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Nitrate contamination of groundwater in the catchment of Goczałkowice reservoir

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Goczałkowice dammed reservoir (area - 26 km^2 , volume - 100 million m^3 at a typical water level) is a very important source of drinking water for Upper Silesian agglomeration. At the catchment of the reservoir there are many potential sources of groundwater pollution (agriculture, bad practices in wastewater management, intensive fish farming). Thus local groundwater contamination, mainly by nitrogen compounds. The paper presents groundwater monitoring system and preliminary results of the research carried on at Goczałkowice reservoir and its catchment in 2010 - 2014 within the project „Integrated system supporting management and protection of dammed reservoir (ZiZoZap)". The main objective for hydrogeologists in the project is to assess the role of groundwater in total water balance of the reservoir and the influence of groundwater on its water quality. During research temporal variability of groundwater – surface water exchange has been observed.
Monitoring Network of groundwater quality consists of 22 observation wells (nested piezometers included) located around the reservoir – 13 piezometers is placed in two transects on northern and southern shore of reservoir. Sampling of groundwater from piezometers was conducted twice - in autumn 2011 and spring 2012. Maximum observed concentrations of nitrate, nitrite and ammonium were 255 mg/L, 0,16 mg/L and 3,48 mg/L, respectively. Surface water in reservoir (8 points) has also been sampled. Concentrations of nitrate in groundwater are higher than in surface water. Nitrate and ammonium concentrations exceeding standards for drinking water were reported in 18% and 50% of monitored piezometers, respectively. High concentration of nitrate (exceeding more than 5 times maximal admissible concentration) have been a significant groundwater contamination problem in the catchment of the reservoir. Periodically decrease of surface water quality is possible. Results of hydrogeological research indicate substantial spatial variability in concentrations of nitrogen compounds in groundwater of the Quaternary aquifer. To determine an origin of nitrate in groundwater the study of isotopic composition of nitrogen and oxygen in nitrate was conducted.