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Relation between hemispheric scale factors and the occurrence of winter storms on seasonal time scales and its predictability

D. Renggli (1), G. C. Leckebusch (1), U. Ulbrich (1), and E. Faust (2)

(1) Freie Universität Berlin, Institut für Meteorologie, Berlin, Germany (dominik.renggli@met.fu-berlin.de), (2) Munich Re, Munich, Germany

Previous work has demonstrated a limited but statistically significant skill in predicting the winter NAO and the occurrence of winter storms on seasonal time scales. One possible actor modulating the interannual variability of winter storm climate could be surface conditions such as snow cover or SST. However, the physical mechanisms behind this predictability are still unknown.

In this study, the relation of the occurrence of winter storms in the North Atlantic/European region to hemispheric scale drivers like continental snow cover, SST in the North Atlantic and the NAO is examined in observational and/or reanalysis data for different lead times. Winter storm events are defined according their impact and therefore identified by means of a tracking algorithm based on the exceedance of the local 98% percentile of the 10m wind speed. It is shown that there are statistically significant correlations between the considered hemispheric scale drivers and the occurrence of winter storms with the former leading by up to 8 month. Largest correlations of about 45% are found with a lead time of 4-6 month. These empirical relationships can be used for a simple statistical forecast scheme.

The same approach is applied to dynamical seasonal forecast data of the DEMETER project. In this way, the ability of the models to reproduce winter storms and their relation to the hemispheric scale factors is analysed. First results show that the simulated relationships are weaker than observed for both snow and SST as predictors. Furthermore, there is evidence that models reproducing the observed relations more realistically attain higher skill in predicting the occurrence of winter storms.