Little Ice Age (LIA) – a cold long lasting climate crisis and its impacts on Scandinavian society

Large volcanic eruptions are the major drivers of natural climate variability in the pre-industrial era of the last millennium (Hegerl et al 2006; Schurrer et al 2014). They are thought to have triggered the onset of the Little Ice Age (end of 13th century) sustained by sea-ice/ocean feedback (Miller et al 2012) and several other little ice age like periods during the Holocene (van Dijk et al 2024). The strongest and most studied in the past millennium are the tropical explosive eruptions of Samalas 1257, Kuwae 1458, Tambora 1815, and the 1783-1784 Laki flood lava eruption in Iceland. Only recently, new high resolution ice core records led to a rewriting of the volcanic eruption history of the past 2500 years and the Holocene (Sigl et al 2015, 2022). Thus, less is known about the climate effects of large to very large or a clustering of volcanic eruptions given the uncertainties in the previously prescribed volcanic forcing. This project will use the new generation of Paleo Model Intercomparison Project 4 (PMIP4) model data with the new revised volcanic forcing to analyze and explore volcanic climate impacts on climate and society in Scandinavia and beyond. The model data will be validated with available climate proxies, observations and written documentary if possible.

Number of participants: 1-2

Supervisors: Prof. Kirstin Krüger

Number of projects: 1

Preferred project period: June - September 2025

Preferred background: Climate, Atmosphere, Ocean-Sea Ice, Environment, Society

Outline of project work / deliverables:

1. Participate at the Nordic LIA workshop at CAS in 2.-3. June.
2. Search for literature on the Little Ice Age and PMIP4.
3. Define major volcanic events and periods to focus on during the LIA.
4. Visit “The LIA” Klimahuset exhibition; consider interviews.
5. Search for new PMIP4 model data with improved volcanic forcing.
6. Analyse and visualize the new PMIP4 model data with improved volcanic forcing with respect to:
   -Climate effects on Scandinavia versus the Northern Hemisphere.
   -Validate with climate proxies (tree rings, ice cores) and observations (instrumental).
   -Explore society effects.
   -What is different to PMIP3?
   -Compare LIA with LALIA events.
7. Deliver eventual a popular science product in form of an oral/poster presentation or a contribution to a museum exhibition.

References

Hegerl, G. C., et al., Nature, 440, 10291032, 2006.

Miller, G., et al., Geophys. Res. Lett., 39, L02708, 2012.

Schurrer, A. P. et al., Nature Geosci., 7, 104-108, 2014.

Sigl, M. et al., Nature, 523, 543–549, 2015.

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van Dijk, E. et al, Commun Earth Environ 5, 242, 2024