

How to extract and prepare DWD standard COSMO-analysis for the use with INIFOR using Pamore

INIFOR expects four input files containing COSMO output:

- hhl.nc
- soil.nc
- <prefix>YYYYMMDDHH-flow.nc
- <prefix>YYYYMMDDHH-soil.nc

The prefix distinguishes different DWD products, for instance COSMO analyses (laf) or forecasts (lff). In the following we describe how you can get the required data from DWDs COSMO standard analysis using Pamore.

Preparation:

Please, check if your institution is already registered for Pamore. If not, download the registration form via the Webpage <https://www.dwd.de/DE/leistungen/pamore/pamore.html>, (see link below “zur Registrierung”).

When you are registered, you can start Pamore from the same webpage using the link “Start Pamore” and choose the button “change to english” or use the link <https://oflxd21.dwd.de/cgi-bin/spp1167/web-service.cgi> Login with your user and password.

There are different possibilities to get your data. E.g., you can use the interactive interface. But there is also the possibility to put in command lines. How you do that, is described in the following.

Choose “Database request”. You will get to a page where you can choose the kind of model data interactively or press the button “Free input of database request”.

The image shows two overlapping screenshots of the Pamore web interface. The background screenshot is the main page titled "Web Services of DWD". It displays a balance of delivered model data (210 TB, 350 Million GRIBs, 17 Million database requests) and a user login status for "Heike Noppel". It offers several services: "Retrieve model data out of database" (with a "Database request" button circled in red), "External Parameters for ICON and COSMO", "Transformation of coordinates", and "Change of user information". The foreground screenshot is a "Database request" form. It asks the user to choose the kind of model data to retrieve, with options: "Model data from operational model cycle", "Model data from NUMEX model experiments", and "Model data from the SPP 1167 testsuite". Below these options is a "Proceed" button. Below the "Proceed" button is the text "or" and a button labeled "Free input of database request", which is also circled in red. At the bottom of the form are buttons for "Go back one page", "Go back to main form", "Log out", and "Zur deutschen Version".

Step 1: Static (invariant) data (hhl.nc, soil.nc)

For INIFOR you will need the data files for the static data [hhl.nc](#) and [soil.nc](#). COSMO grid and the standard variables have changed with time. Therefore, you have to make sure to get static data for the right time period. For the static data as well as for the dynamic data you will have to set the start date (START_DATE) or/and end date (END_DATE) of the time period you want to retrieve. These must have the format `yyyymmddhh`.

Some settings of the command line options depend on your START_DATE and/or END_DATE.

For example, to get hhl.nc (the height of the vertical layers) for May, 24th 2016 type in

```
pamore -d 2016051600 -ee HHL -model lmk_ana -suffix '-hhl' -ofmt netcdf
```

On the webpage it may look like this. You submit your command by pressing the button “Submit request”.

Database request - enter resp. verify the pamore order

Please straight enter resp. verify your database request and if necessary revise it:

```
pamore -d 2016051600 -ee HHL -model
lmk_ana -suffix '-hhl' -ofmt netcdf
```

no DWD control words inside GRIB (stf_to_raw)

Submit request

or

Export your *database request* to file:

Export request

Your database query will be processed in a “batch job”. When this is finished, the data is stored on an ftp-server and an email is sent to the address given in your Pamore-account, giving you a link to where you can download your data. If you try to retrieve a large amount of data this may take a few days! In case of static data like hhl this should need only some minutes. You will need to download the zipped Netcdf-File. In the example given, its name would be `laf2014070800-hhl.nc.gz`

For the use by INIFOR you will have to unzip and rename the file it to `hhl.nc` .

The meaning of the commandline options is as follows:

-d: start date

-de: end date

-model: the model (lmk_ana for COSMO DE or cd2_ana for D2 analysis)

-suffix: a suffix for the output file which is added to the automatically generated file name (which corresponds to the start date), e.g. in order to distinguish it from other requests for the same start date.

The command to retrieve the data file with the soil type (used by INIFOR to identify water bodies) is very similar:

```
pamore -d 2016051600 -ee SOILTYP -model lmk_ana -suffix '-soiltype' -ofmt
netcdf
```

For the use by INIFOR you will have to unzip and rename the result to `soil.nc`

You will have to adjust the command line options to the time period you want to download. For details see step 2.

To make sure the COSMO standard grid was not changed within the time period you have chosen, you may repeat the command for hhl and soiltype replacing START_DATE by your END_DATE, rename the

unzipped result files to hhl_end.nc and soil_end.nc and compare them to the files you got for the start date. If they differ you should choose another time period (probably simply a shorter one).

Step 2: download the static and dynamic data

Because the format and or content of the standard analysis has changed over time, the pamore commands depend on the period of time you have chosen. There are three standards:

1. Before introduction of KENDA-Analysis (2006-07-19 to 2017/03/21)
2. Since introduction of KENDA-Analysis (2017-03-21 to 2018-05-15)
3. Since introduction of COSMO-D2 (since 2018-05-16)

For INIFOR you will need two files with static (soiltype and hhl, see above) and two files with dynamic data, one for atmospheric variables with the suffix "flow", and one for the soil variables marked by suffix "soil". That means, you need to start four queries. For the three different standards the commands are

- Before introduction of KENDA-Analysis (before 2017-03-21)

```
pamore -d START_DATE -ee HHL -model lmk_ana -suffix '-hhl' -ofmt netcdf
```

```
pamore -d START_DATE -ee SOILTYP -model lmk_ana -suffix '-soiltype' -ofmt netcdf
```

```
pamore -d START_DATE -de END_DATE -dinc 1 -ee U%110,V%110,W%109,QV%110,QC%110,T%110,P%110,PP%110 -model lmk_ana -suffix '-flow' -ofmt netcdf
```

```
pamore -d START_DATE -de END_DATE -dinc 1 -ee T_SO,W_SO -model lmk_ana -suffix '-soil' -ofmt netcdf
```

- Since introduction of KENDA-Analysis on 2017-03-21

```
pamore -d START_DATE -hstop 0 -ee HHL -model lmk -lt ass -suffix '-hhl' -kenda -ofmt netcdf
```

```
pamore -d START_DATE -hstop 0 -ee SOILTYP -model lmk -lt ass -suffix '-soiltype' -kenda -ofmt netcdf
```

```
pamore -d START_DATE -de END_DATE -dinc 1 -ee U%110,V%110,W%109,QV%110,QC%110,T%110,P%110 -kenda -model lmk_ana -suffix '-flow' -ofmt
```

```
pamore -d START_DATE -de END_DATE -dinc 1 -ee T_SO,W_SO -kenda -model lmk_ana -suffix '-soil' -ofmt netcdf
```

- Since introduction of COSMO-D2 on 2018/05/16

```
pamore -d START_DATE -hstop 0 -ee HHL -model cd2 -lt ass -suffix '-hhl' -kenda -ofmt netcdf
```

```
pamore -d START_DATE -hstop 0 -ee SOILTYP -model cd2 -lt ass -suffix '-soiltype' -kenda -ofmt netcdf
```

```
pamore -d START_DATE -de END_DATE -dinc 1 -ee U%110,V%110,W%109,QV%110,QC%110,T%110,P%110 -kenda -model cd2_ana -suffix '-flow' -ofmt netcdf
```

```
pamore -d START_DATE -de END_DATE -dinc 1 -ee T_SO,W_SO -kenda -model cd2_ana -suffix '-soil' -ofmt netcdf
```

The options that have to be changed/added depending on your `START_DATE` are marked in blue. With the option `-dinc` you can set the temporal distance between the output. With `-dinc 1` you get hourly output. As before `START_DATE` and `END_DATE` have to be replaced by date and hour in the format `yyyymmddhh`.

Caution: with these queries you get datasets for the whole model domain (Germany), i.e. large datasets! As mentioned, the retrieval of the data may take some time (e.g. one to two days).

You can find a list of Pamore options here <https://webservice.dwd.de/pamore.html>

Extra variables

You can easily retrieve other variables using the `-ee` option, e.g.

Turbulent kinetic energy:

```
-ee tke
```

Radiation:

```
-ee ATHB_S,ASOB_S,ASWDIFD_S,ASWDIR_S,T_G
```

Precipitation, evaporation and air temperature at 2 m above ground:

```
-ee RAIN_GSP,SNOW_GSP,GRAU_GSP,TOT_PREC,AEVAP_S,T_2M
```

Cloud cover:

```
-ee CLCT,CLCH,CLCM,CLCL
```

Choose an appropriate suffix for the filename using `-suffix`.

You can find out what variables are available when you use the interactive mode, in which after choosing the model (e.g. COSMO-DE), type of COSMO date (e.g. Main run analysis), the time type (e.g. One time interval), the time interval, and the level type (e.g. single level fields) a drop down menu for the variables available for the chosen level type is offered.

If the variable you need is not in the analysis output, you may check whether you find it in the forecast and use the value after the first forecast hour as an "approximation".

Caution: the option `-ofmt netcdf` is a rather "quick and dirty" solution. If this doesn't work out, simply omit the option. You will get files in grib-format, which you can change into netcdf using `cdo` (e.g. with the command `cdo -f nc copy file.grb file.nc`)