



## Unprecedented Expansion of the Azores High due to Anthropogenic Climate Change

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The Azores High is a subtropical high-pressure ridge in the North Atlantic. During boreal winters, anticyclonic winds rotate around the Azores High, transporting moisture to Western Europe. Variability in the size and intensity of the Azores High thus corresponds to variability in hydroclimate across Western Europe. We use the Last Millennium Ensemble (LME), which is run using the Community Earth System Model (CESM) and features thirteen transient simulations covering the period 850 to 2005 A.D. with prescribed external forcing (e.g. greenhouse gas, solar, volcanic, land use, orbital, and aerosol). The LME is shown to accurately simulate the variability and trends in the Azores High when compared to observational records from the 20<sup>th</sup> century. The Azores High has grown in size during the Industrial Era. This growth is most dramatic when observing the frequency of winters during which the Azores High is extremely large. The LME shows more winters with an extremely large Azores High in the past 100 years than any other 100-year period in the last millennium. Using LME as well as other simulations from the Paleoclimate Modelling Intercomparison Project Phase III, the recent expansion of the Azores High is shown to be well outside the range of natural variability since 850 A.D. Individual forcing simulations within the LME provide smaller ensembles in which only one external forcing is varied. These experiments attribute Azores High expansion to the recent increase in atmospheric greenhouse gas concentrations. Recent hydroclimatic signals across Western Europe consistent with the Azores High variability are also discussed.