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Computer Science in Ocean and Climate Research

Exercise 9

Tutorial: (Exercise June 9th + 16th, 2020) and **Home** (until June 23th, 2020):
Topic of this exercise is the work with the simulation data obtained with Metos3D in the last exercise. The idea is to convert the data to the NetCDF data format and display it using a software called ncview. All paths below are relative to the Metos3D home directory (usually, `.metos3d`).

1. Check output files:
   - Metos3D writes output in files specified in the options file. What are the names of these files?
   - Have they been written after your test run?
   - The output file suffix is `.petsc`, i.e., the data are stored in the PETSc binary format, in this case as a vector.
2. To convert the files to the NetCDF data format, we need some prerequisites:

   Install the Conda environment on your NEC cluster account by typing:

   ```
   curl -O https://repo.anaconda.com/miniconda/Miniconda3-latest-Linux-x86_64.sh
   ```

   (Careful: It is the letter "O", not zero), and then

   ```
   bash Miniconda3-latest-Linux-x86_64.sh
   ```

   Log out and then log in again to the system.
3. Install all tools necessary for NetCDF using Conda:

   ```
   conda install netcdf4 pyyaml
   ```
4. Convert the PETSc files to NetCDF files:
   - In the `simpack` directory, run the command

     ```
     petsc2nc.py
     ```

     (this is a script which is contained in the `metos3d` subdirectory, but it can be called from anywhere). It does the conversion.
   - If you run the script without any arguments, it gives you the correct calling sequence.
   - You will need
     - to decide whether the data is 2D or 3D (we compute in the whole ocean, so the data is ...?)
     - to provide a grid file. This is available in

       ```
       data/data/mitgcm-128x64-grid-file.nc
       ```

  - a model configuration file

    `model/model/N-DOP/option/test.N-DOP.petsc2nc.conf.yaml`
  - What information does the config file contain?
- Now convert the PETSc file to a NetCDF file.

5. Use the command

   ```
   ncdump -h <filename>.nc
   ```

   to see what variables are in the NetCDF file.

6. Visualize the data using ncview, a standard climate data visualization software:

   ```
   module load ncview1.2.7
   ncview <filename>.nc
   ```

   You have to log in to the NEC cluster using `ssh -Y ...` to get the graphical output to your local machine.

7. In OLAT on the exercise page in the directory ex9, there is another NetCDF file with time-dependent output of the atmosphere model ECHAM. You can also use ncview to look at this file. The variables are just numbered in the file and have no meaningful names, but among them are, e.g., surface temperature (169), temperature at 2m (167), precipitation (142 and 143). A more detailed list of the variables that are contained in the file are listed on pages 44pp of the document

   `https://icdc.cen.uni-hamburg.de/fileadmin/user_upload/icdc_Dokumente/ECHAM/echam6_userguide.pdf`