LM-PAFOG : three-dimensional fog forecasting with the "Lokal Modell" of the German Weather Service

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The presence of fog and low clouds in the lower atmosphere can have a critical impact on both airborne and ground transports. High quality predictions of fog formation and dissipation, together with the associated changes in visibility, would therefore be of immense operational value in the field.

However, the many physical processes involved in fog formation interact in a complex and highly non linear fashion. These interactions are not adequately resolved by current operational mesoscale models. Numerical simulations require high horizontal and vertical resolutions combined with a sophisticated cloud microphysics. A new microphysical parameterization based on the one dimensional fog forecast model, PAFOG (Bott & Trautmann, 2002) , was implemented in the “Lokal Modell” (LM), nonhydrostatic mesoscale model of german weather service (Steppler et al., 2003). The implementation of cloud condensation nuclei as a new prognostic variable, into the dynamical core of LM, integrates the new microphysics into the three-dimensional frame. LM-PAFOG runs over a small, local area (100x100 pixels) with a horizontal resolution of 2.8km. The high vertical resolution is concentrated near the ground : In LM-PAFOG 25 of 35 levels are located in the first 2000 meters.

The current research involves fog events around the Lindenberg area (Germany) for the last quarter of 2005. The results have been compared with satellite data and measurements taken at the Observatory of the german weather service.

Reference :

Bott, A., Trautmann, T. (2002), PAFOG - a new efficient forecast model of radiation fog and low-level stratiform clouds. Atmospheric Research, 64, 191-203.

Steppeler, J., Doms, G., Schettler, U., Bitzer, H.W., Gassmann, A., Damrath, U., Gregoric, G. (2003) Meso-gamma scale forecasts using nonhydrostatic model LM’, Meteorol. Atmos. Phy. 82, 75-96.