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Circulation weather types for Europe related to storminess in the state of Hesse

Tobias Pardowitz, Gregor C. Leckebusch, and Uwe Ulbrich
Freie Universität Berlin, Germany (tobias.pardowitz@met.fu-berlin.de)

The present study aims to quantify possible changes in the thread by winter storms imposed on the German state Hesse. Regional impacts of wind storms are highly influenced by small-scale orographic effects as well as socio-economic factors, such as vulnerability and the distribution of values. This requires the application of high resolution climate models as well as the modeling of the local occurrence of losses. On the other hand, information on frequency and intensity of storm systems can be derived from large scale flow properties. Thus, in a first step the flow properties, using daily mean sea level pressure (MSLP) patterns for Europe, are investigated and related to the occurrence of storm days in Hesse. For this, different classification algorithms are applied and evaluated. It can be found that the simulated annealing and diversified randomization clustering (SANDRA) gives the best results, being able to identify 2 major storm classes. In a second step, this classification is applied to global climate model (GCM) simulation runs (MPI-ECHAM5), to study the development of class frequencies under changing climate conditions. As a result, for model simulations following the SRES A1B Scenario conditions, a significant increase in class frequencies can be found for both major storm classes. Compared to recent climate conditions the increase towards the end of the 21st Century is about 1 class day per year (about 15%).