Stable Isotopes of Groundwater and Subsurface Temperature Distribution in the Chao Phraya Basin, Thailand

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The Chao Phraya Basin, Thailand, is divided into the upper and lower basin at the Nakhon Sawan Province. The Bangkok Metropolitan, situated in the lower basin, has land subsidence and sea water intrusion due to excessive groundwater pumping. The lower basin extends about 200 km from the north to the south and about 175 km from the west to the east. The basin is bounded on the west by the mountain ranges about 100 km from the Chao Phraya River, on the east by mountainous about 75 km from the river, on the south by the Gulf of Thailand and on the north by series of small hills which divide it from the Upper Central Plain. The upper basin extends about 250 km from the north to the south and about 140 km from the west to the east. The main rivers in the upper basin are Ping, Wang, Yom and Nan which flow from north to south and come into concurrence at Nakon Sawan Province. The mean annual rainfall is 1202 mm and the mean annual evapotranspiration is 887 mm.

We surveyed groundwater flow systems in the upper and lower Chao Phraya Basin from 2003 to 2005, and took water samples for chemical analyses and temperature-depth profiles.

Oxygen and hydrogen stable isotopic compositions of water samples has difference between upper and lower basin. Most of stable isotopic compositions in the upper basin are lower than that of in the lower basin. The isotopic ratio taken from the depth of 150 m is lower than the ones taken from 60 m in the same observation point. Moreover, the isotopic ration taken from the depth of 200 m at the Bangkok City shows the lowest value. Temperature-depth profiles are classified into two types due to their thermal gradient. The thermal gradients in the upper basin is higher than that in the lower basin. However, GWA0041 and GWA0076 in the lower basin have rather low temperatures and the type of their profiles are that of recharge zone. Therefore, these wells are considered to be located in local recharge zones of the lower basin for shallow groundwater flow. The results of Oxygen and hydrogen stable isotopic compositions and subsurface temperature distribution show that regional groundwater flow systems has difference between upper and lower basin.