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Is it time for interactivity and 3D? New approaches to analysing NWP data for observational campaigns using 3D and ensemble visualization

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Visualization is an important and ubiquitous tool in the daily work of atmospheric researchers to analyse data from simulations and observations, and field campaigns are no exception. Visualization techniques are applied during flight planning to analyse Numerical Weather Prediction (NWP) output to perform weather forecasting under campaign-specific requirements, for example, to predict the occurrence of warm conveyor belts or specific chemical species. Also, after a campaign has been conducted, analysis of collected cases heavily relies on visualization.

Visualization research has made much progress in recent years, in particular with respect to techniques for ensemble data, interactivity, 3D depiction, and feature-detection. Transfer of new techniques into the atmospheric sciences, however, is slow. This talk will present recent developments of interest to flight planning and case analysis, in particular focusing on the “Met.3D” project (<https://met3d.wavestoweather.de>), our effort to make novel 3D ensemble visualization techniques accessible to atmospheric researchers. We will discuss experiences gained during the 2016 North Atlantic Waveguide and Downstream Impact Experiment (NAWDEX), during which interactive 3D ensemble visualization was applied to analyse ECMWF forecasts for flight planning. The NAWDEX cases also subsequently received strong focus of research conducted on facilitating visual analysis of synoptic-scale atmospheric features including jet-stream core lines and fronts in midlatitude cyclones, and on interactive visual analysis of similarity and sensitivity within ensemble predictions. We will discuss the benefit of these new techniques for analysing campaign cases, and point out the potential of 3D interactive visual analysis as a diagnostic tool to link observational data to model data. We will show how future campaigns can make use of the new techniques.

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