

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

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1. Introduction

Interdisciplinary research project 'Lithotheque of Czech historical dimension stones' (e.g. Přikryl, 2007; Přikryl et al., 2001)

This project includes:

- Literature research - published and unpublished data, data from archives;
- Fieldwork - location and description of historic quarries, stone sampling;
- Laboratory studies - mineralogical, petrographic, geochemical, physical, mechanical and technical properties testing;
- Lithotheque preparation - thin sections, sawn and polished stone slabs, large blocks;
- Compilation in printed form of the 'Atlas of Dimension Stones' (all available data for each stone type).



2. Carbonate stone resources: samples from the quarries and historical monuments

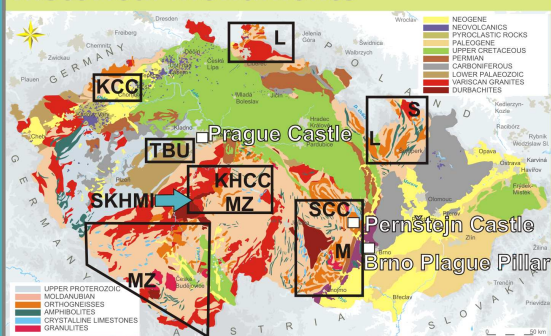


Fig. 3. Geological map of the Czech Republic, showing the locations of the quarry areas and artefacts studied. The marble and limestone samples were collected from several different geological units of the Bohemian Massif: Krušné Hory Crystalline Complex (KCC), Kutná Hora Crystalline Complex (KHCC), Lugicum (L), Moldanubian Zone (MZ), Moravicum (M), Sedčany-Krásná Hora Metamorphic 'Islet' (SKHMI), Silesicum (S), Svratka Crystalline Complex (SCC) and Teplá-Barrandian Unit (TBU).

3. Macroscopic description

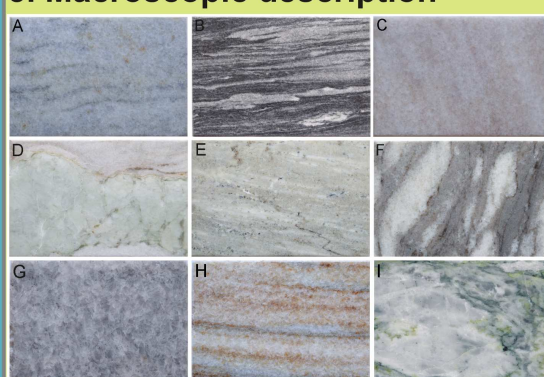


Fig. 4. Polished slabs (15 x 15 cm) of selected principal Czech marbles which have been quarried and used for decorative purposes. A - Nedvědice (SCC), B - Horní Lipová (S), C - Velké Kuněčice (S), D - Český Šternberk (MZ), E - Bohdaneč (KHCC), F - Skoupý (SKHMI), G - Staré Hradisko, H - Supíkovice (S), I - Raspenava (L). For geol. units see the caption of Fig. 3

4. Geochemical method

Stable isotopic geochemistry (SIRA), C- and O- isotope ratios ($\delta^{13}\text{C}$, $\delta^{18}\text{O}$) measurement

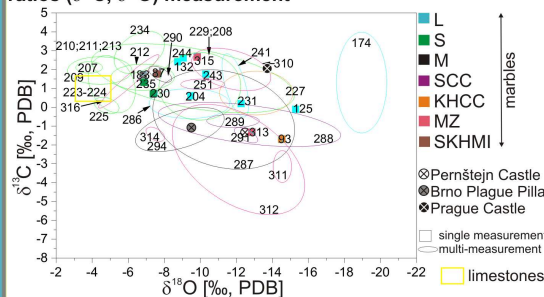


Fig. 5. Comparisons of the stable isotope data of marbles from different parts of the Bohemian Massif, with the studied artefacts. The values considered here are related to the carbonate groundmass. Sample No.: 87 - Skoupý; 93 - Sázava; 125 - Strážné; 132 - Křižany; 174 - Raspenava; 183 - Uherčice; 204 - Rašovka; 207 - Bohdík; 208, 229 - Branná; 209 - Velké Kuněčice; 210, 211, 213 - Supíkovice; 212 - Horní Lipová; 223, 224 - Staré Hradisko; 225 - Žulová; 227 - Bohdaneč; 230 - Strachovičky; 231 - Bílá Voda; 234 - Lipová-Na Pomezí; 235 - Vápenná; 241 - Jitřava; 243 - Pilínkov; 244 - Horní Hanychov; 251 - Český Šternberk; 286 - Velká Morava; 287 - Tišnov-Dřínová; 288 - Nedvědice; 289 - Ujčov; 290 - Tišnov-Květnice; 291 - Štěpánovice; 294 - Lyseice; 310 - Nehodiv; 311 - Rábí; 312 - Bohumilice; 313 - Votice; 314 - Vyšný; 315 - Český Krumlov; 316 - Blížná. KHCC - Kutná Hora Crystalline Complex, L - Lugicum, M - Moravicum, MZ - Moldanubian Zone, S - Silesicum, SCC - Svratka Crystalline Complex, SKHMI - Sedčany-Krásná Hora Metamorphic 'Islet'.

5. Petrographic method

Cathodoluminescence study (CL), a cold cathode apparatus coupled with a polarising microscope

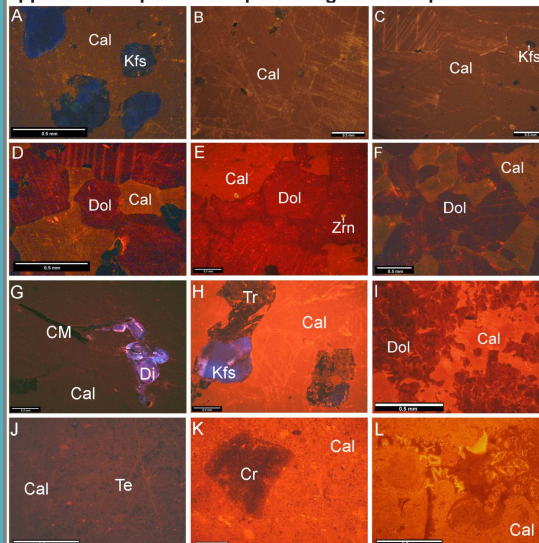


Fig. 6. Comparison of CL microscopy of selected principal Czech marbles and limestones, which have been quarried and used for decorative purposes, with studied artefacts. A - Nedvědice (SCC), B - Pernštejn Castle, C - Plague Pillar in Brno, D - Český Šternberk (MZ), E - Bohdaneč (KHCC), F - Prague Castle, G - Staré Hradisko (S), H - Supíkovice (S), I - Raspenava (L), J - Kosoř (Radotín limestones, TBU), K - Roblín (Třebotov limestones, TBU), L - Chotěč (Třebotov limestones, TBU). Geological units: KHCC - Kutná Hora Crystalline Complex, L - Lugicum, MZ - Moldanubian Zone, SCC - Svratka Crystalline Complex, TBU - Teplá-Barrandian Unit. Mineral phases: Cal - calcite; CM - carbonaceous matter; Cr - crinoid fossil (sea-lilies); Di - diopside; Dol - dolomite; Kfs - K-feldspar; Te - tentaculite fossil; Tr - tremolite; Zrn - zircon. CL of B-C; F artefacts corresponds to A; D source marbles.

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6. Physical method

Magnetic characteristics, mass-specific Magnetic Susceptibility (MS) measurement

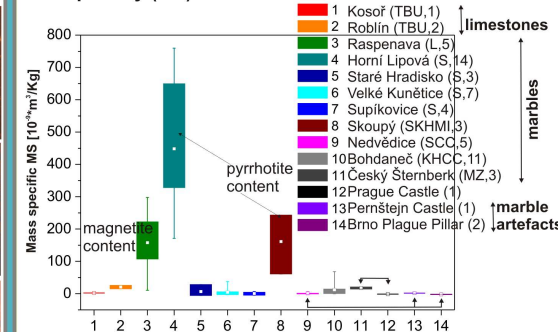


Fig. 7. Statistical evaluation of the mass-specific MS of selected principal Czech limestones and marbles, which have been quarried and used for decorative purposes, along with the studied artefacts. The box bars show 25% (bottom), mean (inside) and 75% (top). The ends of the lower and upper part of the box plots represent the minimum and maximum values, respectively. The geological units and the number of samples are shown in parentheses. Geological units: KHCC - Kutná Hora Crystalline Complex, L - Lugicum, MZ - Moldanubian Zone, S - Silesicum, SCC - Svratka Crystalline Complex, SKHMI - Sedčany-Krásná Hora Metamorphic 'Islet', TBU - Teplá-Barrandian Unit.

7. Main conclusions

- Up until now, around fifty carbonate stone quarries from nine areas of investigation (KCC, KHCC, L, M, MZ, S, SCC, SKHMI, TBU) located in the Bohemian Massif (Czech Republic) were examined, and correlated with three marble artefacts from the relevant historical monuments (the Prague Castle, the Pernštejn Castle, and the Plague Pillar in Brno).
- The extensive database of mineralogical-petrographic, geochemical and physical characteristics was obtained for the differentiation of carbonate stones. Methodology based on the combination of qualitative and quantitative petrography, cathodoluminescence of microfacies, C and O isotope geochemistry of carbonates and mass-specific magnetic susceptibility of the whole rock was shown to be the useful provenance tool (e.g. Šťastná et al., 2009).
- The most probable marble source of both Pernštejn Castle and the Plague Pillar in Brno was determined to be from Nedvědice marble. The artefact from Prague Castle was assigned as having come from the Český Šternberk marble (e.g. Šťastná et al., 2011).

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