



Sedimentary Media Modelling Platform for Groundwater Management in Urban Areas

Radu Constantin Gogu (1,2), Dragos Gaitanaru (1), Zenaida Chitu (1), Angela Ionita (2), Marin Palcu (1), Violeta Velasco (3), Enric Vasquez-Sune (4), Loretta Batali (1), and Ioan Bica (1)

(1) Technical University of Civil Engineering, Bucharest, Romania, (2) Romanian Academy Center for Artificial Intelligence Bucharest, Romania, (3) Department of Geotechnical engineering and Geosciences Technical University of Catalonia, Barcelona, Spain, (4) Institute of Environmental Analysis and Water Studies, CSIC Barcelona, Spain

Urban areas are a focus of increasing conflict with regard to water use and water protection. Half of the world's population and about 73% of Europeans live in cities. In Europe numerous urban areas are located in flood plains of the rivers. Sedimentary media (alluvial sediments, deltas, etc.) form particular frequently occurring environments within these valley fills. However, sedimentary media are normally significant aquifers due to their high permeability, storage and management ability, interaction with surface water, etc.

A reliable management of the hydraulic resources in urban areas can be performed only by using modeling. The models can provide accurate results if they correctly reproduce the hydrogeological processes. Nevertheless, it is well-known that sedimentary media are normally extraordinarily heterogeneous, which is a paradox as it leads to simplified models based on the homogeneity of large zones characterizing the medium. Tools and methodologies should allow the representation in three dimensions of the of the geological record heterogeneity and its spatial distribution as well as the interaction of the groundwater with the urban infrastructure (water supply and sewer systems, drainage systems of basements, subway network, parking lots, etc.). The paper will focus on the main aspects of these instruments, which are currently developed within a national research project, that have to support the 3D hydrogeological modeling.

Within this project is developed a software platform containing methodologies and tools that facilitate the integration of the 3D geological models in sedimentary media into the hydrogeological modeling of flow and contaminant transport. This is composed by a geospatial database and a set of tools allowing accurate stratigraphical analysis. The geospatial database is used for the management of a large amount of different data types coming from different sources (geophysical, geological, hydraulic, and others). Its structure allows storing accurate and very detailed geological core description that can be straightforwardly generalized and further upscaled. An application of this platform is currently developed for the Moesian aquifer system (Bucharest city Region). This involves: (1) 3D geological characterization – application of the methodologies and developments suggested, (2) 3D parameterization of the Moesian aquifer system (Fratesti strata, Mostistea, and Colentina), (3) Management of the hydrogeological data base (tests and hydraulic parameters, level data, hydrochemical data, etc.), (4) Hydraulic definition/parameterization of facies and other geological concepts and, (5) Interaction between underground works and hydrogeology