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ESTIMATION OF THE RIVER CONDUCTANCE COEFFICIENT USING STREAMBED SLOPE FOR MODELING OF REGIONAL RIVER-AQUIFER INTERACTION

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Summary. River–aquifer interaction is usually simulated in regional groundwater models using streambed conductance. This is a proxy coefficient, generally estimated from streambed deposits properties, since it is assumed that measurable head losses between stream and aquifer are limited to those across the streambed itself. However, it is difficult to obtain reliable data on streambed deposits on a regional scale, e.g. due to scaling issues.

It is widely accepted that there is a physical relationship between streambed slope, mean flow velocity and deposit characteristics such as thickness, granularity and composition. Adequate groundwater modeling of alluvial aquifers requires the study of this relationship.

In a case study at the Abrera Basin (Lower Llobregat river, Barcelona, Spain), the conductance coefficient turned out to be the main parameter of the calibration process. Average streambed slope was used in order to partition the river path in various tracks. According to the average slope, the parameter band width was limited by physically realistic boundary values. Consequently, a direct relationship between slope and conductance coefficient was established, which served as a starting point for the calibration process.

The streambed slope proved to be a useful coefficient to structure the calibration of the river conductance on a regional scale, especially when no data is available on local streambed properties. During periods with stationary flow regime, the results were generally satisfying. However, additional research is needed to understand the influence of peak flows that tend to alter streambed deposits in a highly dynamic way. Previous research revealed that these events are particularly significant for alluvial aquifer recharge. It is therefore recommended as a future improvement to undertake a calibration process in which streambed conductance is variable not only as a function of slope, but also of time. This will require identifying periods with normal and peak river discharge.