EMS Annual Meeting Abstracts,
Vol. 6, EMS2009-465, 2009
9th EMS / 9th ECAM

9th EMS Annual Meeting
9th European Conference on Applications of Meteorology
High resolution meteorology
- applications and services

European winter storm losses in relation to extreme wind speeds in a multi-model ensemble of GCM and RCM simulations

M.G. Donat, G.C. Leckebusch, S. Wild, and U. Ulbrich
Freie Universität Berlin, Institut für Meteorologie, Berlin, Germany (markus.donat@met.fu-berlin.de)

Extreme 10m wind speeds and related loss potentials caused by severe winter storms are investigated in multi-model simulations with global (GCM) and regional (RCM) climate models. Regional climate simulations were carried out driven by ERA40-reanalysis as well as by GCM scenario simulations. Main objectives of this study are (i) investigation of the benefits of dynamical downscaling for windstorm loss calculations, (ii) examination and quantification of the performance of a multi-model ensemble of climate simulations and investigation of the influence of model selection on the ensemble results, and (iii) estimating a range of potential future changes of extreme wind speeds and storm loss potentials in Europe due to anthropogenic climate change.
Based on reanalysis driven RCM simulations, calculated losses are validated against observed insurance loss data. For most of these simulations calculated losses reveal reasonable correlations with observed losses, although correlation values are in general smaller than for losses calculated directly from the large-scale reanalysis wind field. Combining the individual RCMs to a multi-model ensemble, the performance of the ensemble mean is as good as the performance of the best single model. The influence of the ensemble construction on the performance is investigated systematically by considering all possible sub-ensembles. Generally, the more models are included in a ensemble a higher minimum performance is obtained, demonstrating that large ensembles assure a higher consistency of the results.
Future changes of extreme wind speeds and storm losses are analysed based on GCM and RCM simulations according to the IPCC SRES A1B scenario. Most simulations as well as the ensemble mean reveal enhanced extreme wind speeds (up to 5% in ensemble mean) over northern parts of Central and Western Europe for the future scenarios. As a consequence, also loss potentials are increased in these regions. For Southern Europe decreased extreme wind speeds and loss potentials are analysed. There is, however, a considerable spread between the change signals of the individual ensemble members, partly even contrary signals are analysed in different models. E.g. for Germany, considering again all possible sub-ensembles from GCMs and RCMs, 90 % of the possible results show increased loss potentials in a range between +13% and +37%, with an ensemble mean increase of +25%. The downscaling of the large-scale simulations with RCMs increases the range of possible changes. Even RCMs with identical large-scale driving feature partly fundamentally different change signals.