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A severe bow echo in Western Germany on June 9, 2014: Aspects in forecasting and the use of latent heat nudging to optimize regional models

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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).

During the days of June 8 to 11, 2014 models have shown the potential for severe thunderstorms for parts of France, Benelux and Germany. Ahead of an unseasonably pronounced upper level trough west of Ireland, a hot and increasingly humid air mass was advected from the western Mediterranean Sea towards Germany. Vertical wind shear was forecast to strengthen due to the approach of an upper level jet, which emerged from France. A preliminary peak of this weather pattern was the severe bow echo that affected western Germany during the evening of June 9, 2014 (Pentecost Monday).

A rather warm air mass was present at mid-levels of the troposphere and led to a strongly capped environment. In combination with relatively weak synoptic scale lifting, numerical models had serious problems in predicting this severe weather event. This includes actual initiation of convection as well as further propagation of the thunderstorms into Germany.

This poster will describe in particular the synoptic and mesoscale situation that led to the development of the devastating bow echo, which affected North Rhine-Westphalia. It will also be shown why numerical models had problems to detect the bow-echo in advance. The poster will deal with the improvement of the German local area model COSMO-EU (*) by the assimilation of radar data with the help of the method of „latent heat nudging“ (Jones and Macpherson, 1997). The functionality of that method will be explained in more detail. Subsequently it will be shown how the assimilation of radar data can help to improve the forecast of regional models in this severe weather event, both in time and in space (Stephan et al., 2008). Finally, it will be investigated, whether the new German global model ICON (**) that is operational since January 2015 would have been able to give better initial and boundary values to get an improved COSMO-EU forecast of the Pentecost Monday bow echo event.

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References

Jones, C. D., B. Macpherson, 1997: A Latent Heat Nudging Scheme for the Assimilation of Precipitation Data into an Operational Mesoscale Model. – Meteorol.Appl.4, 269–277

Johns, R. H., and C. A. Doswell III, 1992: Severe local storms forecasting. Wea. Forecasting,7, 588–612.

Stephan K., S. Klink, C. Schraff, 2008: Assimilation of radar derived rain rates into the convective scale model COSMO-DE at DWD. Q.J.R.Meteorol.Soc.134, 1315-1326

(*) http://www.cosmo-model.org/

(**) https://earthsystemcog.org/projects/dcmip-2012/icon-mpi-dwd