Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.37339

Controls on organic-matter depletion and elevated thermal maturity in karstified carbonate rocks of the Rovte region (central Slovenia)

JUSTYNA MAŁGORZATA CIESIELCZUK[1], MONIKA J. FABIAŃSKA[1], BEATA GEBUS-CZUPYT[2], MAGDALENA MISZ-KENNAN[1], FILIP ŠARC[3], ANDRZEJ TYC[1], VANESSA JOHNSTON[3], KRZYSZTOF GAIDZIK[1] AND BOJAN OTONIČAR[3]

[1]University of Silesia in Katowice
[2]Polish Academy of Sciences
[3]Karst Research Institute ZRC SAZU

The study is part of a wider research effort to determine the initial formation conditions of karstified carbonate rocks in the Rovte region of central Slovenia and to examine how their early development and composition may have influenced subsequent karstification and speleogenesis. To reach the goal, the first thirteen samples of host rocks (dark grey Triassic limestones, marls, and dolostones) were examined in detail.

Total carbon contents varied from 1.73 to 13.08 % wt. (aver. 7.79 % wt.), TS values were 0.55 % wt., and TOC 0.43 % wt., on average. Reflected light microscopy results agree with the organic geochemistry. Organic matter particles are rare, fine-grained (a few μm), mostly present as altered vitrinite with small pores from devolatilization and graphite laths.

Organic-matter research enabled the determination of the depositional conditions of the host rocks. Most probably, they were sedimented in an anoxic environment, as indicated by the pristane/phytane ratios; however, due to the extreme organic matter maturity and low content, the final distribution may have already been altered by hydrothermal fluid leaching. Such phenomena may decrease pristane relative to phytane and acyclic isoprenoids relative to *n*-alkanes. The absence of other biomarkers, such as steranes and hopanes, as well as aromatic hydrocarbons, limits the interpretation but also confirms the extreme OM maturity.

Isotopic analysis of $\delta^{13}C$ and $\delta^{18}O$ in carbonates indicates marine signatures, slightly to significantly altered by meteoric waters. In turn, $\delta^{13}C$ values of analysed TOC, from approximately -32 ‰ to -25 ‰, may be related to kerogen of varying degrees of maturity.

The low kerogen contents can result from 1) destruction of sedimented organic matter within the water column due to bacterial consumption, or 2) initial low productivity of the marine environment. Previous research on organic compounds in karstic water suggests the same source of organic compounds. This means that compounds found in springs derive from the host rocks or rocks with similar geochemical characteristics. The similarities between water and rock organic matter concern the marine anoxic environment and high organic matter maturity.

Funded by Polish National Science Centre (UMO-2020/39/I/ST10/02357), Slovenian Research Agency (No. N1-0226), within OPUS-20 (LAP).