

Sustainability assessment of geothermal exploitation by numerical modeling

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One of the major issues of the 21st century is how to use the natural resources in a renewable and sustainable way to reduce greenhouse emissions in compliance with the Kyoto Protocol and the subsequently Conferences on Climate Change. The groundwater exploited in the Euganean Geothermal Field (EGF) is one of the most important and economically profitable thermal resources in Italy. EGF, extending on a plain band of about 25 km² to the Southwest of the city of Padua, represents the discharge area of a broader geothermal system involving the central part of the Veneto Region (Euganean Geothermal System). In this area, upwelling of thermal water has been used for therapeutic purposes since the Roman period. Starting in the early 1900's, approximately 600 wells have been drilled to meet the increasing demand of thermal water and to promote the growth of a local tourism industry. Actually, 15 million cubic meters per year of thermal water are extracted through 142 wells and used mainly for balneotherapy and recreational purposes. The huge number of tourists visiting the hotels produces an income of 300 million Euros per year, among the highest in Europe for thermal tourism.

The project is aimed at quantifying the long-term sustainability of the thermal water exploitation in the EGF, especially in relation to the recharge of the geothermal system. This main objective will be achieved by implementing numerical models at different scales and with several approaches. These approaches will be: (i) equivalent porous medium (EPM), (ii) discrete fracture network (DFN) and (iii) hybrid, while the model domain extensions will vary from regional to local scale. A secondary goal will consist of simulating the groundwater flow in the fractured aquifer with particular attention paid to the mechanisms which favor the quick ascent of the thermal water from the deep aquifer toward the ground surface.

This project is part of a research effort focused on groundwater sustainability assessment in the Venetian Plain (Dalla Libera et al., 2017; Fabbri et al., 2016) and on the Euganean Geothermal System (Pola et al., 2015). It will reinforce the ongoing collaboration established with the German Research Centre for Geosciences (GFZ) of Potsdam (D) to model the system with DFN and hybrid approaches. Available financial resources: ENSER 2016, ENSER 2017, DOR 2016, DOR 2017

References

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