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Lithotheque of Czech historical carbonate stones: the present state of investigation

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The concurrent effort to establish a sufficient database of analytical data for complete natural stone collections is going on in most European countries. During the past decades, this problem has also been encountered in the Czech Republic, which initiated an interdisciplinary research project entitled 'Lithotheque of Czech historical dimension stones'. This project includes: (a) literature research (published and unpublished data, data from archives), (b) fieldwork (location and description of historic quarries, stone sampling), (c) laboratory studies (mineralogical-petrographic, geochemical, physical, mechanical, and technical properties testing), (d) lithotheque preparation (thin sections, sawn and polished stone slabs, large blocks), and (e) compilation in printed form of the 'Atlas of Dimension Stones' (with all available data for each stone type). The inventory of historic quarries follows a defined structure including basic quarry data, petrographic descriptions and name of the rock, analytical data, technical properties, deposit details, exploitation and historical use. The 'Atlas of Dimension Stones' is intended to be a tool for stone provenance assessment and for the education of geologists, restorers, and architects.

Czech Republic shows extensive carbonate stone deposits that have been quarried for decorative purposes since Neolithic times. Up until now, around fifty marble quarries from six areas of investigation (Lugicum, Moravian-Silesian Domain, Kutná Hora-Svratka Crystalline Complex, Moldanubian Zone, Sedlčany-Krásná Hora Metamorphic 'Islet' and Krušné Hory Crystalline Complex) located in the Bohemian Massif were examined, and correlated with three marble artefacts from the relevant Czech monuments (the Prague Castle, the Pernštejn Castle, and the Plague Pillar in Brno). Further part of the carbonate stone database is composed of limestone samples of the Barrandian area and clayey-calcareous silicites of the Bohemian Cretaceous Basin.

Similarity in macroscopic characteristics and overall mineralogical compositions of natural stones do not allow the correct sourcing of historical artefacts without use of more complex analytical approach. This study tries to distinguish carbonate stones (marbles, limestones and clayey-calcareous silicites) and some of their selected artefacts according to the traditional fingerprinting methods i.e. qualitative and quantitative petrography (optical and electron microscopy, petrographic image analysis, X-ray diffraction), cathodoluminescence and stable isotope geochemistry of carbonates. The highly variable character of local natural stones is mainly shown in their microfabric (type and degree of metamorphic involvement) and mineralogical composition (presence of non-carbonate phases). Additional techniques such as mass specific magnetic susceptibility measurement of the whole rock and Raman microspectrometry of the graphitic marbles were shown to be very useful for distinguishing marbles, which include accessory minerals with different magnetic characteristics and carbonaceous matter transformed, due to the various degrees of metamorphism, respectively.