

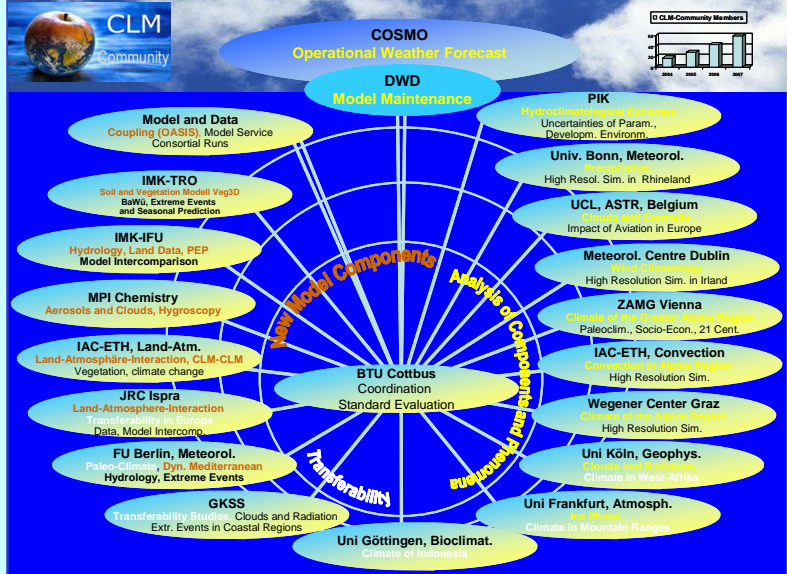


# The CLM-Community and its Activities

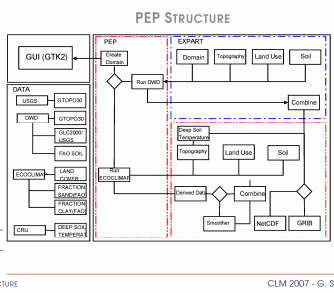
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The CLM-Community is an growing international network of scientists from different climate research institutions developing and applying the climate mode of the COSMO model (COSMO-CLM), which is a unified model version for operational weather forecast and regional climate modelling. In the last year 16 new members joined the community. The figure on the right gives an overview of the members institutions and their main activities within the network.

The main achievements of the last year are presented further below. The PrE Processor PEP and the unified interpolator int2lm2 provide the opportunity to use different initial and boundary conditions for regional climate simulations and for numerical weather prediction runs. The scenario simulations with ECHAM5/MPIOM boundary conditions are at the moment a unique data set of an ensemble of transient, high resolution (1/6 °) climate change simulation over the time period 1960-2100. Furthermore, the priority projects for model developments are listed also.



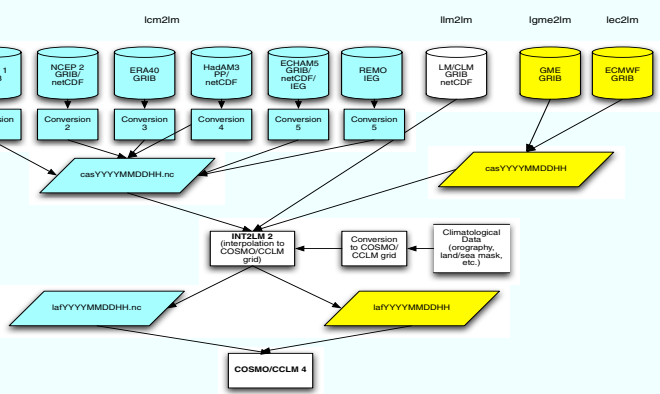
## Initial and Boundary Conditions



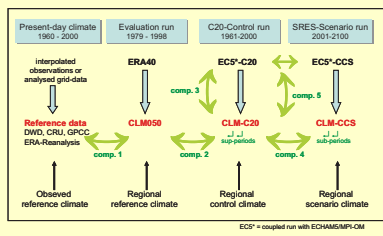
**Figure 1+2: Structure of the PrE Processor PEP.** Additionally to the DWD external data the ECOCLIMAP data set is made available by the program PEP (G.Smatek, IMK-IFU). The topography is taken from the USGS data and the deep soil temperature from the CRU data set. The output format can be chosen GRIB or NetCDF, which is an international standard used by the CLM-Community. The output parameters are given below.

| Variable | Description               | DWD | ECO          |
|----------|---------------------------|-----|--------------|
| HGBR     | Surface height            | •   | •            |
| COVFR    | Land cover                | •   | •            |
| SL       | Surface roughness length  | •   | monthly mean |
| LAI      | Leaf area index           | •   | monthly mean |
| FLAND    | Land use fraction         | •   | •            |
| FLCOV    | Vegetation area fraction  | •   | monthly mean |
| F_SFC0   | Forest deciduous fraction | •   | •            |
| F_CON    | Forest coniferous         | •   | •            |
| F_EV2R   | Forest evergreen          | •   | •            |
| ROCDP    | Root depth                | •   | •            |
| SOIL_TK  | Soil texture              | •   | •            |
| TCL      | Deep soil temperature     | •   | •            |
| SLT_WAE  | Under-soil traction       | •   | •            |

**Fig. 3: The int2lm2 interpolator**  
The figure shows the in- and output of the interpolator int2lm2. The number of different input data is substantially increased in comparison to int2lm1. The ERA40 and NCEP reanalysis and the output of different global (ECHAM5, HadAM3, GME) and regional (COSMO, REMO) models can be used now as initial and boundary conditions for weather and climate applications with the COSMO-CLM. Further conversion tools are in preparation. The possible



## Scenario Simulations and the Quality Control

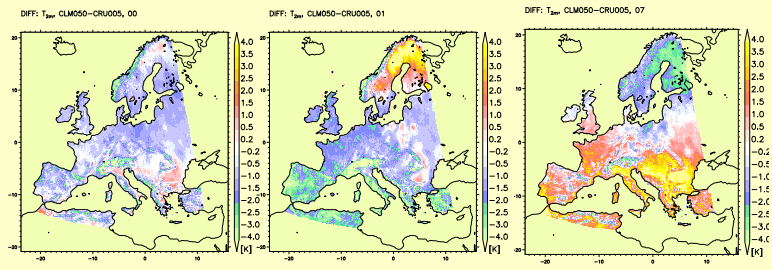


During the last 18 months the scenario simulations with the CLM 3.1 model version have been successfully conducted by the M&D group. The configuration of the runs is available on internet. The main configuration parameters are:

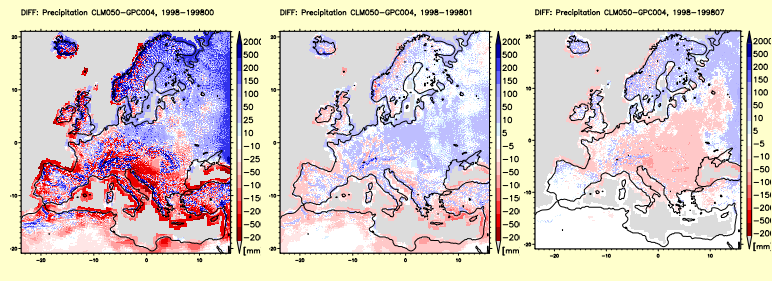
Horizontal resolution: 18km  
Europe (21x257x32)  
Time Step: 75s

The following simulations have been conducted in transient mode:  
Simulations Time Period Forcing  
CLM050 1979-2000 ERA40  
C20\_1, C20\_2, C20\_3 1955-2001 ECHAM5/MPIOM control  
A1B\_1, A1B\_2 2001-2100 ECHAM5/MPIOM scenario  
B1\_1, B1\_2 2001-2100 ECHAM5/MPIOM scenario

**Figure 4: Quality control for Scenario Simulations**  
The figure gives an overview of the concept of the quality control of scenario simulations. Selected results will be published in a Technical Report. All results will be made available on internet. The very basis of the quality control is the comparison 1 between the evaluation run CLM050 and the reference data.



**Figure 5: Climatological difference of the 2m-Temperature between CLM050 and CRU for the time period 1979-1998.** The evaluation of the 2m-Temperature of the CLM 3.1 model version against CRU data exhibits a cold bias of roughly 0.5 K in most parts of Europe for the yearly climatology. In the winter and in the summer the results are substantially different. In each season there are regions, which exhibit nearly perfect results, like e.g. the T<sub>2m</sub> in Germany in the summer. As shown by the other comparisons, the results depend on the forcing, the time period, the season and the region.



**Figure 5: Climatological difference of Precipitation between CLM050 and GPCP data for the time period 1979-1998.** The evaluation of precipitation of the CLM 3.1 model version against GPCP data exhibits a moderate overestimation of precipitation in northern Europe and an underestimation in some regions in southern Europe for the yearly climatology. The results are qualitatively different for the summer and the winter season (notice please, that the monthly sums are one order of magnitude smaller). However nearly perfect precipitation was simulated for Germany, as shown by the annual cycle figure. As shown by the other comparisons, the results depend on the forcing, the time period, the season and the region.

## Model Development Activities

The most of the developments of the COSMO Model system in last 3 years provided by members of the CLM Community have been devoted to technical improvements like restart, NetCDF-standards, extension of the preprocessor. This stage is mainly finished and the activities focus now on model extensions and improvements of existing model components in order to reduce the model uncertainties.

The main model developments are:

- Coupling with the Soil-Vegetation model VEG3D**, Cathérine Meißner and Gerd Schädler, IMK-TRO Karlsruhe  
VEG3D is already fully coupled with COSMO\_4.1  
Additional parameters:  
Land use => taken from the DWD Pep  
Soil parameters => additional file in CLM code  
  
General Results in comparison to TERRA\_ML:  
Annual evapotranspiration sum is more homogenous in VEG3D which agrees better with measurements (figures).  
Influence on annual precipitation is in the range of 100 – 200 mm.
- Coupling with the Soil-Vegetation Community Land Model (CLM)**, Reto Stöckli and Sonia Seneviratne, ETH  
The coupling between COSMO-CLM and CLM is not finished.  
The documentation of the Community Land Model can be found on the homepage <http://www.cgd.ucar.edu/tss/clm/>. The model is used in the Community Climate System Model (CCSM). It provides several additional features as given in the graph.
- Aerosol-Cloud Coupling and Atmospheric Chemistry in Climate Mode**, S.Metzger (MPI-C Mainz), E.Schaller (BTU Cottbus)  
Recently the COSMO-ART model version has been finished for atmospheric aerosol and chemistry applications. This work shall be combined with further developments in this field, like the cloud-aerosol feedback (hygroscopicity), investigated by S.Metzger and fast atmospheric chemistry solvers being tested in Cottbus.
- Implementation of the NEMO ocean model for the mediterranean (NEMO-MED)**, G.Leckebusch, H.Hübener, U.Ulbrich (FU Berlin), S.Legutke and I.Fast (Model and Data, Hamburg), A.Will (BTU Cottbus)  
The COSMO-model simulations over Europe are strongly influenced by the prescribed SSTs of the mediterranean sea. A project has been started to couple the NEMO ocean model in the configuration for the mediterranean with the COSMO-CLM in order to overcome this short coming.

