Rare earth elements, yttrium, and the isotopic composition of Sr and Nd for assessing the origin of the Quaternary travertines from Acquasanta Terme (Marche, central Italy)

F. CASTORINA[1,2*], U. MASI[2]

[1]Dipartimento di Scienze della Terra Università "Sapienza" P.le A. Moro 5-I00185 Roma, Italy. (*correspondence: francesca.castorina@uniroma1.it)

[2]Istituto Di Geologia Ambientale e Geoingegneria-CNR, c/o Dipartimento di Scienze della Terra Università "Sapienza", P.le A. Moro 5-I00185 Roma, Italy (umberto.masi@uniroma1.it)

The Acquasanta Terme travertines of Quaternary age (from >350 ka up today) crop out on the eastern side of the Apennines, Marche, central Italy. They display ranges of Sr and REE+Y contents, and REE+Y patterns, which are consistent with a sedimentary rock source of hydrothermal fluids, in particular, evaporites. The Sr isotopic ratios of the travertines exhibit a very narrow range (0.70782-0.7079), which indicates an unchanged Sr source throughout the carbonate deposition. In the context of the local stratigraphy, the source can be identified with the Burano anhydrite-limestone Formation of the Upper Triassic. No contribution of Sr from magmatic sources has been detected. The Nd isotopic ratios of the travertines also show a very narrow range (0.512195-0.51224), indicating the REY provenance from an unchanged source through time. This source was likely the same one, which provided Sr.

The comparison of the chemical and isotopic data of the Acquasanta travertines of slope environment with those from the Tivoli plateau (Latium) of similar age and outcropping on the western side of the Apennines indicates the common origin of hydrothermal waters from the Burano Evaporite Formation. In contrast, the isotopic data, in particular, those of Sr clearly distinguish the Acquasanta travertines from the Quaternary bedded travertines of Semproniano (southern Tuscany), in agreement with the different source rocks inferred for the hydrothermal waters of the two deposits.