Meteorologische Zeitschrift, Vol. **17**, No. 4, 347-348 (August 2008)

Editorial

The Regional Climate Model COSMO-CLM (CCLM)

BURKHARD ROCKEL[1]*(GUEST EDITOR), ANDREAS WILL[2] (GUEST EDITOR) and ANDREAS HENSE[3] (EDITOR)

[1]GKSS Forschungszentrum Geesthacht, Germany
[2]Technische Universität Cottbus, Germany
[3]Meteorologisches Institut Universität Bonn, Germany

In the early 1990s the German Weather Service (DWD) found that future demands on weather forecasting would require convection resolving weather simulation. This required grid mesh sizes much less than ten kilometres, which could not be achieved by the Deutschlandmodell (DM), the operational model at that time. DM was a hydrostatic model and thus limited by physical reasons to grid mesh sizes larger than about ten kilometres. Therefore the DWD decided to develop a new non-hydrostatic model, the Lokalmodell (LM). The LM superseded the DM as operational weather forecast model in 1999 and after several improvements met the expectations in several respects.

The same arguments seem to be valid for climate simulations. Furthermore, most regional climate models (RCMs) originate in a weather forecast model. Therefore it was not surprising that scientists at the Potsdam Institute for Climate Impact Research (PIK) took into account the LM as an option when they looked for an appropriate RCM for their WAVES project (BÖHM et al., 2003) at the end of the 1990s. The non-hydrostatic kernel, the modern, clear and modular programming, and the efficient MPI parallelization were some of the reasons to take LM into consideration. After test simulations with encouraging results scientists at PIK decided to develop a new RCM on the basis of the LM. In summer 2002 the first climate version of the LM (CLM) was completed. Meanwhile scientists from TU Cottbus and GKSS Research Centre jointed the CLM development and formed the basis for the further development of the CLM over the next years. The first long term hind-casting simulations (fifteen years driven by ERA15 re-analysis data) where performed in 2004. The third version of these simulations was used in an intensive validation of the CLM with focus on the ability of the model to serve as a RCM in comparison with other RCMs. Scientists at TU Cottbus carried out the major part of this validation and found the CLM to be in the same range of accuracy as other RCMs resolving similar scales. In the same year the CLM was successfully applied to future scenario simulations in the PRUDENCE project (CHRISTENSEN et al., 2007). In the performed time slice experiments (1961–1990, 2071–2100) the CLM again exhibited competitive results.

The successful initial phase was followed by the development of a scientific community. All scientists have been invited to build an open, international network of scientists, aiming to systematically develop the CLM, to coordinate their activities and to effectively use the computational resources. The CLM-Community was born. Fig.1 shows the development of the number of the scientists participating in the CLM-Community. In June 2008 the community had 70 members belonging to 21 working groups (see www.clm-community.eu).

A major milestone in the CLM development was the nomination as community model for the German climate research by the steering committee for the German Climate Research Centre (DKRZ) in 2005. This was a pre-condition for adopting the CLM for the ensemble, transient climate change runs (consortial runs) in 2006, which were performed by the Model & Data group of the Max-Planck-Institute for Meteorology in Hamburg with support of the CLM-Community. These simulations consist of two climate scenarios (A1B and B1) with two realisations each for the time period 1960–2100 driven by ECHAM5 at the boundaries. The outcomes of the simulations form the basis of several studies on changes in future regional climate including impact studies.

One of the basic ideas of the CLM development was, that a perfect model should simulate the weather and the climate best. Therefore the CLM-Community always kept in touch with the LM developers at DWD. In 2007 this resulted in the reunion of the CLM and the LM (which was re-named to COSMO-model in the meantime) into the unified limited area model for operational weather forecast and regional climate modelling COSMO4. The special setup of this model for climate simulations is named COSMO-CLM or CCLM. Two large groups (the COnsortium for Small-scale Modelling (COSMO) of several European national weather services and the Climate Limited-area Modelling Community (CLM-Community)) are currently using and developing further the COSMO4 unified model with joint efforts. It is expected that this will provide a great potential of this model in the future. In this special issue members of the CLM-Community present results from their work regarding the CLM over the last years in 15 articles. An additional block of articles will still follow in a standard issue of the *Meteorologische Zeitschrift* including a detailed description of the CLM and its dynamical and physical core. We

*Corresponding author: Burkhardt Rockel, GKSS Forschungszentrum, Max-Planck-Str., 21502 Geesthacht, Germany, e-mail: Burkhardt.Rockel@gkss.de

0941-2948/2008/0309 $ 0.90
DOI 10.1127/0941-2948/2008/0309

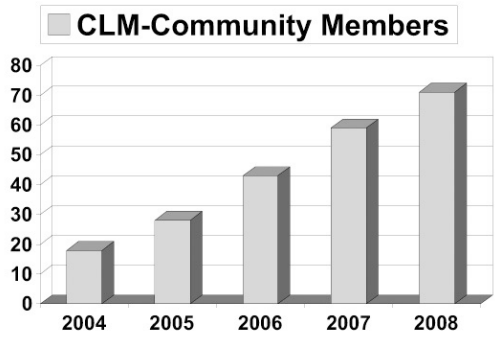

Figure 1: Development of the number of scientific members in the CLM-Community.

thank the editors and the publisher of *Meteorologische Zeitschrift* for the opportunity of making a special issue on the CLM. We especially acknowlege the work of the anonymous reviewers who helped to prepare this special issue and significantly contributed to its scientific quality.

References

BÖHM, U., F.-W. GERSTENGARBE, D. HAUFFE, M. KÜCKEN, H. ÖSTERLE, P.C. WERNER, 2003: Dynamic regional climate modeling and sensitivity experiments for the northeast of Brazil. – In: Global Change and Regional Impacts. Ed.: GAISER, T., M. KROL, H. FRISCHKORN, J.C. ARAÚJO, Springer-Verlag Berlin, Heidelberg, New York, 153–170.

CHRISTENSEN, J. H., T.R. CARTER, M. RUMMUKAINEN, G. AMANATIDIS, 2007: Evaluating the performance and utility of regional, climate models: the PRUDENCE project. – Climatic Change **81**, 1–6.