



The winters 2009/2010 and 2011/2012 as archetypes exhibiting extreme opposite behavior of the North Atlantic jet stream

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The atmospheric circulation over the North Atlantic–European sector experienced exceptional but highly contrasting conditions in the recent 2009/2010 and 2011/2012 winters (November–March). Evidence is given for the remarkably different locations of the eddy-driven westerly jet over the North Atlantic. In the 2009/2010 winter the maximum of the jet stream was systematically between 30° and 40°N (south jet regime), whereas in the 2011/2012 winter it was predominantly located around 55°N (north jet regime). These jet features underline the occurrence of either weak flow (2010) or strong and persistent ridges throughout the troposphere (2011/2012). This is confirmed by the very different occurrence of blocking systems over the North Atlantic, associated with episodes of strong cyclonic (anticyclonic) Rossby wave breaking in 2009/2010 (2011/2012) winter. These dynamical features underlie strong precipitation and temperature anomalies over parts of Europe, with detrimental impacts on many socioeconomic sectors. Despite the highly contrasting atmospheric states, mid- and high-latitude boundary conditions do not reveal strong differences in these two winters. The two winters were associated with opposite ENSO phases, but there is no causal evidence of a remote forcing from the Pacific sea surface temperatures. The exceptionality of the two winters is demonstrated in relation to the last 140 years. It is suggested that these winters may be seen as archetypes of North Atlantic jet variability under current climate conditions.