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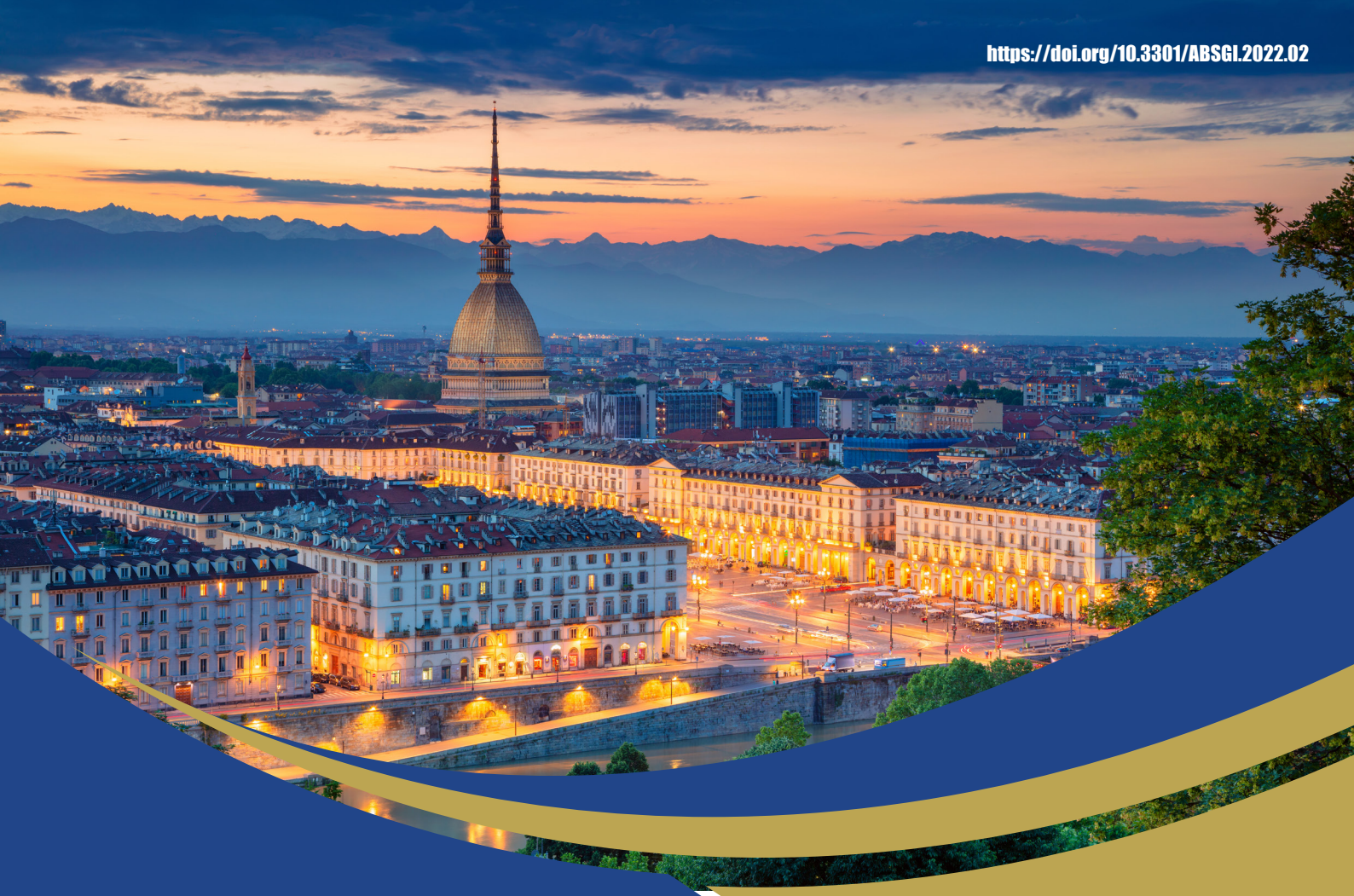

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ABSTRACT BOOK

a cura della Società Geologica Italiana

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COVER IMAGE:

Aerial cityscape image of Turin during sunset.

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

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This work aims to investigate the shape and geotechnical features of the subsoil of the city of Cassino (Central Italy) through the interpretation of an extensive database of geophysical, geognostic and bibliographic data. 3D geological models of urban areas provide critical information for geological and hydrogeological analysis and studies. Particularly, the city of Cassino hosts important springs coming from the Caira-Ernici-M. Cassino hydrostructure. Currently, few data are available for the characterization of lateral and vertical contacts between the carbonate hydrostructure and quaternary alluvial deposits. To overcome such a limitation, we aim at developing a 3D subsoil model by exploiting available and new data.

The available dataset comprises 229 geognostic boreholes and 73 HVSR microtremor measurements. The collected data were processed through the 3D geological modelling software Leapfrog (Seequent Limited). In particular, the HVSR analysis proposed in Saroli et al. (2020) has been reworked in a new statistical raster surface representing the substrate's depth.

The 3D model is made by stacking on top of each of the interpolated surfaces representing stratigraphic and tectonic boundaries. Such model highlights the main structural and lithological elements of the subsoil, such as the surface of the bedrock, the quaternary fluvio-lacustrine filling, and secondary tectonic structures (i.e., faults) buried below the city.

The carbonate and flyshoid bedrock are disarticulated in a horst and graben structure by a normal fault system (pre-Miocene) oriented along the appenninic and anti-appenninic direction.

The model highlights a horst located to the south-southeast, which represents the continuation of a large-scale structure that connects the bedrock outcrops of *Terme Varroniane* and *Borgo Mastronardi* localities. The bedrock subsurface is approximately 100 m deep under the area of the town. Still, in the northern portions of the city, this surface deepens to a depth of about 300 m, as testified by deep boreholes and microtremor measurements.

The quaternary filling is composed of impermeable silty and clayey lithologies, interspersed by several lenses of sandy and gravelly layers up to about 10 m thick in the center of the city, resulting from past alluvial events of the Rapido River. These lithologies are often saturated by water filtrating upward from the buried carbonate bedrock or by lateral feeding where the sandy-gravelly lithologies are in contact with the carbonate relief of M. Cassino.

Furthermore, the 3D geological models of the Cassino area highlight vertical and horizontal filtration phenomena inside the hydrostratigraphic basin of the Cassino plain from the carbonate structure

Saroli M., Albano M., Modoni G., Moro M., Milana G., Spacagna R., Falcucci E., Gori S. & Scarascia Mugnozza G. (2020) - Insights into bedrock paleomorphology and linear dynamic soil properties of the Cassino intermontane basin (Central Italy), Engineering Geology, 264, 105333.

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