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Determination of transit times of recharge water in the unsaturated zone in a volcanic island using stable isotopes

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According to the previous studies, deuterium excess (d-) values of precipitation in NE Asia display a distinct winter-summer seasonal variation and this could be used a good tool in groundwater recharge study. In order to investigate movements of water using d- values through the unsaturated zones of temperature climates in NE Asia, seventeen lysimeters were installed at a test site of a volcanic island, Korea and oxygen and hydrogen isotopic compositions of soil waters were monitored for one year period. For comparison, monthly composite precipitations were also collected during the study period. Oxygen and hydrogen isotopic compositions of soil waters showed a distinct seasonal variation, indicating direct reflection of isotopic composition of precipitation recharged through soil zones. A seasonal change for soil waters of 30 cm depth was much faster than that for soil waters of 60$\sim$80 cm depth. Overall, damping of variation in isotopic compositions was more pronounced with increasing depth. Compared deuterium excess (d-) values of precipitations with those of soil waters, transit time of $\sim$ 2 months was estimated for infiltration of water through the soil layer to depths of 30 cm. For the soil layer of to depths of 60$\sim$80 cm, transit time of 4$\sim$5 months was estimated. The isotopic compositions of soil waters plotted between the local meteoric water line of dry season precipitation and that of rainy season precipitation, indicating that soil waters were recharged from the whole season precipitations in the study area. No or little evaporation effect was observed in the soil waters of the unsaturated zones

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