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DECIPHERING THE PEDO-SEDIMENTARY COMPLEX OF EASTERN ADRIATIC COAST: A CASE STUDY IN PRIVLAKA, CROATIA

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This study provides the first results of the Quaternary eight-meter-thick pedo-sedimentary complex developed in Privlaka, Croatia to understand the succession of paleosols and sediments, the deposition mechanism and the source of the material. This pedo-sedimentary profile (8 meters) is divided into four main units (Figure 1): a reddish paleosol and three sediment packages (sands with gravels) each indicating a different pedo-sedimentological context. Each distinctive horizon was sampled for sedimentological, physico-chemical, mineralogical and petrographical analyses to conduct a high-resolution investigation. In addition, optically stimulated luminescence (OSL) dating is used to assess the sediment's age. Grain size analysis revealed that the paleosols are rich in fine-grained components, predominantly silt. The quartz grains exhibit an angular to subangular morphology typical for (glacio-)fluvial transport, suggesting that the sand-gravel body is formed by sediment transport and deposition by water. The upper part of investigated profile has dominantly carbonate grains such as carbonate concretions (ryzoconcretions) and nodules. The $CaCO_3$ content (calcites) generally decreases from the upper to the lower part of the investigated profile. All analysed samples had an alkaline reaction. Organic matter is higher in the paleosol part of the profile due to soil pedogenetic development. The proportion of the light mineral fraction (LMF) in almost all samples is roughly 98 %, with quartz as the dominant component, followed by lithic particles (5 – 15 %) and feldspars (3 - 7 %). Volcanic glass is accessory (<3 %). Such high content of quartz, suggesting that these sediments have undergone more redeposition of quartz than in loess of the northern Adriatic Island of Susak . The increase in weathered quartz grains with increasing depth could indicate that the proportion of fluvial sediments has increased compared to the aeolian sediments. The distribution of weight share for heavy mineral fraction (HMF) is uniform across the profile and ranges from 1.1 to 2.5 %. Among the HMF, opaque grains predominate. Along with opaque grains that cannot be determined (30 - 57 %), goethite grains make up a significant proportion (12 – 33 %). The most abundant transparent heavy minerals are resistant grains like dominant garnet (27 – 51 %), followed by zircon (9 – 24 %) and rutile (6 – 21 %). The predominant minerals in the paleosols are calcite and quartz. The samples also contain feldspars, goethite and some phyllosilicates. Two types of calcites are distinguished in the paleosol and (glacio-)fluvial sediments: primary calcite, which was formed by the process of physical weathering of carbonate rocks from the hinterland, and secondary, i.e., authigenic calcite, which was precipitated as a cement in carbonate concretions and rhyzoconcretions during pedogenesis. Petrographic analyses confirmed the presence of chromite, serpentinite and serpentinized olivine basalt, indicating the area of

origin within ultramafic rocks, which could be the Dinaric ophiolitic zone in the hinterland. The carbonate grains are polygenetic in origin and consist of equal parts of highly spherical upper Cretaceous rudist limestones, Eocene nummulitic limestones and low spherical pedogenic carbonate concretions, indicating local transport. The apparent OSL ages of the (glacio-)fluvial sediment overlying the paleosol would range between ca. 230 ka and 130 ka for the lowermost sample, and ca. 190 ka and 105 ka for the uppermost sample. According to the OSL dating results, the (glacio-)fluvial materials were deposited during the earliest part of OIS5 or OIS6, while the paleosol can most likely not be younger than OIS5 and might even have an age that corresponds with OIS7. This research is funded by the Croatian Science Foundation under the project ACCENT (IP-2020-02-3274).

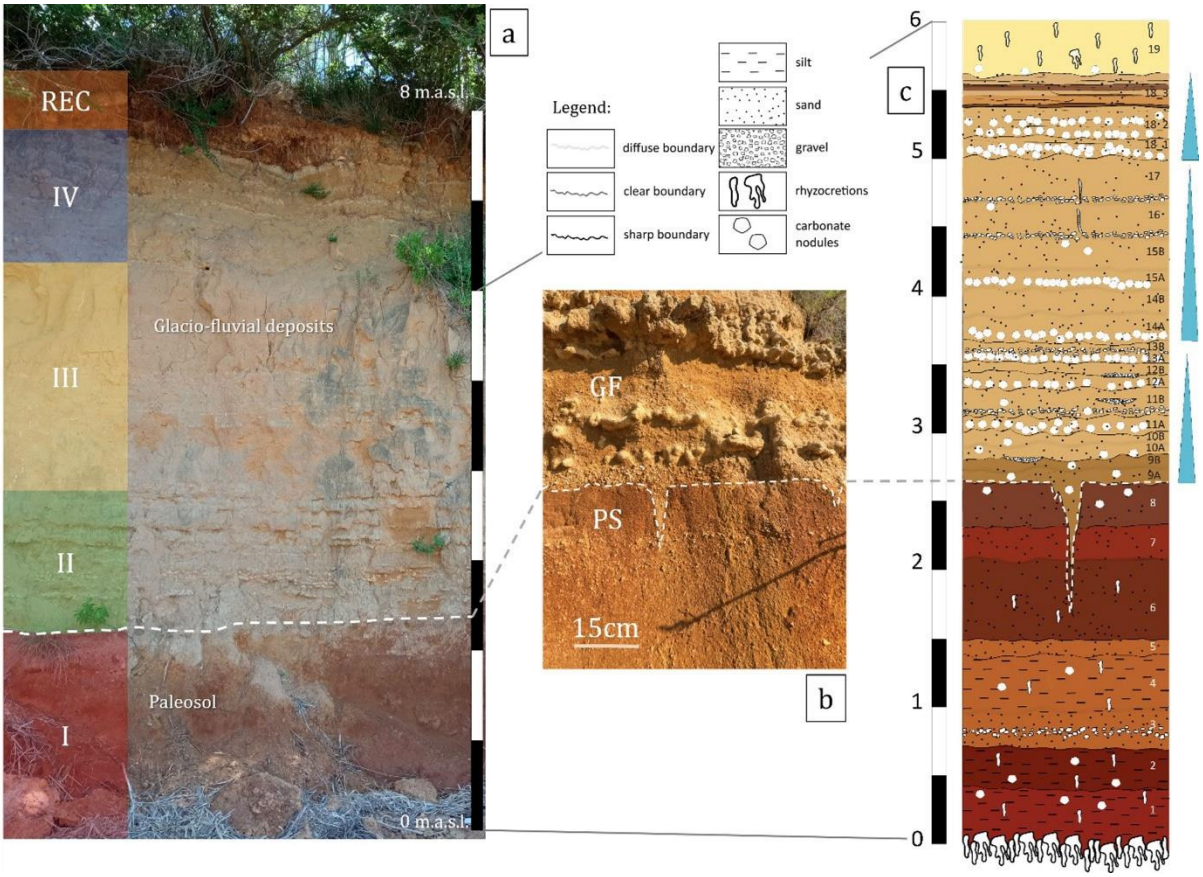

Figure 1: The pedo-sedimentary complex of Privlaka, profile a) units of the pedo-sedimentary complex; b) paleosol(s) (PS)/(glacio-)fluvial (GF) erosion boundary with distinctive features; c) detailed graphical log of the profile PN1-5 with marked horizons/layers.