

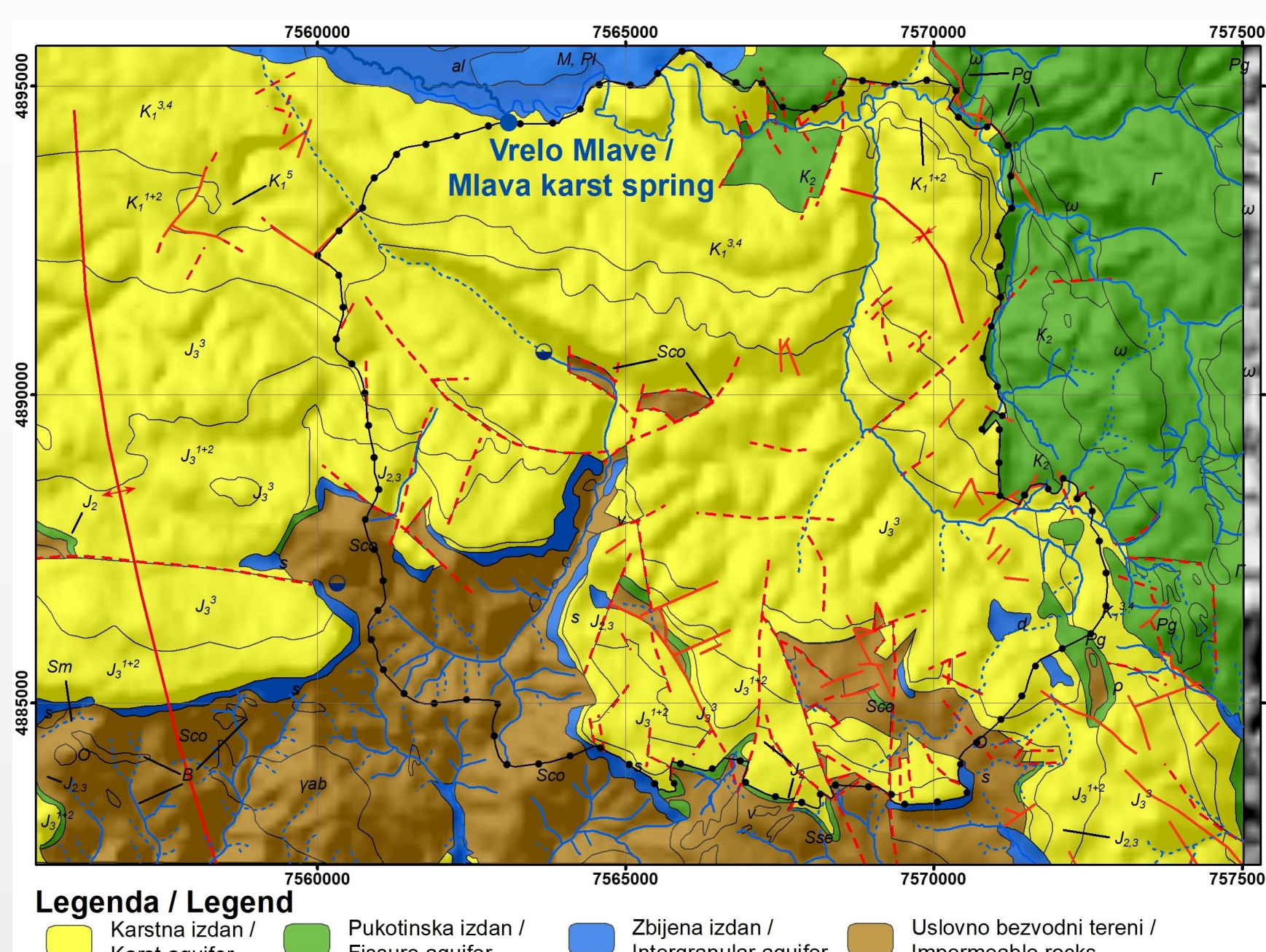
ABOUT THE PROJECT

MIKAS je međunarodni projekat Komisije za karst Svetske asocijacije hidrogeologa (IAH) koji je uspostavio listu najznačajnijih karstnih izvora na svetskom i nacionalnom nivou na bazi istorijskih, ekonomskih, estetskih, naučnih i ekoloških kriterijuma. Vrelo Mlave je uvršćeno u listu svetski značajnih izvora.

MIKAS is an international project of the IAH Karst Commission that aims to establish a list of the most important karst springs at global and international levels based on historic, economic, aesthetic, scientific, and ecological values. Vrelo Mlave (the Source of Mlava) has been inscribed on the list of globally important springs.

VRELO MLAVE

MLAVA KARST SPRING



Uprošćena hidrogeološka karta sliva vrelo Mlave
Simplified hydrogeological map of the Vrelo Mlave catchment

HISTORY & RESEARCH

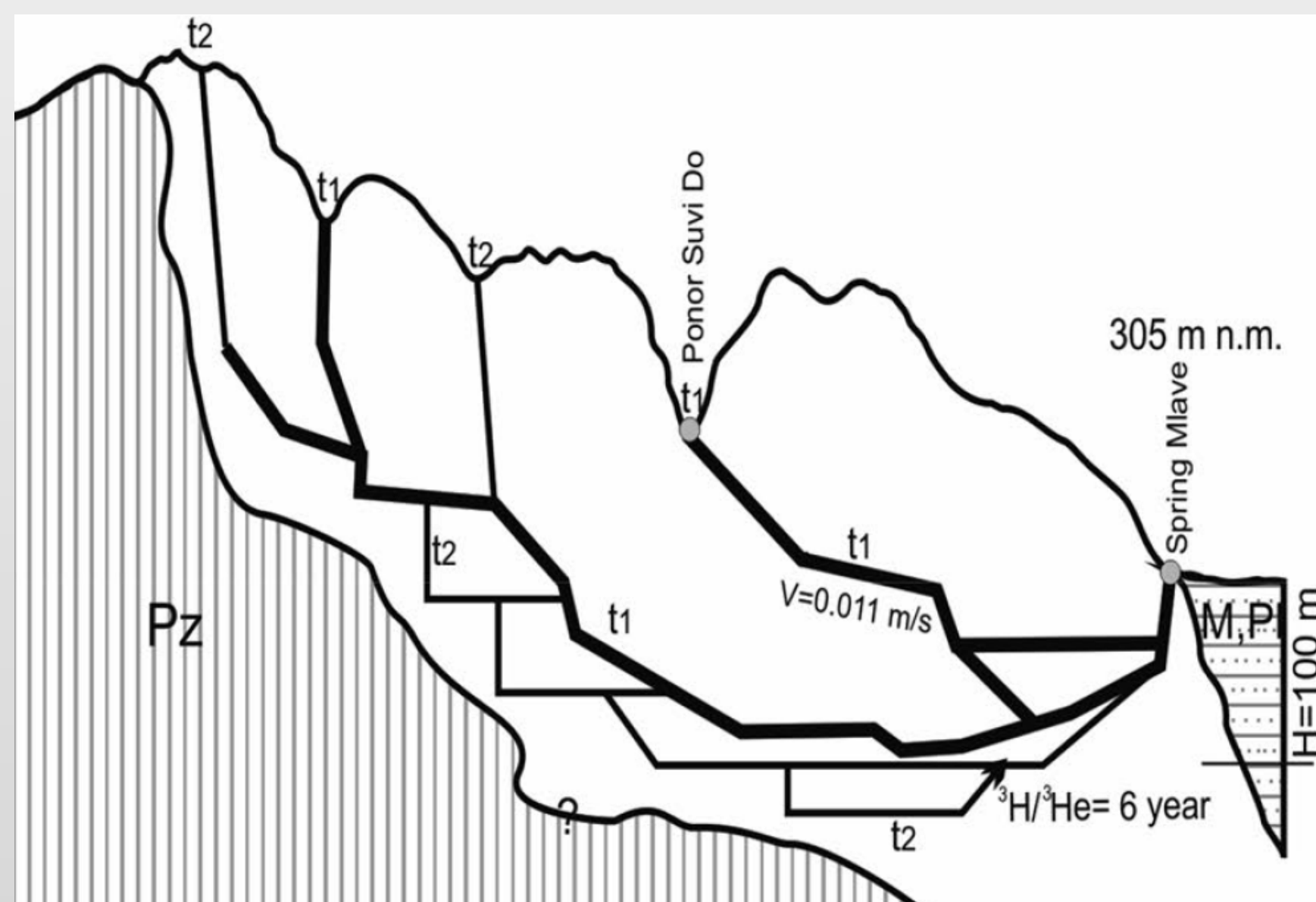
Vrelo Mlave je najbolje izučen izvor u Srbiji sa preko 60 godina osmatranja njegove izdašnosti. Jovan Cvijić, osnivač karstologije, sproveo je ovde prva istraživanja (1889-1896) kada je merio dubinu sifona u jezeru sa drvenog splava pomoću topovskog đuleta i pratio reakciju izvora na zemljotres čiji je epicentar udaljen oko 50 km. Izvor je nakon 1980 analiziran u više naučnih studija i disertacija.

Vrelo Mlave is the most studied spring in Serbia with 60 years of systematic discharge measurements. Jovan Cvijić, the founder of karstology, conducted his first explorations here (1889-1896), including measuring the lake and siphon depths from a wooden raft by use of a cannonball, and observing spring's reaction on an earthquake whose epicentre was some 50 km away. Spring was further studied in detail since 1980s in several studies and dissertations.

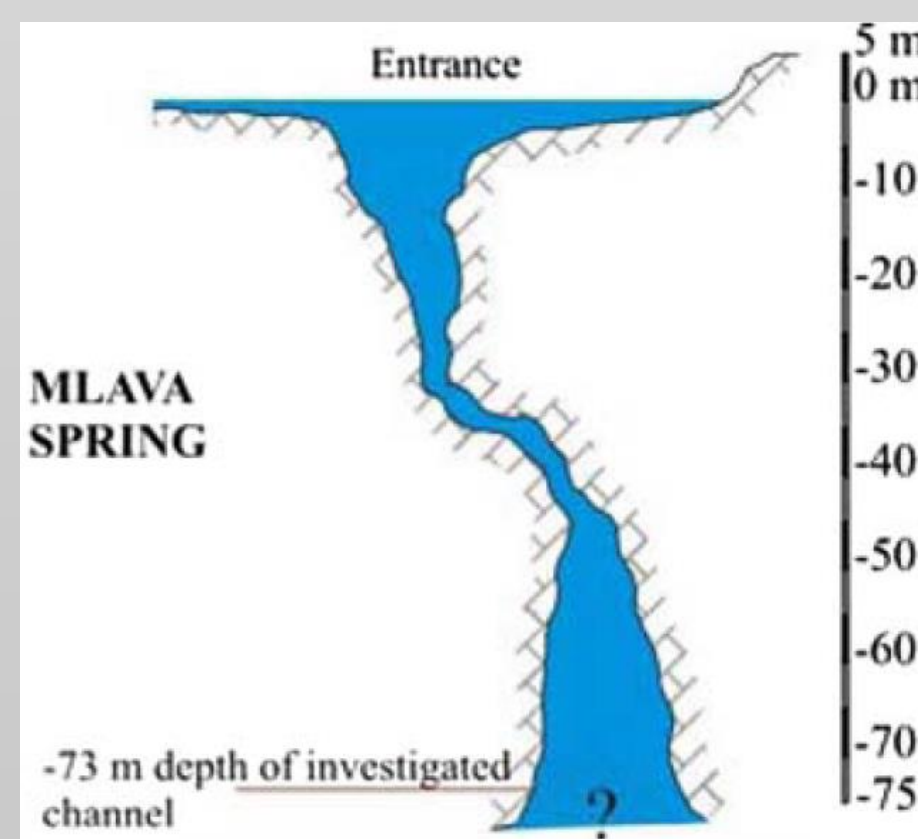
AUTHORS

Tim Centra za hidrogeologiju karsta RGF Univerziteta u Beogradu: Zoran Stevanović u saradnji sa Sašom Milanovićem, Ljiljanom Vasić, Vesnom Ristić Vakanjac i Veljkom Marinovićem

The Centre for Karst Hydrogeology team at FMG, University of Belgrade: Zoran Stevanović, in collaboration with Saša Milanović, Ljiljana Vasić, Vesna Ristić Vakanjac, and Veljko Marinović.



Konceptualni model vrelo Mlave (Vasić, 2017)
Conceptual model of the Mlava spring (Vasić, 2017)



Profil vrelo Mlave (Milanović, 2007)
Cross-section of the Mlava spring (Milanović, 2010)

ECOLOGY

Izvor Vrelo Mlave pripada prirodnom rezervatu – Nacionalnom parku Kučaj-Beljanica (obuhvata oko 45.000 hektara). Vrelo Mlave je uvršteno u nacionalni spisak spomenika prirode od 1995. godine. Izvorska voda napaja nizvodno locirani ribnjak pastrmke.

Vrelo Mlave spring belongs to natural reserve area – National Park Kučaj-Beljanica (comprises c. 45,000 ha). Vrelo Mlave is inscribed in the national list of the Natural Monuments since 1995. Springwater is feeding downstream located fish (trout) pond.

ABOUT THE KARST

Karst (kras) je specifični tip morfologije terena koji nastaje rastvaranjem karbonatnih i evaporitskih stena i u kojima se formira mreža podzemnih kanala kojima se kreću podzemne vode sve do pojave na jakim izvorima. Karst pokriva više od 15% kontinentalnog kopna, dok karstni vodonosnici snabdevaju pijaćom vodom oko 700 miliona ljudi u 150 zemalja.

Karst is a specific type of terrain morphology that is formed by the dissolution of carbonate and evaporite rocks, characterized by underground water movement along preferential pathways (channels, conduits, and caves) and large springs. Karst covers over 15% of the Earth's land surface, and karst aquifers supply potable water to around 700 million people in 150 countries.

HYDROGEOLOGY SETTINGS

Vrelo Mlave, glavni izvor reke Mlave, najveći je izvor u karpatskom karstu istočne Srbije. Ovo je tipičan uzlazni (voklijski) izvor iz jezera prečnika 30 m. Ronioci su istraživali sifon izvora u nekoliko navrata. Ukupna dostignuta dubina je 73 m, ali galerija na dnu je dodatno proširena i produžena u pravcu unutrašnjeg dela karstne izdani. Izdašnost izvora je 0.27-16.5 m³/s. Dva testa trasiranja potvrdila su vezu izvora sa ponornicom Crna Reka (brzine u periodu niskog vodostaja bile su 0,013-0,019 m/s). Na osnovu izotopskih analiza ³H i ³H/³He karstni sistem je „relativno brz“, starost podzemnih voda je oko 6 godina. Karstna izdan Mlave sadrži velike statičke rezerve skladištene u dubljim delovima izdani i predložen je za detaljna istraživanja i moguće inženjerske intervencije radi regulisanja minimalnih izdašnosti.

Vrelo Mlave, the main source of river Mlava, is the largest karst spring in Carpathian karst of eastern Serbia. This is typical ascending (vaucclusian) spring issuing from lake of 30m in diameter. Spring siphon was explored by divers on several occasions. The total reached depth is 73m, but gallery at the bottom is further expanded and extended to the inner part of the karst aquifer. The spring discharge is 0.27-16.5 m³/s. Two tracer tests confirmed connection of Vrelo Mlave spring with sinking stream Crna Reka (apparent velocities in low water period were 0.013-0.019 m/s). Based on isotopic analyses of ³H and ³H/³He karst system is „relatively fast“, groundwater age is around 6 years. Mlava karst aquifer contains large static reserves stored in deeper aquifer sections and was proposed for detail research and possible engineering interventions to regulate minimal flows.