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Quantification of infiltration processes in urban areas by accounting for spatial parameter variability

U. Mohrlok (1), L. Wolf (2) and J. Klinger (2)

(1) Universität Karlsruhe, Institute for Hydromechanics, Kaiserstrasse 12, 76128 Karlsruhe, Germany (mohrlok@ifh.uka.de), (2) Universität Karlsruhe, Applied Geology, Kaiserstrasse 12, 76128 Karlsruhe, Germany (wolf@ifh.uka.de)

According to human living and activity infiltration to the subsurface in urban areas is strongly related with quality issues of the infiltrated water. There exist several kinds of infiltration sources like infiltration from precipitation, irrigation, leaking pipes as well as sewers, septic tanks and rain water infiltration ponds. Contaminant mass transport is associated with these infiltrations in many cases. Depending on the construction details of the infiltrating facilities, e.g. size, as well as the quality of that facilities, e.g. sewer leaks, the infiltration rates and the affected volume of soil and groundwater vary. In order to set up an integrated urban water balance it becomes essential to estimate the infiltration processes, i.e. water flow and solute transport, from these different infiltration sources and to take into account the large spatial variability of soil properties, the geometric settings of these sources and the groundwater table. Since a detailed three-dimensional numerical quantification of those infiltration processes is not possible simplified approaches have been developed. The source locations were classified according to the spatial distribution of the parameters determining the infiltration processes. The simplifications of transient processes by considering steady state condition were assessed. Particularly, the residence times of contaminants based on the flow conditions were estimated as base for simply balancing contaminant transformations. The developed approaches were applied to the case study city of Rastatt within the EU funded project AISUWRS in order to assess the impact on the urban groundwater of Rastatt.