Geophysical Research Abstracts
Vol. 16, EGU2014-12644, 2014
EGU General Assembly 2014

Reconstruction of late Holocene flooding events in the Gulf of Genoa, Ligurian Sea

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The area of the Gulf of Genoa contains a large potential for studying past rainfall variability as it is one of the major Mediterranean centers for cyclogenesis. The strongest depressions form when cold arctic/subarctic air outbreaks flow through the Rhone valley into the Gulf of Lions and the Ligurian Sea during late autumn when sea surface temperatures are still relatively high. The cyclones are more frequent during negative Arctic Oscillation / North Atlantic Oscillation (AO/NAO). As well, significant negative correlations exist between AO/NAO and winter/spring precipitation and river discharge in northwestern Italy. Related autumn flooding events occur at interannual time-scales and may cause substantial damage in the region. Moreover, the "Genoa Cyclones" sometimes move northeastwards into eastern/central Europe (the so-called "Vb" cyclone track) and contributed for example substantially to the Elbe flooding in 2002.

During R/V Poseidon cruise P413 (May 2011), ca. 60 sediment cores were taken along the Ligurian shelf, continental slope and in the basin between off Livorno and the French border. Coring profiles from the coastal area to the deep basin allow reconstructing past environmental variability over the last ca. 90000 years with sedimentation rates varying between ca. 0.5 cm*yr-1 for the latest Holocene to ca. 10 cm*kyr-1 for the last glacial. On the shelf, mud lenses with exceptionally high sedimentation rates reaching several m/kyr provide detailed Holocene records of changes in terrigenous sediment input primarily related to autumn rainfall events. We performed high resolution (mm) analyses of major elements using XRF core-scanning on two cores with extremely high resolution (0.2-0.4 cm/year) over the last 2.5 kyr BP. Typical elements of detrital origin (i.e. Ti, Fe) present a very high variability, probably related to flooding events during the late Holocene. Spectral analysis on these records reveals significant periodicities around 4-5 and 7-8 years, i.e. within the spectral band of the Arctic Oscillation / North Atlantic Oscillation (AO/NAO) variability. We expect that our new records will provide important information on Holocene and last glacial changes in continental rainfall and surface ocean conditions and will allow establishing relationships to regional oceanographic changes as well as to large-scale atmospheric variability.