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REGIONALIZATION OF GLOBAL CLIMATE SCENARIOS WITH MCCM

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1 Aim of the research within QUIRCS

The aim of this subproject is

- to provide regional climate scenarios generated by the MCCM modeling system with the meteorological model MM5 for model inter-comparison and model evaluation
- to investigate the influence of the model resolution on the regionalization of global climate scenarios, and
- to develop and apply in MM5/MCCM an improved parameterization scheme for the calculation of subgrid scale transfer and transport processes, accounting for slope effects, and to assess the achieved progress.

2 Recent and completed activities

The first task was to perform regional climate simulations of the present day climate using global reanalysis data provided by ECMWF. A new pre-processing program for the assimilation of global climate model data required for driving MCCM was developed. Meanwhile, the pre-processing tools have been provided all necessary input data. The simulations are in progress and will be finished soon. The available modeling results are post-processed and transferred continuously and are provided for the model inter-comparison and model evaluation.

Further activities will concentrate on the influence of model resolution and of slope effects in complex terrain. A subdomain encompassing the Alpine Region and Southern Germany was selected for nested higher resolution simulations with a grid size of about 5 km in which the previously regionalized present day climate conditions with a resolution of 19 km will be used as driving data. The necessary geographical data for this subdomain like orography and land use have been prepared.

3 Principle results and Conclusions

Preliminary results of the present day climate calculations show that the model is working as expected. The main features are reproduced well. A detailed quantitative assessment will be made during the evaluation process (see contribution of BTU).

In respect to the intended sensitivity studies with higher resolutions some theoretical investigations were made. As in most models MM5 approximates the magnitude of the interface between the atmosphere and the underlying soil or vegetation layer by the projection area. In complex terrain this results in an underestimation of the transfer across the interface. A more realistic representation of the surface will enhance the energy and moisture exchange and may accelerate the onset and the development of thermally driven regional/local circulation systems in mountainous regions, e.g. mountain valley winds. Qualitative

assessments show that in many situations this may be the most significant slope effect.

4 Planned activities

A new subgrid scale transport and transfer scheme which considers slope effects will be developed, whereby first the above mentioned underestimation of the surface area will be corrected.

After finishing the regional climate simulation using the ECMWF reanalysis data, the two ECHAM4 driven regional climate simulations (control run and scenario run) will be carried out with the MCCM modeling system. Parallel to these main experiments additional sensitivity studies for the Alpine subdomain will be performed. First the effect of enhanced resolution is investigated using the original model formulation. In a next step the improved transfer scheme will be implemented in MM5/MCCM and the high resolution simulations will be repeated. Comparison with the previously obtained results will show the progress achieved by the new scheme.