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3D modelling and construction of a standard cross section of the Euganean Hydrothermal circuit – NE Italy

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The Euganean geothermal field (EGF) is the most important thermal field in the northern Italy. It is located in the Veneto alluvial plain, southwest of Padova (NE Italy). The EGF extends on a plain band of 36 km^2 located immediately northeast of the Euganei Hills. In this area about 100 mining claims and more than 400 wells have been drilled. Thermal waters are mainly used for cure and wellness, with a subsidiary use as energy to heat hotels and greenhouses. At present about 250 wells are active and the total average flow rate of thermal fluids is about 17 Mm^3/year.
The present hydrogeological conceptual model of the Euganean thermal circuit proposes that the thermal groundwaters are of meteoric origin and infiltrate at about 1500 m a.s.l. in the Pre – Alps, 70 Km to the north of the Euganei Hills. The waters reach a depth of about 3000 m, warm up by a normal geothermal gradient and flow into a fractured carbonate reservoir. Near the Euganei Hills, the groundwaters intercept a regional fault system (Schio – Vicenza fault system) that acts as a barrier for the groundwater flow. The high fracturing of the rocks in this area allows the hydrothermal fluid to rise quickly.
It is increasingly found that hot waters outflow is related to local bends or stepovers of regional strike-slip faults. Also the active Schio – Vicenza fault system, which presently has a strike-slip kinematics, shows a geometric complexity that could produce a local extensional regime enhancing the outflow of the thermal fluid.
The aim of this work is to construct a standard cross section of the hydrothermal circuit linked to EGF by using different type of geological and geophysical information (seismic sections, deep wells, geological maps of the subsurface). The standard section will be used to improve the conceptual model of thermal circuit and will be the base of the 2D mathematical hydrothermal model of Euganean thermal circuit, which will be performed using the software Hydrotherm. This software uses 2D model sections, therefore the standard cross section will be useful as starting point for the hydrothermal model and to test its parameters sensitivity.
The analysis of some available unpublished seismic lines, located few kilometres to the southeast of the EGF, has permitted to construct a 3D model of the subsurface, performed by gOcad. In the north-western part, including the EGF, the main constraint is given by the stratigraphies of deep wells penetrating the bedrock for few kilometres. Therefore, this work confirms the idea that the outflow of the thermal waters, in the area near the Euganei Hills, is caused by the local extensional regime related to the strike-slip kinematics of the Schio – Vicenza fault system.