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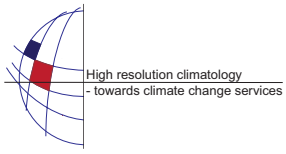

Crossing historical and sedimentary archives to reconstruct an extreme flood event calendar in high alpine areas

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Torrential flood hazard is expected to increase in the context of global warming. However, long time-series of climate and gauge data at high-elevation sites are too sparse to assess reliably recurrence times of such events in high mountain areas. Historical documents are an alternative which provide valuable information. However, historic archives are by nature subjective and variable in quality owing to hazard perception and vulnerability according to the banks land-use throughout time.

To overcome these limits, natural archives may be used as complementary records. Among the various natural archives lake sediments have the advantage to be continuous records in which particular events are preserved such as earthquakes and especially flood events. Furthermore an objective magnitude of these events can be assessed from the thickness of noteworthy event-triggered deposits. However if the recognition of major event-triggered deposits can be simple, a high-resolution dating of these events is more difficult over the historical period due to a lack of chronological markers.

In this paper, we present a sediment record study of a French high alpine lake where an important effort was undertaken to date precisely 56 flood events over the last three centuries from the use of historical archives. The caesium and the lead were measured to detect the fallouts of the Chernobyl accident (1986), the atmospheric nuclear weapons tests (1955-1963) and the use of leaded gasoline which culminated in the 70's. In parallel local and regional historical archives were going through in order to correlate the thickest sediment deposits triggered by major floods and earthquakes with their potential triggering historic events. Thus we were able to associate 12 historic flood and 4 earthquake dates to particular sediment deposits. The resulting flood calendar is very well-constrained thanks to 19 chronological marks over the last 270 years, i.e. one mark by 14 years.

This method permitted so to reconstruct a high-resolution flood calendar to assess a reliable frequency of extreme flood events which can be compared with precise climatic parameters as the instrumental and reconstructed temperature. Finally it was equally possible to compare the recorded intensity of flood events between the both archives and thus estimate the hazard perception and vulnerability of local people throughout the last three centuries.