Stop 1: Rovinj-1 deposit – Lower Kimmeridgian – upper Tithonian unconformity

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Field trip A2 - Red Istria

Western Istrian Anticline as an ideal natural laboratory for the study of the regional unconformities in carbonate rocks

STOP 1: ROVINJ-1 DEPOSIT – Lower Kimmeridgian – upper Tithonian unconformity

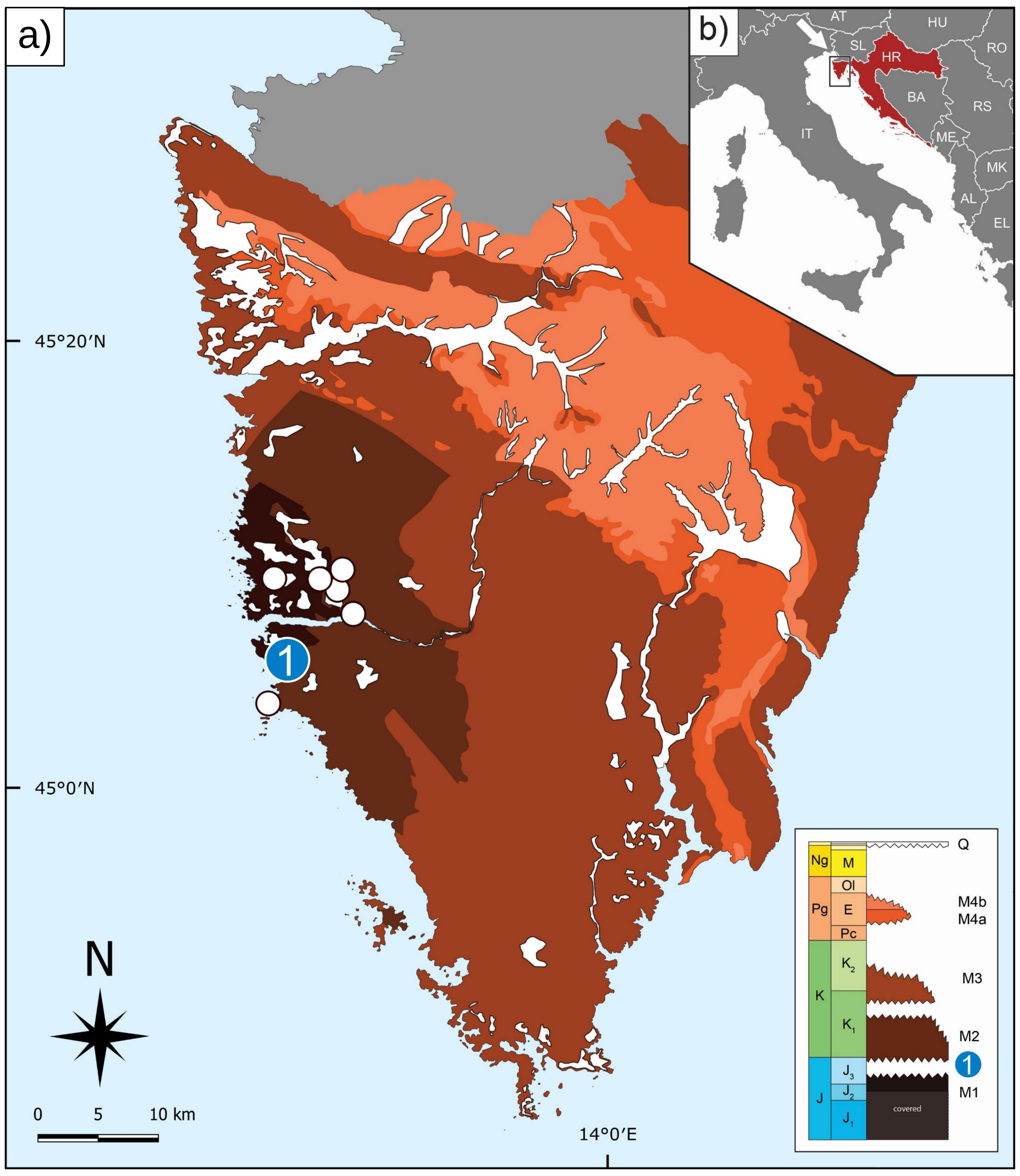

Figure 1. a) Geological map of the Istrian peninsula showing large-scale megasequences separated by regional unconformities, modified after VELIĆ et al. (1995). Legend: M1 – 1st Megasequence (lower Bathonian/lower Kimmeridgian); M2 – 2nd Megasequence (upper Tithonian/lower/upper Aptian); M3 – 3rd Megasequence (lower/upper Albian/upper Santonian); M4a – Carbonate deposits of the 4th Megasequence (lower– middle Eocene); M4b – Clastic deposits of the 4th Megasequence (middle– upper Eocene); Q – Quaternary deposits. (b) Location map of Istria. The location of the Rovinj-1 deposit is indicated by the **blue circle**.

- The 1st stop represents one of the best exposures of the 1st unconformity.
- The 1st unconformity is situated between the Bathonian to lower Kimmeridgian 1st megasequence and the upper Tithonian to lower/upper Aptian 2nd megasequence
- The unconformity is a result of a long period of subaerial exposure, lasting at least for 6 My
- The uplift which led to this phase was triggered in response to the overburden pressure generated by the obduction of the Vardar Ocean in the Upper Jurassic (SCHMID et al, 2008, 2020)
- Different materials accumulated during this phase, such as bauxites, palaeosol and breccias.
- The unconformity on this stop is marked with the formation of a large bauxite body, known as the Rovinj-1 deposit
- It was formed by the bauxitisation of different parent materials, which mainly comprise windblown dust and volcanic material

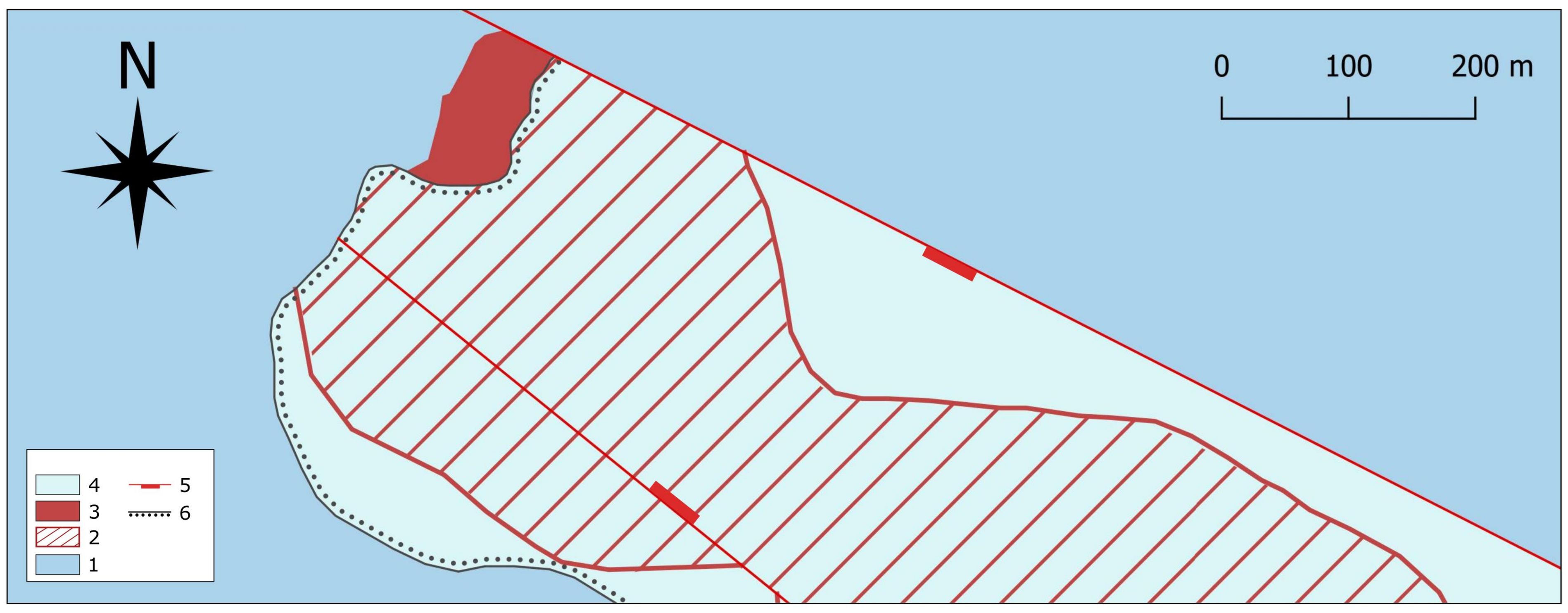

Figure 2. Geological map of the Rovinj-1 deposit, based on the data provided by the GEO-5 company, 1 – Muča unit, 2 – extent of the bauxite body below the Kirmenjak unit, 3 –bauxite, 4 – Kirmenjak unit, 5 – normal faults, 6 – unconformity.

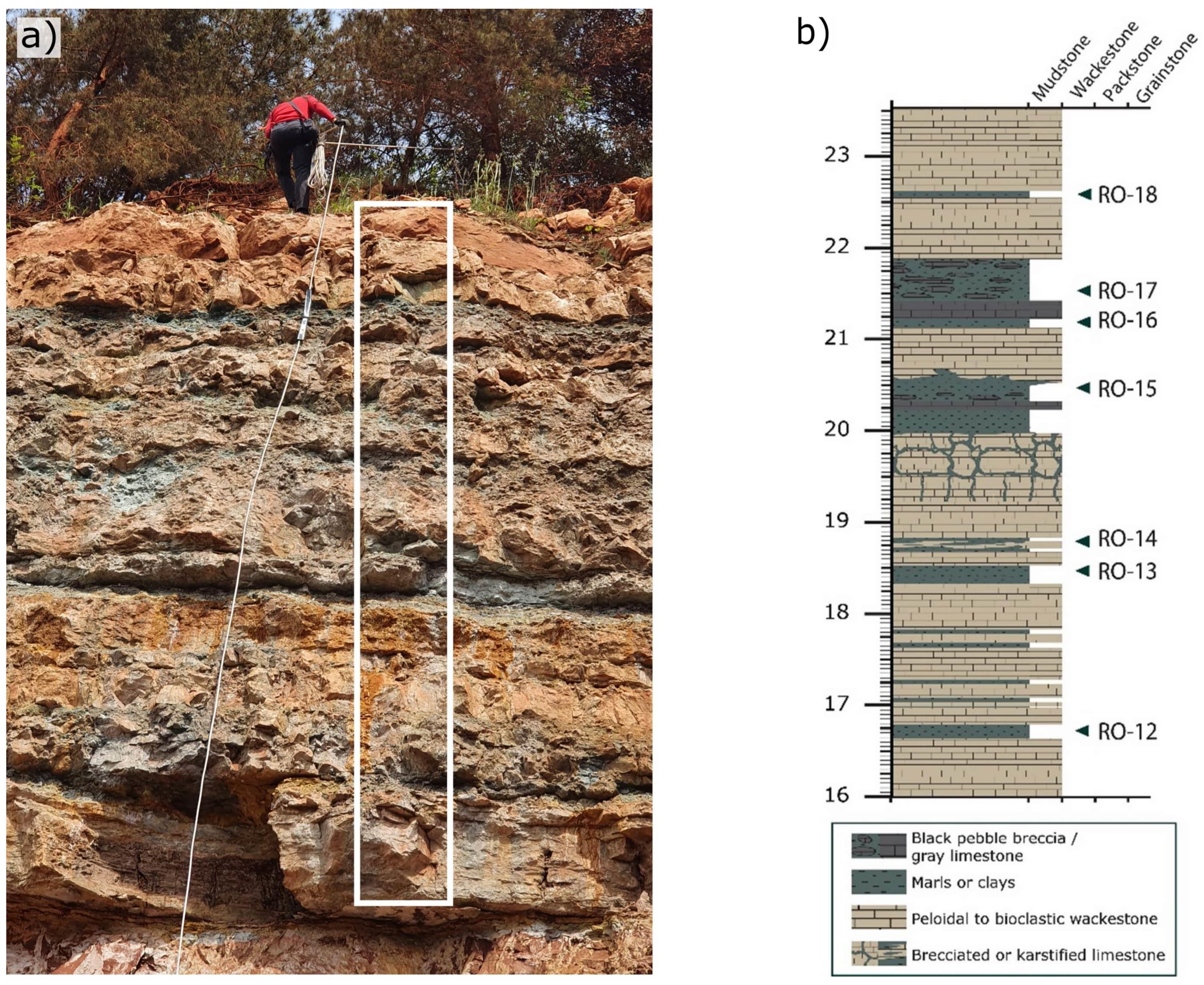

Figure 3. Studied profile of the bauxite cover, a) field photography of the profile, with the studied section indicated with the white rectangle, b) reconstruction of the studied cover section. RO – sampling site.

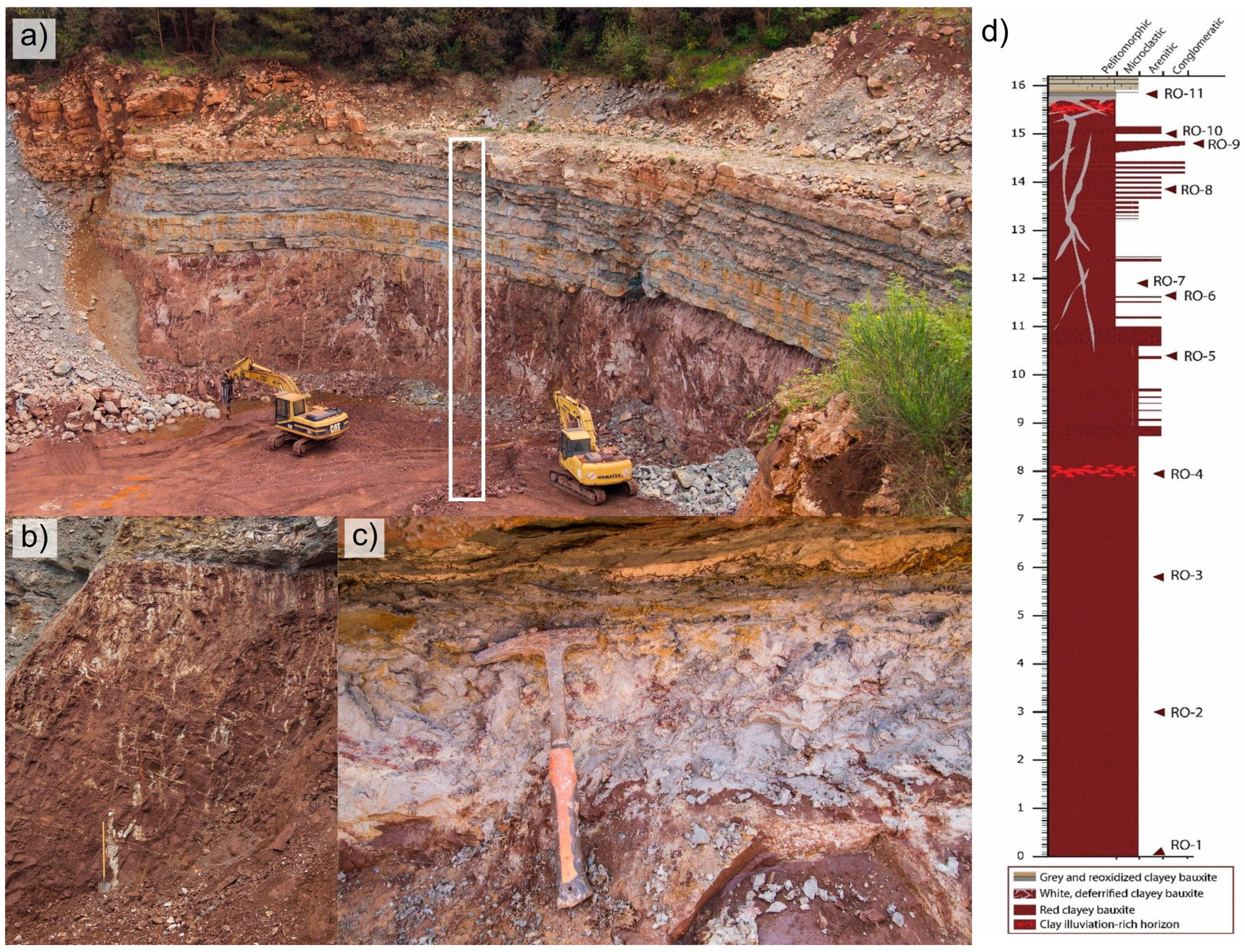

Figure 4. Field photographs from the Rovinj-1 deposit and the analysed bauxite profile, a) Rovinj-1 deposit with indicated position of the analysed profile, b) red bauxite cross-cut with veins of white bauxite, c) topmost part of the bauxite, with visible grey baxite, pyritised roots and kaolintic marl (white intercalations in the clay at the top of the photograph) and red bauxite with occurences of white bauxite, d) reconstruction of the sampled bauxite profile. RO – sampling site.

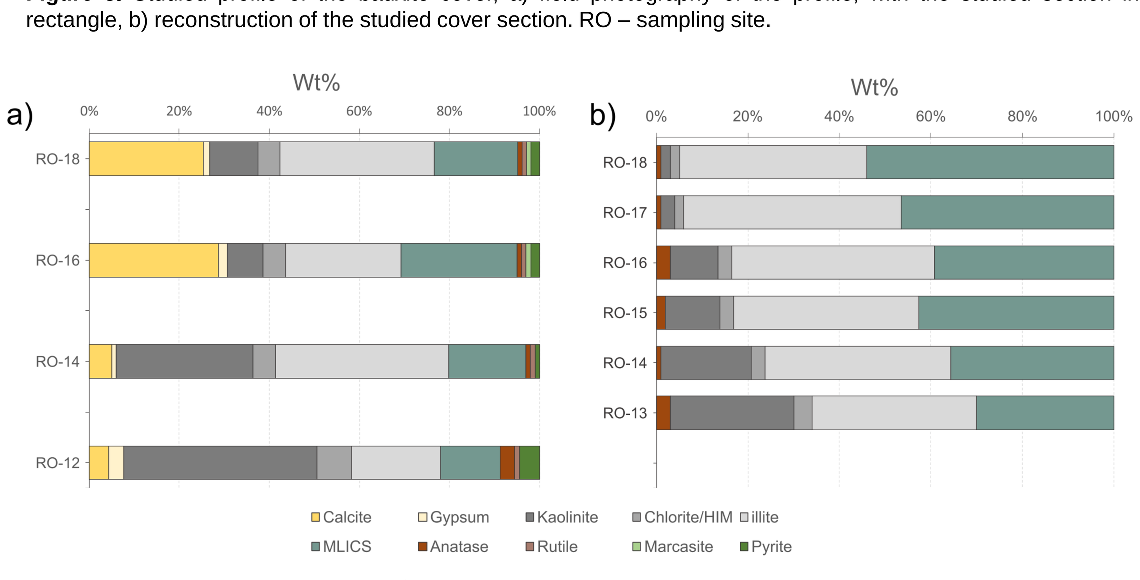

Figure 5. Mineralogical composition of the studied clay/marl samples throughout the studied section, a) bulk mineralogical composition throughout the analysed profile, b) mineralogical composition of the clay fraction throughout the analysed profile

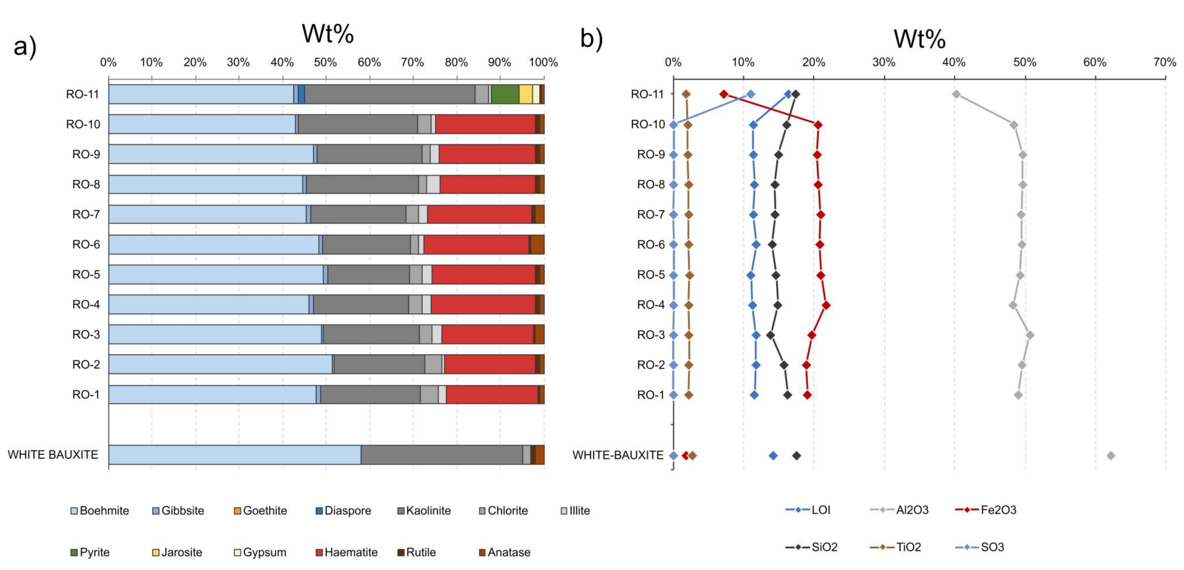

Figure 6. Plots displaying mineralogical and chemical composition of the analysed bauxite, a) bulk mineral composition throughout the Rovinj-1 bauxite, b) distribution of major oxides along the studied bauxite profile.

CONCLUSIONS

1. The deposit is composed from three types of bauxites: red, grey and white – all differing in mineralogy and geochemistry, which arise from the differences in iron-bearing phases
2. The bauxite is mainly pelitomorphic to microclastic, while the upper section also contains layers of conglomeratic to arenitic bauxite, which is linked to the aridisation of climate during the end of the subaerial exposure phase
3. The presence of clay illuviation horizon at on the lower section of the bauxite profile indicates that there was a long-standing palaeosurface before the deposition of the upper section, which is also structurally different than the lower section
4. The composition of clays and marls in the cover of the bauxite supports the shift towards a more arid climate, as throughout the profile of the cover, kaolinite content declines, while the content of illite and mixed-layered illite smectite increases
5. The cover succesion of the bauxite resembles a „blue hole" sequence (RASMUSSEN & NEUMANN, 1988), as it is comprised of ostracod and charophyta containing schizohaline limestones in its lower part, and of fully marine Kirmenjak limestone in its topmost section

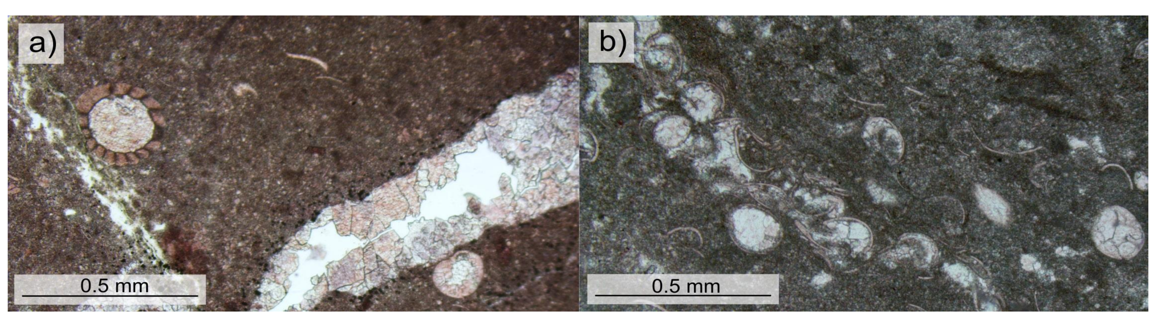

Figure 7. Photomicrographs from the limestones in the cover sequence, a) charophyta oogonium, PPL, b) accumulation of ostracod shells, PPL.

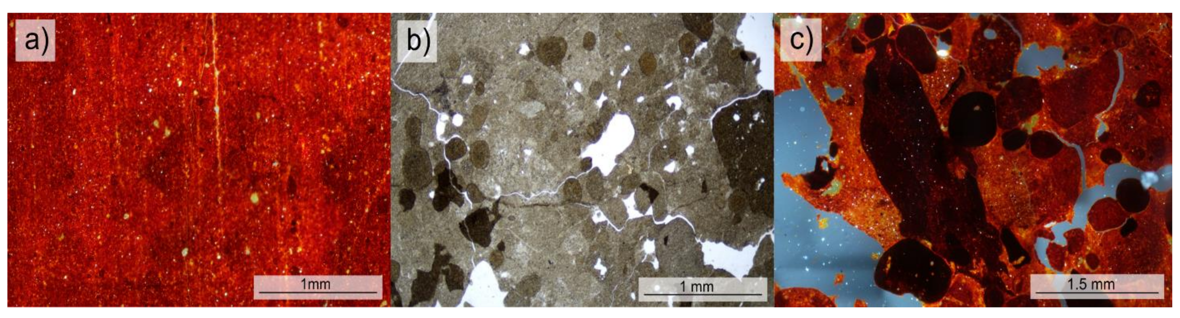

Figure 8. Photomicrographs of different bauxite samples, a) pelitomorphic to microclastic red bauxite sample (RO-6), taken under conoscopic illumination, b) white bauxite sample with visible arenitic structure, PPL, c) red bauxite (RO-9) sample with visible conglomeratic structure and bauxite clasts enriched in iron oxides, taken under conoscopic illumination

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