



Spatio-temporal changes of the nitrate-ion concentration in the groundwater

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The first observation wells were established in 1995 at Nyírólapos in Hortobágy (eastern part of the Great Hungarian Plain) for searching the connection between alkalization and pedogeochemistry. Later on other wells were installed in new study areas (Szarvas, Apajpuszta, Csípőhalom, Gödöllő, Bugac, Fülöpháza, Fülöpszállás, Csólyospálos) that represent different geological regions of the Great Hungarian Plain. Recent research focused on alkalization, nutrient circles, water management in forests and environmental effects on the groundwater in the soil–parent material–base rock system.

The observation wells were sampled monthly. Depth to the groundwater was measured and the pH and conductivity were checked in the field. All water samples were analysed for the major components (Na^+ , K^+ , Ca^{++} , Mg^{++} , Fe^{++} , NH_4^+ , Mn^{++} , Cl^- , HCO_3^- , CO_3^{--} , SO_4^{--} , NO_3^- , NO_2^- , H_2SiO_3) and for the micro-elements (Cr, Zn, Co, Ni, Ba, Al, Cu, Sr, Mo, B, Pb, Cd, Li).

Based on the first evaluation of the analytical results, new wells were established in 2001 on the Nyírólapos–model area next to the existing ones, for sampling in different water depths at the same place. Since that time water samples have been taken from the uppermost zone of the groundwater (2-3 m) (the original sampling depth), between 4-6 m, and from the depth to 8-10 m. From our first observations, most of the measured ion concentrations varies widely in the certain levels of the studied profiles and they change strongly in time, too.

This paper shows the changes of the nitrate-ion concentration in the groundwater, in space and time in different study areas. Nitrate-ion was chosen because its concentration reached the environmental limit value in the drinking water at some settlements (according to Hungarian law, the background concentration in the groundwater is 10 mg/l, the contamination limit value is 25 mg/l, the limit value in drinking water is 40 mg/l). Follow-up the changes in space and time, areas and periods that need further monitoring. Environmental factors such as pH and Eh having an effect on nitrate-ion concentrations measured in the groundwater were analysed with multi-dimensional statistical methods.

Based on the results, the legislative nitrate vulnerability ranking of certain agricultural lands had to be redefined. Results indicate that, in contradiction to EU and Hungarian legislation, local environmental thresholds should be defined with respect to the local geochemical background.