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A strong winter NAO during Medieval time: European / North Atlantic climate during the past millennium as seen in proxy-guided coupled model-based reconstructions

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In his syntheses of available historical and botanical data during the 1960's and 1970's, H. H. Lamb proposed that the average winter climate of northern and central Europe was notably warmer during Medieval time than during later centuries, with more moist conditions over the British Isles. Lamb argued that such climate changes could be explained by a northward shift and strengthening of the upper level westerlies across the North Atlantic into Europe, a change that would bring an enhanced maritime influence into the region. Later years saw over-extrapolation of Lamb's ideas into a global "Medieval Warm Period" (MWP) and valuable critical reviews of the evidence concerning Medieval climatic change.

The past decade has seen the development of a number of well-dated, high resolution proxy data for winter temperature and precipitation in Eurasia and northwest Africa. Among other things, these proxy data indicate that Medieval time saw winter aridity in montane northern Morocco and the northwest Tibetan Plateau, relative warmth in the Alps and increased precipitation in Scotland. We have used these data with the Proxy Surrogate Reconstruction (PSR) method to produce proxy-guided, model-based reconstructions of European winter climate during the past millennium. The

model data come from long NCAR and MPI coupled model simulations. The results, which succeed very well in achieving model field / proxy correspondence, are in general agreement with Lamb's suggestions. Composites for Medieval centuries show an enhanced NAO-like pattern over the North Atlantic, with increases of 20-40% in mean westerlies over Europe and Eurasia, warmer temperatures across much of Europe and northern Eurasia, increased precipitation across the British Isles, the Low Countries and Scandinavia and decreased precipitation in southern France, Iberia, and Morocco and across large portions of central Eurasia.

The PSR technique used for this work enforces model – proxy agreement at control points and conserves cross-variable and cross-spatial relationships between model variables allowing clearer understanding of what proxy records imply about past circulation changes.