



Clarifying the role of volcanism on mid-15th Century climate using historical sources, proxy archives, and climate modelling

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The mid-15th Century is marked by one or more large-magnitude explosive volcanic eruptions and a strong multi-decadal-scale drop in Northern Hemisphere (NH) temperature often considered the beginning of the Little Ice Age (LIA). While a connection between mid-15th century volcanic activity and NH temperature is generally well accepted, scientific debate persists with respect to the number of major eruptions, their source volcanoes, their exact timing, apparent discrepancies between the estimated magnitude of eruptions and the resultant temperature changes, as well as the possible connection between volcanic forcing and the long-term regional climate anomalies of the LIA.

As a collaborative activity within the Past Global Changes (PAGES) Volcanic Impacts on Climate and Society (VICS) working group, this study aims to bring together evidence from a wide range of scientific and scholarly disciplines in order to piece together a holistic and unbiased picture of the connections between volcanism and climate in the mid-15th Century. We assess NH temperature proxy reconstructions and climatic information from documentary sources during the period, helping to establish a more robust picture of climate anomalies including their spatial structures and uncertainties. We critically assess the correlation (or apparent lack thereof) between reconstructed NH temperature and volcanic radiative forcing derived from polar ice core records, supplementing the discussion with dedicated simulations with the CESM(WACCM) aerosol-climate model. We also investigate the apparent mismatch between documented optical phenomena consistent with a volcanic aerosol veil in the 1460s with the lack of evidence for large-magnitude explosive eruptions from ice core records. Through this work, we aim to advance general techniques for combining natural and documentary archives and climate model simulations for quantitative hypothesis testing regarding the impacts of volcanism on climate.