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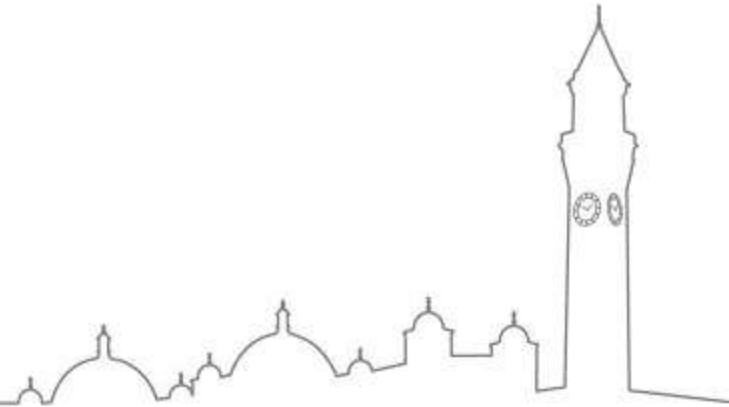


Seasonal forecast skill of severe winter windstorms over Europe and assessing the influence of dynamical factors

Lisa Degenhardt

Gregor C. Leckebusch

Adam A. Scaife





Xavier 2017



Eunice 2022



David 2018



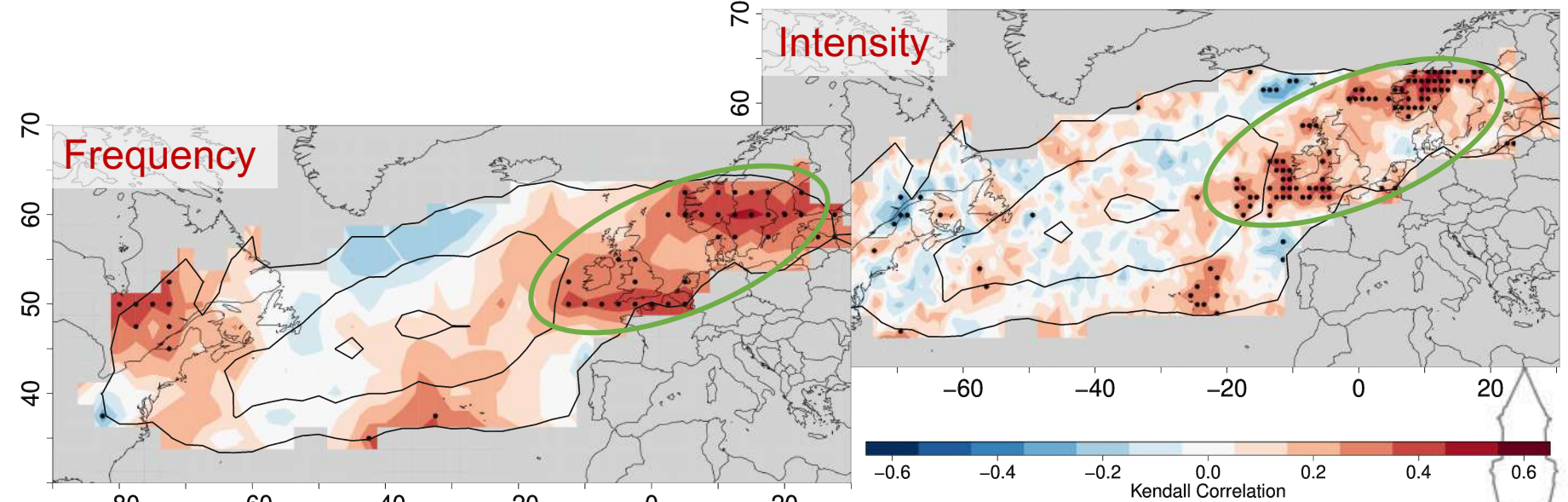
Kyrill 2007



Dennis 2020



Seasonal forecast skill for storms – UKMO Model

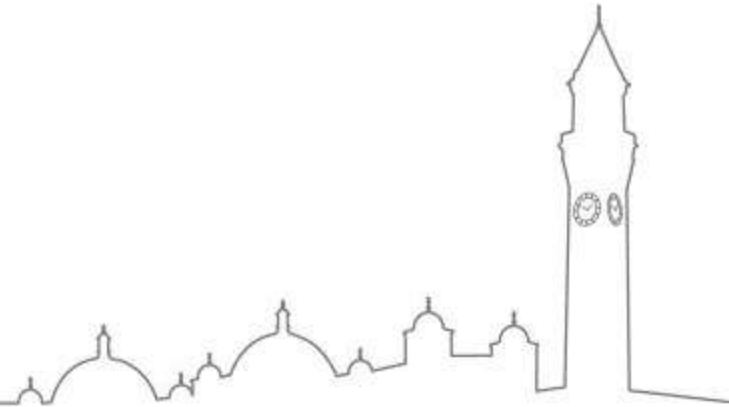


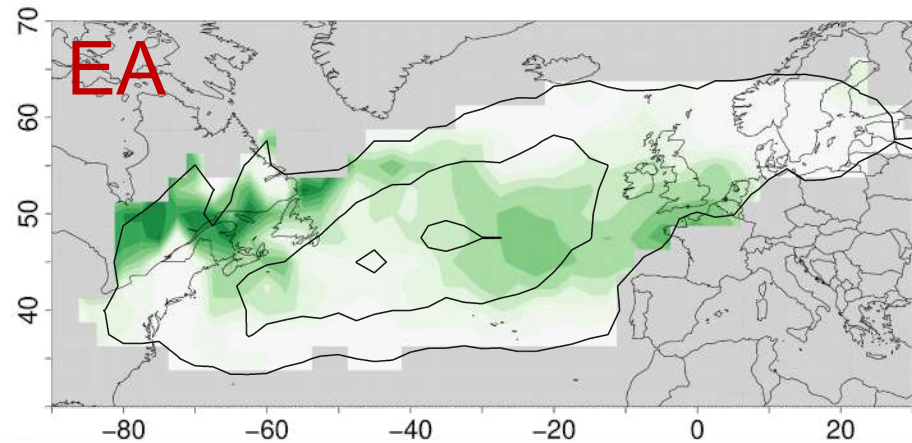
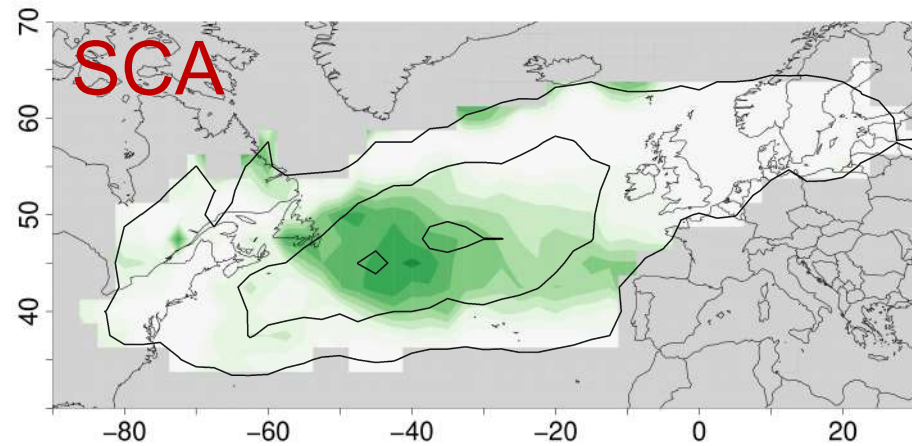
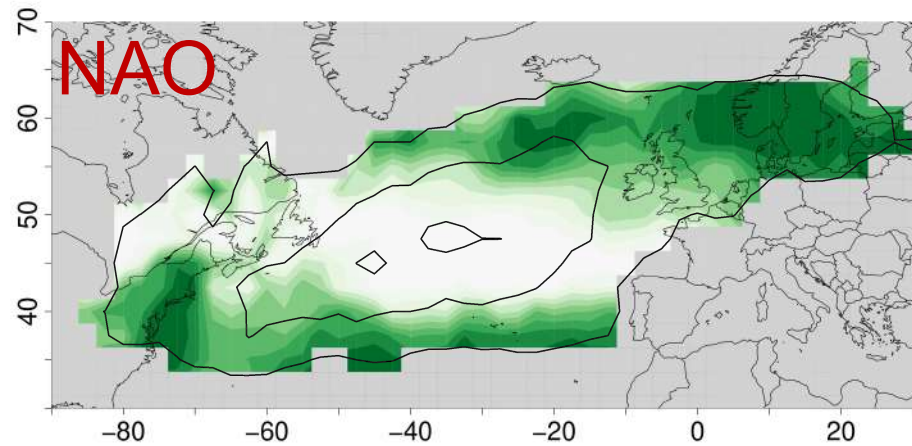
Just published in:

Degenhardt, L., Leckebusch, G. C., & Scaife, A. A. (2022). Large-scale circulation patterns and their influence on European winter windstorm predictions. *Climate Dynamics*. doi:10.1007/s00382-022-06455-2

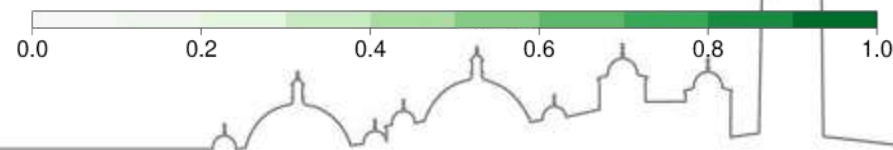


What makes storm seasons predictable a month ahead?





Storm Parameter
 $\sim NAO + SCA + EA$
 $R^2 - ERA5$

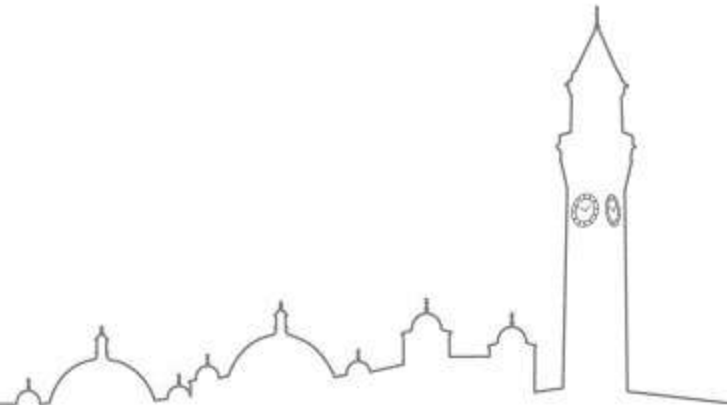


Which
dynamics

~~What~~ makes storm seasons predictable a month ahead?



Under Review in *Weather & Climate Dynamics*:
*Degenhardt, L., Leckebusch, G. C., & Scaife, A. A. (2023).
Understanding Winter Windstorm Predictability over Europe. Weather
Clim. Dynam. Discuss., 2023, 1-28. doi:10.5194/wcd-2023-12 [preprint]*



- UK Met Office Model GloSea5
- Reanalysis ECMWF ERA5
- 1993-2015
- Dec-Jan-Feb
- 5 primary and 5 secondary dynamical Factors



Factors

Primary

Potential Vorticity 350K

Equi. Pot. Temperature θ_e 850hPa

Eady Growth Rate 400 & 700hPa

Divergence 200hPa

Rossby Wave Source 200hPa

Secondary

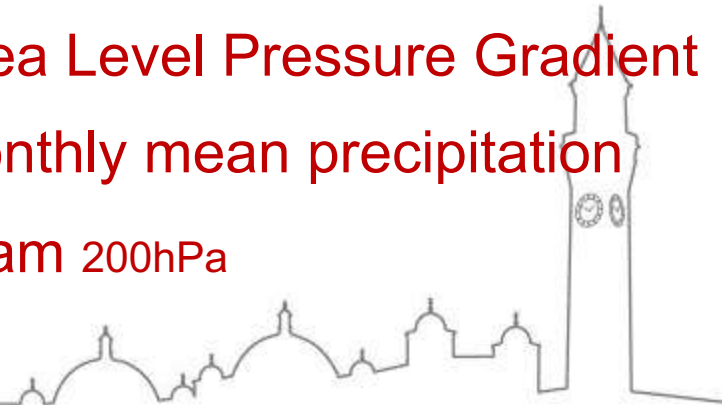
Temperature Dipole index

Sea Surface Temperature

Mean Sea Level Pressure Gradient

Total monthly mean precipitation

Jet Stream 200hPa



1. Validation of Factors:

Is the physical connection of factors to storms known from observations represented in model?



2. Skill of Factors:

Is the dynamical factor skilful predicted?



3. Relevance of Factors for Storm forecast skill:

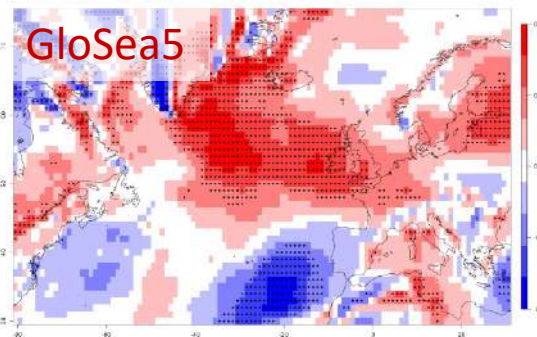
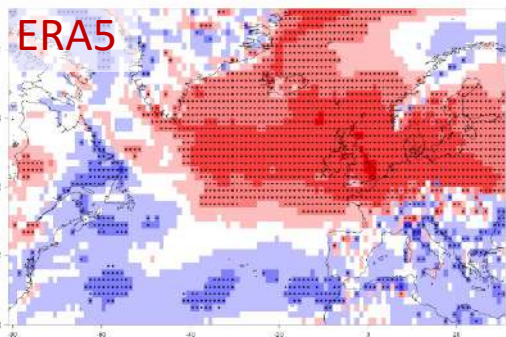
Does the factor forecast have an influence on the storm forecast?



Mean Sea-Level Pressure Gradient

1.

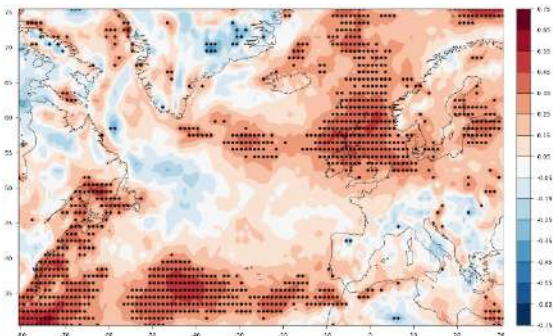
Validation



Composite Anomalies – strong-weak storm seasons

2.

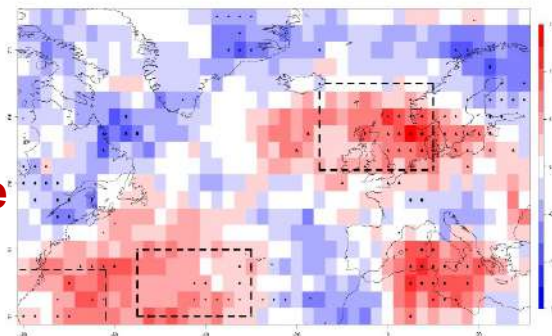
Skill



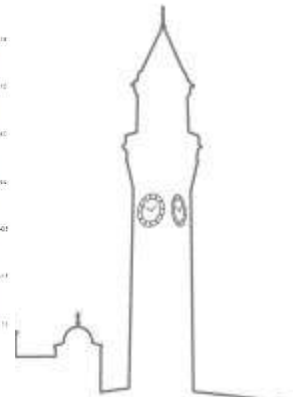
Kendall Correlation

3.

Relevance



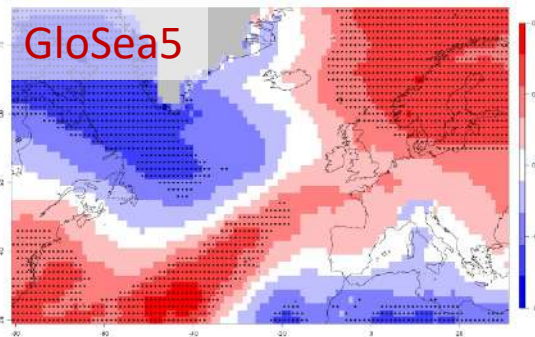
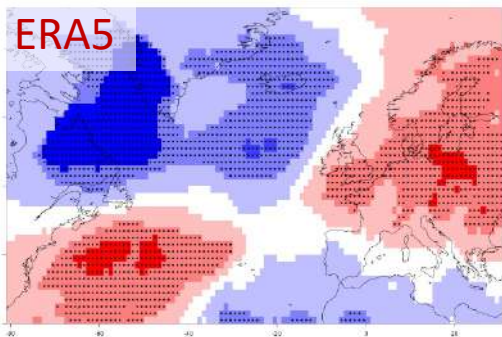
Kendall Correlation Difference



Equivalent Potential Temperature 850hPa

1.

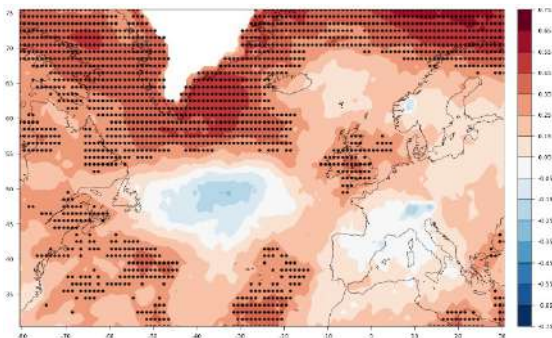
Validation



Composite Anomalies – strong-weak storm seasons

2.

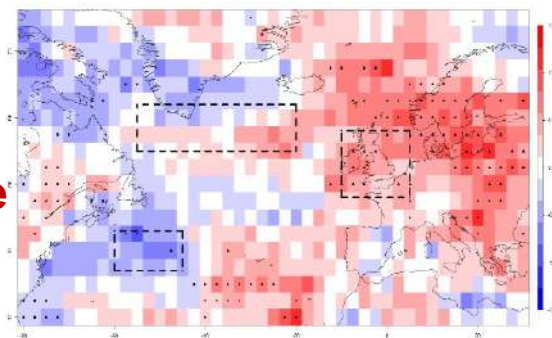
Skill



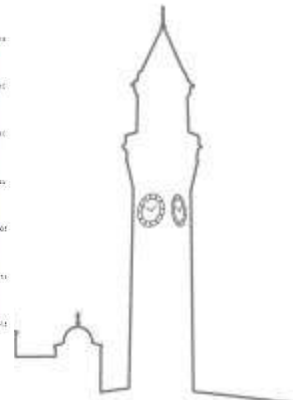
Kendall Correlation

3.

Relevance



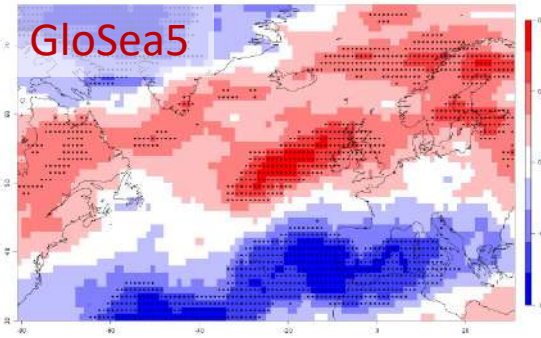
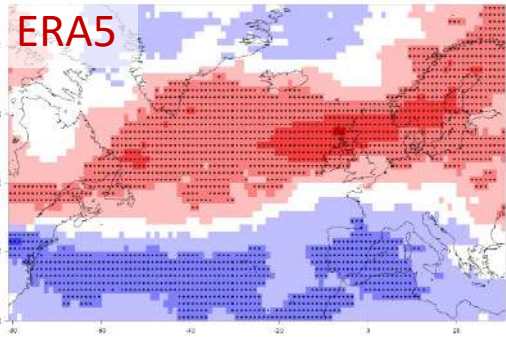
Kendall Correlation Difference



Eady Growth Rate 400hPa

1.

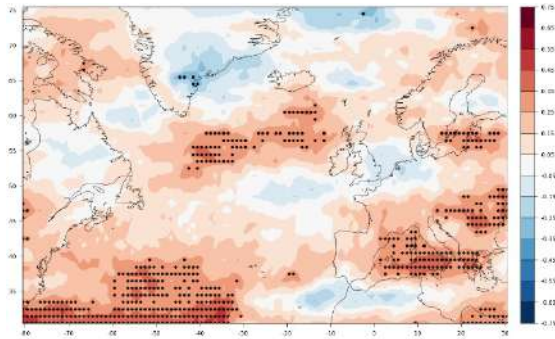
Validation



Composite Anomalies – strong-weak storm seasons

2.

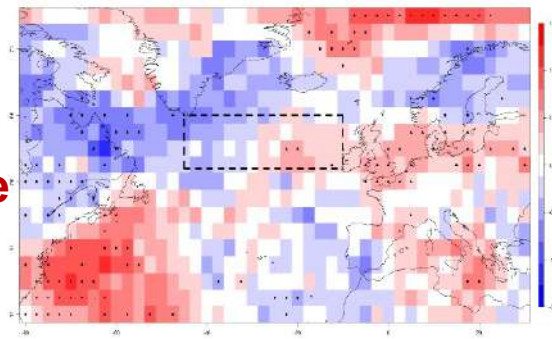
Skill



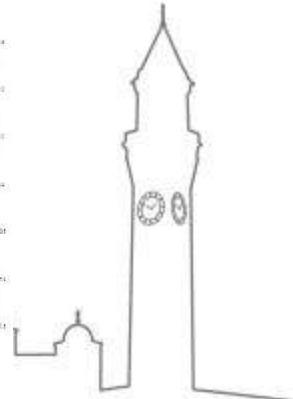
Kendall Correlation

3.

Relevance



Kendall Correlation Difference



Take Home Message

- #1 Main Factors show agreement between ERA5 and model in physical processes
- #2 Important Factors for model skill out of the forecast
- #3 Model shows forecast skill out of the forecast right physical reasons!
- #4 Model shows forecast skill in specific regions
- #5 Model improves storm forecast



Thank you!

Paper 1 –
Seasonal
Prediction



Preprint –
Dynamical
Factors



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LinkedIn®



BUT – Signal-to-noise Paradox

