



## North Atlantic westerlies variability from ships' logbooks: 1685-2008

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A monthly index based on the persistence of the westerly wind over the English Channel is constructed for 1685-2008 using daily data from ships' logbooks and marine meteorological datasets. This Westerly Index (WI) provides the longest instrumental record of atmospheric circulation currently available. Anomalous WI values are associated with climatic signals in temperature and precipitation over large areas of Europe, which are stronger for precipitation than for temperature and in winter and summer than in transitional seasons. Overall, the WI series reveal that the frequency of the westerlies in the eastern Atlantic during the 20<sup>th</sup> century or the Late Maunder Minimum was not exceptional in the context of the last three centuries.

The WI provides additional and complementary information to the North Atlantic Oscillation (NAO) indices. Thus, there is a significant year-round signature on precipitation and a seasonal-dependent temperature signal associated with the WI that is partially missed by the NAO indices. Although the WI reveals an overall good temporal agreement with the winter and high-summer NAO, there are several multidecadal periods of weakened correlation during the industrial era. These decoupled periods are interpreted on the basis of several sources of non-stationarity affecting the centres of the variability of the North Atlantic and their teleconnections. Comparisons with long instrumental indices extending back to the 17<sup>th</sup> century suggest that similar situations have occurred in the past, which call for caution when reconstructing the past atmospheric circulation from climatic proxies. In fact, there is a generally poor correlation of the WI with purely proxy-generated indices of the NAO.