



Geochemical processes governing nitrate natural attenuation in shallow groundwater near surface water interface in Latvia

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Central part of Latvia is dominated by intensive agricultural activity, thus nitrate pollution is a common problem in surface water and shallow groundwater. High temporal and spatial variability of nitrate concentrations in shallow groundwater and springs have been observed where concentrations are more elevated compared to the nitrate values in deeper aquifers. The importance and intensity of geochemical processes governing shallow groundwater composition and dynamics in Latvia near the surface water-groundwater interface are still not well understood. This research aims to investigate the variability of groundwater composition and transformations in most common geological media types in study area in presence of intensive land use.

In total 147 groundwater, surface water and spring water samples were seasonally collected for one year period (2017-2018). Nested wells up to depth of 4 meters with small volume and discrete screen intervals were deployed in order to take minimal disturbed samples. The chosen approach allowed to detect groundwater chemical composition changes at multiple depths. Groundwater levels and temperature were measured continuously to identify groundwater dynamics and interaction with surface waters.

Results revealed that dominating geochemical conditions in shallow groundwater are governed by geological settings and hydrological regime and that subsequently determines the rate of natural attenuation of nitrates. Despite the fact that two thirds of all groundwater samples contained nitrate concentration under detection limit, few sites showed seasonally fluctuating nitrate levels with concentrations up to 48 mg/l - close to nitrate threshold value 50 mg/l (according to EU Nitrates directive 91/676/EEC). As a result of this research conceptual models for nitrate transformation and movement in groundwater were developed for future groundwater management needs in Latvia.

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