Northern Hemisphere atmospheric variability in a glacial climate: a model intercomparison

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ABSTRACT: We investigate the nature of past extratropical (20°-90°) Northern Hemisphere atmospheric variability, in particular in the Atlantic sector, to determine how sensitive the variability and the dominant modes of variability are to the mean climate state. We analyze the sea level pressure (SLP) field in a cold climate (Last Glacial Maximum; LGM, 21 ka) and the pre-industrial climate (PI, 1750 AD) as simulated by four coupled climate models (CCSM3, IPSL, MIROC3.2, HadCM3M2) belonging to the Paleoclimate Modelling Intercomparison Project Phase II (PMIP2).

The models exhibit an equatorward shift of the low pressure systems and a reduction in both the interannual variability (except one) and seasonal cycle of sea level pressure variance during the LGM compared to the PI. An NAO-like behavior is also present in the LGM, though it represents less total variance and the centers of action are weaker. Such coherent changes in total variance and in the spatial and seasonal distribution of this variance are an indication that climate variability is sensitive to the mean climate state, and are likely to influence the signals recorded in climate proxies.