Guide to CORDEX simulations with RCA4

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Contents

1   Introduction

This is a short guide for setting up and perform CORDEX simulations with RCA4 on gimle and ekman. If you need any more detailed explantaions on RCA please refer to the RCA user guide `README.pdf`.

RCA code developers should refer to Section 2 while baby-sitting colleagues can go directly to Section 3.

2   Check out and compiling

- The code for CORDEX production simulations is under branch RCA4_CORDEX. Check it out like this:

  ```
  svn co svn+ssh://$USER@gimle.nsc.liu.se/home/rossby/svn/rca_repository/rca/branches/RCA4_CORDEX SRC_D
  ```

- Make sure you have the adequate compilers, modules etc. loaded/available.

  On gimle:

  ```
  module load intel/12.0.3
  module add impi/4.0.1.007
  ```

  On ekman:

  ```
  module load easy/1.8.ekman
  module load heimdal/standard
  module load beta-modules
  module load i-compilers/12.0.5
  module load openmpi/1.4.4-intel-12
  module load netcdf/4.0.1
  module load afsws
  module add subversion
  ```

- Make sure that your code is up to date and that you do not have any local changes before you compile. Thus, it is always good to do `svn update` and `svn status` before compiling.

- Compile the code with `make ARCH=gimle` or `make ARCH=ekman`. For ekman simulations you can compile your code on `k33n39.pdc.kth.se` instead to avoid problems with exceeding time limit during compilation.

3   Set up a result directory and submit a job

- Find out where your result directory, `WORK_OUT`, should be located

  On gimle:

  The `WORK_OUT` directory already exists under `/nobackup/rossby15/rossby/joint_exp/cordex`. You find the correct identification number, directory, from the list on `http://www-int/cmp/jsp/polopoly.jsp?d=1157`. You must belong to group `cordex` to be able to write under the `cordex` directory.

  On ekman:

  Create a `WORK_OUT` directory under `/cfs/ekman/scratch/x/xxxx/WORK_OUT`. Results produced here should then be transfered to correct directory under `/nobackup/rossby15/rossby/joint_exp/cordex` on gimle/vagn.

- Appropriate executable, namelist files and runScript

  - Copy appropriate executable, `rca.x` from an already performed experiement under
    `/nobackup/rossby15/rossby/joint_exp/cordex/20yyxx` on gimle,
    `/cfs/ekman/scratch/x/xxxx/WORK_OUT` on ekman,
    or from `SRC_DIR/$ARCH/bin/rca.x`.

- Copy appropriate namelist files to `WORK_OUT` from an already performed experiement under
  `/nobackup/rossby15/rossby/joint_exp/cordex/20yyxx` on gimle,
  `/cfs/ekman/scratch/x/xxxx/WORK_OUT` on ekman,
  or from `SRC_DIR/reference_setups/domains/Cordex/xxxx/`

- Copy appropriate runScript to `WORK_OUT` from an already performed experiement under
  `/nobackup/rossby15/rossby/joint_exp/cordex/20yyxx` on gimle,
  `/cfs/ekman/scratch/x/xxxx/WORK_OUT` on ekman,
  or from `SRC_DIR/tools/runScriptGimle_CORDEX`

- Edit your `WORK_OUT/namelists.dat`:

  - `&institute`
    `inst='nsc'` for gimle or `inst='pdc'` for ekman

  - `&scenario`
    Should be empty for an ERA Interim forced simulations or one of `lrcp`,`lrcp45` or `lrcp85` set to `.true.` for a control/scenario simulation.

  - `&namgcm`
    One of `lecmwf`, `lcanesm2` or `lcnrm` should be set to `.true.`.

  - `&namrestart`
    Set `doRestart=.false.` (see Section 4 for restart) and specify appropriate starttime with `reyear=` and `remonth=`.
    The default interval writing restart files is once per year. You can specify `monthly=.true.` to write restart files once per month or specify your prefered interval in number of timesteps between restart files by setting `ntimesteps=xxx`.

- Edit your `WORK_OUT/runScript`

  On gimle edit `WORK_OUT/runScriptGimle_CORDEX`:

  - `#SBATCH -n xx ##number of processors`
    Recommended number of processors for Europe is 32 and for Africa 48.

  - `#SBATCH -t xx:00:00`
    Maximum allowed wallclock time is 168 hours (7 days).

  On ekman edit `WORK_OUT/runScriptEkman_CORDEX`:

  Set appropriate number of processors as a factor of 8, e.g. `NPROC=192`

- Edit your `WORK_OUT/gcmpaths.xxx` file.

- Submit job

  On gimle:

  Do `cd WORK_OUT` and submit job as `sbatch -p nehalem runScriptGimle_CORDEX`

  On ekman:

  Do `cd WORK_OUT` and submit job as `esubmit -n24 -t60 ./runScriptEkman_CORDEX`

  where `-n24` is number of nodes (corresponing to number of processors in runScript) and `-t10080` is requested time in minutes. Maximum allowed time is 7 days which correspond to 10080 minutes. Note that you must make sure that your kerberos ticket is valid during the whole simulation. The default requested time is 30 days if you use the script `kth.sh` provided by Patrik Martinsson for Linda. So, if you have an old valid ticket it may be best to remove it and request a new one for 30 days.

4 Restart of a simulation

A restart of RCA may be needed for different reasons:

- A simulation ended in an unexpected way.

- The maximum allowed wallclock time is exceeded before the simulation should end.

- A scenario should follow on a prevoius control simulation.

By default RCA writes a restart file January 1 each simulation year (`dump_yyyy010100.nc`). Thus, to perform a restart of RCA you need such a file along with the appropriate namelist files and runScript in a directory. The best, or most safe, habit is probably to make a restart in a directory different from the one where the previous results were written, independent on the reason for a restart. Thus, let's say we have now `WORK_OUT_OLD/` and `WORK_OUT_NEW/`, respectively.

- `cp WORK_OUT_OLD/rca.x WORK_OUT_NEW/`

- `cp WORK_OUT_OLD/model_* WORK_OUT_NEW/`

- `cp WORK_OUT_OLD/namelists* WORK_OUT_NEW/`

- `cp WORK_OUT_OLD/gcmpaths* WORK_OUT_NEW/`

- `cp WORK_OUT_OLD/runScript* WORK_OUT_NEW/`

- Copy the appropriate restart file, e.g. `cp WORK_OUT_OLD/dump_yyyy010100.nc WORK_OUT_NEW/`

Depending on the reason for the restart you need to edit your namelist files more or less. For example, if you start a scenario you must specify appropriate emission scenario under `&scenario` in `namelists.dat` and you must specify an appropriate path to lateral boundary conditions in your `gcmpaths`-file.

At least you must edit `&namrestart`: Set `doRestart=.true.` and specify start time so that `reyear=yyyy` and `remonth=01` correspond to the time of the current restart file (`dump_yyyy010100.nc`).

5 Transfering of files from ekman to vagn/gimle

File transfer between Ekman and Vagn/Gimle has to be done from Ekman. To use `rsync` you have to be logged on to `ekman-rsync@pdc.kth.se`. An `rsync` example:

`rsync -ave ssh ekman_folder sm_xxx@gimle.nsc.liu.se:/nobackup/rossby15/sm_xxx/from_ekman/`

An alternative is to use the NSC 'asynchronous file transfer tool', FFV, which is design for transferring large amount of data between Ekman and Vagn (see `www.nsc.liu.se/~perl/ffv/`).

6 Analyse a simulation

On gimle:

At any moment during a simulation you can submit the script `analysis_script.sh` to recieve a pdf-file of the current status of the results:

- `cd WORK_OUT`

- `sbatch -p nehalem analysis_script.sh`

- When the job is done check the latest pdf-file in `WORK_OUT/ANALYSIS/REPORT/`

For ekman:

Transfer your results to the appropriate `cd WORK_OUT` directory on vagn/gimle. Make sure to also transfer the used `rca.x` so that we can keep track on which exact version of RCA that was used for the simulation.

Then on vagn/gimle:

- `cd WORK_OUT`

- `cp /home/matlab/rossby/GENERAL_RCA_ANALYSIS/analysis_script_RCA4_CORDEX.sh analysis_script.sh`

- `sbatch -p nehalem analysis_script.sh`

- When the job is done check the latest pdf-file in `WORK_OUT/ANALYSIS/REPORT/`