

Isotopic evaluation of spring water recharge in urban areas: A case study in Kurome and Shakujii river basins, Tokyo, Japan

Akihiko Inamura[1]; Masaya Yasuhara[2]; Takeshi Hayashi[3]; Kenichi Miyakawa[4]

[1] GSJ, AIST; [2] Geol. Surv. J.; [3] FS, U-Tokyo; [4] Natural Environmental Studies, Frontier Sciences, The Univ. of Tokyo

As well as reducing recharge by precipitation, urbanization creates a new important source of water for recharge, that is leaking water mains. Although it has been realized by a water balance method that urban recharge is often as high, or higher, than pre-urbanization rates owing to the downward percolation of leaking mains water, the increases have rarely been quantified in a direct manner. In this study, contribution of leaking mains water to the discharge of springs in the Kurome River basin and Shakujii River basin, both in Tokyo, were evaluated through a comparison among the δD and $\delta^{18}O$ of precipitation, leaking mains water (tap water), and spring water. In the moderately-urbanized Kurome River basin, all the springs represented almost 100% precipitation contribution. This is also the case in the more urbanized upper reaches of the Shakujii River basin, where precipitation alone could account for 90-100% of the discharge of springs. Precipitation was found to play a less important role in spring discharge in the highly-urbanized lower reaches of the Shakujii River basin (impermeable surface ratio: some 80% and more), where some springs contained substantial proportions of leaking mains water of as much as 50-70%. On the other hand, it is worthy of notice here that, even in central Tokyo, the isotopic composition of many spring waters was indicative of predominant contribution of precipitation, which is contrary to the results of the previous studies on the basis of a water balance method.