

Sand grain producing and transport processes in downstream reaches of the dams-constructed Tenryu River, central Japan

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Introduction

Dams hold not only water resources but also detritus produced in upstream reaches, and have been considered the cause of social problems (significant decrease in sediment supply, coastal erosion and so on). Several artificially-sediment transport countermeasures as dredging has already been carried out, however, these countermeasures are generally based on the assumption that detritus grains have experienced only "transport and deposition" processes. We focused on changes in roundness of gravels and sands, which the latter could be results of "crushing and abrasion of gravels", and attempted to reveal the influences of dam reservoir on "sand grain producing and transport" processes in downstream reaches.

Study area

There are fifteen dams in the watershed of Tenryu River had the largest amount of sediment discharge among all Japanese rivers (Ashida,2008), and the Sakuma dam which is the largest one, has completely prevented gravel/sand grains from transportation. In downstream reaches lower than this dam, the Misakubo River joins between the Sakuma and Akiha dams and the Keta River joins between the Akiha and the Funagira dams. These are often considered as the tributaries having the largest sediment supply to downstream reaches.

Methods

Sediment samples were obtained from downstream side of the Funagira dam, nearest the river mouth (downstream site), and from two tributaries (upstream sites). We investigated the sediments based on both field survey and on measurements with a digital microscope and a particle image analyzer. Roundness of shale grains were measured following "Krumbein chart" with ca. 200 grains in each phi scale from 128 to 0.5 mm in diameter (cobble to coarse-grained sand).

Results and discussion

The roundness of shale grains in the downstream site tends to be more angular than in the upstream site. Considering the sand grain producing process, it implies that sediments, in particular, very-coarse sand (2 to 1 mm in diameter) and coarser fractions, have not been transported across the Funagira dam, and at downstream reaches, sand grains are newly produced from shale gravels deposited before dams construction. While, on the coarse-grained sand fraction (1 to 0.5 mm in diameter) of the downstream site, rounded and sub-angular grains are coexisting. It implies that the transport across the Funagira dam may occur on and smaller than coarse-grained sand fraction.

References

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