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## GEOMORPHOLOGIC CHANGES OF THE VELEBIT CHANNEL DURING LATE PLEISTOCENE AND HOLOCENE (NE ADRIATIC)

**ABSTRACT:** BENAC Č., BOČIĆ N. & JURAČIĆ M., *Geomorphologic changes of the Velebit Channel during Late Pleistocene and Holocene (NE Adriatic)*. (IT ISSN 0391-9838, 2022).

The Velebit Channel and its marginal basins in the northeastern Adriatic Sea were analyzed in order to reconstruct the geomorphological evolution of this area during the Late Pleistocene and Holocene (130 ka, MIS 5 to MIS 1) using detailed seabed maps, new data on sea-level changes, and submarine investigation. Submerged parts of the canyon, paleodeltas, traces of ancient lakes, and a large polje were discovered by analyzing these maps. Significant climate fluctuation during the Late Pleistocene and Holocene caused large variations in the Adriatic sea-level. On the very indented karst relief, the paleogeographic changes were quite impressive. The paleoflow of the Zrmanja River incised a canyon in the present Velebit Channel. A reconstruction of the paleoflow of the Zrmanja River shows that it could be traced at least 140 km from the current mouth during the Last Glacial Maximum. The transition from the marine to terrestrial/freshwater/lacustrine environment in the southeastern part of the Velebit Channel and in the marginal basins took place when the sea level dropped and oscillated between -20 m and -50 m (110-70 ka B.P.) after reaching a maximum of +5 m in 125 ka B.P. (MIS 5e). The basin in the northwest remained connected to the Kvarnerić marine basin at sea-level between -50 m and -80 m (70-30 ka B.P.). The sea completely receded from the Velebit Channel and Kvarnerić basin became polje during the Last glacial maximum (30-20 ka B.P.) when the sea level fluctuated between -100 and -120 m, whereas lakes probably remained in the deep depressions. During rapid sea-level rise between 19 and 7 ka B.P. the sea flooded a large part of the Zrmanja paleoriver valley and canyon (all of the Velebit Channel) and the sea penetrated into marginal basins. At the beginning of the stagnation of the Adriatic Sea level 7 ka B.P. a fine example of drowned fluvio-karst relief was formed and the dynamics of water in the karst underground became similar to the present.

**KEY WORDS:** Adriatic Sea, Sea-level change, Karstification, Fluvio-karst, Canyon, Polje.

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**SAŽETAK:** BENAC Č., BOČIĆ N. & JURAČIĆ M., *Geomorfološke promjene Velebitskog kanala tijekom kasnog pleistocena i holocena (Sjeveroistočni Jadran)*. (IT ISSN 0391-9838, 2022).

Jugoistočni dio Velebitskog kanala i rubni bazeni analizirani su kako bi se rekonstruirala geomorfološka evolucija ovog područja tijekom kasnog pleistocena i holocena (130 ka, MIS 5 do MIS 1) korištenjem detaljnih karata morskog dna, novih podataka o promjenama razine mora i istraživanjem podmorja. Značajne klimatske fluktuacije tijekom kasnog pleistocena i holocena uzrokovale su velike varijacije u razini Jadranskog mora. Na vrlo razvedenom krškom reljefu paleogeografske promjene bile su vrlo impresivne. Paleotok rijeke Zrmanje usjekao je kanjon u današnji Velebitski kanal. Rekonstrukcija paleotoka rijeke Zrmanje pokazuje da je tijekom posljednjeg glacijalnog maksimuma bio najmanje 140 km duži nego što je danas. Prijelaz iz morskog u kopneni/jezerski okoliš u jugoistočnom dijelu Velebitskog kanala i u rubnim kotlinama dogodio se kada je razina mora nakon postizanja maksimuma oscilirala između -20 m i -50 m u razdoblju od 110-70 ka B.P., nakon što je bila dosegla najvišu razinu od +5 m 125 ka B.P. (MIS 5e). Bazen na sjeverozapadu ostao je povezan s Kvarnerićem na razini mora između -50 m i -80 m (70-30 ka B.P.). More se potpuno povuklo iz Velebitskog kanala i Kvarnerića tijekom posljednjeg glacijalnog maksimuma (prije 30-20 ka) kada je razina mora fluktuirala između -100 i -120 m. Kvarnerić je postao krško polje a jezera su vjerojatno ostala u dubokim depresijama. Tijekom brzog porasta razine mora između 19 i 7 ka more je poplavilo veliki dio doline i kanjona paleorijeke Zrmanje (cijeli Velebitski kanal) te prodrlo u Paški i Ljubački zaljevi i Novigradsko more. Na početku stagnacije razine Jadranskog mora prije 7 ka formiran je lijep primjer potopljenog fluvio-krškog reljefa, a dinamika vode u krškom podzemlju postala je slična današnjoj.

**KLJUČNE RIJEČI:** Jadransko more, Promjene morske razine, Okršavanje, Fluvio-krš, Kanjon, Krško polje

## INTRODUCTION

Reconstruction of submerged paleorelief, paleohydrology, and paleoenvironments in Pleistocene and Holocene is rapidly evolving (Mattei & *alii*, 2022). However, reconstructions of paleohydrology in karst areas are not so common (Sikora & *alii*, 2014). An attempt to reconstruct the evolution of the Velebit Channel and the Kvarnerić basin in the karstic northeastern part of the Adriatic Sea