



## **Quantifying the predictability of the European temperatures based on the Atlantic SST**

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This study quantifies the contribution of the Atlantic Ocean sea surface temperature (SST) on interannual to decadal variations of the European land surface temperatures (LST), during the period 1872-2004. Using Singular Spectral Analysis, common quasi-oscillatory modes to the LST and SST have been identified, and a cross-correlation analysis has shown the time lags found between them. Finally, multiple-regression models have been used in order to quantify the importance of the SST for explaining the variations of the LST. Specifically, oscillatory modes with periods around 13.7 years, 7.5 years and 5.2 years are found for the SST and for the north-western Europe LST. For the SST case, all the modes are associated mainly with a quadripolar SST pattern with two positive anomaly centres to the south of Greenland and around 15°N latitude, as well as two negative anomaly centres located about 40°N latitude and over the North Sea. Although the SST is able to predict these LST quasi-oscillatory modes separately with high accuracy, the Atlantic SST explains only 10% of the north-western European LST variance, mainly because these oscillatory modes represent only a small fraction of the total variance of the north-western European temperatures. Additionally, on longer time scales (multidecadal) a common quasi-oscillatory mode to the SST and LST is found with period around 60-100 years (depending on the region), which is related with the Atlantic Multidecadal Oscillation (AMO). At these later time scales the surface pressure patterns associated both to the Iberia Peninsula and the AMO are very similar and they differ of those found for the rest of Europe, pointing to the existence of different physical mechanisms responsible of them.

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