Geophysical Research Abstracts
Vol. 17, EGU2015-14332, 2015
EGU General Assembly 2015

Landscape characteristics impacts on water quality of urban lowland catchments: monitoring the Amsterdam city area

Liang Yu (1), Corné van der Vlugt (1,2), Joachim Rozemeijer (3), Hans Peter Broers (4), Boris van Breukelen (1), Maarten Ouboter (2), Pieter Stuyfzand (1,5)

(1) VU University, Amsterdam, the Netherlands, (2) Waternet, Amsterdam, the Netherlands, (3) Deltares, Utrecht, the Netherlands, (4) TNO Geological Survey of the Netherlands, Utrecht, the Netherlands, (5) KWR Watercycle Research Institute, the Netherlands

In Dutch lowland polder systems, groundwater quality significantly contributes to surface water quality. This process is influenced by landscape characteristics such as topography, geology, and land use types. In this study, 23 variables were selected for 144 polder catchments, including groundwater and surface water solute concentrations (TN, TP, NH_4^+, NO_3^-, HCO_3^-, SO_4^{2-}, Ca^{2+}, Cl^-), seepage rate in mm per year, elevation, paved area percentage, surface water area percentage, and soil types (calcite, humus and lutum percentage). The spatial patters in groundwater and surface water quality can largely be explained by groundwater seepage rates in polders and partly by artificial redistribution of water via the regional surface water system. High correlations (R^2 up to 0.66) between solutes in groundwater and surface water revealed their probable interaction. This was further supported by results from principal component analysis (PCA) and linear regression. The PCA distinguished four factors that were related to a fresh groundwater factor, seepage rate factor, brackish groundwater factor and clay soil factor. Nutrients (TP, TN, NH_4^+ and NO_3^-) and SO_4^{2-} in surface water bodies are mainly determined by groundwater quality combined with seepage rate, which is negatively related to surface water area percentage and elevation of the catchment. This pattern is more obvious in deep urban lowland catchments. Relatively high NO_3^- loads more tend to appear in catchments with high humus, but low calcite percentage soil type on top, which was attributed to clay soil type that was expressed by calcite percentage in our regression. Different from nitrogen contained solutes, TP is more closely related to fresh groundwater quality than to seepage rate. Surface water Cl^- concentration has a high relation with brackish groundwater. Due to the artificial regulation of flow direction, brackish inlet water from upstream highly influences the chloride load in surface water bodies downstream, especially in infiltrated urban catchments. We conclude that, apart from artificial regulation, groundwater has significant impacts on surface water quality in the polders. Especially in low-lying urban catchments surface water solute concentrations like TP, TN, NH_4^+, HCO_3^-, SO_4^{2-}, and Ca^{2+} can be predicted by groundwater characteristics. These results suggest that groundwater quality plays a crucial role in understanding and improving surface water quality in regulated lowland catchments.