

## **Evidence for a non-linear regime shift in the North Atlantic ocean circulation at the onset of the Little Ice Age**

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The mechanisms behind the transition from the Medieval Climate Anomaly to the Little Ice Age are still unclear although it is one of the most prominent climate signals of the pre-industrial last millennium. We applied a novel time series irreversibility test to high-resolution ocean sediment August sea-surface temperature records and report evidence for a non-linear regime shift in North Atlantic ocean circulation during this period. We performed ensemble simulations with the model of intermediate complexity CLIMBER- $3\alpha$  and find a persistent regime shift and an AMOC weakening as a result of a volcanically triggered sea-ice ocean feedback cascade. The sediment record from the central subpolar basin shows an anomalous warming during the Little Ice Age period that is reproduced by the model. Our results suggest that such a regional multi-stability in the North Atlantic can affect regional climate on centennial time-scales.