Geophysical Research Abstracts
Vol. 13, EGU2011-5791, 2011
EGU General Assembly 2011

Modeling groundwater resources in an alluvial aquifer of Somaliland

Laura Cattaneo (1), Mauro Giudici (1), Bruno Petrucci (2), and Alfredo Lozej (1)

(1) Italy (laura.cattaneo1@unimi.it), Dipartimento di Scienze della Terra "A.Desio", Università degli Studi, Milano,Italia, (2) NGO Africa'70 Consultant, Italy

Water for the city of Hargeisa (Somaliland) is supplied by wells drilled in the alluvial aquifer of the Ged Deeble (GD) basin. The well fields were started in the 1970's by the Chinese cooperation and some new wells were drilled later. The water production, after the drop due to the civil war, raised again to the pre-war levels (around 6000 m^3/day) in the first years of the millennium, and up to 10.400 m^3/day at the beginning of 2010. This trend reflects in the variation of the water table depth with time. An EU project allowed to perform some exploration activities from 2003 to 2007, including: a detailed geological survey, a geoelectrical campaign, a series of pumping tests, a continuous monitoring activity prolonged for two years. The data permit a first reconstruction of the basin shape, of the hydrological structure and of the mechanisms of the aquifer recharge. The aquifer consists of unconsolidated sediments deposited in lacustrine or fluvial environments and is bounded by a Precambrian crystalline bedrock. From a structural point of view, the basin is the result of the intense tectonic thrusts that gave birth to the Gulf of Aden rift: it probably formed by two major tectonic trenches, E-W oriented, connected by a long fracture with N-S alignment. A wide outlet was found at the N-E edge which connects the GD basin to the Laas Dhuurre-Damal (LDD) basin. The available data were used to apply MODFLOW for the simulation of 2D groundwater flow. The mathematical model considers a 2D hydraulic flow approximation, pseudo-steady conditions corresponding to the average annual flow, no-flow boundary conditions in correspondence of the crystalline bedrock and fixed head at the edge with the widespread and thick LDD basin. The calibration of the mathematical model was quite difficult for the uncertainties on the old data, but showed some results that improved the knowledge of the physical system and gave some practical answers to the questions posed by the water management agency. From the hydrogeological point of view, there is a division of the basin in two sections, separated by an area of low permeability; the recharge in the upstream (southern) section probably comes partly from the seasonal stream floods and partly from an underground fracture-fault network which drains the crystalline head-section of the basin, whereas in the downstream (northern) section comes from the LDD basin. From the point of view of resource management it appears that the GD basin alone cannot satisfy the future water demand of the city without a further, more dramatic depletion. However, a shift of the production from the wells in the southern section to those located in the northern one or even to the much wider LDD basin could support the growth of the city water demand.