

A North Atlantic circulation wavelet analysis

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Due to the relevant influence of the North Atlantic ridge in Western European winter climate, a better understanding of the physical mechanisms that contribute to its development and maintenance is of utmost relevance. In fact, taking into account previous results, where some dynamical precursors of strong and persistent North Atlantic ridges were already identified at specific locations over North America and the North Atlantic, three target areas were initially chosen so as to isolate common periodicities (two over North America at both tropospheric and stratospheric levels and one over the North Atlantic at tropospheric levels). A spectral analysis was then applied in order to identify common significant oscillations, which might be considered a manifestation of a dynamical connection. Daily mean geopotential height values at different isobaric levels and for selected winters with highly contrasting dynamical conditions over the North Atlantic are analyzed here. Wavelet analysis has been used for numerous studies with atmospheric data and is becoming a common tool for analyzing one-dimensional time series, as it is useful in determining the dominant modes within a time series, especially in studying the displacement characteristics of a moving oscillating structure. This property allows the analysis of its temporal evolution and the detection of short duration events, even in large time series. As such, two different approaches are undertaken. Firstly, a power spectral analysis allows a preliminary insight into the aforementioned periodicities at the different target areas. Secondly, a wavelet analysis significantly enhances this study.