Session: C29 Poster: W150A

Analysis of uncertainty in large scale climate change projections over Europe

Andreas Prein[†]; Andreas Gobiet; Heimo Truhetz
[†] Wegener Center, University of Graz, Austria
Leading author: andreas.prein@uni-graz.at

Accounting for uncertainty is a major challenge in current climate research and huge efforts are made to quantify and reduce uncertainty in climate projections. In this study the basic resource for most climate change impact investigations worldwide, the CMIP3 multi-model dataset, is analyzed with respect to performance under present climate, climate change, uncertainty, and the major sources of uncertainty over Europe. Eight near surface and upper air parameters are considered over two domains centered over central Europe for the mid and end of the 21st century. The performance analysis of the GCMs showed that it is crucial to regard upper air parameters in model rating and that evaluating just near surface parameters can lead to overoptimistic assessment of model performance. Regarding climate change, air temperature, geopotential height, and specific humidity are consistently projected to increase by all CMIP3 simulations. Eastward wind is projected to increase by most simulations, while for pressure, precipitation, and northward wind, the sign of change is inconsistent between the simulations and varies with season. The dominating source of uncertainty is the model uncertainty which roughly contributes between 50 % and 85 % to total uncertainty. Internal variability of the climate system accounts for 10 % to 20 % (in 30-year averages), while emission scenario uncertainty is nearly negligible until 2050 and becomes important only for temperature, specific humidity, and geopotential height at the end of the 21st century (up to 35 %). The results indicate that studies focusing on downscaling, regional climate change, and regional climate change impacts should be based on a carefully selected set of GCMs in order to avoid undersampling uncertainty. It is by far more relevant to reasonably capture model uncertainty than emission scenario uncertainty. This is particularly true for the first half of the 21st century and particularly important of more uncertain parameters like precipitation.