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An instrumental index of the Eastern Atlantic atmospheric circulation back to 1685

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In this work, a new monthly index based on the persistence of the westerly winds over the English Chanel is presented for the period 1685-2008 using data from ships' logbooks. The "Westerly Index" or WI provides the longest instrumental record of atmospheric circulation over the eastern Atlantic currently available.

Our results reveal a winter signature on temperature and precipitation over large areas of continental Europe quite similar to that of the North Atlantic Oscillation (NAO). However, and differently to the NAO, the WI shows a significant year-round signal, even in summer.

The WI series, with the exception of some short intervals, accords closely with the known European climatic history. We found also that the frequency of the westerlies in the eastern Atlantic during the twentieth century was not significantly different to that of the preindustrial era.

Comparisons with other instrumental and proxy-based zonal indices indicate the occurrence of decoupled periods between the frequency and the intensity of the zonal flow that call for caution when reconstructing the past atmospheric circulation from climatic proxies. The robustness and geographic extension of the WI signal, the length of the series and its instrumental nature make the WI a promising reference for future proxy calibration in Europe and Greenland.