

Contribution to the Understanding of the Hydrodynamic Behaviour of Aquifers of the Taoudéni Sedimentary Basin (South-eastern Part, Burkina Faso)

Authors : Kutangila Malundama Succes, Koita Mahamadou

Abstract : In the context of climate change and demographic pressure, groundwater has emerged as an essential and strategic resource whose sustainability relies on good management. The accuracy and relevance of decisions made in managing these resources depend on the availability and quality of scientific information they must rely on. It is, therefore, more urgent to improve the state of knowledge on groundwater to ensure sustainable management. This study is conducted for the particular case of the aquifers of the transboundary sedimentary basin of Taoudéni in its Burkinabe part. Indeed, Burkina Faso (and the Sahel region in general), marked by low rainfall, has experienced episodes of severe drought, which have justified the use of groundwater as the primary source of water supply. This study aims to improve knowledge of the hydrogeology of this area to achieve sustainable management of transboundary groundwater resources. The methodological approach first described lithological units regarding the extension and succession of different layers. Secondly, the hydrodynamic behavior of these units was studied through the analysis of spatio-temporal variations of piezometric. The data consists of 692 static level measurement points and 8 observation wells located in the usual manner in the area and capturing five of the identified geological formations. Monthly piezometric level chronicles are available for each observation and cover the period from 1989 to 2020. The temporal analysis of piezometric, carried out in comparison with rainfall chronicles, revealed a general upward trend in piezometric levels throughout the basin. The reaction of the groundwater generally occurs with a delay of 1 to 2 months relative to the flow of the rainy season. Indeed, the peaks of the piezometric level generally occur between September and October in reaction to the rainfall peaks between July and August. Low groundwater levels are observed between May and July. This relatively slow reaction of the aquifer is observed in all wells. The influence of the geological nature through the structure and hydrodynamic properties of the layers was deduced. The spatial analysis reveals that piezometric contours vary between 166 and 633 m with a trend indicating flow that generally goes from southwest to northeast, with the feeding areas located towards the southwest and northwest. There is a quasi-concordance between the hydrogeological basins and the overlying hydrological basins, as well as a bimodal flow with a component following the topography and another significant component deeper, controlled by the regional gradient SW-NE. This latter component may present flows directed from the high reliefs towards the sources of Nasso. In the source area (Kou basin), the maximum average stock variation, calculated by the Water Table Fluctuation (WTF) method, varies between 35 and 48.70 mm per year for 2012-2014.

Keywords : hydrodynamic behaviour, taoudeni basin, piezometry, water table fluctuation

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