Geophysical Research Abstracts
Vol. 14, EGU2012-4730-1, 2012
EGU General Assembly 2012

River bank restoration effects on dissolved organic carbon concentrations in groundwater during floods

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Estimating the effect of river restoration on groundwater quality is important in the view of nationwide implementations demanded by e.g. the EU Water Framework Directive. DOC transport during river infiltration conditions was examined based on 3D flow and contaminant transport simulations with transient groundwater-surface water interaction. In a scenario setting the effects of river restoration on DOC concentrations, travel time and distance from the river required for DOC reduction in groundwater during river floods were investigated. River restoration was assumed to cause scouring of the riverbank, which a) affects the bank geometry and provides more chance of the river to interact with groundwater and b) reduces bank sediment clogging. A shallow unconfined alluvial aquifer of gravel and sandy gravel media was assumed which was either well connected to the river or was confined by a thin clogging layer at the top of the river bed and bank at natural infiltration conditions. Scenario results showed that riverbank restoration facilitates DOC transport into the aquifer during floods. Even if riverbank permeability remained unchanged, floods caused significantly higher DOC concentrations at a restored than at a channelised riverbank. At the same time, DOC concentration peaks in groundwater arrived earlier and the required distance from the river reducing DOC to background concentrations increased. These effects were explained by changes in bank geometry, and thus a greater ability of the river to interact with groundwater.