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Hydrogeological and isotope mapping of the karstic Savica River (NW Slovenia)

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Mapping is important part of the hydrogeological terrain investigations, especially when spatial and temporal relations are not known precisely. There are many different methods available; among them not least important is careful visual inspection of the stream and its stream bed at regular intervals with the aim to detect phenomena which reflect surface water groundwater interactions. In parallel with the inspection various measurements can be performed. Together with usual water electro conductivity and water temperature we tested complimentary information which can be obtained with the concomitant regular sampling for δ^{18}O determination in the river water course. Combination of all these information proved to be very useful in obtaining spatial trends in river characteristics and to determine relations between its water balance components. Testing of the methodology of hydrogeological mapping with the means of isotopes on the karstic Savica River during low flow period where water balance relations between its tributaries were not known before demonstrate the usefulness of the applied approach.

Savica River is positioned in the north-west part of Slovenia in the centre of Triglav national Park which covers large part of East Julian Alps. River represents the main recharge of the Bohinj Lake, largest Slovenian natural lake. Savica River is short with the length of only 4.0 km and consists of two tributaries in the upper part; Mala Savica coming from the west and Velika Savica coming from the north-west. The first is recharged from several water caves of various lengths in which water level depends on hydrological conditions, consequently terminal end of the water in its riverbed part changes during the year. The second tributary is recharged from the 510 m long karstic cave with the entrance at 836 m a.s.l. where water disappears over 75 m high famous and picturesque waterfall. Geology of the catchment is predominantly formed by Dachstein limestone of Upper Triassic age subordinated by small number of dolomite beds. In the period between years 1954 and 2012 was average discharge at the gauging station Savica Ukanc 5.08 m^3/s. At the gauging profile riverbed is occasionally reported as dry and maximum measured discharge was 138 m^3/s.

Based on the three sampling campaigns performed at low water conditions when each time between 35 and 40 samples were taken, we were able to estimate relations between various Savica River components. During low water period Mala Savica defined presents between 12 % and 17 % of the total outflow from the total Savica recharge area. Velika Savica in its complete water course represents between 78 % and 82 % of the total outflow. There is also small part recharging in the area between the confluence of Velika Savica and Mala Savica and confluence of Savica with Bohinj Lake; this part represents from 3 % to 5 %, however estimations are very rough and probably prone to large error.

Estimated relations are based on the rough calculations but represent important step forward in the understanding of complex Savica River system. Until now no data was available on the amount and share of Velika Savica and Mala Savica to the total outflow from the vast karstic recharge area on high mountainous plateau. Mapping campaigns along the whole river were performed at low to moderate hydrological conditions; therefore results cannot be transferred to the all possible hydrological conditions. However, similar results obtained during three seasons with slightly different discharge regimes indicate that the spatial relations are relatively stable.

Results are important for further investigations of Savica River system. Such information can help to discern hydrogeologicaly important points along the river course and based on them we can focus on more detailed observations at particular sites. In the future they will help us in better understanding of hydrograph components and better understanding of the functioning of karstic aquifer draining through Savica springs and direct inflows of groundwater into the riverbed.