

Project: 105

Title: ANDIVA (Analyse, Diagnose und Validation)

Report for period 01.01.2017-31.12.2017

During the year 2017, different ongoing research questions have been addressed, leading to a publication in Weather and Forecasting. In this report, we give a short overview of achieved and ongoing research projects.

a) Simulation of the severe convective event during Pentecost in 2014

The COSMO-CLM is used with convection permitting resolution (2.8 km) to analyze the severe convective system crossing North-Western parts of Germany on Pentecost Monday 2014. This storm was one of the most severe thunderstorms in Germany in decades, leading to hurricane-force wind gusts (reaching 40 m s^{-1}) along a narrow swath in the Rhine–Ruhr region causing substantial damage. The high-resolution simulations provide insights into the generation and dynamics of the event. Important features like a rear inflow jet or a mesocyclone connected to strong surface wind gust are reproduced by the simulation and thus provide insight to this rare type of event. Moreover, the forecast potential of the storm is evaluated using sensitivity experiments with a regional climate model. Operational numerical weather prediction models mostly failed to forecast the storm, but high-resolution regional model hindcasts enable a realistic simulation of the storm. The model experiments reveal that the development of the bow echo is particularly sensitive to the initial wind field and the lower-tropospheric moisture content. Adequate initial and boundary conditions are therefore essential for realistic numerical forecasts of such a bow echo event.

Mathias, L., V. Ermert, F.D. Kelemen, P. Ludwig, and J.G. Pinto, 2017: Synoptic Analysis and Hindcast of an Intense Bow Echo in Western Europe: The 9 June 2014 Storm. Wea. Forecasting, 32, 1121–1141, <https://doi.org/10.1175/WAF-D-16-0192.1>

b) Analysis of a Cold-Season Derecho over Europe in January 2014

Within the framework of a master thesis, a Derecho over France, BeNeLux and Germany is analyzed with the help COSMO-CLM simulations (again up to a convection permitting resolution of 2.8 km). The focus is on the development stage of the system. Additionally, the predictability is addressed in this study. As shown by the forecast by ESTOFEX (<http://www.estofex.org/>), severe weather was not expected over large areas that were affected by the system. The master thesis is about to be submitted in November this year.

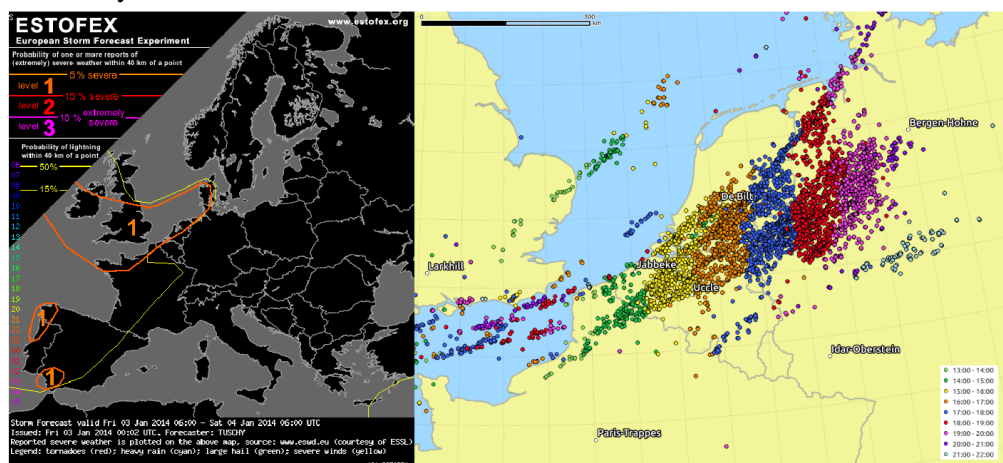


Figure: left: Areas where severe weather was expected on January 3rd; right: observed lightning activity based on data from EUCLID-Network.