

Severe thunderstorm environments across Europe: comparison of convective parameters derived from radiosonde and reanalysis data (*description for the general public*)

Around 9000 severe thunderstorm incidents are reported each year in Europe according to the European Severe Weather Database (ESWD). Unfortunately, ESWD content is still too limited and geographically biased with a much higher proportion of severe weather reports in central Europe and towards densely populated areas. This makes it difficult to obtain reliable climatological estimates of severe thunderstorm occurrence on a pan-European scale. In order to overcome this issue, many researchers have addressed the idea of using covariates in the form of convective parameters (thunderstorm ingredients) which reflect environmental conditions favorable for thunderstorms. The relationship between these parameters and thunderstorm occurrence allows them to be applied as a proxy for the probability of a thunderstorm occurring in particular time and place. This relationship can be used in so-called meteorological reanalysis, which provide a climatological snapshot of conditions that are as close to reality as possible. The main advantage of the reanalysis is that in the opposition to observations, the data is continuous in time and space. Thanks to this, it becomes possible to estimate the frequency of atmospheric conditions conducive to the occurrence of thunderstorms in a given place, despite the lack of reports from that area. The use of reanalysis in the studies concerning climatological aspects of atmospheric environments is currently one of the most important trends in meteorology and climatology. However, without information of how well these reanalysis sample real atmospheric environment, it is difficult to define how reliable can be the research results that use them. Given the inherent uncertainties in the forecast model, input data, and data assimilation, it is essential to assess the quality of these reanalysis. Unfortunately, up to now, not many studies concerned how well reanalysis represent complex convective parameters over Europe.

The main aim of the project is to assess the quality of the reanalysis in sampling atmospheric conditions conducive to the occurrence of severe thunderstorms over Europe. For this purpose meteorological observations (radiosondes, surface observations) from years 1981-2017 will be compared with three different sets of reanalysis: ERA5, MERRA2 and NCEP/NCAR. This will allow to assess the reliability of reanalysis depending on the geographical location, time of the year, and time of the day. Analysis will help to determine which factors are responsible for biases between observations and reanalysis, and allow to define climatological aspects of convective parameters over Europe (e.g. annual cycles, seasonal and spatial variability). Successful implementation of the project may contribute to the development of the current state of knowledge in the fields of mesoscale meteorology, climatology and numerical weather prediction, especially in the connection with severe weather research in Europe.