INFLUENCE OF CLIMATE CHANGE ON GROUNDWATER RESOURCES. APPLICATIONS TO THE BASINS OF THE SOMME AND THE LOIRE (FRANCE).

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Abstract

In the catchment of the Somme river (6 433 km^2) the Chalk aquifer is present everywhere, but in contrast there are few tributaries. Consequently 95% of water consumption comes from groundwater. Due to the inertia of this thick aquifer, water resources are relatively well secured in case of classical drought. However, the projected climate change may reduce this current security. To analyze the consequences of climate change on groundwater, flow models were developed as part of national research projects (project RExHySS) and calibrated on the monitored flows of the Somme river and on more than fifty aquifer observation wells. A set of climate change scenarios from the IPCC and major international meteorology boards were then used as forcing conditions for analyzing the flow variations of the Somme river and the aquifer levels variations in 2050 and 2100. Although the results depend on the scenarios, as well as on the simulation models, they are very consistent: the flow of the Somme could decrease by about 25% to 30% by the end of the century. Groundwater levels could drop dramatically: from about 5 to 10 meters in the highlands and a few meters in the valleys. The Loire basin (100 000 km^2) was also studied under the national project ICC-Hydroqual. In contrast to the Somme basin, a lighter modeling approach has been used for the Loire basin: clusters of lumped hydrological models, namely the EROS model developed by BRGM and the CLSM model developed by UMR Sisyphe. The use of 21 climate scenarios has predicted a decrease in the flow of the Loire river at its outlet, in the order of 25% to 30%. Levels of groundwater, simulated in 29 points, also would drop by an average of 2 meters at the end of the century, but the decline could exceed 5 meters in some locations. These researches showed the sensitivity of surface water and groundwater to climate change that must be taken into account in development plans. The models produced will also, to some

extent, help to assess the feasibility of mitigating these consequences, for example through better management of reservoir dams, or by reducing crop irrigation.