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An isotopic study on the origins of water and chloride ion in artesian groundwater of the Kanto plain, central Japan

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There exist three regions in the Kanto plain, central Japan, whose artesian groundwater is characterized by a high Cl^- concentration: 1) central parts of the Kanto plain (Saitama Prefecture), 2) floodplains and deluvial uplands along the lower reaches of Kokai and Tone rivers (Ibaraki and Chiba Prefectures), and 3) south-east parts of Gunma Prefecture). An isotopic study has been under way to make it clear the origins of both water and Cl^- of these Cl^- -rich artesian groundwaters. As for that in the central parts of the Kanto plain, confined groundwater with a high Cl^- concentration of up to 216 mg/l is obtained from the productive bores of 200-430 m depth. The area of Cl^- -rich groundwater, spreading from the northwest to southeast, corresponds with the so-called Motoarakawa tectonic zone (ca. 10 km wide by 35 km long) bounded by the faults on its longer sides. Taking all isotopic data ($\delta\text{-D}$, $\delta\text{-}^{18}\text{O}$, ^{13}C , ^{14}C , ^4He , $^{36}\text{Cl}/\text{Cl}$) obtained so far into account, with regard to the origin of groundwater in the Motoarakawa tectonic zone, a potential source is assumed to be precipitation of low stable isotopic composition in the Last Glacial Maximum when the sea level of the Tokyo Bay was lower than the present by more than 100 m. Admixture of sea water in the period of and/or after the Shimosueyoshi transgression (peak period at around 125,000 yrs. BP) is likely to account for its elevated Cl^- concentration. The Ayasegawa and Kuki faults, and other unknown faults could act as a geologic barrier to the modern regional groundwater flow system, preventing mixing of groundwater between in and out of the tectonic zone. The results from the similar isotopic study now in progress on the other two Cl^- -rich groundwater regions will help an overall understanding of the long-term groundwater system development in the Kanto plain in these 500,000 yrs.

Keywords: Kanto plain, artesian groundwater, chloride ion, $\delta\text{-}^{18}\text{O}$ & $\delta\text{-D}$, ^{14}C , $^{36}\text{Cl}/\text{Cl}$ ratio