EMS Annual Meeting Abstracts,
Vol. 6, EMS2009-328, 2009
9th EMS / 9th ECAM

9th EMS Annual Meeting
9th European Conference on Applications of Meteorology
High resolution meteorology
- applications and services

Verification of wind fields by means of rain cell tracking

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VERIFICATION OF WIND FIELDS BY MEANS OF RAIN CELL TRACKING

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The regional weather forecast model COSMO-DE of the German weather service is run at a spatial resolution of 2.8 km. This results in rather detailed simulations of meteorological fields like pressure, temperature and wind. In contrast, for verification of those NWP products outside the atmospheric surface layer, only a few radiosonde stations can provide the necessary observations. In order to improve the spatial and temporal resolution of observed wind fields we propose a new method based on the motion of rain cells as observed by the German rain radar network.
The radar product consist of the radar reflectivity over Germany caused by hydrometeors with a spatial resolution of about 1 km and a temporal resolution of 5 minutes. The tracking of localised radar echoes caused by post frontal showers has been used for statistical analysis of rain showers in earlier work at our institute (Weusthoff and Hauf,2008). The fields of radar reflectivity are analysed in our work by the so-called PIV (Particle Image Velocimetry) method as used in experimental fluid mechanics for obtaining velocity fields of flow phenomena. Instead of solid particles as used as tracking objects in laboratory flows we use the localised radar reflectivities caused by the rain showers as tracer particles for the PIV method. The PIV algorithm provides two dimensional wind fields in the area of Germany with a few kilometres spatial resolution.

The observed wind fields are compared to the wind fields obtained by the COSMO-DE model at several vertical levels in the lowest 4 kilometres of the atmosphere. By this way we could not only obtain some estimates for the skill of the wind field forecasts of the model but also could provide information on the most suitable model level for wind forecast verification by means of rain cell tracking.

Weusthoff,T. and T.Hauf: Quart.J.Roy.Met.Soc.,134,841-857 (2008).