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# The role of baroclinic instability for the transformation of cyclones to severe storms over the North Atlantic

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The development of European surface wind storms out of normal mid-latitude cyclones is substantially influenced by upstream tropospheric growth factors over the Northern Atlantic. The main factors include divergence and vorticity advection in the upper troposphere, latent heat release and the presence of instabilities of baroclinic waves of suitable wave lengths.
In this study we examine this tropospheric baroclinicity as an example of potential growth factors to transform extra-tropical cyclones into severe damage prone surface storm systems.

Previous studies have shown a link between baroclinic instability and surface wind storms related to extreme cyclones. In our study we investigate in further detail the relevant processes and spatial coherence and temporal variability between surface developments of wind storms and North Atlantic baroclinicity at different vertical levels of the troposphere. Questions will be addressed like: How does the magnitude of baroclinicity anomalies relate to the strength of the storm system? How does the position of anomalies in baroclinicity influence the downstream location of the surface storm event?

First results using ERA Interim Reanalysis from 1979-2012 show the expected result of enhanced baroclinic instability over the North Atlantic previously to the occurrence of wind storms in the extended winter season from October to March. Further on, our findings suggest that wind storms over Northern Europe are mainly preceded by a SW-NE elongated anomaly pattern while wind storms in Central Europe are preceded by a more zonal oriented anomaly in baroclinicity. Factors steering these anomalies are investigated including the link to hemispheric anomaly patterns such as the North Atlantic Oscillation.