Srednjotrijaski sin-riftni rioliti i riolitni ignimbriti na sjeveroistočnom rubu Adrie (SI Slovenija, SZ Hrvatska): mogući izvor riolitnih tufova (Pietra Verde) u širem području Dinarida

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ment and landscape stability (soil formation), (2) the most striking feature of palaeosoil formation is decalcification rather than the addition/preservation of soil organic matter or other soil formation indicators, and (3) the Holocene aeolian sands witness the input of fresh, less weathered material.

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MIDDLE TRIASSIC SYN-RIFT RHYOLITES AND RHYOLITIC IGNIMBRITES ON THE NORTH-EAST MARGIN OF ADRIA (NE SLOVENIA, NW CROATIA): POSSIBLE SOURCE OF RHYOLITIC TUFFS (*PIETRA VERDE*) IN THE WIDER DINARIDE AREA

SREDNJOTRIJASKI SIN-RIFTNI RIOLITI I RIOLITNI IGNIMBRITI NA SJEVEROISTOČNOM RUBU ADRIE (SI SLOVENIJA, SZ HRVATSKA): MOGUĆI IZVOR RIOLITNIH TUFOVA (*PIETRA VERDE*) U ŠIREM PODRUČJU DINARIDA

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Ključne riječi: *srednji trijas, bazaltno-andezitne stijene, riolit, riolitni tuf (Pietra Verde), Adria*

Srednjotrijaske magmatske i piroklastične stijene u području Adrie, odnosno šireg područja Dinarida i Južnih Alpa su česta pojava. To su uglavnom bazične magmatske stijene: bazalti, andezit-bazalti, rjeđe andeziti te riolitne piroklastične stijene (*Pietra Verde)*. Izvorište riolitnog piroklastičnog detritusa u širem području Dinarida do sada nije jasno određeno.

Trijaske kisele magmatske stijene poznate su samo na SZ rubu Adrie. U okviru projekta GOST istraživane su ove stijene na uzvisini Sv. Junger u SI Sloveniji, koje su determinirane kao rioliti, te na području Margečana na uzvisinama Gradišće, Hamec, Oštra Gorica i Sv. Duh u SZ Hrvatskoj, koje su određene kao riolitni ignimbriti.

Rioliti imaju porfirnu strukturu i homogenu teksturu. Fenokristali su plagioklas i K-feldspat, a osnova je leukokratna, devitrificirana u sitnozrnati kvarc, feldspat i bijeli tinjac. Fenokristali plagioklasa su alterirani u sitnolistićavi bijeli tinjac i minerale glina. K-feldspat je sviježs alteriranim inkluzijama.

Riolitni ignimbriti imaju debljinu veću od 100 m. Izdvajaju se (1) čvrsti laminirani folijativni tok riolitnih ignimbrita i (2) čvrsti masivni riolitni ignimbriti. Folijativne trake su debljine od 1–10 cm. Izmjenjuju se vrlo tanki slojevi vitrofirnog, lapilno vitrofirnog i kristaloklastičnog riolitnog piroklastičnog toka. Lamine vitrofirnog riolitnog piroklastičnog toka izgrađene su od izmijenjenog matriks-potpornog piroklastičnog detritusa manjeg od 2 mm i devitrificirane staklaste osnove. Vitrofirni riolitni lapilni ignimbrit sadržava izmijenjene matriks-potporne do klast-potporne plovučce veće od 2 mm i kristaloklaste u devitrificiranoj staklastoj osnovi. Kristaloklastični riolitni piroklastični tok izgrađen je od kristaloklasta kvarca, albita ($An_{0.0\text{-}4.5}Ab_{95.1\text{-}99.9}Or_{0.1\text{-}0.6}$) i K-feldspata ($An_{0.0\text{-}1.0}Ab_{1.8\text{-}4.2}Or_{95.0\text{-}98.4}$), kao i vrlo rijetkih čestica lapilnog plovučca, dok je matriks izmijenjen u fengit. Masivni čvrsti riolitni lapilni ignimbriti izgrađeni su od klast-potpornih do matriks-potpornih alteriranih lapilnih plovučaca, a

rjeđe od kristaloklasta izmijenjenih feldspata i kvarca u devitrificiranoj staklastoj osnovi. Produkti izmjene u svim varijetetima su sitnozrnati kvarc i listići filosilikata. Alteracijski procesi su dvofazni: tijekom dijagenetskih procesa i postdijagenetskih tektonskih procesa kao što su dinamo-termalne metamorfne promjene, koje se očituju u klivažu uškriljavanja po kojem se razvija folijativni bijeli tinjac. Bijeli tinjac je fengit sa sadržajem 3.4 SiT a.p.f.u.

Izvorište riolitnih tufova (*Pietra Verde*) na području Strahinjščice, Žumberačke gore i šireg područja Dinarida (Lika, Knin, Svilaja i dr.) mogu biti navedene istraživane eksplozivne riolitne vulkanske stijene SI ruba Adrie.

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KVARNERIĆ POLJE AND ZRMANJA PALEORIVER DURING LAST GLACIAL MAXIMUM

KVARNERIĆKO KRŠKO POLJE I PALEOZRMANJA TIJEKOM ZADNJEG GLACIJALNOG MAKSIMUMA

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The Velebit Channel and its marginal basins and Kvarnerić (the channel zone of NE Adriatic Sea) were analysed in order to reconstruct the geomorphological evolution of this area during the Late Pleistocene and Holocene (MIS 5 to MIS 1) using detailed seabed maps, new data on sea-level changes, and submarine investigation. Submerged parts of the river canyon, paleodeltas, traces of ancient lakes, and a large polje were discovered by analysing these maps (BENAC *et al.*, 2022).

The highly rugged terrestrial and submarine karst relief was formed in relatively resistant carbonate rocks. This relief probably slightly changed during the Late Pleistocene and Holocene. Deep straits or canyons are the link between the depressions within the Velebit Channel, as well as with the marginal basins: the Pag and Ljubač bays and the Novigrad Sea.

While the sea-level fluctuated between –20 m and –50 m below recent sea-level i.e. from 110 to 70 ka B.P. (MIS 5.d – 5.a) the drying up took place in the Novigrad Sea, the Ljubač Bay and in the Pag Bay, but also in the marginal SE part of the Velebit Channel. When the sea-level fluctuated between –50 m and –80 m i.e. 75 – 30 ka B.P. (MIS 4 and MIS 3) the sea gradually retreated from the SE part of the Velebit Channel to the northwest. Marine connection between the central part of this channel and the NE part between Rab Island and the mainland was interrupted. The remaining connection to Kvarnerić basin was possible only through the passage between the Pag and Rab islands. The previously submerged karst elevations emerged and the Kvarnerić basin became much smaller.

When the sea-level dropped to a depth between –100 to –120 m from 30 ka to 20 ka B.P. i.e. during Last Glacial Maximum (LGM) the sea completely withdrew from the Velebit Channel leaving only the Zrmanja paleoriver flow, and Kvarnerić became the largest paleo-polje in the Dinarides with an approximate area of 880 km^2 (Fig. 1). Lakes could have been preserved in the deepest parts. The maximum depth of karstification was recognised –70 m below recent sea-level in wide Kvarner area. These data correspond to paleo marine terrace, which are a reliable indicator of sea-level stagnation.

During LGM, the valley of the Zrmanja paleoriver can be traced along the Velebit Channel at a distance of approximately 140 km. The location of the paleo-riverbed is not visible on the ancient flood plains, unlike in the canyons or straits. As a result, the shape and depth of paleobasins may have changed during the Late Pleistocene. However, there are not enough data on whether the Zrmanja paleoriver during LGM flowed on the surface to the Po paleoriver through straits between Ilovik and Premuda islands or Škarda and Ist islands. The other plausible possibility is that this paleoriver was a sinking river with ponors in the paleo-polje in the present-day