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Study of Recent Sediments in the City of Como (Northern Italy): a new perspective from the Como Drilling Project

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The purpose of the Como Drilling Project is to provide a reconstruction of the LGM to Holocene environmental evolution of the urban area of the Como town and of the whole Lake Como (or Lario, N Italy). At the same time, the Project is aimed at understanding the mechanical behaviour of the recent deposits filling the Como basin, in order to characterize from a geotechnical point of view the history, rates and future trends of the subsidence affecting the downtown area. The urban area is in fact affected by environmental phenomena like deformation of the ground surface, and lake floods of Lario. To clearly define the controlling factors of these phenomena is important to take into account the role of all the different natural and human components in the environmental post glacial evolution of the Como sedimentary basin. This twofold aim is therefore achieved through a multidisciplinary approach and analysis conducted on the urban subsurface sediments and the surrounding geological setting. A more detailed knowledge of the Holocene stratigraphy of Como can lead to a more accurate urban planning and territorial management of a large, highly developed Alpine region with strategic environmental value.

Como provides indeed a privileged point of view for understanding the post glacial evolution in the Alpine Italian setting, because it preserves a high resolution, continuous, and datable archive of environmental data. This area has been occupied by a hydrologically-closed branch of Lake Lario after the LGM, with a relatively high sedimentation rate of fine-grained, organic deposits, and with limited erosional phenomena.

Since 2001 the University of Insubria, in collaboration with the Como Municipality, APAT (Italian Agency for Environmental Protection and Technical Services – Geological Survey of Italy), IMONT (National Institute for the Mountain) and others Institutions as listed in the affiliations of this abstract, is carrying out a multidisciplinary research to investigate in detail the stratigraphy of the urban subsurface. Firstly, we collected in a database and interpreted the stratigraphic, hydrogeologic and geotechnical information resulting from about 100 boreholes located in the entire urban area. Then we conducted a detailed analysis in 3 zones of the city (S. Abbondio site, Ticosa's area and Valleggio Street). In particular, we drilled three new shallow boreholes at the S. Abbondio site in 2003. For these sites we collected samples for sedimentologic, stratigraphic, palynologic, mineralogic and radiocarbon dating analyses and proposed a model of climatic and environmental evolution for the area after the LGM. Previous data (Comune di Como, 1980; Castelletti and Orombelli, 1986; Apuani et al., 2000) and our new analyses allowed us to work out a preliminary 3D geological model describing the spatial geometry of deposits and then to interpret the stratigraphic succession of Como subsurface from the palaeoenvironmental point of view.

From our model, we infer that Holocene ground subsidence rates in the urban downtown area had an average rate of 4 mm/yr. This long-term value seems in agreement with short-term estimates obtained by archaeological data, and geodetic and PSInSAR data available for the last 70 and 12 years, respectively (Comerci et al., 2005).

Two new boreholes about 70 m deep were performed in October - November 2005 at the Piazza Verdi site, near the Duomo of Como. These 2 boreholes have been instrumented for monitoring water table fluctuations and soil compaction through time. Piezometric survey planned for the next 3 years on other 30 drillings in the urban area will provide new data for modeling underground aquifer architecture and behavior. The detailed geotechnical and stratigraphic analysis of the drilled sediments includes analysis of pollen, charcoals, paleobotany, diatoms, radiocarbon, and geotechnical properties (such as soil density, penetration testing and edometric testing). The results will allow us 1) to verify the inferred Holocene subsidence rates and understand their fluctuations through time, 2) to better constrain the recent history of the physical environment, and 3) to calibrate realistic models of interaction between natural processes and human impact in this sector of the Lake as well as in the whole Lario Basin.