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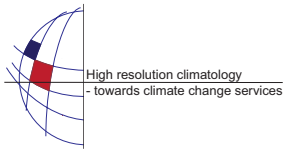

Investigation of predictability during the Extratropical Transition of Tropical Cyclones using the THORPEX Interactive Grand Global Ensemble (TIGGE)

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Several times per year tropical cyclones pass through a recurvature after their typical tropical life-cycle. They start to interact with the mid-latitude flow and may be transformed into an extratropical system. Such an extratropical transition (ET) process of a tropical cyclone often leads to a reduction in the predictability for the synoptic development of the cyclone itself as well as for the downstream region. Recent studies investigated the predictability during ET events based on the variability among members of single operational medium-range ensemble forecasts. The new THORPEX Interactive Grand Global Ensemble (TIGGE) provides an opportunity to extend these previous studies. TIGGE was established in the world weather research program THORPEX and combines the forecasts of 10 different EPS, operated at weather services all over the world. They are based on different assumptions, initial perturbation methods, resolutions and they also differ in the number of ensemble members, contained in the forecast. Thus TIGGE offers the possibility to compare predictability during ET events in a number of different ensemble prediction systems (EPS). Furthermore, TIGGE may show new possible development scenarios that could not be gained, using one single EPS.

To extract the information, contained in the ensemble forecasts, we perform an empirical orthogonal function (EOF) analysis on the variance-covariance-matrix of the forecast field in question. By calculating the principal components we get information, how each member, contained in the ensemble forecast contributes to the obtained EOF distribution. Using a fuzzy clustering, all members that show a related contribution, are grouped together. Thus, this analysis process allows us to extract possible development scenarios out of the ensemble forecast and at the same time we gain information about the possibility of these scenarios. For our investigations eight of the ten TIGGE EPS are used and interpolated to the same horizontal resolution and pressure levels. The investigations are mainly done for the geopotential height at a 200 hPa pressure level, to catch the interaction between the mid-latitude jet and the outflow of the tropical cyclone.

Using this data base and analysis technique, we perform case studies of several tropical cyclones, which underwent ET in 2008 or later. The focus here is to study the dominant development scenarios, to identify the physical processes that produce the different developments and lead to the reduction of forecast skills during an ET event. To address the question as to how the tropical cyclone influences the development, an analysis of the eddy kinetic energy budget is performed on several interesting scenarios. Furthermore, we investigate the behavior of the several TIGGE EPS and their contribution to the different development scenarios. In this presentation a selected case study will be introduced.