

# Spatial distribution of riverine water quality in Central Japan and its controlling factors

# Mizuho Hataya[1]; Masumi Zaiki[2]; Takashi Oguchi[2]

[1] Earth and Planetary Sci., Univ. Tokyo; [2] CSIS, Univ. Tokyo

SSC (Suspended Sediment Concentration), BOD and COD have been widely used to evaluate general water quality in rivers. BOD and COD reflect the concentration of organic matter in river water, while SSC reflects the total concentration of both organic and inorganic matter. These parameters strongly reflect the amounts and types of suspended sediment. Suspended sediment is supplied from various sources such as hillslope erosion, riverbank erosion, runoff from agricultural land and urban surfaces, sewage/industrial effluent, and construction activity.

To investigate the effects of these human and natural factors on river water quality, this paper investigates SSC, BOD and COD data in the eight large catchments in central Japan, along with catchment properties including topography, land use and population density. The study area includes both rural mountainous areas and highly populated lowlands, enabling investigation on both human and natural factors. A Geographical Information System (GIS) was used to display and analyze the large data. Attention is paid to the spatial distribution of water quality, relationships between water quality and catchment variables, correlations among SSC, BOD and COD, and relationships between river discharge and water quality. The water quality data encompass the period between 1978 and 1998. 460 sites with more than 150 measurements during the period were selected for analysis. The number of discharge gauging stations is 57. The mode and the highest 2.5% value of SSC, BOD and COD were used to represent both regular and polluted conditions.

Analyses of these values along with river discharge show that discharge tends to increase during the polluted condition. Thus, the polluted condition can be correlated with flood periods due to heavy rainfall. For the regular condition, SSC, BOD and COD tend to have high values in populated areas. BOD and COD show particularly high correlations with the settlement ratio and population density, indicating abundant supply of organic matter from human-related sources. For the polluted condition, the correlation between human factors and SSC is indistinct. The supply of inorganic matter due to natural erosion in the upper reaches during heavy rainfall has probably obscured the correlation between human-related factors and SSC. However, BOD and COD have strong correlations with human-related factors even under the polluted condition, reflecting the high availability of organic matter in lowland rivers. COD under polluted conditions also tends to increase in mountainous rivers, reflecting the supply of humus from hillslopes and peatlands. The availability of human-produced organic matter that tends to increase BOD is very low in mountain rivers, and thus BOD shows the strongest correlation with the human-related factors.