

STUDY ON THE GROUNDWATER FLOW SYSTEM BY ENVIRONMENTAL TRITIUM IN ICHIHARA REGION, CHIBA PREFECTURE *

By Akihiko KONDOH**

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ABSTRACT

This study was performed in order to elucidate the actual condition of a groundwater cycle both qualitatively and quantitatively in Ichihara region, Chiba Prefecture, Japan.

In this study, tritium (^3H) is used to clarify the three-dimensional flow pattern of groundwater. As the results of tritium analyses of 85 samples, it is made clear that groundwater is recharged at the upland regions and flows to the lowland regions. At the vicinity of drainage divides or the Yoro River, it becomes clear that the vertical components of groundwater flow are important.

Tritium concentrations in streams in the drainage basin dissecting uplands indicate the existence of the local flow systems, and their residence time are estimated to be below 30 years. On the contrary, the residence time of the intermediate flow system whose discharge area is the lowland of the Yoro River is over 30 years.

Although a certain degree of mixing occurs during groundwater movement, it is made clear that the general pattern of tritium concentration distribution in groundwater well reflects the history of the groundwater movement. These results support the availability of the environmental tritium as a tracer, and it is clarified that it can be used to trace the regional groundwater movement.

The tritium analyses reveal the structure of the groundwater flow system, which is much influenced by topography. Then the three-dimensional mathematical model based on the obtained flow pattern is constructed in order to evaluate the dynamic flow through the groundwater basin and its sensitivity against the variation of the recharge.

On the basis of the water balance calculation on the ground surface, the recharge is estimated to be about 600 mm/year. It leads to the total amount of recharge to the basin about 150,000 m³/day as the results of water balance simulation, but about 80% of the total recharged water discharges through the local or intermediate flow systems.

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** Address from April 1, 1985 is the Environmental Research Center, the University of Tsukuba, Ibaraki 305 Japan.

The flow across the section along the coast of Tokyo Bay is estimated to be about 30,000 m³/day. This flow, namely the one in the regional system, is relatively stable according to the sensitivity analysis of the dynamic flow. Flow in the local or intermediate flow systems is influenced by precipitation variation to much greater degree than the flow in the regional system is affected.