Extra-tropical Cyclones and Windstorms in Seasonal Forecasts

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Severe damages and large insured losses over Europe related to natural phenomena are mostly caused by extra-tropical cyclones and their related windstorm fields. Thus, an adequate representation of these events in seasonal prediction systems and reliable forecasts up to a season in advance would be of high value for society and economy. In this study, state-of-the-art seasonal forecast prediction systems are analysed (ECMWF, UK Met Office) regarding the general climatological representation and the seasonal prediction of extra-tropical cyclones and windstorms during the core winter season (DJF) with a lead time of up to four months.

Two different algorithms are used to identify cyclones and windstorm events in these datasets. Firstly, we apply a cyclone identification and tracking algorithm based on the Laplacian of MSLP and secondly, we use an objective wind field tracking algorithm to identify and track continuous areas of extreme high wind speeds (cf. Leckebusch et al., 2008), which can be related to extra-tropical winter cyclones. Thus, for the first time, we can analyse the forecast of severe wind events near to the surface caused by extra-tropical cyclones.

First results suggest a successful validation of the spatial climatological distributions of wind storm and cyclone occurrence in the seasonal forecast systems in comparison with reanalysis data (ECMWF-ERA40 & ERAInterim) in general. However, large biases are found for some areas.
The skill of the seasonal forecast systems in simulating the year-to-year variability of the frequency of severe windstorm events and cyclones is investigated using the ranked probability skill score. Positive skill is found over large parts of the Northern Hemisphere as well as for the most intense extra-tropical cyclones and its related wind fields.