# Table of Contents

# Post processing tools

## Standard Post-Processing

CDO is a very useful tool for postprocessing SOCOL output, e.g. for calculating averages, interpolation to pressure levels, selection of variables, time steps, etc.: https://code.mpimet.mpg.de/projects/cdo/

- cdo is already installed on the IAC Linux system and can be loaded by `module load cdo`

The classical post processor for ECHAM data is the "afterburner" which provides the following operations:

- Extract specified variables and levels
- Compute derived variables
- Transform spectral data to Gaussian grid representation
- Vertical interpolation to pressure levels or height
- Write data in `GRIB`, `NetCDF`, `SERVICE` or `EXTRA` format
- User manual: afterburner.txt
- Afterburner source code and Makefile: after.tar
- ⚠ The cdo command *after* does the same as the afterburner, and is easier to use!!!

## Calculation of Residual Circulation and EP-fluxes

The calculation of the residual circulation and the EP-fluxes follow Andrews (1987): https://wiki.iac.ethz.ch/pub/Chemie/PostProc/Andrews_1987_p127ff.pdf

### Required Input

- daily mean or 6 hrly (better) instantaneous 3D T [K], u [m/s], v [m/s], omega [Pa/s] on pressure levels [Pa]
- ⚠ ATTENTION: the namelist setting `PUTDATA    = 24, 'hours', 'first', 0` outputs **instantaneous values every 24 hours, not daily averages**!!! That leads to artefacts in the calculated TEM in the mesosphere. If you intend to calculate the residual circulation from your model output, set `PUTDATA    = 12, 'hours', 'first', 0` or better `PUTDATA    = 6, 'hours', 'first', 0`
- cdo script for preparing input data for epf routine from model output: https://wiki.iac.ethz.ch/pub/Chemie/PostProc/make_epf_vars_netcdf.sh

### EPF-Routines

- Using a temperature-dependent density: https://wiki.iac.ethz.ch/pub/Chemie/PostProc/epf_from_daily_v3.f90
- Using a fixed scale height of *H=6950 m* and log-pressure altitude: https://wiki.iac.ethz.ch/pub/Chemie/PostProc/epf_from_daily_v4.f90
- ⚠ *NOTE: Although CCMI recommended a fixed scale height, we used a temperature-dependent density to calculate the residual circulation and EP-fluxes from the CCMI simulations!!!*

### Other Useful Scripts

- Compiling epf routines: https://wiki.iac.ethz.ch/pub/Chemie/PostProc/compile_epf_from_daily.sh
- Script to postprocess several months: https://wiki.iac.ethz.ch/pub/Chemie/PostProc/calc_ep-flux.csh

# CMOR (Climate Model Output Rewriter)

CMOR is a "handy" data post-processing tool originally designed to produce datasets conforming to CMIP conventions. It has since been adapted by the CCMI community for CCMI-1. CMOR stands for Climate Model Output Rewriter.

- Laura's CMOR documentation: https://wiki.iac.ethz.ch/pub/Chemie/PostProc/CMOR_SOCOL_documentation.pdf
- Laura's CMOR scripts: https://wiki.iac.ethz.ch/pub/Chemie/PostProc/cmor_scripts.tar