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The impact of volcanism on the Holocene climate (536 AD and 540 AD) using the iLOVECLIM model and archaeological data within the Scandinavian Region

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Volcanism is one of the main natural climate forcings at annual to multi-decadal timescales. Therefore, this forcing is important to study Holocene climate variability. Our main objective is to examine the impact of volcanism on the climate in the 6th century AD within the iLOVECLIM model and analyze the results with archeological data. We hypothesize that large volcanic eruptions around 536 AD and 540 AD contributed to cooling of the climate, resulted to the adversities of Late ancient societies throughout Europe, and caused a major environmental event in Iron Age Scandinavia.

In this work, we have made three groups of simulations with the iLOVECLIM model, representing the climate of 536 AD and 540 AD. Two scenarios include high and low volcanic activity forcing, while in the third scenario, volcanic forcing is absent. We applied a model version with dynamical downscaling to reach a spatial resolution that allows for a meaningful comparison with archeological data. We compared our model results with C14-dated archeological records from Scandinavia to analyze the spatial intensity of land use during these time periods. An evaluation of the difference between these simulations will highlight the impact of the volcanic activity on early to mid-6th century Scandinavia.

This study demonstrates the link between climate and volcanism during these periods and shows the advantage of combining the archeological records with climate data to understand human-environment interactions. Future research that considers both climatological and archeological data can benefit our understandings of the impact extreme natural events had on the environment, the climate and people.