Geoarchaeological non-invasive techniques (pMS, pXRF, Schmidt Hammer) to study quarrying activity of the Corsican granites and the related monuments during the Roman period

Nadine Mattielli\(^1\), Antoine Triantafyllou\(^{1,2,3}\), Sébastien Clerbois\(^4\), Gaël Brkojewitsch\(^5\), Letizia Nonne\(^6\), Nicolas Paridaens\(^7\), and Nicolas Authom\(^8\)

\(^1\)Laboratoire G-Time, DGES, Université Libre de Bruxelles (ULB), 1050 Brussels, Belgium (nmattiel@ulb.ac.be)
\(^2\)Department of Geology, University of Liège, Sart Tilman, 4000 Liège, Belgium (atriantafyllou@uliege.be)
\(^3\)Department of Geosciences, University of Arizona, Tucson, AZ 85721, USA (atriantafyllou@uliege.be)
\(^4\)CReA-Patrimoine, Université libre de Bruxelles (ULB), 1050 Brussels, Belgium (Sebastien.Clerbois@ulb.be)
\(^5\)Metz Métropole, Université Aix Marseille, CNRS, CCJ, Aix-en-Provence, France (gael.brkojewitsch@gmail.com)
\(^6\)FAW&B c/o Musée Art et Histoire, 1000 Brussels, Belgium (lnonne@hotmail.com)
\(^7\)PANORAMA, Université Libre de Bruxelles (ULB), 1050 Brussels, Belgium (Henry-Louis.Guillaume@ulb.ac.be)
\(^8\)AWAP, 5000 Namur, Belgium (nicolas.authom@awap.be)

Although several authors have previously reported the limited Roman quarrying activity in Corsica, recent research programs revealed a real basin of granitoid quarries in the archipelago of Lavezzi (Strait of Bonifacio, southern Corsica). A series of fundamental archaeological questions have arisen for which a geological expertise could provide new answers: (i) what was the quarrying strategy during Roman times in the Strait of Bonifacio area, (ii) is it possible to characterize and catalogue the quarried granitic rock materials and establish ‘quarry-to-monument’ relationships (i.e. comparisons with building stones and quarries), and (iii) how to identify and constrain the timing of major phases of quarrying activity (discrimination of Roman activities relative to modern footprints in the quarries)?

To achieve these goals, our geoarchaeological study proposes a pluri-disciplinary, innovative, non-destructive methodological strategy, coupling techniques of digital photogrammetry, field petrography, mineralogical and chemical analyses by portable magnetic susceptibilimeter (pMS) and portable X-Ray Fluorescence spectrometer (pXRF) respectively, and physical rock properties using a Schmidt Hammer. The field geochemical measurements were calibrated by laboratory major and trace element analyses on ICP-OES and HR-ICP-MS, respectively. Here, we present preliminary results of two field campaigns. These results indicate that a statistically significant number of measurements by pMS and pXRF from the same representative area of the studied rocks – natural rocks or building stones, can be used to discriminate different quarried sites and identifying distinct rock sources. Several profiles of rebound measurements at the rock surface using the Schmidt Hammer (indicative of the degree to which a rock surface has been weathered and by extension, exposed) might help revealing the initial volume of natural rock massifs before their initial extraction. Our study provides original and reproducible techniques contributing to
significantly improve geoarchaeometric investigations and brings key information on the quarrying activity in southern Corsica during Roman times along with its implications on the Mediterranean commercial exchange trades.