Agreement (v.4)

on the joint utilisation and further development of the regional climate model CLM

1. Preamble

After more than 10 years of development regional climate models have reached a level which allows the recording of regional climate patterns with continuous, high-resolution long-term simulations in great detail and to simulate their possible changes under the influence of global and regional interference with the climatic system. But the operation of these models, the analysis of their results, as well as the continuous improvement of their efficiency and its quantitative examination are connected with considerable and continuously increasing costs. Thus the efficient use and further development of a regional climate model increasingly requires coordinated, joint actions of a large group of scientists. In order to concentrate common interests and to support rapid scientific progress, it is recommended to use a central regional model, which will be referred to here as the "community model".

The scientists and/or scientific institutions signing this agreement declare that they are willing to jointly use and develop the COSMO-CLM software (int2lm-clm, COSMO-CLM, PEP, PPP). The rules developed for the main COSMO-CLM software (int2lm-clm and COSMO-CLM) are applied accordingly on PEP and PPPs. COSMO-CLM is the climate version of the weather forecast model COSMO, originally developed by the DWD and now further developed and applied by COSMO (COnsortium for Small scale Modelling), as a regional climate model. In addition to the general improvement of the cooperation in solving urgent questions of regional climate research, the members of this community especially see the opportunity:

- to make more rapid progress in increasing the performance of the model used by co-ordinated model development,
- to guarantee a higher efficiency in utilisation and development through the division of work,
- to maximise scientific and technical experience and results by regularly exchanging information,
- for optimised conduct of joint simulations which conserve resources,
- for a more complete analysis of the extensive simulation results considering various aspects,
- to make a substantial contribution to international cooperation in the field of regional climate modelling.

The signatories are obliged to implement and keep the rules and agreements specified in here. They agree that maintaining the scientific community and the desired coordinated intensification of regional climate research can only be achieved by voluntary and joint implementation of the regulations stated herein.

2. Purpose of the Community Agreement

The aim of the agreement signed is to facilitate and to assure

– a coordinated further development and maintenance of the regional climate model COSMO-CLM as a community model of university institutes and research centres of climate research,

– a joint conduct and analysis of simulations,

– the exchange of experience and results in the field of climate modelling and

– the support of external users (e.g. from the field of climate impact research) of the simulation results in the utilisation and interpretation of the data.

The following points regulate the handling of the model and the cooperation of the community members. All members *(see Paragraph 8)* of the community recognise the regulations stated herein as obligatory.

3. Utilisation of the Community Model (Rights and Obligations)

The community model CLM as well as all routines for pre- and post-processing are made available for every member for the time of his/her membership in the community. The commercial utilisation of the model within the framework of this agreement is explicitly forbidden and is subject to a special contractual arrangement between the DWD, the coordinating office (*Paragraph 9*) and the member. Furthermore, passing the model on to third parties is excluded if they have not yet become members of the community. This applies to all existing versions of the model, including those developed as interim or improved solutions.

The community member is allowed to

- conduct his/her own simulations using the model and publish their results (*Paragraph 7*),
- pass on the results obtained to third parties,
- change the model code for test purposes, the required adaptations and extensions and the general improvement of the model quality.

The community member has to:

- explain to the community the intended work with the model for the purpose of better coordination of their activities (*Paragraph 8*),
- make the achieved results available to the community (*Paragraph 5*),
- return the model modifications to the community (*Paragraph 4*),
- stick to guidelines for code structure and documentation (P*aragraph 9, Appendix C*) when returning altered model versions,
- take measures for quality assurance (*Paragraph 6*), which guarantee the reproducibility of the results achieved.

Pass on the Identified errors in the code or in the results immediately to all members by informing the responsible colleagues (source code administrator, coordinating office, bug report system). The corrected source code version has to be forwarded immediately to the source code administrator. It will be evaluated later within the framework of the standard evaluation of the subsequent version.

The community member should:
- inform the community about problems and progress during the work in timely manner,
- participate in joint user meetings,
- inform the community about presentations and publications which contain results achieved by using the model,
- stick to the recommendations made by the DFG for securing good scientific practice (*Appendix B*).

A joint utilisation of simulation results and an intensive exchange of experience during model development are explicitly desired and are supported by the coordinating office (*Paragraph 9*).

4. Model Development and Documentation

A major aim of the community is to systematically further develop the regional climate model COSMO-CLM through continuously improving individual model components and by extending additional process modules. In this section, general rules are summarized, which have to be fulfilled by code developers. An additional document "COSMO Standards for Source Code Development" (Schättler, 2011) explains the rules in more detail.[1]

a) General Aspects:

Coordinated Model Development: Improvements and extensions of the COSMO-CLM software by individual members or work teams should always be in-line with the scientific / technical planning coordinated by the CLM-Community Coordinating Group (CLM_CO). Before starting a new COSMO-CLM software development, the CLM_CO should be contacted. This aims to avoid unnecessary double work and to use already existing experience in a better way (*see Appendix A*). The final decision on changes to the COSMO-CLM software is taken by the CLM-Community Assembly.

Information about model developments: After the completion of work or single work steps, community members are informed about the results of the model extension by presentation at the CLM-Community Assembly.

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[1] The document COSMO Standards for Source Code Development has not been accepted by the CLM Community at the assembly 2011. It is under revision. Some of the rules specified in this section might be revised in the near future.

A **Code Responsible Person** must be named, who can be contacted in case of questions or problems. In order to assure good quality code and support, there is the need that all components of the code do have a responsible person.

The **administration of the community model versions** is organized by the coordinating CLM-Community office and the CLM-Community WG Support and Technical Issues (SUPTECH). **Source code administrators (SCAs)** and members of the CLM-TAG are named by the CLM-Community for all components of the COSMO-CLM software.

A version control system has to be used for all components of the CLM-Community software by the SCA so that accessing older versions and reconstructing alterations made are possible at any time.

b) Coding rules:

The source code provided must be properly designed and conform to the coding rules (see chapter 4 in Schättler, 2011). Alterations and extensions of the model code needs to be integrated in such a way that results of previous versions can be reproduced at any time. Exceptions are corrections of model bugs.
The decision, whether the coding rules are fulfilled, is taken by the SCA of the corresponding software. In case of conflict, the case is taken to the CLM-TAG.

c) Documenting of model developments:

Together with the modified source code the developer has to deliver a product and a process documentation of the implementation (i.e. extensions, changes, bug fixes) in a form accepted by the SCA. It has to be well understandable and complete in the sense that the extensions and/or modifications can be identified by other users. In particular it has to be written in such a way that it can be included in the existing documentation without major modifications.
The Product Documentation has three parts: the external scientific documentation describing the basis of the model developments and the method of implementation, the external user's guide describing the basic features and the internal code documentation describing the implementation method.
The Process Documentation is a short external description of the changes of the source code for the version log-file.

In the case of further developments of model physics and dynamics **a documentation of the results** needs to be made available to the community.

d) Quality Control and Quality Assurance (Testing)

Three types of quality tests are to be conducted for each CLM-Community (released) model version: the technical test suite, process-oriented evaluation and standard evaluation. They are described in more detail in (Schättler, 2011).

The quality of model extensions and/or modifications has to be checked by the colleagues who implemented it by application of the technical test suite and by thorough evaluation of the relevant processes (process-oriented evaluation) before first submission to the SCA.

In preparation of new released COSMO-CLM model versions the standard evaluation is conducted by the responsible colleagues, as specified in "Responsibilities for CLM-Community Tasks".

e) Status of the model version:

Every version which is not part of a VCS is called a private version and is available only for the developer. Only if code is provided to the SCA and checked into the VCS, it is part of an official version. For every official version the SCA defines a certain status to identify its availability for the users. (see also sec. 6.1. of (Schättler, 2011))

Preliminary development Version (PDV)
is a CLM-Community Test or Released Version which contains a new model development, which passed the technical test suite and appropriate process studies and for which a report exhibiting the relevance of the modification exists.

Development Version
Is a CLM-Community model version containing new model developments already implemented in a PDV and discussed in the CLM_CO. The version passed the technical test suite and meets the coding rules.
These versions are intermediate versions that are only given to the developers for further work and testing (process studies). With different development versions the SCA has the possibility to check in the different developments one by one.

Test Version
is a CLM-Community model versions containing one or more model developments already implemented in a DV.
The version passed process studies, the 4 eye principle and is fully documented. These versions are given to special test persons, who are conducting more extensive common tests (evaluation).

Released version (CLM-Community version):

After discussing the model evaluation the community is to jointly decide which changes in the COSMO-CLM code should become part of the next released version. This version is then released to the community.

Unified version (CLM-Community and COSMO released version):

A model version, which has the status of released model version in COSMO and the CLM-Community is a unified version.

5. Archiving and availability of results

Archiving and Reproducibility: In order to guarantee the community's high quality demands to their scientific way of working, the results of relevant and especially published simulations are always to be documented in such a way that their reproduction is possible at any time. In addition to archiving the driving data used and the numerical simulation results achieved, this also includes the securing of the model configuration (programme codes and the accompanying control variables). The respective data and codes are to be archived by the creator of the model results and kept beyond the end of his/her own scientific work in accordance with the suggestions made by the DFG for securing good scientific practice (*Appendix B*).

Model Developments and Simulation results: After the completion of one's own work the results of model development are to be made available for the community as quickly as possible via the corresponding source code administrator and the central coordinating office (*Paragraph 9*), the results achieved with the model are to be made available to the community members as quickly as possible via information of the coordination office, unless it is explicitly forbidden by stipulations from third parties (e.g. the project grantor). This includes the location of the programme code, of the driving data needed for the simulation and of the results of the relevant simulations. In doing so, the data formats, code and programme structures as well as the documentation conventions specified by the coordinating office are to be kept.

It is explicitly appreciated when simulation results are already made available to community members even if one's own work has not been yet completed, or when several members reach an agreement concerning the conduct and analysis of joint climate simulations in advance.

Guidelines for users: When working with the results the general guidelines of scientific work (e.g. indication of author, co-authors) are to be kept as is, for example, specified in the suggestions made by the DFG to secure good scientific practice (*Appendix B)*.

In any case the protection of the individual idea is guaranteed by the community members as a scientific principle.

External Usage of simulation results: Passing on simulation results to colleagues or institutions outside the community (external users) is subject to the explicit agreement by the author.

Archiving Guidelines: All relevant in- and output files as well as programme codes used for the simulation are to be archived to enable quality assurance (*Paragraph 6*), reproducibility and further utilisation by the author. The description of data and information of their availability (metadata) are to be administered by the coordinating office.

6. Publications

The right to publish scientific results achieved by using the COSMO-CLM (CCLM) belongs to the respective user of the model without limitation. Individual results can be presented at conferences at any time.

Citation of the model: In each publication the use of the "COSMO model in Climate Mode (COSMO-CLM)" is to be indicated and the statement "COSMO-CLM is the community model of the German regional climate research" has to be used. Basic publications or links to the model configuration and evaluation are to be cited, if required. When presenting joint results the participating partners are to be informed.

Information about publications: The coordinating office should be informed about lectures, conference presentations, and publications which are directly connected with the use of the community model. The list of publications generated serves for the exchange of information within the community and, if needed, can be used for the documentation of the community's efficiency.

7. Membership

Every person affiliated at a research institution who wishes to use the model for his/her own research purposes and accepts the guidelines stated herein without restrictions can become a community member of the users of the model COSMO-CLM. Membership is effected by means of an informal application *(see sample in Appendix D)* to the coordinating office. This application must contain:
- a declaration of consent to obey the community agreement,
- a description of the intended scientific work for which the model is to be used.

Membership is documented by listing the member (name and institution) and a description of the objectives in Appendix A of this agreement.

Every member has the right to nominate further users of the CLM. Such users will be a community member for a year provided that the guidelines of the community are obeyed by them and the nominating member.

The membership in the community ends when she/he leaves the institution.

The coordinating office is to inform the community immediately about the changes in membership and the objectives of the members.

8. Organisational Structure

Bodies: For the coordination of the activities of community members, the support of the exchange of information, and the maintenance of code and documentation the following bodies of the CLM-Community have been established:
- regular CLM-Community meetings,
- a special coordinating office at the BTU Cottbus,
- Working and Project Groups
- the Scientific Advisory Board and
- the Technical Advisory Group (TAG).

The character, competence and decision rules of the bodies are specified in the "Terms of Reference of the CLM-Community".

Responsibilities: The tasks relevant for the community are named Community-tasks. The responsibilities for these tasks are shared between the coordinating office and the working

and project groups at the sharing is decided at the regular CLM-Community meetings. The list of Community-Tasks and the responsibilities are summarized in the document "Responsibilities for CLM-Community Tasks".

Cooperation with COSMO: By means of close cooperation between the CLM-Community and COSMO the versions of the operational forecast model COSMO and the regional climate model COSMO-CLM are to be reunified regularly. This involves the willingness of COSMO to provide new model versions of the COSMO model to the CLM-Community and to integrate CLM-Community model development into the code package of the COSMO model. Details concerning this will be regulated in special arrangements and agreements.

Appendix A: List of community members and their area of work

The people and institutions listed in the members list have agreed to obey the community agreements explained here and have thus declared their membership within the CLM community. With the topic specified they will contribute to the further development and utilisation of the CLM.

Appendix B: Securing good scientific practice

The community members commit themselves to keep a high scientific-ethical standard when communicating with each other and while handling their scientific results. The recommendations of the DFG commission "Self-control in Science" for securing good scientific practice serve as the basis for their scientific work provided they can be applied to the tasks involved in the daily work and the structures concerning this community. If detailed implementation of these recommendations, which is obligatory for the staff at the institutions involved, does not exist, the DFG's general guidelines, as outlined in "Suggestions for the securing of good scientific practice" of January 1998, can be used as an orientation. The DFG's recommendations are a subject of this agreement and can be read on the CLM-Community homepage (www.clm-community.eu).

Appendix C. Documentation and Programming standards

Altered or additional model components have to be documented according to the guidelines of COSMO model scientific documentation. The scientific documentation of the climate mode (CLM) and the climate specific model developments are part of the corresponding section of this documentation. The documentation guidelines are provided by the DWD.

The "COSMO standards for source code development" (Schättler, 2011) form the basis for programming of the model extensions in the COSMO-CLM.[2]

Appendix D.   Rules of internal procedure

The rules of internal procedure of the CLM-Community are described in (CLM-Community, 2011).

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[2] The document COSMO Standards for Source Code Development has not been accepted by the CLM Community at the assembly 2011. It is under revision. Some of the rules specified might be revised in the near future in order to meet the needs of the CLM Community in a better way.

Appendix E. Acronyms

COSMO-CLM	COSMO model version of the CLM-Community
SCA	Source Code Administrator (see General Aspects)
PEP	Processor for external Parameters
PPP	Preparation of the Parameters of the global model for the int2lm
int2lm	COSMO software int2lm for interpolation of initial and boundary conditions for the COSMO model (originally named LM)
DWD	German Weather Service
DFG	German Research Foundation
TAG	Technical Advisory Group
CO	COordination group
SUPTECH	CLM-Community working group SUPport and TECHnical Issues
WG	Working Group

Appendix F. Literature

CLM-Community. (2011). *Rules of Internal Procedure.* Cottbus: CLM-Community.
Schättler, U. (2011). *COSMO Standards for Source Code Development.* Offenbach: Deutscher Wetterdienst.

Schättler, U. (2011). *COSMO Standards for Source Code Development.* Offenbach: Deutscher Wetterdienst.