

Shallow Subsurface Thermal Structure in the Chikushi Plain, SW Japan

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The Chikushi Plain, NW Japan, is the largest plain in Kyushu and surrounded by hills on three sides, bounded on the south by the Bay of Ariake. The Chikushi Plain is divided into three areas; Shiroishi, Saga, and Chikugogawa area. This study object is to understand shallow subsurface thermal structure in the Chikushi Plain.

We measured groundwater temperatures in the observation wells from surface to bottom at 2m interval. Hydrological survey was carried out to estimate of thermal advection due to groundwater flow. As for hydrological survey, chemical compositions and stable isotope data of groundwater were collected from observation wells, pumping wells, rivers and springs. We carried out 3D groundwater flow and heat transport analyze based on the observation results to estimate shallow subsurface structure and effect of thermal advection due groundwater flow.

Observed thermal gradients in the Shiroishi area is larger than the ones in the Chikugogawa area. Groundwater flow system in the Chikugogawa area is different from Shiroishi and Saga area. Groundwater flow in the Shiroishi and Saga area is recharged in the mountain region and flows to the Bay of Ariake. Groundwater flow system in the Chikugogawa area, on the other hand, has wide recharge area. Their recharge areas are located not only at mountain region, but also at low land. Shallow subsurface thermal structure in the Chikushi Plain is assumed to be affected by differences of groundwater flow systems bounded by Chikugogawa River. 3D groundwater flow and heat transport analyzes were validated with the estimation by observation results.