

EGU22-3876

<https://doi.org/10.5194/egusphere-egu22-3876>

EGU General Assembly 2022

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



Unprecedented Expansion of the Azores High due to Anthropogenic Climate Change

Caroline Ummenhofer¹, Nathaniel Cresswell-Clay¹, Diana Thatcher², Alan Wanamaker², Rhawn Denniston³, Yemane Asmerom⁴, and Victor Polyak⁴

¹Woods Hole Oceanographic Institution, Physical Oceanography, Woods Hole, United States of America (cummenhofer@whoi.edu)

²Department of Geological and Atmospheric Sciences, Iowa State University, Ames, Iowa, USA

³Department of Geology, Cornell College, Mount Vernon, Iowa, USA

⁴Department of Earth and Planetary Sciences, University of New Mexico, USA

The Azores High is a subtropical high-pressure ridge in the North Atlantic surrounded by anticyclonic winds that steer rain-bearing weather systems. The size and intensity of the Azores High modulate the oceanic moisture transport to Europe thereby affecting hydroclimate across western Europe, especially during wintertime. While changes in the North Atlantic storm track have been linked to the variability of the North Atlantic Oscillation (NAO), we focus on North Atlantic variability with a subtropical perspective by focusing on the Azores High independently of the Icelandic Low. The subtropical perspective provides a direct understanding of regional climate variability in the western Mediterranean and reveals dramatic changes to North Atlantic climate throughout the past century and can provide insight into the impact of future warming on the dynamics of the Azores High and associated hydroclimate. Here we show that winters with an extremely large Azores High are significantly more common in the industrial era (since 1850 CE) than in preindustrial times, resulting in anomalously dry conditions across the western Mediterranean, including the Iberian Peninsula. Climate model simulations of the past millennium indicate that the industrial-era expansion of the Azores High is unprecedented throughout the last millennium (since 850 CE), consistent with proxy evidence from Portugal. Azores High expansion emerges after the end of the Little Ice Age and strengthens into the 20th century consistent with anthropogenically-driven warming.