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Stability of weather regimes during the last millennium from climate simulations

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The variability of the extra-tropical atmospheric circulation and its potential dependence on external forcings have been debated topics in climate modeling and observation communities. A recent reconstruction of the North Atlantic Oscillation Index has argued that the Middle Age period yielded a persistent positive phase of this index in contrast with an oscillating mode during the Little Ice Age.

We test whether this feature can be obtained, in millennium simulations from three different climate models (IPSL & CNRS, France; MIROC, Japan). We examine the daily atmospheric dynamics that drives the main modes of extra-tropical variability.

We find that the transition from a Medieval Warm Anomaly to a Little Ice Age in the North Atlantic does not imply changes in patterns or frequency of weather regimes, although the mean surface temperature change is significant. This suggests that the interpretation of proxy records in terms of atmospheric variability should be revised in order to take into account the structure of daily meteorological patterns, and/or climate models are too constrained to infer large changes of atmospheric variability.