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富士山南麓地域における地下水年代の検討

Groundwater ages in the southern foot of Mt. Fuji

戸崎 裕貴[1*], 田瀬 則雄[1], 笹 公和[2], 高橋 努[3], 長島 泰夫[2]

Yuki Tosaki[1*], Norio Tase[1], Kimikazu Sasa[2], Tsutomu Takahashi[3], Yasuo Nagashima[2]

[1]筑波大学生命環境科学研究科持続環境学専攻, [2]筑波大学数理物質科学研究科物理学専攻,
[3]筑波大学研究基盤総合センター

[1]Life & Environ. Sci., Univ. Tsukuba, [2]Pure & Appl. Sci., Univ. Tsukuba, [3]Appl. Accel. Div., Univ. Tsukuba

Generally, groundwater is highly vulnerable to excess use and contamination, because of its typically long mean residence time. If groundwater depletion and contamination occur, aquifers will require considerably long time for its recovery and purification. Therefore, the knowledge of groundwater flow system and residence time is crucial for the development and sustainable utilization of groundwater resources.

Having an elevation of 3,776 m, Mt. Fuji is one of the largest Quaternary stratovolcano in Japan. It primarily consists of alternating basaltic lava flows and coarse-grained pyroclastic rocks. It can be structurally divided into three parts (i.e. Komitake, Older Fuji and Younger Fuji volcanoes in ascending order). Underlying basement rocks are mainly Neogene marine sediments.

Mt. Fuji holds large groundwater reservoirs in its body because of a total volume of about $2 * 10^9$ $m^3$of precipitation over a year. Annual precipitation over the Mt. Fuji area ranges from 1500-2000 mm on the northern slope to 2750-3000 mm on the eastern slope. A number of springs distributed over its foot mainly originate from the confined groundwater in permeable part of lava flows which were formed in the early Holocene.

Application of environmental tracers (e.g. CFCs, tritiogenic ^{3}He, $SF_6$and ^{85}Kr) is one of the most promising approaches for dating groundwater. Bomb-produced ^{36}Cl can also provide a potential dating tool covering the last 60 yrs. In our previous study (Tosaki et al., 2008), we applied ^{36}Cl to estimate residence times of spring waters around Mt. Fuji.

This presentation reports an extension of the previous work, and mainly focuses on the results for the groundwater samples from wells on the southern foot. The ^{36}Cl/Cl ratios in the samples were in the range between $3.3 * 10^{-14}$and $79.5 * 10^{-14}$, resulting in ^{36}Cl concentrations of $0.5\text{-}27.7 * 10^6$ atoms/L. This variation can be ascribed to the differences in groundwater age between aquifers, spanning back to the pre-bomb period.

References:
Tosaki, Y., Tase, N., Sasa, K., Takahashi, T. and Nagashima, Y. (2008): Estimation of groundwater residence time using bomb-produced ^{36}Cl: a case study on spring waters from Mt. Fuji, Japan. In: Proceedings of the XXXVI IAH Congress, pp. 999-1005.