



Investigation into influences on Little Ice Age climate

T. Kleinen, T. Osborn and K. Briffa

Climatic Research Unit, School of Environmental Sciences, University of East Anglia,
Norwich, UK

We are investigating the climate of the Little Ice Age. While cooling as a simple, direct response to the reduced insolation due to solar minima, as well as high concentrations of volcanic aerosols, may explain part of the changes in climate during the Little Ice Age, it is possible that dynamic changes in the climate system also play an important role. Dynamical changes in the atmosphere or ocean may themselves be part of the response to solar and volcanic forcing, but this is currently unclear because many climate models simulate only a relative weak dynamical response to changes in external forcings.

In order to explore the potential causes of the Little Ice Age climate anomaly, we are conducting sensitivity experiments with HadCM3 to investigate the consequences of three candidate mechanisms for North Atlantic climate, and different combinations of these three. The candidate mechanisms are: (i) a reduction in North Atlantic MOC, (ii) changes in North Atlantic atmospheric circulation to negative NAO states, and (iii) reduced radiative forcing.

We will present results from experiments involving these mechanisms. We will present the simulated consequences of a 25% reduction in North Atlantic MOC for climate in the North Atlantic area. In addition we will present the methodology of pattern nudging and its implementation in HadCM3. We are using this method to nudge the HadCM3 atmospheric circulation towards a state with weaker westerly winds across the North Atlantic (i.e., a negative NAO state) during winter, without suppressing the synoptic-scale variability such as storm tracks. We will present results from nudged HadCM3 simulations for circum North Atlantic climate. Finally we will show the consequences of reduced radiative forcing.