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PRE-PROCESSING OF METEOROLOGICAL DATA FOR THE EVALUATION OF CLIMATE MODEL SIMULATIONS

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1 Aim of the research within QUIRCS

QUIRCS aims at the quantification of uncertainties of regional climate models. Therefore, observational data are needed to assess model climate simulations. The German Meteorological Service (DWD) runs networks on a lot of meteorological elements since several decades, some of them dating back to the 19th century. All measurements are quality checked and collected in archives. Data of the last fifty years are mostly stored electronically. The climate data archive of DWD includes near surface data as well as upper air data. There is a long list of meteorological parameters as output from climate model simulations, comprising e.g. the near surface air temperature, the daily amount of precipitation and the humidity profile from the earth surface to the lower stratosphere. The specific aim of this subproject is to prepare observational data sets in a suitable format for the comparison with climate model results. Meteorological measurements usually are made in networks of irregular distributed stations. To be comparable with model output, they have to be interpolated to the model grid. DWD provides data sets of climate parameters from meteorological observations in a horizontal grid of 1 km x 1 km over the area of Germany. This is done on a monthly basis for a period of 51 years, namely 1951-2001. Thus, 612 gridded data sets are provided per climate parameter. The result of this procedure will serve as a reference for the performance of climate models within QUIRCS and beyond. There is a great variety of interpolation methods. In this subproject, a lot of different methods are tested and then selected as most suitable for each climate parameter. This will be another important contribution to QUIRCS, but also for future interpolation tasks.

2 Recent and completed activities

The DWD has completed the interpolation of several near surface climate parameters. These are: the daily mean air temperature, the daily maximum of the air temperature, the daily minimum of the air temperature, the diurnal range of the air temperature (all in 2m above ground), the daily precipitation sum, and the mean air pressure at sea level. As far as we know, this has been the first time that the mean sea level pressure was interpolated in the area of Germany on a 1km grid. Thus, a high quality data set of this climate parameter is now available to the climatological community. Changes of the number and location of observational stations were special difficulties during the testing of interpolation methods and the production of the gridded data sets. Recent efforts are focussed on the horizontal interpolation of wind speed. Due to the high spatial variability of this parameter, the interpolation has to be carried out using a modified version of the so-called “statistical wind model” which is available in DWD.

3 Principle results and Conclusions

As an example of a gridded climate data set, obtained from meteorological observation, fig. 1 shows the monthly mean of the daily mean temperature in January of 1978. On this occasion the interpolation method 'Inverse Distance Weighted' was used. Equivalent data sets to the one shown in fig. 1 are already available for the climate variables mentioned in Section 2. The 'Inverse Distance' algorithm used provides reasonable results even when analysing spatially more structured data like precipitation. A comparison between results achieved in DWD and analogous data sets generated by the Climate Research Unit, University of East Anglia, U.K., revealed a remarkably good correspondence for most climate parameters.

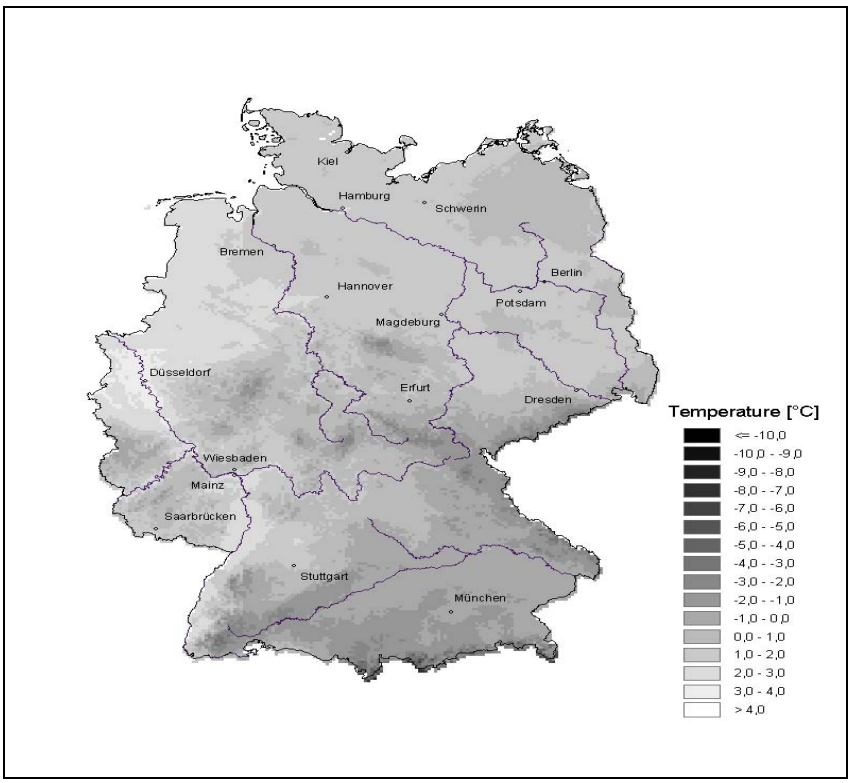

Figure 1. Mean air temperature 2 m above ground for January 1978, spatial resolution is 1km × 1km

4 Planned activities

Future work will focus on the interpolation of further climate parameters like dew-point temperature, snow cover, the frequency of the occurrence of 'extreme' weather situations, e.g. number of days with $T_{max} > 25°C$ and number of days with $T_{min} < 0°C$. Furthermore, we will generate interpolated aerological data sets for selected sub-regions of Germany. These data sets are based on radiosonde measurements. The results will be made available to our partners within QUIRCS. Finally, corresponding fields of the variance of climate parameters will be computed from the original interpolated data sets in the same grid.

References

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