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The effects of the North Atlantic and Arctic Oscillation upon Europe's synoptic scale atmosphere dynamics during midHolocene

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The classical view of the positive and negative phases of the North Atlantic Oscillation (NAO) has a close relation with either the Icelandic Low or the Azores High. The Azores High is a semipermanent subtropical anticyclone over the North Atlantic basin. Historically, the blocking phenomena over the North Atlantic Ocean (NAOC) are characterized by the retrogression or slowing down in the normal eastward propagation of the troughs, ridges, low center pressure, etc (hereinafter Lows). It is well documented that negative phase of NOA leads to blocking or detouring of westerlies such as cyclones and troughs and vice versa. The existence of the atmosphere-ocean coupled general circulation models (CGCMs) enables us to have a better view of the underlying dynamical mechanisms governing the synoptic scale atmospheric motions over the NAOC and consequently over Western Europe. On the other hand, decadal and inter-decadal Arctic Oscillation (AO) cause serious impediments to eastward movements of Lows toward Europe. In this study, by means of CGCM's simulations and Weather Research and Forecasting (WRF) model, we try to shed light on the dynamical nature of the large blocking Highs impeding westerly flows to Northern and Western Europe during the Mid-Holocene. By examining the spatial and temporal variation of the low and high centered pressure systems over the NAOC, Lows and Highs, we analyze the major westerly trajectories of migratory Lows that have a major influence on the climate of much of the eastern United States, Western Europe, and Northwestern Africa. The Lows and Highs are defined by the corresponding sea level pressure (SLP). In this study we are focused more on Europe. The behavior of Lows, such as frequency and geographical distribution during approaching a blocking High over the North Atlantic and Western Europe is investigated as well. So by categorizing both NAO and AO oscillations to four different scenarios, we studied environmental conditions at each case.