Climate of the Past Discussions

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Comment on cp-2021-82

Christian Pfister (Referee)

Referee comment on "The 1600□CE Huaynaputina eruption as a possible trigger for persistent cooling in the North Atlantic region" by Sam White et al., Clim. Past Discuss., https://doi.org/10.5194/cp-2021-82-RC1, 2021

The lead author is one of the world's key scholars in Historical Climatology and Climate History cooperating with natural scientists and historians, mainly from Europe. The Huaynaputina is a stratovolcano in southern Peru. Its eruption in February 1600 CE triggered a persistent summer and winter cooling in the North Atlantic region during the early 17. It-was the largest eruption in the Andes in historical times. The paper explores the eruption-induced cooling mechanism in some detail. The study compares simulations and a North Atlantic subpolar gyre shift in annual proxies in archives of nature to more detailed with documentary evidence.

The Huyaputina injected fewer sulfates into the stratosphere than other LIA eruptions with a compatible cooling effect. In particular the eruption generated much more and longer lasting winter cooling than summer cooling in Central and Northern Europe, which is unusual. It is hypothesized that reduced heat transport by the North Atlantic Subpolar Gyre SPG in terms of a cooling of the North Atlantic may be one of the reasons, though many aspects remain unclear. Historical written records as well as contemporary historical observations of relevant climate and environmental conditions demonstrate patterns of cooling and sea ice expansion consistent with, but not necessarily indicative of an eruption trigger for the proposed SPG slowdown mechanism.

The arguments of scientists and modellers should still be improved in view of the limited understanding of people from the historical sciences for processes in the ocean. Some relevant studies might still be included: The herring catch on the west coast of Scotland declined remarkably between 1585 and 1597 which Parry (1978) interpreted this as an escape of this cold-sensitive species from the cold water masses advancing southwards. The detailed temperature reconstruction by Dobrovolny et al. (2010) for Western and Central Europe since 1500 CE was overlooked. It contains seasonal temperature that are explained in more detail by the recent synthesis by Pfister and Wanner (2021) that is published on 6th September. These data show that the very severe winter of 1600 preceded the Huynaputina eruption in contrast to the cold winter in 1601. Likewise, just spring 1600 was very cold. On the other hand, the summer 1601 was very cold.