

## **Dynamic and Chemical Evolution of Groundwater System in Quaternary aquifers of Yangtze Estuary Region, China**

BAOPING SONG<sup>1</sup>, ZHONGYUAN CHEN<sup>2</sup>, ZHENG FANG<sup>3</sup>

<sup>1</sup>*Department of Resources & Environment, Shijiazhuang College*

<sup>2</sup>*Department of Geography, East China Normal University*

<sup>3</sup>*Shanghai Institute of Geological Survey*

Groundwater of Yangtze Delta plain flows much slowly due to closed circumstance in natural state. During the last several decades, however, heavy groundwater withdrawals and artificial recharges, especially occurred in Yangtze estuary region, could have disturbed seriously dynamic and chemical pattern of groundwater system. In order to explore the distribution and evolution of groundwater in aspect of hydrodynamics, hydrochemistry and the interface between saltwater and freshwater, a large number of hydrochemical data (coming from 259 groundwater samples in 78 hydrogeological drills during 1958 to 1985 A. D.) and artificial discharge/recharge yields (from 1949 to 2000 A. D.) were collected and analyzed in this study. Methods of hydrogeological, geological and hydrochemical analyses, and model of groundwater flow were applied, and the results are as below:

- 1) 4~7 marine transgressions of Quaternary controlled the basic structure of saltwater distribution. Under this background, chemical evolution occurred after/during aquifer system forming as three main ways: dilution of saltwater, cation exchange and mixing of water with different hydrochemical types. Each evolution ways played different actors due to different geological or hydrochemical setting.
- 2) Variety of human discharge/recharge intensity is the main driving force of water flow changing. It can guides interfaces of saltwater and freshwater to different direction. So the process of groundwater evolution can be divided three stages: groundwater system taking shape and natural evolution (before 1949 A. D.), human immoderate exploiting (from 1949 to 1966 A. D.), and abstemious discharging and artificial recharging (after 1966 A. D.).
- 3) Based on hydrogeological condition of aquifers, hydrodynamic and hydrochemical characteristics, three groundwater systems are recognized: shallow system, mid-deep system and deep system. For different groundwater systems, different measures of exploitation and protection should be selected.

Keywords: Artificial Discharge/Recharge of Groundwater; Groundwater Evolution; Yangtze Estuary.