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Hydrogeochemistry at the 100 years old sewage farms Berlin Karolinenhoehe

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Berlin has well established sewage farm districts for over 100 years now. The sewage farms are still in operation for maintaining the water balance, avoiding changes in vegetation patterns, acidification of soils and displacement of pollutants accumulated in the soil and vadose zone. Water balance is an important reason for keeping these farms in operation, since Berlin's water supply is entirely derived from groundwater resources. To be able to continue the operation of the sewage farms, it is necessary to show that past activities and current irrigation practices do not affect the quality of groundwater supplied to the city. Therefore a study was carried at the sewage farm "Karolinenhöhe" (in operation since 1890). It was irrigated with untreated wastewater until the mid 1980s, followed by a period with combined (treated and untreated) sewage. Since 1997, only treated wastewater is used. The study was focused on the evolution of the hydrogeochemical conditions at the farms with respect to the changing management practices. Recommendations were developed for further investigations to find a suitable solution regarding the impact of continued irrigation on the groundwater production at the waterworks in the vicinity.

Based on existing hydrogeological and hydrogeochemical observations by Berliner Wasserbetriebe, TU Dresden, and others, in and after the 1980s, a conceptual hydrogeological model was established and the dynamics of the groundwater system in the area were analysed. Statistical methods and numerical modelling were used for hydrological analysis, while situation maps, time series diagrams, redox diagrams and Voigt-Krajnov diagrams were used to understand the hydrochemical trends in the investigation period, and to establish theories for the hydrochemical development and to develop recommendations for further investigations.