Multidisciplinary analysis at Lake Moo: Changes in high intensity precipitation on the Northern Apennines (Italy) over the last 9000 years

Stefano Segadelli¹, Federico Grazzini², Margherita Aguzzi², Alessandro Chelli³, Veronica Rossi⁴, Maria Teresa De Nardo¹, Roberto Francese³, Silvia Marvellì⁵, Marco Marchesini⁵, and Sandro Nanni²

¹Geological, Seismic and Soil Service, Emilia-Romagna Region Administration, Bologna, Italy
²Regional Agency for Prevention, Environment and Energy of Emilia-Romagna, Hydro-Meteo-Climate Service (ARPAE-SIMC), Bologna, Italy
³Department of Chemistry, Life Sciences and Environmental Sustainability, University of Parma, Italy
⁴Department of Biological, Geological, and Environmental Sciences - BiGeA, Alma Mater Studiorum University of Bologna, Italy
⁵Laboratory of Palynology and Archaeobotany - C.A.A. Giorgio Nicoli, San Giovanni in Persiceto, Bologna, Italy

The Lake Moo plain has a surface area about 0.15Km². It is located near the boundary between Emilia-Romagna and Liguria regions, at an altitude of 1130m a.s.l. (northern Apennines, Italy). This site is strategic to the dominant atmospheric currents, very prone to high intensity precipitation events (HIP) and related high-density flood. Indeed, Lake Moo area has been partially covered by a flood deposit released by a record-breaking rainfall intensity in September 2015. The intensity and wide spatial scale of those phenomena has leads us to investigate their frequency in the past, beyond the instrumental time. The lacustrine succession (ca. 13 m-thick) was studied through the extraction of one core and framed within sedimentary facies analysis approach. The paleoenvironmental interpretation of the succession was achieved combining sedimentological, pollen and pedological data and radiocarbon dating. Thirteen different facies types have been identified and the core succession is was subdivided into five informal units. The different coarse-grained layers interbedded with organic-rich silty clays and peaty layers have been interpreted as the extreme flood deposits triggered by high-intensity convective rainfall events in the catchment area that flow into the Lake Moo plain.

These coarse-grained deposits were grouped according to the genetic approach and therefore based on facies tract concept. The goal of this study is how the facies tract approach may represent a novel method that can be used to improve our understanding of flood reconstruction dynamics and may be applied to other similar deposits. We interpret the local lacustrine succession is like to the infill of a structural depression produced by gravitational block sliding that was induced by post-glacial fluvial incision.

Finally, the observed depositional cycles were put in relation with other specific paleoclimatic proxies available in literature for the area.