# ZWEK – A Project of the German Meteorological Service

## Project summary

The German Meteorological Service (DWD) has been developing a technique to predict long-term climate changes and their impacts on a regional and local scale since the beginning of 2007, the ZWEK Project (**Z**usammenstellung von **W**irkmodell-**E**ingangsdatensätzen für die **K**limafolgenabschätzung; English: Compilation of Datasets for Climate Impact Assessment). The database currently comprises simulations from four regional climate models for the German area, i.e. the numerical models CLM (1) and REMO (2) and the statistical models WETTREG (3) and STAR (4, 5). The former three were all driven by the ECHAM5-T63L31/MPI-OM global climate simulations (scenario A1B, run no. 1) by the Max Planck Institute for Meteorology. The preset trend for the STAR model was also derived from the ECHAM5 results[1].

During the first project phase the individual projections were analyzed and juxtaposed. Currently, the impacts of the predicted climate change are scaled down to regional and even local levels. The project objectives are to develop area-wide mappings of the expected changes in parameters characteristic for technical climatology and to assess the agricultural impacts by means of the DWD's agricultural advisory system AMBER. Another focus area of the project is urban climatology: by linking the DWD's urban climate models with the Klima-Michel model detailed spatial distributions of urban heat load will be obtained.

Utilizing the results from various regional climate models as input data for the DWD's impact models corresponds to the approach of the IPCC, which bases its climate change statements on a multi-model ensemble. This approach ensures that the results depict a range of possible climate changes and their impacts. By considering numerical and statistical methods it is simultaneously possible to reduce the significance of the weaknesses inherent to both. Each method has its strengths so that the methods complement each other in the entire ensemble. The ZWEK project results thus help to alleviate political and business decision making.

The aim for the future is to broaden the ensemble by adding further climate simulation results. Along with the additional use of at least one other emission scenario besides the A1B scenario it is also planed to increase the number of regional models. Finally, the use of further global driving models is intended to provide further insights into possible future climate states.

## Explanations relating to the download files

The download files provided on the Internet pages of the 'Service Group Adaption' contain the main results of the first ZWEK project phase. Mappings of mean temperature changes and mean precipitation amount changes are available for two projection periods and various

[1] The STAR model differs from the other three regional models in the way it is linked to the results of the global climate models. Instead of directly fitting the statistical models to the simulation outputs, the scheme simply transposes a specified trend derived from the global models. The present STAR simulation was generated by presetting a linear increase of the annual mean temperatures of 2 K between 2004 and 2055. At present STAR simulations do not extend further into the future.

meteorological seasons[2]. As reference period the time segment 1971-2000 from the model specific control runs has always been used.

Besides these direct climate variables, the expected changes of two of the so-called characteristic days were examined: summer days ("Sommertage") are defined as those days were the maximum temperature reaches at least 25°C. Correspondingly, days with a maximum temperature of above 30°C are called hot da ys ("Heiße Tage"). Here, too, the two projection periods named above have been analyzed.

A first impact study result has already become available as well: the expected change in the annual heating degree days. This index is used to determine the duration and intensity of winter cold and to estimate home heating requirements according to the VDI Guideline 3807/1. Basically, it is calculated from the difference between the desired room temperature and the prevailing daily mean temperature.

Note:

Occasionally, colour deviations from the original colours as displayed on the screen may occur when printing or projecting the files. Therefore, an always clear differentiation of all colour nuances cannot be guaranteed.

## Citations

(1) Keuler, K., Lautenschlager, M., 2006: Climate Simulations with CLM. Climate of the 20th Century run No.1, 1960-2000, Data Stream 2 und Scenario A1B run No.1, 2001-2100, Data Stream 2. European region, MPI-M/MaD. CERA-Datenbank: http://cera-www.dkrz.de/WDCC/ui/BrowseExperiments.jsp?proj=CLM_regional_climate_model_runs

(2) Jacob, D., 2005: REMO Climate of the 20th century run No. 006210, 1950-2000 und A1B scenario run No. 006211, 2001-2100. UBA Project, 0.088 degree resolution, 1h Data. CERA-Datenbank: http://cera-www.dkrz.de/WDCC/ui/BrowseExperiments.jsp?proj=REMO-UBA

(3) Kreienkamp, F., Enke, W., 2006: WETTREG 20C control run 1961-2000 und WETTREG A1B scenario run 2001-2100, UBA Project. CERA-Datenbank: http://cera-www.dkrz.de/WDCC/ui/BrowseExperiments.jsp?proj=WETTREG-UBA

(4) Orlowsky, B., Gerstengarbe, F.-W., Werner, P.C. (2007): A resampling scheme for regional climate simulations and its performance compares to a dynamical RCM. Theor. Appl. Climatol. online published, DOI: 10.1007/s00704-007-0352-y

(5) Potsdam Institute for Climate Impact Research, 2007: STAR 2.0 – Control run and A1B scenario run. Personal communication.

[2] The meteorological seasons comprise the entire months December, January, and February (Winter), March, April, and May (Spring), June, July, and August (Summer), and September, October, and November (Autumn).