

Norme e regole, tra adattamento e resistenza, nella città e negli insediamenti: la documentazione d'archivio e la costruzione reale / Norms and rules, between adaptiveness

Original

Norme e regole, tra adattamento e resistenza, nella città e negli insediamenti: la documentazione d'archivio e la costruzione reale / Norms and rules, between adaptiveness and resistance, in towns and settlements: archival documents and true realisations / Devoti, Chiara; Bodrato, Enrica; Ordasi, Zsuzsanna - In: Adattabilità in circostanze ordinarie / Ordinary Conditions Adaptability / Devoti Chiara, Bolca Pelin (a cura di). - ELETTRONICO. - Torino : AISU International, 2024. - ISBN 978-88-31277-09-9. - pp. 13-16

Availability:

This version is available at: 11583/2991630 since: 2024-09-05T15:40:11Z

Publisher:

AISU International

Published

DOI:

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The role of hydrogeological conditions and thermophysical properties on the evaluation of geothermal exchange potential in Central Italy

Jessica Chicco (1), Massimo Verdoya (2), Vittorio Verda (3), and Chiara Invernizzi (4)

(1) University of Camerino, School of Science and Technology, Geology, Camerino, Italy (jessica.chicco@unicam.it), (2) Department of Earth, Environment and Life Sciences - DISTAV, Genoa, Italy (verdoya@dipteris.unige.it), (3) Department of Energy – DENERG, Polytechnic of Turin (vittorio.verda@polito.it), (4) University of Camerino, School of Science and Technology, Geology, Camerino, Italy (chiara.invernizzi@unicam.it)

Within the framework of the EU strategy for sustainable development, the exploitation of the shallow subsurface geothermal resources is of great relevance. In this regard, a multidisciplinary investigation aimed at optimising the performance of borehole heat exchangers is in progress in the Marche region (Central Italy). In particular, an improvement of the present-day knowledge about thermo-physical parameters of the sedimentary deposits forming the Umbria-Marche succession, as well as the hydrogeological setting and geological structures, is fundamental in order to obtain a better picture of the regional geothermal exchange potential. Therefore, we carried out accurate laboratory measurements of thermal conductivity, volume heat capacity, thermal diffusivity, porosity, and density of both core and outcrop samples of the main geological formations of Marche. Moreover, the mineralogical content was defined through XRD diffraction. Because climatic variations can influence the moisture content of the shallower portions of the subsoil, the groundwater physical properties (temperature and electrical conductivity above all), have been continuously monitored for several years. Based on the collected data, a detailed thermo-fluid dynamic modelling was carried out under different, hydrogeological and geo-structural conditions to calculate the effect of groundwater velocity on the heat exchange between the boreholes and the ground. A relation, based on well-known non-dimensional parameters, was obtained in order to correct the purely conductive heat transfer on the basis of groundwater velocity. The preliminary results show that groundwater plays an important role, giving rise to higher heat exchange coefficients. This improves the present-day knowledge of the geothermal exchange potential in the region and overtakes previous analyses that only considered heat conduction.