

Groundwater geochemistry in the Saijo plain, western Japan

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Saijo plain of Saijo City, western Japan, is rich in groundwater of good quality welling up from the underlying artesian aquifer. Many of the citizens of the city are dependent their daily life on the groundwater. However, some problems, such as water pollution, descent of water head during summer, and salination of ground water in coastal areas, have arisen recently. Elucidation of the groundwater flow system inherent to the Saijo plain is needed in developing the countermeasure of the problems. The results of this geochemical and isotopic study has revealed that, 1) groundwater system of the Saijo plain is largely divided into two areas, the eastern part recharged by the Kamogawa River and the western part recharged by the Nakayamagawa River, 2) there probably exist two different aquifers, the shallow aquifer recharged from the adjacent downstream of the Kamogawa River and the deeper aquifer recharged from more upstream of the river, in the eastern area, and 3) salination is advancing in the coastal region of the eastern area, but is not recognized in the western area.

Disconnect of groundwater system between the western and eastern area of the Saijo plain is suggested from the discontinuity in the spatial distribution of the oxygen and hydrogen isotope ratios of groundwater at the immediate east of the Nakayamagawa River mouth (Figure). Oxygen and hydrogen isotope ratios of groundwater in the western and eastern area are correspond to those of river water of the Kamogawa and the Nakayamagawa River, respectively, indicating the aquifer of each area is mainly recharged by each of the rivers. The impermeable boundary dividing the two systems may be the thick muddy strata, which composes the subsurface of immediate eastern area of the Nakayamagawa River mouth.

In the eastern area, the aquifer of the alluvial fan area of the Kamogawa River and that of the fringe zone where many of the artesian wells are distributed (artesian belt) may be different matters. It is suggested from the fact that oxygen and hydrogen isotope ratios and concentration of antimony (Sb) decrease in a discontinuous manner from the fan area to artesian belt across the fringe line. The spatial distribution of Sb concentration also suggests that the recharge zone of the fan aquifer is the Kamogawa downstream lower than the confluence of the Ichinokawa River. Sb is obviously derived from the Ichinokawa River and is not contained in water of the Kamogawa River upper than the confluence of the Ichinokawa River. Therefore, it can be used as local tracer of water. Groundwater in the artesian belt contains considerably high Sb on the contrary that water in the fan area does little. This suggest that groundwater in the fan area has been recharged in the Kamogawa River lower than the confluence of the Ichinokawa River, while that in artesian belt has been recharged in more upstream region and passed through deeper permeable layer than the aquifer in the fan area.

Salination of groundwater in coastal region of the eastern area is indicated by contrastingly high chlorine and sodium concentration compared with groundwater in internal region. Seawater intrusion is suggested. Salination is not recognized in coastal region of the western area.

