3D geological modelling in urban contexts for geological reconstruction: a case study of the city of Cassino (Central Italy)

Rompato M. *1, **Saroli M.** 1-2**, Albano M.** 2**, Moro M.** 2, **Bozzano F.** 3**; Scarascia Mugnozza G.** 3**, Fiorucci M.** 1, **Colagiacomo V.** 1

*Ph.D. student

1 Civil and Mechanical Engineering Department (DiCeM), University of Cassino and Southern Lazio.

2 National Institute of Geophysics and Volcanology (INGV), Rome.

3 Department of Earth Sciences and CERI Research Center on Geological Risks, Sapienza University of Rome.

The aim of this work is to show how classical methods of geological investigation can be combined with implicit 3D modeling software to reconstruct detailed geological and hydrogeological models of quaternary intramontane basins in order to describe the relationships between different lithological bodies representing the filling deposits post chain structuring. For this purpose, the urban area of Cassino, in southern Lazio (central Italy), was chosen. It is located at the end of the Latin Valley bordered by the carbonate structures of M. Cairo in NW, of the M. Venafro to NE and SE and by other main tectonic elements mainly in Apennine development. For reconstructing the lithostratigraphic structure of subsoil, about 200 stratigraphic surveys and about 25 seismic noise measurements HVSR were analyzed and processed through the 3D geological modelling software Leapfrog (Seequent Limited). These have been correlated with the deposits and depositional environments described in the literature. Seven main stratigraphic units were recognized. It shows a carbonatic bedrock very articulated for tectonics, on the top are localized local clay sandstone units attributable to the Frosinone Flysch (Upper Miocene), followed by a complex of allotigene series attributable to a generic Messinian sea-lake (Lower Pliocene). These sediments are covered by the normal lake sequence of Lake Lirino characterized by an alternation of clayey silt and sand with gravel and with thicknesses ranging from a few meters near the carbonate relief of M. Cassino and up to about 150 m in the NW portion of the center urban. It should be noted that this sequence, close to the relief of M. Cassino, is characterized by the presence of layers of gravel and sand attributable to the paleo Rapid, water course today diverted by anthropic activity, which probably constituted an ancient tributary of that part of the Lirino lake that occupied the current plain of Cassino. In this model two piezometric surfaces have also been reconstructed: the first one relating to a confined artesian aquifer hosted by the carbonate bedrock and a second piezometric surface relating to filtration phenomena from the deeper carbonate aquifer towards more permeable components of the Lirino Lake deposits.