

The aquifer characterization in the headwater regions by using resistivity method

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Many studies have been conducted about the hydrological process in the headwater region using multi hydrometric method. Especially, many researchers have done about the rain fall-run off processes by using hydrological observation. However, it is difficult to estimate the detail aquifer system with only observed hydrological data. So we apply the resistivity method, the one of geophysical exploration techniques, to understand about the aquifer system precisely. In this study, we will estimate the groundwater aquifer storage system in the headwater region using resistivity method.

The study areas are the Mamushi-dani watershed at Shiranui town and the watershed-3 at the Kahoku experimental watershed, Kumamoto prefecture. Geology is mainly consisted of andesite lava in the Mamushi-dani watershed and crystalline schist in the Kahoku experimental watershed. So it could be expected to be different hydrogeologic environment. We have done several times of resistivity survey throughout 3 years in each watershed and the intensive resistivity survey during rainy season in the Kahoku experimental forest. We used the multi-electrode system NEXT-400 manufactured by Kowa Company. Also we have measured the precipitation, the discharge at the foot of watershed, and the groundwater level at the observation wells.

The hydrological observation data shows obvious difference of hydrologic environment. The Mamushi-dani watershed, there is seasonal fluctuation of groundwater level and discharge in watershed and the observed subsurface resistivity shows also clear seasonal change and has good correlations with other hydrometric observation data. So it is estimated that the Mamushi-dani watershed has the seasonal perched groundwater and the groundwater storage in bedrock.

On the other hand, the Kahoku experimental watershed, the groundwater level is approximately constant and the discharge doesn't disappear throughout the observation period. The observed subsurface resistivity is low correspond to the bedrock depth and doesn't change seasonally. The results of intensive resistivity survey during rainy season at the Kahoku experimental forest shows rainfall infiltration clearly and the possibility of the bedrock groundwater flow system during rainfall. So the Kahoku experimental watershed has also the groundwater storage in bedrock, but the saturate zone is shallower depth compared with the Mamushidani-watershed.