:55 BENG_exp2_ow_execute
drwxr-xr-x 3 student60 courses 4096 Jan 19 11:01 BENG_exp2_ow_outputs
drwxr-xr-x 3 student60 courses 4096 Jan 19 11:01 BENG_exp2_ow_restarts
drwxr-xr-x 3 student60 courses 4096 Jan 19 10:24 BENG_exp3_oa_execute
drwxr-xr-x 3 student60 courses 4096 Jan 19 10:28 BENG_exp3_oa_outputs
drwxr-xr-x 3 student60 courses 4096 Jan 19 10:28 BENG_exp3_oa_restarts
drwxr-xr-x 3 student60 courses 4096 Jan 19 11:16 BENG_exp4_owa_execute
drwxr-xr-x 3 student60 courses 4096 Jan 19 11:22 BENG_exp4_owa_outputs
drwxr-xr-x 3 student60 courses 4096 Jan 19 11:22 BENG_exp4_owa_restarts
```

in particular the results are in **BENG_exp4_owa_outputs** contains the directory **20050101_20050102**

```
-rw-r--r-- 1 student60 courses 170M Jan 19 11:22 croco_avg_20050101_20050102.nc
-rw-r--r-- 1 student60 courses 158M Jan 19 11:22 croco_his_20050101_20050102.nc
-rw-r--r-- 1 student60 courses 1.3M Jan 19 11:22 out_grd_20050101_20050102.ww3
-rw-r--r-- 1 student60 courses  32M Jan 19 11:22 wrfout_d01_20050101_20050102.nc
-rw-r--r-- 1 student60 courses 3.0M Jan 19 11:22 wrfxtrm_d01_20050101_20050102.nc
-rw-r--r-- 1 student60 courses 946K Jan 19 11:22 ww3_20050101_20050102.nc
```

while the restart files are in
BENG_exp4_owa_restarts/20050102

```
-rw-r--r-- 1 student60 courses  83K Jan 19 11:22 areas.nc
-rw-r--r-- 1 student60 courses 150K Jan 19 11:22 atm_BENG_exp4_owa_20050102.nc
-rw-r--r-- 1 student60 courses 2.4M Jan 19 11:22 croco_rst_20050102.nc
-rw-r--r-- 1 student60 courses 823K Jan 19 11:22 grids.nc
-rw-r--r-- 1 student60 courses  42K Jan 19 11:22 masks.nc
-rw-r--r-- 1 student60 courses  27M Jan 19 11:20 mod_def.ww3_20050102
-rw-r--r-- 1 student60 courses  63K Jan 19 11:22 oce_BENG_exp4_owa_20050102.nc
-rw-r--r-- 1 student60 courses 4.4M Jan 19 11:22 restart.ww3_20050102
-rw-r--r-- 1 student60 courses 331K Jan 19 11:22 rmp_atmt_to_ocnt_DISTWGT.nc
-rw-r--r-- 1 student60 courses 326K Jan 19 11:22 rmp_atmt_to_ww3t_DISTWGT.nc
-rw-r--r-- 1 student60 courses 371K Jan 19 11:22 rmp_ocnt_to_atmt_DISTWGT.nc
-rw-r--r-- 1 student60 courses 282K Jan 19 11:22 rmp_ocnt_to_ww3t_DISTWGT.nc
-rw-r--r-- 1 student60 courses 336K Jan 19 11:22 rmp_ww3t_to_atmt_DISTWGT.nc
-rw-r--r-- 1 student60 courses 282K Jan 19 11:22 rmp_ww3t_to_ocnt_DISTWGT.nc
-rw-r--r-- 1 student60 courses 143K Jan 19 11:22 wav_BENG_exp4_owa_20050102.nc
-rw-r--r-- 1 student60 courses 1.9M Jan 19 11:20 wind.ww3_20050102
-rw-r--r-- 1 student60 courses  24M Jan 19 11:22 wrfrst_d01_2005-01-03_00:00:00
```

Before you continue copy the script **mynamelist.sh** file for this configuration

```
cp mynamelist.sh mynamelist.sh.owa
```

6. Analysis of Results

1. Comprare the different fields using **ncdiff**
2. View the output files using **ncview**
3. Take a look at the **namcouple** file used by **OASIS**. This file can be found in the **rundir** directory.
4. Copy all your croco_AVG files with a different name

```
cp rundir/BENG_exp1_frc_outputs/20050101_20050102/croco_avg_20050101_20050102.nc croco_avg_o.nc
cp rundir/BENG_exp1_ow_outputs/20050101_20050102/croco_avg_20050101_20050102.nc croco_avg_ow.nc
cp rundir/BENG_exp3_oa_outputs/20050101_20050102/croco_avg_20050101_20050102.nc croco_avg_oa.nc
cp rundir/BENG_exp4_owa_outputs/20050101_20050102/croco_avg_20050101_20050102.nc croco_avg_owa.nc

```

and using **NCO** calculate the differences

```
ncdiff croco_avg_oa.nc croco_avg_o.nc diff_oa-o.nc
ncdiff croco_avg_owa.nc croco_avg_o.nc diff_owa-o.nc
ncdiff croco_avg_ow.nc croco_avg_o.nc diff_ow-o.nc
```

Study the effect on:

- SST
- surface velocity
- zeta (see Fig. 1)

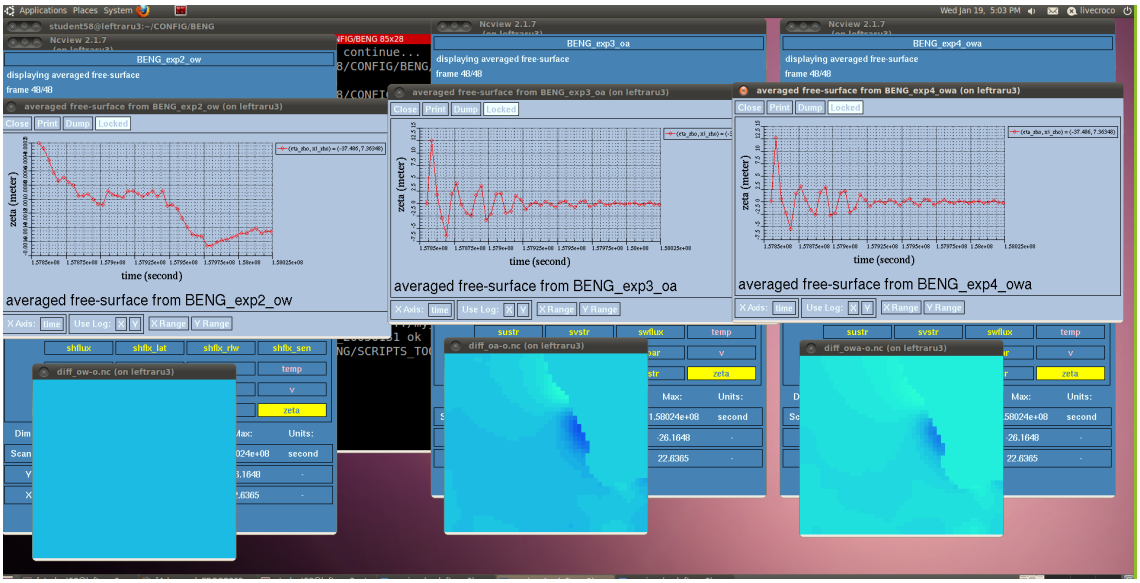

Figura 1: Comparison of sea level (ZETA) differences with respect to the ocean-only run for the OW, OA, and OWA coupled runs

7. Conclusion

In this tutorial you practiced the new **CROCO** framework to run stand alone CROCO configuration and **CROCO** coupled to **WRF** and **WW3** using **OASIS** in the predefined Benguela domain.

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Swen Jullien
Mathieu Le Corre

8. References

Coupling
https://croco-ocean.gitlabpages.inria.fr/croco_doc/tutos/tutos.16.coupling.html

TOY Model coupling

https://croco-ocean.gitlabpages.inria.fr/croco_doc/tutos/tutos.16.coupling.simple.html

Advanced coupling
https://croco-ocean.gitlabpages.inria.fr/croco_doc/tutos/tutos.16.coupling.advanced.html

Couvelard, X., Lemarié, F., Samson, G., Redelsperger, J. L., Ardhuin, F., Benshila, R., & Madec, G. (2020). Development of a two-way-coupled ocean{wave model: assessment on a global NEMO (v3. 6){WW3 (v6. 02) coupled configuration. Geoscientific Model Development, 13(7), 3067-3090.

Jullien, S., Masson, S., Oerder, V., Samson, G., Colas, F., & Renault, L. (2020). Impact of Ocean-Atmosphere Current Feedback on Ocean Mesoscale Activity: Regional Variations and Sensitivity to Model Resolution. Journal of Climate, 33(7), 2585-2602.

Oerder, V., Colas, F., Echevin, V., Masson, S., Hourdin, C., Jullien, S., ... & Lemarié, F. (2016). Mesoscale SST{wind stress coupling in the Peru{Chile current system: Which mechanisms drive its seasonal variability?. Climate Dynamics, 47(7), 2309-2330.

Renault, L., Masson, S., Arsouze, T., Madec, G., & Mcwilliams, J. C. (2020). Recipes for how to force oceanic model dynamics. Journal of Advances in Modeling Earth Systems, 12(2), e2019MS001715.

Appendix A: Old CROCO framework

You can recover the old CROCO code framework creating a configuration with **create_config.bash** by defining

```
# Configuration name
# ------------------
MY_CONFIG_NAME=BENG_CLASI
```

and

```
options=( all-dev )
```

so when you type

```
./create_config.bash
```

you get in the **BENG_CLASI** directory

```
-rw-r--r-- 1 student60 courses  32K Jan 19 11:27 cppdefs_dev.h
-rw-r--r-- 1 student60 courses  42K Jan 19 11:27 cppdefs.h
-rwxr-xr-x 1 student60 courses  24K Jan 19 11:27 create_config.bash.bck
drwxr-xr-x 2 student60 courses 4.0K Jan 19 11:27 CROCO_FILES
-rw-r--r-- 1 student60 courses 9.1K Jan 19 11:27 croco_forecast.in
-rw-r--r-- 1 student60 courses 9.1K Jan 19 11:27 croco_hindcast.in
-rw-r--r-- 1 student60 courses 8.9K Jan 19 11:27 croco.in
-rw-r--r-- 1 student60 courses 8.9K Jan 19 11:27 croco.in.1
-rw-r--r-- 1 student60 courses 8.9K Jan 19 11:27 croco_inter.in
-rw-r--r-- 1 student60 courses 1.6K Jan 19 11:27 croco_stations.in
-rw-r--r-- 1 student60 courses  18K Jan 19 11:27 crocotools_param.m
drwxr-xr-x 2 student60 courses 4.0K Jan 19 11:27 DATA
-rwxr-xr-x 1 student60 courses 9.4K Jan 19 11:27 jobcomp
drwxr-xr-x 2 student60 courses 4.0K Jan 19 11:27 MUSTANG_NAMELIST
drwxr-xr-x 2 student60 courses 4.0K Jan 19 11:27 NAMELIST_OANALYSIS
-rw-r--r-- 1 student60 courses 5.5K Jan 19 11:27 namelist_pisces_cfg
-rw-r--r-- 1 student60 courses 5.5K Jan 19 11:27 namelist_pisces_cfg.1
-rw-r--r-- 1 student60 courses  22K Jan 19 11:27 namelist_pisces_ref
-rw-r--r-- 1 student60 courses  22K Jan 19 11:27 namelist_pisces_ref.1
-rw-r--r-- 1 student60 courses 2.3K Jan 19 11:27 oct_start.m
-rw-r--r-- 1 student60 courses  31K Jan 19 11:27 param.h
-rwxr-xr-x 1 student60 courses 4.3K Jan 19 11:27 process_xios_xml.sh
-rwxr-xr-x 1 student60 courses 8.0K Jan 19 11:27 run_croco.bash
-rwxr-xr-x 1 student60 courses 7.3K Jan 19 11:27 run_croco_forecast.bash
-rwxr-xr-x 1 student60 courses  11K Jan 19 11:27 run_croco_inter.bash
-rw-r--r-- 1 student60 courses 2.8K Jan 19 11:27 sediment.in
-rw-r--r-- 1 student60 courses 4.2K Jan 19 11:27 start.m
drwxr-xr-x 3 student60 courses  16K Jan 19 11:27 TEST_CASES
-rw-r--r-- 1 student60 courses 1.2K Jan 19 11:27 town.dat
```

Appendix B: Error Messages

1. `[student20@leftraru3 BENG_OWA]$ ./submitjob.sh`
   `/home/courses/student20/CONFIG/BENG_OWA`
   `LEFTRARU`

   ```
   A job_BENG_OWA_exp1_20050101_20050131.sh file already exists in
   /home/courses/student20/CONFIG/BENG_OWA/jobs_BENG_OWA_exp1
              => exit.

   Clean up and restart
   ```

2. `Disk quota exceeded`

   You need to remove previous runs as you are out of space

Appendix C: Machine-specific settings

These are located in

```
~/croco/croco/SCRIPTS/SCRIPTS_COUPLING/SCRIPTS_TOOLBOX/MACHINE/LEFTRARU
```

In particular **header.LEFTRARU** has the number of cores per server.