Subaerial exposure surface within carbonate deposits at Zlatni rt cape, Rovinj, Istria – a record of a Late Jurassic emergence of the Adriatic Carbonate Platform

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Source / Izvornik: **Knjiga sažetaka = Book of abstracts / 7. hrvatski geološki kongres s međunarodnim sudjelovanjem, 2023, 39 - 40**

Conference paper / Rad u zborniku

Publication status / Verzija rada: **Published version / Objavljena verzija rada (izdavačev PDF)**

Permanent link / Trajna poveznica: https://urn.nsk.hr/urn:nbn:hr:169:219761

In April then, the soil water would have a pH of 7.3 and an electric conductivity (EC) of 952 μS/cm. Cave water has a significantly lower EC and a pH of 8, indicating water-rock-cave air interaction processes. While soil water has higher concentrations of Ca^{+2}, Mg^{+2}, Cl^{-} and trace elements, the cave water is comparatively enriched in HCO_3^-. The calcite and aragonite saturation indices (SI) shift from an undersaturated to a slightly supersaturated state. The CO_2 measured within the cave is half the field measured soil CO_2 (993 and 2298 ppm, respectively).

In June, the pH of the soil water would be nearly the same as the cave water pH (7.8), but the EC is still significantly higher. Compared to the soil water recreated for April, there is a significantly higher amount of trace elements such as B, Al, and Fe, but less Si and Sr. Calcite and aragonite SI are similar in soil and cave water, both slightly supersaturated. The CO_2 measured within the cave is slightly higher than the CO_2 concentration measured in the soil (3000 and 2744 ppm, respectively).

It is then observed that during the cold-humid months, the soil water has carbonates SI below zero, which indicates possible mineral dissolution processes taking place in the vadose zone. Dilution processes are also feasible, associated with the water reservoir overlying the cave, which sustains the various dripping sites. The similarity in the SI of soil and cave water in June shows that, likely, there is calcite saturation throughout the entire profile, which could indicate an attenuation of the carbonates dissolution and mobilization processes during summer.

In summary, cave ventilation cycles have a marked influence on the cave water chemistry since it is in chemical equilibrium with the air. As suggested by the laboratory experiment, the processes taking place in the system are also conditioned by the original chemistry of the water in the vadose zone after passing through the soil. Likewise, soil water chemistry is conditioned by soil itself, but also by the conditions determined by the climate.

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SUBAERIAL EXPOSURE SURFACE WITHIN CARBONATE DEPOSITS AT ZLATNI RT CAPE, ROVINJ, ISTRIA – A RECORD OF A LATE JURASSIC EMERGENCE OF THE ADRIATIC CARBONATE PLATFORM

POVRŠINA SUBAERSKOG IZLAGANJA KARBONATNIH NASLAGA ZLATNOG RTA, ROVINJ, ISTRA – ZAPIS EMERZIJE TIJEKOM MLAĐE JURE NA JADRANSKOJ KARBONATNOJ PLATFORMI

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Keywords: *Subaerial exposure surface, Late Jurassic, Adriatic Carbonate Platform, Istria*

Middle and Upper Jurassic carbonates comprise the first large-scale sequence deposits in Istria, ending with the deposition of the Oxfordian to lowermost Kimmeridgian Muča unit. This succession is overlain by the second large-scale sequence (Upper Tithonian–Lower/Upper Aptian) which begins with the deposition of the upper Tithonian Kirmenjak unit. These two large-scale sequences are separated by important discontinuity characterized by stratigraphic hiatus of different duration, reflecting a compressional tectonic event caused by ophiolite obduction along the NE Adria Microplate margin. The beginning of this subaerial exposure phase is marked by the Rovinj breccias formed during the regression that preceded the emergence. These breccias display a gradual transition from Muča and Lim units and are composed of fragments belonging to both units. This regionally recognized subaerial exposure phase is locally marked by bauxites that filled paleo-depressions within the Lim and Muča unit limestones and the Rovinj breccias. In other places subaerial exposure is mostly recorded by palaeosols, and one of the best examples can be found at Zlatni rt locality in Rovinj.

The palaeosol marks the contact between Muča and Kirmenjak units. The Muča unit consists of two lithofacies (LF) types, representing high to moderate energy marine environments: LF 1 – bioclastic-peloidal grainstone to rudstone characterized by common to abundant peloids and benthic foraminifera, rare ooids, algae, fragments of echinoderms, hydrozoans, coated fragments of *Cladocoropsis*, stromatoporids, bivalves, Rivulariacean-like (*Cayeuxia*) cyanobacteria, corals and *Lithocodium*; and LF 2 – bioclastic-peloidal packstone with common to abundant peloids, benthic foraminifera and fragments of echinoderms. The beginning of regression was marked by Rovinj breccias, which form lenses atop of Muča unit. The palaeosol forms a decimetre-thick horizon of grey clay, which is also present as infills in karstified channels and fissures of the Muča unit and Rovinj breccia. Among other minerals, the palaeosol contains glauconite that formed during the incipient flooding of the carbonate terrain. As the transgression progressed, the palaeosol was covered by a decimeter-thick layer of transgressive breccia, containing fragments of Muča unit and upper Tithonian black pebbles. The formation of black pebbles under vadose conditions is evidenced by the presence of *Microcodium*-like structure, alveolar-septal fabric (in voids of fenestral origin?) and other features indicating subaerial exposure. In the area of Zlatni rt the Kirmenjak unit, which covers the palaeosol and the breccia, begins with a bioclastic (algal)-peloidal grainstone to rudstone abundant in bioclasts of *Campbelliella striata*, *Clypeina sulcata*, *Salpingoporella annulata* and *Favreina* faecal pellets. The rest of the Kirmenjak unit is composed of a cyclic alternation of mudstones, peloidal to bioclastic packstones to grainstones and black pebble breccias with subaerial exposure surfaces.

A very well preserved palaeosol level at the Zlatni rt locality documents one of unique terrestrial palaeoenvironments that existed during the early Kimmeridgian to late Tithonian in the northern part of the Adriatic Carbonate platform.

This work has been fully supported by Croatian Science Foundation under the project IP-2019-04-8054 – WianLab (Western Istrian Anticline as an Ideal Natural Laboratory for the Study of the Regional Unconformities in Carbonate Rocks)

GAMMA REY SPECTROMETRY ANALYSIS OF PRE-NEOGENE BASEMENT ROCKS AND ITS IMPLICATIONS ON THE RADIOGENIC HEAT GENERATION POTENTIAL

ANALIZA REZULTATA POVRŠINSKE GAMMA SPEKTROMETRIJE NA STIJENAMA PODLOGE NEOGENA I UTJECAJ NA MOGUĆNOST GENERIRANJA RADIOGENE TOPLINE

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Keywords: *heat flow, thermogenic potential, Neogene basement, basin modelling*

Temperature distribution in the subsurface depends on several factors, including regional heat flow, thermal conductivity of rocks, their radiogenic potential, and local factors that can lead to higher temperatures at shallower depths, such as active migration pathways. In this work, the potential for thermogenic heat generation in the pre-Neogene basement rocks was investigated based on their content of uranium, thorium, and potassium (ABDEL HAFEEZ *et al.*, 2019; ADABANIJA *et al.*, 2020; SANJURJO-SÁNCHEZ *et al.*, 2022). For this purpose, a Gamma Surveyor Vario field gamma-ray spectrometer (Fig. 1) was used to measure the concentrations of the above elements at outcrops on the margins of the Drava sub-basin.

At least three measurements were made at each outcrop, which were later averaged. In total, more than one hundred observation points were measured. The general lithology was summarized in six categories (Table 1): Triassic dolomites, effusive rocks (basalt), granitoid, schist, gneiss, and Miocene effusive rocks. In most cases, the measurements yielded higher values for radioelements than the catalogue values in the Schlumberger PetroMod lithology editor (SCHLUMBERGER PETROMOD, 2022), suggesting a higher potential for radiogenic heat generation. This is a crucial parameter in basin modelling that will help to better estimate the geoenergy potential of the subsurface in the eastern part of the Drava sub-basin.

This work has been supported in part by Croatian Science Foundation under the project GEOlogical characterization of the Eastern part of the Drava depression subsurface intended for the evaluation of Energy Potentials GEODEP (UIP-2019-04-3846)