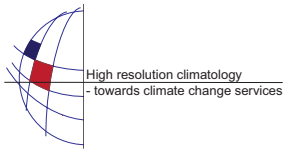
EMS Annual Meeting Abstracts
Vol. 7, EMS2010-757, 2010
10th EMS / 8th ECAC



Extreme flood events occurrence in high and low mountain areas: A spatial and temporal difference of processes throughout the last 2 millennia in NW Alps

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Flood hazard is expected to increase in the context of global warming due to a rise of the hydrological cycle activity with the temperature. However, long time-series of climate and gauge data are sparse and, when they exist, cover a too short time period to assess reliably recurrence times of such events in mountain areas.

In this paper, we present lake sediment-based flood history reconstructed from two alpine lake (Anterne and Blanc) located upper than 2000 m asl and one great perialpine lake (Le Bourget), all located in NW French Alps.

In high elevation sites, the 20th century is marked by the occurrence of thick coarse-grained deposit arguing for a reinforcement of flooding activity on the contrary of the so-called Little Ice Age period (LIA), which is marked by the scarcity of such extreme events.

On the contrary down by the valley, Lake Bourget sediments exhibit a drop in detrital fraction content, in response to decreasing flooding activity of river Rhône, since the end of the LIA. Such an apparent paradox is due to different processes in play in the generation of floods in high and low elevation sites. Indeed, in a recent monitoring study, we showed high altitude flood deposits are triggered by extreme localised summer thunderstorm events. On the contrary only catchment-wide rainfall events are susceptible to generate major floods susceptible to be recorded in a large system, such as Lake Bourget. Through the study of long cores (> 10 m), in the case of lakes Anterne and Bourget, we were able to extend this model over the last 2000 years. Such a result has particularly important implications regarding mitigation procedures to be set in response to present-day climate change in alpine high and low elevation locations.