Groundwater chemical composition response to the recent 2018 drought event in Europe (central part of Latvia)

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More severe and frequent drought events are one of the main challenges faced worldwide in the context of climate change. Now droughts can be observed in the areas that are typically not classified as drought prone regions and more often groundwater vulnerability to prolonged drought events is reported. Groundwater drought is relatively new drought type defined as lower than normal groundwater level.

Most recent drought event in Europe in 2018 significantly affected shallow groundwater aquifers in the Baltic states. That year, groundwater droughts in Latvia caused large financial losses to many farmers, and rural households frequently reported dry dug wells. Even though main groundwater drought consequences are depleted aquifers and/or reduced base flows to rivers, drought may have an influence on groundwater quality as well (e.g. reduced denitrification rates due to lower groundwater levels and shorter travel times in anoxic zone).

This study presents groundwater chemical composition changes with respect to groundwater level variations between six sampling campaigns carried out during the groundwater drought event in 2017-2018 in central part of Latvia. Groundwater samples were taken from specifically established monitoring network with seven stations, each having two to four shallow groundwater wells with the maximum depth of four meters. In total more than 100 groundwater, surface water and spring water samples were collected every two months for a one-year period. Major ions, water stable isotopes, biogenic and trace elements were analyzed in laboratory. Patterns were analyzed by multivariate statistical analysis (Principal Component Analysis, Cluster Analysis and Discriminant Analysis).

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