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Map of the river materials in the northern part of Shikoku Island, Japan

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In the Kagawa Prefecture of Japan, there is a little precipitation, and therefore, the pollution of river water is a serious issue. The rate at which environmental standards have been met with respect to the levels of biochemical oxygen demand (BOD) is below the national average. The same degree of organic matter concentration that is found in the eutrophic lake is also observed in the river downstream. When attempting to clarify how the river becomes polluted with organic matter, it is important to analyze the organic matter source and its load process. During the analysis, it is necessary to relate the origin of the river water and the water use in the basin.

In the present study, a material map of the river was prepared to construct a basic database. The formation mechanism that affects river water quality can be analyzed qualitatively and quantitatively by overlapping notice obtained from the distribution of various materials. In this speech, the current state of the river quality of Kagawa Prefecture is analyzed and the relationship between the river water quality and the watershed environment is considered from a chemical map of various materials, including the Delta ^{18} O and Delta ^{18} D of the river water.

Our analysis showed a negative correlation between precipitation and the water concentration rate (calculated by comparing Cl $^{-}$ O in the stream to Cl $^{-}$ O in precipitation) in the headwaters (r = -0.726, $a < 0.01$). In addition, it showed a positive correlation between major ion concentration and the water concentration rate (r = 0.797, $a < 0.001$). In the northern part of the Shikoku island, the major ion concentration in the headwaters showed a lower value with 0.47 meq/L in the Kamo river of Ehime Prefecture, where much precipitation exists, compared with ion concentrations in Kagawa Prefecture (average 0.94 meq/L) and Ehime Prefecture (average 0.75 meq/L, except for Kamo river). In the headwaters of the north region on the Shikoku Island, the amount of precipitation influenced the water concentration rate in the headwaters. As a result, it had a major impact on the major ion concentration of the stream water.

Chlorophyll *a* and the pheo-pigment concentrations became high in the middle and downstream. As determined from the multiple regression analysis, in the observation points where the irrigation pond density in the watershed was high, chlorophyll *a* and the pheo-pigment concentrations was high. This fact suggests that organic matter produced in the pond could be a factor in the increase in the amount of the organic matter in the river water.

The Delta ^{18} O of the upstream was low and rose by approximately 3 per-ml in the middle and downstream. On the other hand, the difference of the Delta ^{18} O of the rain in the headwaters and the plains is below 1 per-ml. It is difficult to determine if evaporation might be the cause of the high Delta ^{18} O in the middle and downstream, because the river length in the Kagawa Prefecture is short, only 20 to 50 km, and the river water travels from the upstream region to reach the sea in about a day at the average long-run water flow. In the Kagawa Prefecture, many ponds exist in the river watershed to make use of the water resource efficiently, and the Delta ^{18} O of those ponds were several per mil higher than the Delta ^{18} O of upstream water. In the river basin, upstream water was stored in the irrigation ponds, and the water of the irrigation ponds was distributed to paddy fields via the river. In water use of such repeated, it was considered that the Delta ^{18} O of the middle and downstream became high because the river water included much water through the irrigation pond.

In view of the Delta ^{18} O results and the statistical analysis, it can be interpreted that the inflow of organic matter from the eutrophic pond into the middle and downstream of the river was a factor of the organic pollution of the river in Kagawa Prefecture.

Keywords: Shikoku Island, River water, Water quality, delta^{18} O, Kagawa Prefecture