Geophysical Research Abstracts
Vol. 15, EGU2013-9282, 2013
EGU General Assembly 2013

Assessment of the European Severe Convective Storm Climatology using Reanalysis Data

Georg Pistotnik, Pieter Groenemeijer, and Thilo Kühne
European Severe Storms Laboratory, Wessling, Germany

Thunderstorms and their accompanying phenomena like large hail, severe wind gusts, tornadoes and excessive precipitation are increasingly recognized as an important hazard to life and property in Europe. Within the project STEPCLIM ("Severe Thunderstorm Evaluation and Predictability in Climate Models"), we link historic severe thunderstorm events in Europe to atmospheric conditions resolved by reanalysis data. The aim is to find a relation between quantities, which can be represented by relatively coarse climate models, and the occurrence of short-lived and local severe weather phenomena associated with convection. At a later stage, this relation will be applied to climate forecast data, so that the effects of climate change on the frequency and intensity of severe convective storms can be investigated.

A set of parameters is defined for the characterization of the local state of the atmosphere at any given point in place and time. These parameters represent the "ingredients" for severe thunderstorms, namely instability, vertical wind shear, and a measure of support for convective initiation. They are calculated from 6-hourly ERA-Interim reanalysis fields (1979-2011). The such derived fields are compared with the occurrence or non-occurrence of severe weather phenomena according to the quality-controlled severe storm reports collected in the European Severe Weather Database (ESWD).

A logistic regression is then fitted in order to find the best relation between a given combination of parameters and the associated severe weather probability. This relation is postulated to be invariant against any changes in climate, an assumption that is justified by the physics-based nature of the chosen parameters. With this restriction, the derived relation can be used to estimate future severe weather frequencies based on modeled climatic changes of the underlying parameter distributions. In this presentation, emphasis is put on the used methodology and on a way to deal with spatial and temporal inhomogeneities of the observational data.