

## Age dating of spring water and estimation of water storage in mountainous watersheds using chlorofluorocarbons

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It is important to understand the groundwater flow system in quality and quantity for using the groundwater as major water resource sustainably and efficiently. The groundwater residence time and the water storage produce useful information for us. However, in the previous studies, there are few studies on age dating of the groundwater in large area with different geology, and evaluation of the water storage at the same time. In this study, the author performed age dating of the spring water using chlorofluorocarbons (CFCs) and estimation of the water storage, and then compared the groundwater flow system in geology conditions by showing the spatial distribution. The author sampled spring water in Kaikoma-type granite, Hoo-type granodiorite, the Tertiary deposit and the Paleozoic strata in Kamanashi River basin in Yamanashi prefecture, central Japan, in March, April, August, and November, 2011. The author analyzed water ion concentrations, hydrogen and oxygen stable isotope ratios, and CFCs concentrations of all spring water samples, and calculated the water storage volume using the age of the spring water.

The author estimated the residence time of the spring water by using Exponential Model. The age in the granite basin ranges from 11 to 36 years, in the Paleozoic strata ranges from 28 to 31 years, and in the Tertiary deposit ranges from 6 to 22 years.

In the granite basin, the difference of water quality and residence time suggests an existence of two types of the groundwater flow system. One is large contribution from the shallow groundwater flow in the composed granite, and the other is contribution from the preferential groundwater through the joint of decomposed bedrock or fracture zone. The smaller basin with the older age, it seems to contribute to the groundwater recharge flowing in the deep aquifers. On the other hand, in the Tertiary deposit, it is suggested that large-scale and the quick groundwater flow system is dominant due to the heterogeneity of the geological setting.

The water storage is estimated to be from  $10^5$  to  $10^7$  m<sup>3</sup>. It seems to be higher in the granite and lower in the Tertiary deposit. Therefore, the capacity of the water storage is higher in the granite and lower in the Tertiary deposit.

Keywords: groundwater flow system, residence time, chlorofluorocarbons (CFCs), water storage