



## **A severe bow echo in Western Germany on June 9, 2014: Forecasting and warning of a high impact weather event with the help of different tools and methods**

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Each year Germany is affected by numerous severe thunderstorm events with high potential for damage. Physically based ingredients like the content of humidity in the atmosphere, the degree of instability as well as lifting processes and the intensity of vertical wind shear (directional and speed shear) determine the degree of organization and severity of thunderstorms, as well as their accompaniments (Johns and Doswell, 1992).

In some cases numerical models are not able to forecast storms. Either due to the lack of a trigger to initiate storms or due to another missing ingredient. An excellent example for these numerical forecasting problems represents the 9th June 2014 (Pentecost Monday) event when a large MCS with a severe bow echo crossed Western Germany and as a consequence caused widespread wind damage and sadly also six fatalities. The different numerical models like GFS, ECMWF or the German GME did not forecast this event.

This talk will outline how the German Weather Service (DWD) was able to do a good performance in forecasting and warning this severe weather event despite the deficits of the models. First of all it will be explained how the ingredient based method helped to determine the possibility of severe weather on that day. In this context it will be analyzed why numerical models were not able to simulate the thunderstorms on that day and why the wind velocities up to 140 km/h were measured with this event besides the lack of stronger winds in higher levels. In a second part the talk will deal with the nowcasting process performed at DWD in case of a convective event. The different stages starting with the first warning for this MCS until the issuance of the highest warning category (extremely severe weather) will be evaluated and the corresponding reasons for the decision will be explained. Furthermore, it will be shown how remote sensing techniques assisted the warning meteorologist in gathering the severeness of the thunderstorms. In addition other supporting methods will be outlined (e.g. NowCastMix).