

Comparison of spatial distributions of riverine suspended sediment concentration under high- and low-flow conditions

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Riverine suspended sediment concentration (SSC) is a fundamental indicator of fluvial sediment transport and water quality. Previous studies have often related mean SSC values to environmental factors. However, fluvial processes can be represented by both low/base flow and sporadic high flow, and the highly dynamic nature of suspended sediment transport means that SSC may differ significantly under these two conditions. Therefore, the effectiveness of mean values for analyzing SSC seems to be limited. This paper uses the mode and the highest 2.5% values of SSC for each site to represent both low and high flow conditions. The study area in central Japan includes eight major river basins (Ara, Agano, Fuji, Naka, Shinano, Tama, Tenryu and Tone), and SSC data at 460 sites measured between 1978 and 1998 was examined. Statistical analyses show that river discharge when the highest 2.5% SSC was recorded is significantly larger than discharge when the modal SSC was recorded. Therefore, the two SSC parameters, the highest 2.5% and the modal SSC, correspond to high flow and low/base flow, respectively. The two types of SSC values were mapped using GIS. The resultant maps show that the modal SSC tends to be large in populated lowlands but small in mountainous areas. In contrast, the highest SSC does not show a clear difference between upstream and downstream areas. This observation is confirmed by correlation analyses between SSC and the properties of source areas such as land use, topography and population density. In the study area, most suspended sediment observed during low flow is supplied from human activities such as sewage and industrial effluent and farming. In contrast, during high flow, natural erosion in mountainous areas also contributes to increases in SSC, leading to the poor differentiation in SSC between upstream and downstream areas.