

Transit times of soil water in thick soil and weathered gneiss layers using deuterium excess modelling

NAOKI KABEYA¹, AKIRA SHIMIZU¹, KOJI TAMAI², SHIN'ICHI IIDA² & TAKANORI SHIMIZU²

1 Kyushu Research Center, Forestry and Forest Products Research Institute, Kumamoto, Japan

kabeya@affrc.go.jp

2 Forestry and Forest Products Research Institute, Tsukuba, Japan

Abstract Four tension-lysimeter plots were installed in a small gneiss watershed (Tsukuba Experimental Watershed), that is covered by a thick brown forest soil layer and a thick weathered gneiss layer. Soil water was extracted at eight depths ranging from 10–400 cm for each tension-lysimeter and the stable isotope ratios of the soil solution were analysed. Detailed observations of the subsurface structure were also conducted. The mean transit time (MTT) of soil water in each depth increment was estimated using the modified sine-wave method, using tension-lysimeter data and variation in the throughfall deuterium excess (d) value variation. The MTT of soil water extracted from a brown forest soil layer increased in direct proportion to sampling depth. However, the MTT of soil water extracted from the heavily weathered gneiss layer exhibited no clear changes as sampling depth increased.

Key words mean transit time of water; soil water; deuterium excess; heavily weathered gneiss