Changing european circulation types in a greenhousegas climate and their relation to the occurrence of extreme wind storms - a multi model ensemble approach

M. Donat, G.C. Leckebusch, U. Ulbrich

Freie Universität Berlin, Institut für Meteorologie, Germany (markus.donat@met.fu-berlin.de, phone: +49 30 838 71147)

In this study the influence of enhanced greenhousegas concentrations on the occurrence of circulation weather types is investigated. Based on a multi model ensemble of GCM simulations, the investigation is carried out for Central Europe. Different circulation types and gale days are identified by application of an objective scheme (Jones et al. (1993)) which uses daily gridded mean sea-level pressure data. Results from this analysis can help to better understand specific extreme events such as wind storms, heat waves or other hazardous events. The classifications for the 20th century simulations are validated with those for ERA40 reanalysis data. A climate change signal for frequencies of specific circulation types is computed with respect to the IPCC A1B scenario simulations (2081-2100) relative to the 20th century simulations. As a result, for the winter months (ONDJFM) most of the model simulations result in an increase in days with westerly flow, anti-cyclonic flow and gale days while at the same time a slight decrease of days with easterly winds and cyclonic flow can be analysed. The ensemble mean of the increased number of gale days during winter is approximately 15 percent. For the summer months (AMJJAS) all model simulations result in a less pronounced climate change signal. Noticeable, all models exhibit a decreasing amount of days with cyclonic flow and increasing days when anti-cyclonic flow is analysed. In all simulations gale days appear almost only during the winter months when the majority of them is related to westerly flow. This pattern is even amplified in the A1B scenario where the number of gale days with winds from W and SW increased by approximately 3 and 40 percent, respectively. Additionally, the results from circulation

weather type analysis are related to the occurrence of cyclone systems over Europe causing extreme wind speeds.