Visualization of 3D ensemble weather forecasts to predict uncertain warm conveyor belt situations

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We present the application of interactive 3D visualization of ensemble weather predictions to forecasting warm conveyor belt (WCB) situations during aircraft-based atmospheric research campaigns under consideration of uncertainty in the forecast. Based on requirements of the 2012 T-NAWDEX-Falcon campaign, a method based on ensemble Lagrangian particle trajectories has been developed to predict 3D probabilities of the spatial occurrence of WCBs. The method has been integrated into the new open-source 3D ensemble visualization tool Met.3D. The integration facilitates interactive visual exploration of predicted WCB features and derived probabilities in the context of ensemble forecasts from the European Centre for Medium Range Weather Forecasts. To judge forecast uncertainty, Met.3D's interactivity enables the user to compute and visualize ensemble statistical quantities on-demand and to navigate the ensemble members. A new visual analysis method to quantitatively analyse the contribution of ensemble members to a probability region assists the forecaster in interpreting the obtained probabilities. In this presentation, we focus on a case study that illustrates how we envision the use of 3D ensemble visualization for weather forecasting. The case study revisits a forecast case from T-NAWDEX-Falcon and demonstrates the practical application of the proposed uncertainty visualization methods.