Running a user-friendly regional climate model on a common PC: a capacity building activity (not only) for Africa

Arne Kriegsmann, Andreas Haensler, and Daniela Jacob
Climate Service Center Germany

Introduction

Producing climate projections with a regional climate model (RCM) has the potential to improve (a) the understanding of the climate system as well as (b) the knowledge about future climate changes. As research activity, the usage of RCMs is restricted to that part of the climate community that has access to modern high performance computing facilities. Configuring the model and keeping the simulation running requires knowledge of many technical details.

We introduce a preconfigured, easy-to-use version of the RCM REMO (Jacob, 2001). This model is applicable on a common PC and can, due to a reduced complexity to use the model, also be applied as a capacity building tool.

Furthermore, in order to keep computing time as short as possible, we investigate the effects of calculating parts of the model on a common graphical processing unit (GPU).

Objectives of SASSCAL

SASSCAL is a joint initiative of Angola, Botswana, Namibia, South Africa, Zambia, and Germany, responding to the challenges of global change. Funded by the Federal Ministry of Education and Research, Germany, the establishment of a Southern African Science Service Centre for Climate Change and Adaptive Land Management creates added value for the whole southern African region. Its mission is to conduct problem-oriented research in the area of adaptation to climate change and sustainable land management and provide evidence-based advice for decision-makers and stakeholders to improve the livelihoods of people in the region and to contribute to the creation of an African knowledge-based society.

Graphical User Interface (GUI)

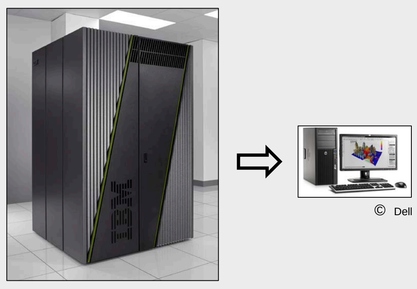
A standard RCM is highly configurable, usually operated with extensive scripts. Inexperienced users, maybe from non-climate-modelling disciplines, cannot use these models without an intensive introduction. Therefore, we provide a combination of a preconfigured RCM and a GUI. With this interface, the user can easily choose different settings.

The user of this preconfigured RCM has to select the forcing scenario (RCP2.6, RCP4.5, RCP8.5) and the time period to simulate. Then, the output variables that the user needs as well as the output frequency (hourly, 6-hourly, daily) is chosen. Thus, the user can reduce the amount of disc space needed. The application window shows progress and the current values of temperature and 1-hour-precipitation.

The GUI provides some information windows (system info, configuration, help text). The model splits the domain and uses automatically as many cores as possible.

Usage of the graphical processing unit (GPU)

Nowadays many supercomputers consist of a mixture of CPUs and GPUs. A first weather prediction model with GPU support is productive (COSMO). We analyzed the question if it is possible to gain speed by the usage of a GPU within a normal desktop PC. Part of the code of the model was adapted with OpenACC so that it can use the resources of a GPU. Results show in single parts of the model a speedup factor of up to three. On the other hand, due to technical restrictions of the used graphics hardware (NVIDIA GTX680, no Hyper-Q), only one MPI process can communicate with the GPU, leaving the rest of the CPU idle, so that the total computing time was not shorter.



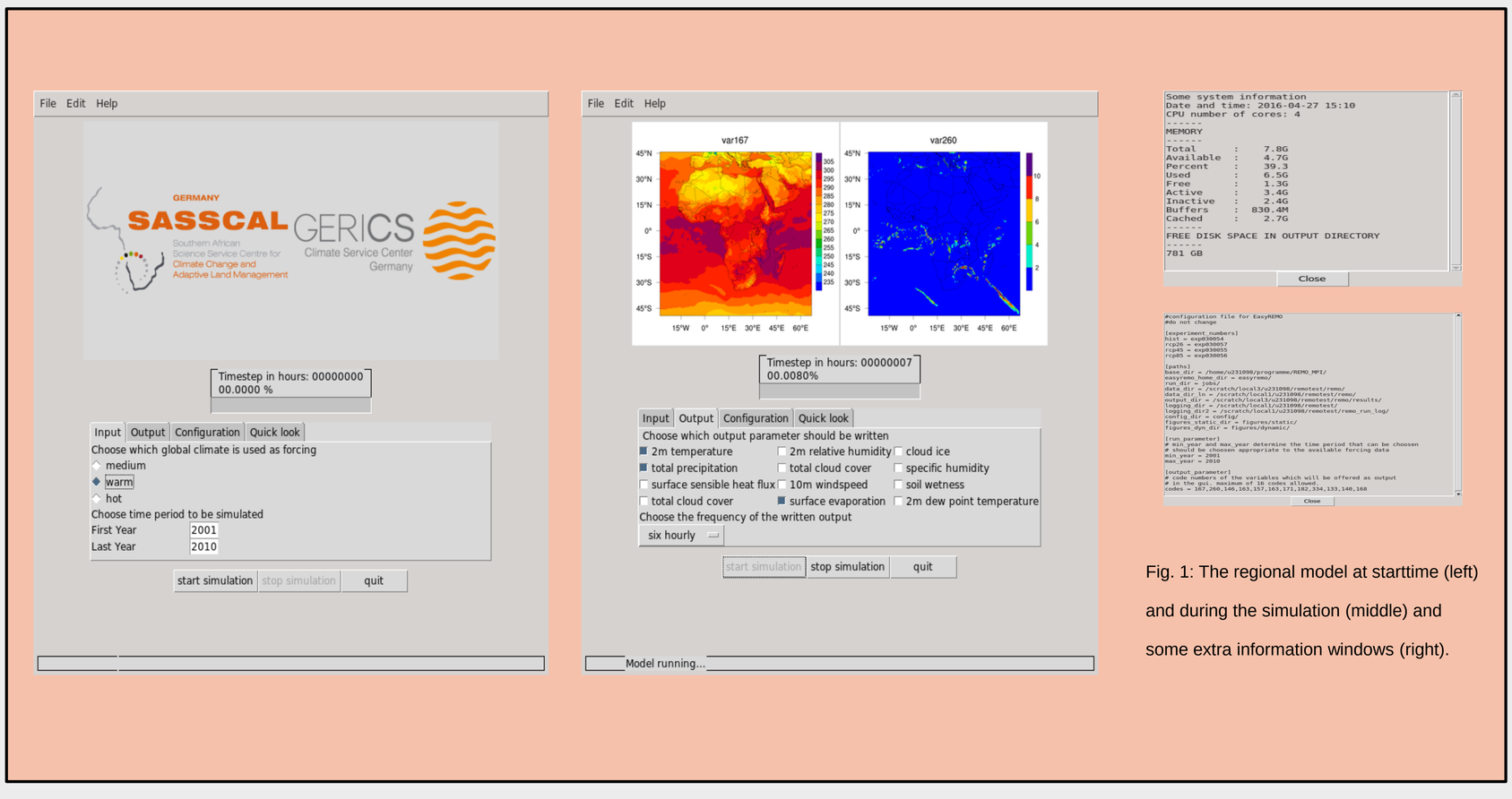


Fig. 1: The regional model at starttime (left) and during the simulation (middle) and some extra information windows (right).

CONCLUSION

- **Easy to use model to produce own climate data for capactiy building**
- **Use of a single common GPUs not yet an advantage**

Literatur:

Jacob, D. (2001): The role of water vapour in the atmosphere. A short overview from a climate modeller's point of view. Phys. Chem. Earth A 26 (6–8):523–527.

Climate Service Center Germany (GERICS) • Helmholtz-Zentrum Geesthacht • Fischertwiete 1 • 20095 Hamburg • Germany • Phone +49 (0) 40 226 338 419 • Fax +49 (0) 40 226 338 163
Contact: Dr. Arne Kriegsmann • Email: arne.kriegsmann@hzg.de • www.climate-service-center.de