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Reconstruction of the Friuli Venezia Giulia Plain aquifers

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The constantly increasing of water demand for human consumptions has necessitated a reconstruction of the hydrogeologic characteristics and properties as well isotopic features of the aquifers of the Friuli Venezia Giulia Plain (FP).
The DiSGAM and DICA have been engaged by the Hydraulic Survey of the FVG Region in order to coordinate an integrated study finalized to the FP confined and unconfined aquifer geometries reconstruction and to provide guide-lines for water rational exploitation (Agreement D.G.R. n. 1827 dd. 27.07.2007).
The Friuli Venezia Giulia Plain, located in the northeastern sector of Italy, hosts well developed Plio-Quaternary unconfined and confined alluvial aquifers. The main surface drainage of the Plain is the Tagliamento River. The regional hydrogeological situation is characterized in the north by an extensive alluvial unconfined aquifer mostly contained in carbonate gravels. This area extends from the Pre-Alps to the resurgence belt. The resurgence belt is 2 to 8 km wide and 80 kilometres long. In this area the water table intersects the topographic surface forming numerous plain springs and rivers. The resurgence belt sets a geohydrological boundary between the Upper and Lower Friulian Plain. In this strip the unconfined aquifer changes into a multi-layered confined that reach a thickness of up to 500 m with a progressive increase in a westward direction towards the Adriatic Sea.
In order to define underground aquifer relations and patterns, more than 1800 stratigraphic columns have been collected from different public departments water well database. Well logs have been georeferred, missing elevations calculated by regional DTM, possible correspondences controlled and datasets updated.
In order to better correlate spatial data, an unique implemented lithostratigraphy legend has been created from present different ones; it is composed of: Lithological Entries (relating lithology and granulometric features; permeability linked different values are also attributed) and Description Notes (including accessory precious information as, for example, fractured, carsified, shell or plants rich intervals turned out to be useful in depositional setting definition and wells spatial correlation).
Wells data have been iteratively analyzed and hydrostratigraphy sequences have been interpreted according to the conceptual model relating to layered shallow and deep confined aquifers (Martelli et al., 2007; Cucchi et al. 2008); where present, A-B-C-D-E-F-G-H-I-L-M aquifers' top and bottom, other than interposed aquitards, have been well picked. Top and bottom maps have been elaborated initially through triangulation, then from grids calculated by different algorithm methods (krigging, inverse distance, ecc), other countouring parameters (polynomial enhancement, declustering, logaritmic gridding, high fidelity, smooth grid) and poligon filterings. Maps should further improve with upcoming wells data.
Hydraulically connected areas have been identified in cross correlating sections; permeability domains, different texture features and heteropic interdigited layers have been highlighted.
Extent outlines of main hydro-stratigraphic units have been reconstructed; top surfaces and thicknesses values have been mapped. All these studies are useful for reconstructing the availability groundwater resource and to evaluate the sustainable exploitation of the resources (water quantities).

References

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