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The Hamburg Tornado (7 June, 2016) from the perspective of low-cost high-resolution radar data and weather forecast model

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Abstract

A tornado hit the northeastern suburbs of Hamburg, Germany, on 7 June, 2016. It had an estimated strength of upper end F1 on the Fujita scale and was short-lived with an approximate duration of only 13 minutes and a path length of just about 1.3 km. We demonstrate that such a small-scale, extreme event can be observed and forecasted accurately by a low-cost radar and by an atmospheric model with low computational costs, respectively.

Observations from a low-cost single polarized X-band radar covering the urban area of Hamburg with 60 m spatial and 30 s temporal resolution are analyzed with respect to their ability to capture the development as well as the track of the tornado. In contrast to the national C-band radar network, the X-band radar is capable of capturing the hook echo of the tornado as well as the circular pattern in rain rates, because of its higher resolution in space and time.

High-resolution forecasts of the tornado event are conducted with the computational efficient Conformal Cubic Atmosphere Model (CCAM) in order to test the capability of predicting the tornado with the lead time of a few hours. A three step downscaling method is used to obtain a spatial resolution of 1 km with initial conditions are taken from the NCEP analysis. Calculated severe weather indices clearly indicate a potential for a tornado. CCAM cannot expilictiy resolve small scale tornadic features but the model

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