

A non-invasive investigation for quarry provenance of Delos archaeological marbles

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Delos Island, one of the smallest islands of Cyclades archipelago in Greece, is known for its exceptionally well-preserved archaeological site. The island is mostly composed of granite and gneiss, with only few marble inclusions but the ancient Delian architecture is first and foremost made of marble and gneiss. Even if the local marble has been used, despite its often mediocre characteristics, a large part of the marbles has been imported from the neighbouring islands and continental Greece. For now, the origin of these marbles remains mostly unknown. Several analytical methods have been developed in archaeometry for years to determine the origin of marbles, but they are generally destructive. Due to the frequent difficulties linked to sampling authorizations, we have prioritized and tested a non invasive approach. It is based on calcite grain size analyses (Maximum Grain Size – MGS) and on a hand-held portable X-ray fluorescence (pXRF) analyser to detect major and trace elements used so far in archaeometry, for example for obsidian or ceramic provenance. We combined the use of pXRF instrument and MGS with cluster analyses based on statistical data processing, the so-called Principal Component Analysis (PCA). Despite a number of limitations induced by XRF miniaturization, pXRF appears to be a powerful tool for preliminary provenance studies when conventional micro destructive analyses are precluded. Moreover, the XRF portability allows to multiply in-situ measurements, permitting a more statistic analysis sampling. By the application of this protocol, we thus managed to verify several provenances suggested by macroscopic observations, or to refute provenances suggested by archaeologists a century ago.

Mots-Clés : Archaeometry, marble provenance, Delos, pXRF spectrometry, Antiquity period