



## **From flood-event to climate in an alpine context (Arve valley, France): methodological issues toward the confrontation of historical documentation and geological records**

Alain Mélo (1), Estelle Ployon (1), Bruno Wilhelm (1,2), and Fabien Arnaud ()

(1) EDYTEM, Université de Savoie, CNRS, Le Bourget du Lac, France, (2) Institute of Geological Sciences and Oeschger Centre for Climate Change Research University of Bern, Baltzerstrasse 1+3, 3012 Bern, Switzerland

Floods are complex multifactor events. As it can occur randomly on a given region, a given singular event does not clearly inform about climate variations. On the contrary, long-time series of well documented events, each one being replaced in its historical and geographical context, should bring valuable information. Such successions can be built-up using heterogeneous historical documentation taken from various social contexts. This is the case of small drainage basin of river Arve and its tributaries (Northern French Alps), on which this paper will focus. We used a plentiful and rich documentation which was elaborated quite exclusively to report damages in the aim of claiming tax abatement. As a consequence each text requires a hard critic to reach the necessary objectivity.

The analysis of 18th century treasury archives led first to a geographical reconstruction of floods impacts and second to an unambiguous chronology of events. The contrasted morphology of river Arve drainage basin generates various types of floods, depending on geographical situations: summer flash-floods in the higher parts of valleys (Chamonix, Sixt) or torrential tributaries (Borne); autumn large floods in lower parts (Bonneville); some unusual events concern the whole basin (1733, 1778...).

The constitution of long continuous series was thus possible. However, this does not allow evidencing any trend because most of the events are randomly-distributed flash-floods. In return, meteorological contextualization of each event replaces it in a larger climatic perception. Using this way (meteorological archives, comparisons with recently well-documented event) led us to corroborate connections between flood events and changing patterns. In order to go a step further, we led a pilot-study aiming at representing our data in space-time information system using concepts and tools of time geography. This study was limited to year 1930 AD which was rich in various meteorological events leading to various flood types. We were hence able to distinguish different types of flood events from localised thunderstorms, generalised thunderstorm activity in uppermost catchment areas toward generalised heavy precipitation affecting the whole river Arve Catchment area ( $\sim 2500 \text{ km}^2$ ). We hence point the diversity of meteorological situations susceptible to lead to the recording of flood events. In order to properly confront historical documents- and geological archives-based flood chronicles this diversity must thus be taken into account. In that aim, using time geography-based representations may help in attributing a given record to a given meteorological context.