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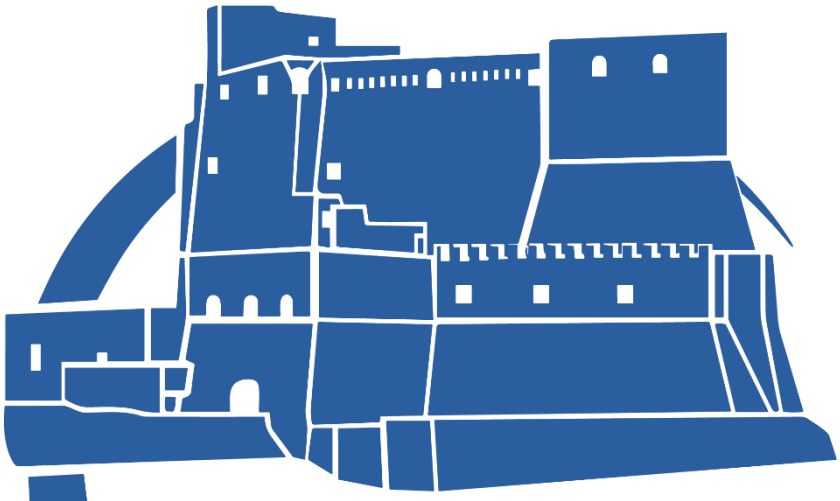

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Abstracts

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Groundwater flow numerical analysis of Sibillini hydrostructure (Central Italy): system characterization and evaluation of hydrogeological changes after the M_w 6.5 Norcia earthquake

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Keywords: numerical modeling, Norcia earthquake, hydrostructure

The M_w 6.5 Norcia earthquake, occurred on 30th October during the 2016 Central Italy seismic sequence, caused important long lasting hydrogeological changes in the Sibillini Mts. basal aquifer, also affecting the groundwater management system. The seismic event, originated from the rupture of different segment of Vettore-Bove normal fault system, produced important surface faulting. The mechanism of "aquifer fault rupture" (Mastrorillo *et al*., 2020) can explain the observed hydrogeological variations at springs and along the main drainage system, suggesting the rupture of the aquifer piezometric caused by the Vettore fault and a subsequent shift of the groundwater divide.

In this work we aim at characterizing the regional Sibillini carbonate hydrostructure and evaluating the important hydrogeological changes induced by the 30th October Norcia earthquake, by using a numerical approach and a simplified analysis method.

The construction of a simplified 3D geometric model of the Sibillini area provided us to define a solid hydrogeological conceptual model, whose boundaries are established according to tectonic and hydrological features. Because of the hydrogeological complexity of the carbonate hydrostructure and in accordance with the "Principle of Parsimony" we have simplified the model by bringing it back to a simple hydraulic system, consisting of 3 tanks separated by faults (Vettore fault and Norcia fault).

We performed a hydrogeological numerical analysis to create a simple regional scale groundwater flow model. The regional scale of the model allows us to consider the Sibillini carbonate basal aquifer, which is heterogeneously fractured, as an equivalent continuous homogeneous medium and thus to assume an average permeability, representative for the entire area. We considered faults as horizontal flow barrier, and we attributed them a different permeability than that of the aquifer. We simulated the groundwater flow before and after the 30th October Norcia earthquake and then we performed an automatic calibration of the model by using spring discharge and hydraulic head data as target parameters, in order to define the hydraulic parameters that characterize the Sibillini hydrogeological system at regional scale.

References:

Mastrorillo L., Saroli M., Viaroli S., Banzato F., Valigi D. & Petitta M. 2020. Sustained post-seismic effects on groundwater flow in fractured carbonate aquifers in Central Italy. Hydrological Processes, 34(5), 1167–1181.

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