



# COSMO / CLM Training Course

DWD and the CLM-Community

DWD Training and Conference Center (BTZ) in Langen

02-06 March 2009

## Introduction

The COSMO-model together with the preprocessing package is a state of the art, unified, nonhydrostatic model system for simulating the processes of the atmosphere. The model has been originally developed by DWD and the COSMO Consortium. Later on a climate mode (CLM) has been provided by the CLM Community with extensions necessary for climatological applications. Today, the COSMO/CLM is a unified model system for numerical weather prediction (NWP) and regional climate modelling (RCM). Different operational configurations are used by different national weather services and regional climate research units.

This course will provide basic training on the usage of the model in NWP and RCM mode. Lectures on the different components of the model (dynamics and numerics, physical parameterizations, data assimilation) will be offered by the model developers with emphasis on standard applications. The practical exercises will give the opportunity to compile the programs, run the model and analyse the output of NWP and RCM runs using standard scripts.

We invite students and scientists interested to work or already working with COSMO/ CLM to participate in this Training Course. Those interested in parts of the training are invited to register for these parts only.

## Location

The Training Course will take place at the DWD Trainingcenter in Langen, Germany. For more information on the Trainingcenter see <http://www.dwd.de/btz>.

## Registration

The deadline for reservation is **01. February 2009**.

A *Registration Form* is available on DWD's web page and can be found under the link <http://www.dwd.de/modellierung>.

First, you will be directed to a german page. For an english version just click the British flag in the upper panel. In the right column of this page you will find a box entitled *Seminars, Workshops* (in german: *Seminare, Tagungen*). From there follow the link to *COSMO User Seminar 2009* → *Registration Form* (in german: *Anmeldungen*).

Due to limited capacity of the computer-pool at the trainingcenter, the number of participants is limited. This year, two computer-pools are available to offer the exercises for NWP- and CLM-applications seperately, so that a total of 60 places can be offered. If there are more applications, a prioritization will be done by the organizers.

For this training 10 places are reserved for the members of each of the groups: COSMO, CLM-Community and the DFG Schwerpunktprogram SPP1167, *Quantitative Precipitation Forecast*.

A limited number of rooms is available at the convention center BTZ Langen at the price of 35.50 Euros and can also be booked with the above mentioned *Registration Form*. Please make your reservation as soon as possible!

## Contents of the Training

### Theory Lessons (TL)

1. Model Overview Schättler
  - Components of the COSMO-Model system
  - The Software Package: Availability and User Support
  - Necessary computing environment
  - Necessary data to operate the model
2. Dynamics and Numerics I Will
  - Continuous and discretized model equations
  - Time splitting
  - Grid definition
  - Spatial discretization schemes
  - Leapfrog and Runge-Kutta time stepping
  - Boundary conditions
3. Dynamics and Numerics II Will / Baldauf
  - The Leapfrog time step and available spatial discretizations
  - The Runge-Kutta time step and available spatial discretizations
  - Advection algorithms (semi-Lagrange, Bott, etc.)
4. Physical Parameterizations I Ritter / Seifert
  - Radiation
  - Cloud Microphysics and (subgrid-scale) cloudiness
5. Physical Parameterizations II Mironov / Raschendorfer
  - Convection
  - TKE scheme
  - Surface layer scheme
6. Physical Parameterizations III Helmert / Mironov / N.N.
  - Soil and Lake Models
  - Subgrid Scale Orography scheme
7. Verification for NWP Damrath
8. Data Assimilation for NWP Schraff
  - Nudging for the Atmosphere
  - Sea Surface Temperature Analysis
  - Snow Analysis
  - Soil Moisture Analysis
  - Latent Heat Nudging
9. Evaluation of CLM runs Will
10. Aerosols and Chemistry Vogel

## Practical Exercises

All exercises will be offered separately for the NWP- and the CLM-applications.

1. Installation of the Model System Schättler / N.N.
  - Installation of the Source Code
  - Installation of the Grib and the NetCDF libraries
  - Creating the binaries for INT2LM and the COSMO-Model
  - Defining the model domain and getting external parameters
2. Preparing external, initial and boundary data Schättler / N.N.
  - Job organization and Run-Scripts
  - External Data
  - Namelist Input for INT2LM
3. Running the COSMO-Model in NWP- / Climate-Mode Schättler / Fast
  - Job organization
  - Namelist Input for the COSMO-Model
  - Basic configurations for NWP
  - Case Studies / Experiments
4. Visualization of GRIB / NetCDF Files Schättler / Fast
  - Graphics
  - Visualization of Grib data
  - Visualization of NetCDF data
5. Troubleshooting in NWP- / Climate-Mode Schättler / N.N.
6. Individual Exercises Schättler / Will
7. Running idealized Test Cases Baldauf / Schättler
8. Running COSMO-ART Vogel

A preliminary detailed timetable is given below.

## Lecturer

Michael Baldauf, DWD FE 13  
Ulrich Damrath, DWD FE 15  
Jürgen Helmert, DWD FE 14  
Irina Fast, Model and Data  
Dmitrii Mironov, DWD FE 14  
Matthias Raschendorfer, DWD FE 14  
Bodo Ritter, DWD FE 14  
Ulrich Schättler, DWD FE 13  
Jan-Peter Schulz, DWD FE 13  
Christoph Schraff, DWD FE 12  
Axel Seifert, DWD FE 13  
Bernhard Vogel, IMK-TRO Karlsruhe  
Andreas Will, BTU Cottbus

## Further Informations

### Language and Prerequisites

Presentations and all slides will be in English. We expect a certain familiarity with Linux and Linux editors, shell-scripts and FORTRAN, basic knowledge in geophysical fluid dynamics, in analytical and discrete mathematics (3D analysis, linear algebra).

### Fee

No fees will be charged!

### Literature and textbooks

Every participant will get a free CD with

- Slides of all presentations
- Short User's Guide
- Model Documentation

The RRZN Handbook *Fortran 95* will be available for the price of 10 EUR.

Time	Monday	Tuesday	Wednesday	Thursday	Friday			
0900 – 1030		Dynamics and Numerics I Overview; Leapfrog Will	Dynamics and Numerics II Runge-Kutta; Stability Baldauf	Phys. Parameterizations II Convection; TKE Mironov Raschendorfer	Verification for NWP Damrath			
1030 – 1100		Coffee Break						
1100 – 1230		Phys. Parameterizations I Radiation; Microphysics Ritter; Seifert	Aerosols and Chemistry COSMO-ART; Dynamics Vogel	Phys. Parameterizations III Soil; Lakes; Subgrid Scale Orography Helmert, Mironov, N.N.	Evaluation of CLM runs Will / NN			
1230 – 1330		Lunch Break						
1330 – 1500	Model Overview Schättler	Running in NWP Mode Schättler	Running in Climate Mode Fast / Will	Idealized Test Cases Baldauf	Running COSMO- ART Vogel	Data Assimilation for NWP Schruff		
1500 – 1530		Coffee Break						
1530 – 1700	Installation of the Model System Schättler	Installation of the Model System N.N.	Running in NWP Mode Schättler	Running in Climate Mode Fast	Trouble- shooting in NWP Mode Schättler	Trouble- shooting in Climate Mode Fast	Individual Exercises Schättler	Individual Exercises Will / Panitz
1700 – 1830	External, initial and boundary data Schättler	External, initial and boundary data N.N.	Visualization of GRIB Files Schättler	Visualization of NetCDF Files Fast	Individual Exercises Schättler	Individual Exercises Schättler	Individual Exercises Will / Panitz	
1830 – 2100			ICE BREAKER					