

Climate Reconstruction and Impacts from the Archives of Societies working group

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Historical climatology is the interdisciplinary field that explores past climates and the human dimension using written records, human artifacts, and early instrumental measurements, collectively termed "the archives of societies". These sources range from chronicles, diaries, and newspapers to flood markers on historic buildings and pre-standard thermometer and barometer readings (Brázdil et al. 2005; Fig. 1).

Research in historical climatology may both complement and extend research in paleoclimatology (Brönnimann et al. 2018). Similar to high-resolution natural archives, the archives of societies may contain proxies for one or more climate parameters dating back as far as several millennia, depending on the region and approach. Archives of society have the advantage of possibly containing seasonal or even monthly information and are not restricted to a particular period (e.g. the growing season). This factor may permit full-year reconstructions utilizing a single approach. In addition, written historical records may provide detailed meteorological descriptions and narratives enabling investigations of historical climate as well as weather impacts and adaptations.

Nevertheless, using the archives of societies poses significant challenges. Their information is neither as continuous nor homogeneous as that provided by natural proxies, and their quantity and quality vary by region and tend to diminish further back in time. Historical climatology requires careful interpretation to overcome problems of subjectivity and errors of recording and transmission. Historical climatologists in different regions of the world have independently

developed methods to address these problems but have not yet coordinated global best practices in source interpretation or production of data, nor has the field established clear language and standards for the attribution of past societal change to climatic variability and change.

Scientific goals

The recently established PAGES working group Climate Reconstruction and Impacts from the Archives of Societies (CRIAS, pastglobalchanges.org/crias) aims to improve methods in historical climatology and to coordinate global best practices in source interpretation and production of data, especially for use by paleoclimatologists and modelers. To this end, three main goals have been defined:

1) *Sharing methods among historical climatologists working in different regions to exchange best practices and ensure the compatibility of results*

In East Asia and Europe, in particular, research in the field of historical climatology already has a long tradition. One goal of CRIAS is to intensify discussions regarding standards of source criticism and reconstruction methods among scholars from these two regions and to extend this discussion to other continents. This process has begun with a comprehensive worldwide review of methods for creating climate indices.

2) *Working with paleoclimatologists and modelers to determine whether and how data drawn from the archives of societies may inform their research (and vice versa)*

A closer collaboration between historical climatologists and paleoclimatologists seems very promising. To enable such a discussion, it is necessary to explore ways to solve problems derived from inhomogeneous records in the archives of society, the loss of low-frequency variability, and the treatment of uncertainties in reconstructions based on the methods of historical climatology.

3) *Communicating standards of climatic causation used in historical research, especially for the benefit of natural and social scientists whose work has historical human dimensions*

As with other interdisciplinary fields, historical climatology must deal with diverging disciplinary concepts, standards, and language used to address causality. This challenge arises particularly in the attribution of past societal changes to climatic variability or change. In order to avoid confusion among scholars in different disciplines as well as overly deterministic statements, CRIAS aims to promote more rigorous standards and language in historical climate impact and adaptation research.

Working group activities

In October 2018, a first workshop on "Methods and Interdisciplinary Communication in Historical Climatology" was organized in Bern, Switzerland (Camenisch et al. 2019). A second workshop was held in October 2019 in Leipzig, Germany, on "Integrating Documentary Evidence into Climate Reconstruction and Impact Studies" (dantean.hypotheses.org/crias), and a third workshop is scheduled in the second half of 2020 in Hong Kong. As a result of these activities, several papers and special issues are in preparation.

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Objectives of Historical Climatology

1. **Reconstruction** of temporal and spatial patterns of weather, climate, and climate-related natural disasters of the past.

2. Investigation of the **vulnerability of past societies** and economies to climate variations, climate extremes, and natural disasters.

3. Exploration of **past discourses** and the social representations of the climate.

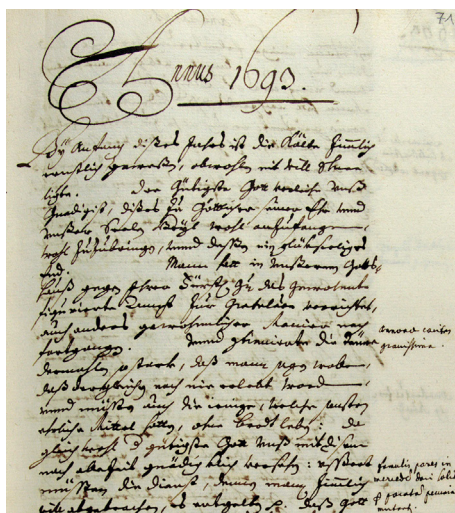


Figure 1: Objectives of Historical Climatology (Brázdil et al. 2005) and examples of archives of society: page from a weather diary from a monk in Einsiedeln, Switzerland, written at the end of the 17th century. Credit: Diarium P. Josef Dietrich, Bd. 8 (1692-1694) (KAE, A.HB.8, S. 71) klosterarchiv.ch/e-archiv_archivalien.php