Geophysical Research Abstracts
Vol. 17, EGU2015-6589, 2015
EGU General Assembly 2015

Can we differentiate alpine groundwater storages regarding volume and residence time by recession observations, ion composition and tracer balance?

Marius Floriancic (1), Maarten Smoorenburg (1), Michael Margreth (2), and Felix Naef (1)

(1) Institute for Environmental Engineering, ETH Zurich, Zurich, Switzerland (m.floriancic@gmail.com), (2) Soilcom GmbH, Zurich, Switzerland

Research on how catchments store and release water is essential to improve flood and low flow prediction in (un)gauged watersheds. Despite their importance for catchment scale assessments on runoff generation, knowledge on storage properties and residence times is still limited.

Here we present some approaches to separate different storage types regarding their residence time and a quantification of the volumes of these storages based on a dataset of winter recession observation in the alpine Poschiavino headwater area. This spatially highly resolved dataset of discharge, electric conductivity and ion composition from a watershed with strongly contrasting storage properties, allowed separating three main contributing sources: continuous discharge from bedrock cracks, strongly delayed discharge from thick sediment deposits and fractured rock and rapid discharge from shallow layers. The gradients of the recession curves, the variation of electric conductivity in the river network and calculated tracer balance were used to separate contribution from different sources. Additionally contribution from sedimentary rocks and crystalline layers could be separated based on the variation of ion composition in the water samples. We derived recession curves for a period of four months for the separated storages in different parts of the catchment allowing estimation of the contributed volumes in this time period. Finally the spatial distribution of the storage types could be mapped throughout the catchment based on information like geo(morpho)logical maps, aerial photographs, DEM and field observations.

We found significant variation comparing the discharged volume and specific discharge throughout the winter season in the different subcatchments. Constant discharge from bedrock cracks is similar in all catchment parts. Storage in the shallow deposits depleted quickly. High winter discharge could be attributed to thick quaternary deposits contributing during the whole observation period. The western part of the watershed covered by these thick deposits showed the highest contribution throughout the low flow measurement campaign. High contribution was also measured from the sedimentary rocks, covering 7% of the area but contributing 14% to total discharge.