Assessment of changes in the storm loss potential over Europe under modified climate conditions based on three ensemble simulations of the ECHAM5/MPI-OM1

E.L. Fröhlich (1), J.G. Pinto (1), G.C. Leckebusch (2), U. Ulbrich (2), M. Kerschgens (1)

(1) Institute of Geophysics and Meteorology, University of Cologne, Germany (2) Institute of Meteorology, Freie Universität Berlin, Germany (lfroehli@meteo.uni-koeln.de)

In the recent past, winter storms have been responsible for enormous economic losses over Europe. There are indications that the storm activity over the North Atlantic region and Europe has increased in the last decades due to GHG forcing. Furthermore, most of the climate models point to an increase in the number of intense cyclones for the future (IPCC 2001). In order to assess in how far the storm climate and the associated economic loss potential may change in the 21st Century, we apply a storm loss model to an ensemble of three transient climate change simulations. These simulations were conducted with the global coupled model ECHAM5/MPI-OM1 and forced by the transient SRES-Scenario A1B. The reference periods are 1960-2000 for the present climate and 2060-2100 for the future climate.

Based on the daily maximum wind speed at 10m asl and alternatively at 850 hPa geopotential height, the model evaluates losses arising from storms over Germany. The model validation is carried out by fitting ERA40-Re-analysis based model outputs to annual observations of storm damage to buildings in Germany provided by the German Insurance Association (GdV) via linear regression analysis. The storm model generates annual storm damage values to buildings quite well in comparison with the historic loss records of the GdV, both in terms of average and interannual variability.

The application of the storm loss model to the three simulations show alterations in storm loss over Germany. Two of the ensemble members show enhanced means and increased variability of the annual storm loss values for 10m wind, while the third ensemble member indicates a marginal reduction in the mean and the interannual variability of the storm damage. On the other hand, results based on wind speed at 850 hPa show a slight decline in the annual storm loss for all ensemble members, and an increase in the interannual variability of storm loss. These results are compared with alterations in synoptic activity between the two periods, which show for all three simulations an increase of activity over Western Europe, though with different magnitudes.