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# Numerical Analysis of Groundwater Flow in Nile Delta Using Water Exchange Model between River and Aquifer

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## Introduction

Many groundwater models applicable for coastal aquifers, but not much attention has been paid to the issues unique to surface water groundwater inter action in deltaic regions.

## Research Objectives

In this study, 2D basin-scaled Groundwater model was modified to simulate the interaction between surface water bodies and aquifer at Nile Delta.

In addition, this research describes the concept of simple method of combining the Advantages of two hydrologic modeling approaches by using output information of the Hydro-BEAM (Hydrological River Basin Environmental Assessment Model) as input for the 2D basin-scaled groundwater model, in order to simulate complex hydrological processes in a mesoscale watershed.

Using such integrated approach, we can easily consider wadi system effects on groundwater system at Nile delta aquifer during long period simulation. The basic assumption is made that groundwater recharge rates provided by Hydro-BEAM are reasonable because the estimation Procedure benefits from the fairly high resolution of meteorological, land use and soil parameters of the surface model.

## Methodology

To develop the numerical analysis, grids of groundwater domain is generated and boundary conditions were presented in figure .1.The model outer boundaries were  The model will be calibrated and adjusted against the historical records of observed groundwater levels in the study area using the records of available observation wells during the period from (2003 to 2006). Aquifer Sensitivity analysis will be conducted on a number of parameters including recharge, hydraulic conductivity, and vertical leakage for the Nile Delta aquifer.

## Numerical Simulation

This study revealed that there was correlation between the recharge and groundwater levels of Nile Delta aquifer. Nile River acts as a drain for the Quaternary aquifer (gaining water from the aquifer) or loses the water, recharging the aquifer at other reaches.

The recharge rate depends mainly on the difference in piezometric head between the aquifer system and surface water bodies, as well as the hydraulic conductance of the base layer sediments of the surface water body. Hydro-BEAM has been used to simulate the flash at Nile river basin flood during the period from 2003-2006. From the primarily calculation the wadies contributes by around 15-20% to the Nile river discharge during the rainfall event.

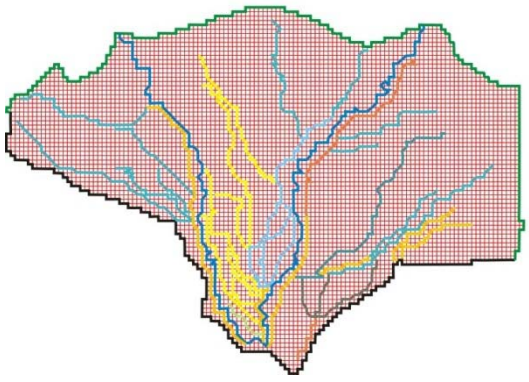

Fig .1 A map showing numerical grids and boundary condition At  Nile Delta