The effect of the choice of time resolution on the prediction of deep drainage rates in rocky covers

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Numerical modelling is a tool allowing the prediction of water flow and water balance based on material properties and time dependent input information at defined boundaries. Long time series are often required for a well informed assessment of the performance of a site. It has been shown that covers as a preferred option constructed in semi-arid and arid climates on mine sites to manage water flows and to prevent deep drainage have a characteristic bi-modal pore system largely caused by a large fraction of coarse rocks. Bi-modal water retention curves have been established for such covers which have proven to describe the response to precipitation with higher accuracy. Meteorological data as input information are in many cases only available on a daily basis if time series over decades are used for modelling. For a bi-modal pore system with often very high values for saturated hydraulic conductivity, a daily time-step may be too large to capture numerically the response in water flow. The objective of the presented work is the comparison of modelled deep drainage data for a specific cover design where hourly data are compared with daily input data. The latter were aggregated from the hourly information.

The results from the numerical modelling showed that for environments with high intensity rainfall events the calculated amount of deep drainage was by up to 10% smaller for the aggregated daily input data compared to the hourly data.

The presentation will inform which rainfall events contributed primarily to the difference in the water balance parameters and to which extent a generalisation can be made on the choice or requirement to choose an appropriate time step for specific climatic conditions.