Geophysical Research Abstracts,
Vol. 11, EGU2009-11062-2, 2009
EGU General Assembly 2009

Stochastic modelling of an heterogeneous porous media: the Komadougu Yobe alluvial aquifer, Lake Chad basin

M. Le Coz (1), P. Genthon (2), and G. Favreau (3)

(1) UM2, UMR HyrdroSciences, Montpellier, France (lecoz@msem.univ-montp2.fr), (2) IRD, UMR HydroSciences, Niamey, Niger (pierre.genthon@ird.fr), (3) IRD, UMR HydroSciences, Niamey, Niger (guillaume.favreau@ird.fr)

The downstream Komadugu Yobe river valley, a Lake Chad tributary straddling the Niger-Nigeria border, is an area of well-developed irrigated cropping. Increasing pressure on both surface water and groundwater resources require a better understanding of the hydrogeological processes, changing water balance and aquifer vulnerability.

The upper part of the aquifer is made up of fine sand matrix with numerous clay lenses. Such facies heterogeneities influence flow and transport in the subsurface and need to be taken into account for hydrogeological modelling. To this goal, the origin of these heterogeneities was first examined; secondly, a methodology to describe the structure of the media by means of a stochastic simulation procedure is suggested.

Drilling in the unsaturated zone ($\sim$ 0-10 m) and granulometric analysis of sediments showed that clay lenses in the Komadugu valley have two main sources. On the one hand, lenses can be due to the filling of abandoned channel resulting from meander cut-off and have then a specific, elongated geometry. On the other hand, they can correspond to overbank deposits formed on floodplains and have less predictable shape and extent.

Cell-based geostatistical simulation methods are commonly used for facies modelling but are inefficient when deposits have complex variation patterns such channel fill deposits. Object-based simulation methods should be more relevant but require a clear knowledge of object geometries. In the study area, complex variation patterns would rule out the cell-based approach whereas overbank deposits may limit the relevance of object based simulations. A facies modelling via image analysis and multiple point statistic simulations was therefore initiated. In a first step, available hard data (geological logs, satellite images) together with soft constraints arising from the general geological knowledge of the area were used to generate synthetic images of the heterogeneous media. A second step will consist in the calculation of statistical relations between multiple location considered jointly based on these images. Finally, conditional simulations of the upper part of the aquifer will be computed by means of these statistical relations.