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[JWARP](#) > Vol.2 No.12, December 2010



Hydrogeochemical and Groundwater Quality Studies in the Northern Part of the Densu River Basin of Ghana

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Author(s)

Abass Gibrilla, Shiloh Osaе, Tetteh T. Akiti, Dickson Adomako, Samuel. Y. Ganyaglo, Edward. P. K. Bam, Alhassan Hadisu

ABSTRACT

Agriculture, rapid urbanization and geochemical processes have direct or indirect effects on the chemical composition of groundwater and aquifer geochemistry. Hydrochemical investigations which are significant for assessment of water quality have been carried out to study the source of dissolve ions in the groundwater in some rural communities in the northern part of the Densu River basin. Twenty six samples comprising of twenty one boreholes, one hand-dug well and four surface waters were sampled for this study. The samples were analyzed in-situ for pH, Conductivity and salinity using a Hach potable meter, bicarbonate using a digital titrator. Major ions such as Na⁺, Ca²⁺, K⁺, SO₄²⁻, NO₃⁻, Cl⁻ etc were analyzed using ion-chromatography, flame photometer and Atomic Absorption spectrometer. The results showed that the groundwater in the study area are fresh and low in TDS (49.5-361 mg/l) and generally mildly acidic to alkaline (pH 5.57-7.48). The ground water quality of the study area are suitable for domestic purposes, since most of the parameters measured were within the WHO recommended values for drinking water, with the exception of nitrate (NO₃-N which showed an elevated concentration in most of the samples (about 60%). Higher concentrations of NO₃⁻, Cl⁻, SO₄²⁻ etc were observed at the middle portion of the basin where there is extensive agriculture and rapid urbanization. The Piper diagram shows three major water types namely Na-Cl or Na-HCO₃-Cl, Na-Mg-Ca-HCO₃ and Na-HCO₃ water types and Ca-Mg-HCO₃ as minor about (8%) which are moderately mineralized. Ion-exchange, Weathering, Oxidation and Dissolution of minerals were found to be the major geochemical processes governing the groundwater evolution in the study area.

KEYWORDS

Aquifer, Hydrogeochemical, Weathering, Densu River, Ion-exchange

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