



## **Diagnosing the extratropical transition of tropical cyclones using ensemble forecast**

**D. Anwender** (1), P. Harr (2) and S. Jones (1)

(1) Institute for Meteorology and Climate Research, University of Karlsruhe/Research Centre Karlsruhe, (2) Department of Meteorology, Naval Postgraduate School, Monterey, California

The poleward movement of a decaying tropical cyclone often results in a rapidly-moving, explosively-deepening midlatitude cyclone. The re-intensification of the remnant tropical cyclone as an extratropical cyclone depends on the phasing between the decaying cyclone and a midlatitude environment that is favourable for midlatitude cyclogenesis. Because of the typical rapid translation speed of the decaying tropical cyclone, accurate extended-range prediction of the phasing between the remnant tropical circulation and the midlatitude environment into which it is moving is critical. However, the complex physical interactions that occur during the structural changes associated with extratropical transition (ET) of the decaying tropical cyclone often contribute to large errors in numerical forecasts from operational global forecast models. Furthermore, forecast errors associated with the ET may propagate rapidly downstream and upstream of the ET location. As a result of this the predictability of the weather over Europe is often reduced in association with the presence of a tropical cyclone in the West Atlantic. In this study we investigate the representation of particular ET cases in the operational Ensemble Prediction System (EPS) of the European Centre for Medium Range Weather Forecasts. In Hovmoller plots of the ensemble standard deviation for variables such as the 200 hPa and 500 hPa geopotential a plume of high values spreads downstream of the ET location. This is an indication of the high uncertainty associated with a particular decaying tropical cyclone. Several objective techniques are and will be applied to have a closer look on these locations of higher spread in the ensemble members. Cluster Analysis of potential temperature on the dynamic tropopause shows that the ensemble members in these sensible regions can be divided in a couple of flow patterns which represent different modes of ET development. Principal component analysis and other methods will be applied to obtain more

information about the role that a decaying tropical cyclone plays in the uncertainty of the weather forecast.