Geophysical Research Abstracts,
Vol. 11, EGU2009-10379-2, 2009
EGU General Assembly 2009

Investigating the apparent paradox between flood intensity reconstructions from high and low elevation lake sediment series in the NW Alps over the last 2 millennia

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Among the global expressions of climatic changes over the Holocene period, changes in hydrological patterns have been particularly important. Indeed, reconstructed changes of past lake levels, flood/droughts frequency or glacier position revealed high magnitude variability at various timescales. 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 (Wilhelm et al., this volume; Giguet-Covex et al., this volume) on the contrary of the so-called Little Ice Age period (LIA), which is marked by the rareness 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 (Enters et al., this volume). 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. Thanks to the study of long cores (> 14m), 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 present-day climate change in alpine high and low elevation locations.