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Are the Atlantic Hurricane and European Winter Windstorm seasons independent? Assessing climate teleconnections using a Seasonal Forecast Ensemble Approach

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The interannual variability of both the Atlantic hurricane season and the European winter windstorm season depends on large scale climate features. It is therefore reasonable to ask, are the two seasons related through climate teleconnection patterns? If so, how frequently does a strong season in one follow a strong season in the other? Answering these questions is not straightforward however, as reliable measures of seasonal activity such as best track data only cover the recent satellite era (1979 to present) over which statistical relationships are unreliable, making it difficult to assess the significance of any such connection. This issue is exacerbated by the fact that connections may occur on multiple timescales, from interannual to multidecadal. With the aim of addressing this problem, we use the latest ECMWF seasonal forecast product (SEAS5) to increase the number of “observations” by including storms which were forecast by the multimember ensemble, but not subsequently observed in reality. This allows for a wide range of theoretically possible storm events over 1800 model years and a much larger sample size, increasing confidence in any relationship found between these extreme weather events and associated climate forcing.

The focus here is twofold. First, we verify that tracks of both tropical and extra-tropical cyclones within SEAS5 are an accurate representation of the climate system, with reference to best track data and reanalysis. The seasonal cycle, interannual variability and spatial variability are all shown to be well represented in both seasons. For tropical cyclones, a post processing step is required to remove some extra-tropical systems. On establishing the viability of SEAS5 for this approach, we shift focus to proposing multiple possible pathways by which the hurricane and windstorm seasons may be related. Initial results with a limited number of ensemble members are presented assessing the viability of each pathway discussed.