Northern North Atlantic oceanic conditions as an important driving factor for forest fire activity in northern Scandinavia

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Proxy evidence from coniferous trees in northern Scandinavia indicate considerable activity of naturally occurring forest fires in this Arctic region over the past centuries (Drobyshev et al. 2016). The characteristic climate conditions favoring increased Summer fire activity include the occurrence of persistent atmospheric blocking events over northern Scandinavia in the preceding winter to summer period, which are in turn associated with negative precipitation anomalies. Since the North Atlantic (NA) is a major source of heat and moisture to the study region, the state of the NA circulation is important for the anomalies in the boreal fire activity. Modelling studies by Born & Stocker (2014) demonstrated a possible bistability of the Subpolar Gyre (SPG) and the associated effects on the regional atmospheric and oceanic heat and moisture flux anomalies in the entire northern NA realm. Furthermore, a recent model study by Moreno-Chamarro et al. (2017) shows a link between a reduction in the SPG vigor, preferential zonal atmospheric circulation in the northern NA and the increased frequency of atmospheric blocking events over Scandinavia favorable for creating and sustaining regional droughts. Using a suite of forced and control GCM simulations of climate of the last millennium we demonstrate a functional relationship between the subpolar NA oceanic conditions, in particular the state of the SPG, and the Drought Code (Girardin & Wotton, 2009) used in the study area as a proxy for fire activity for the past millennium. Inference based on modelling results is further supported by analysis of proxy-based evidence of past atmospheric and oceanic circulation anomalies associated with fire years of the last millennium in northern Scandinavia.

References

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