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Causes of gravel-sand distribution in upstream part of the river revealed from changes in lithology and form of detritus

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Downstream fining of fluvial clastic sediments has been generally attributed to two processes, ”hydraulic sorting” and ”sand grains production”, the former is that finer grains are transported farther than coarser grains, while the latter implies crushing and abrasion of gravels. In this study, we investigated that how the two processes operate on this tendency along the tributary of Watarase River, the major branch of the Tone River on the basis of field survey and measurement of finer grains (4 to 0.5 mm in diameter). Lithological composition of each grain size fraction from cobble to coarse-grained sand (128-0.5 mm in diameter) with 1 ϕ (phi scale) intervals and roundness were obtained with digital microscope.

Changes in lithological composition of cobble – pebble, granule and very coarse sand fractions are not explained only with ”hydraulic sorting” of clastic grains. It implies that crushing and abrasion of gravel – very coarse sand fractions and consequent ”sand grains production” occur at the studied area.

Whereas, coarse sand fraction (1-0.5 mm) shows remarkable features that (i) change in lithological composition along the tributary was not recognized and (ii) grains become rounded in downstream direction. These facts suggest that abrasion of the grains occur dominantly than crushing in coarse sand fraction and ”sand grain production” may not be efficient to grains smaller than coarse sand. Therefore, it will be important to research the distribution of coarse sand and finer grains in bed material along the river in order to reveal the transition from ”producing process” to ”sorting process”, erosion – transport processes of clastic sediments and a development of sedimentological geomorphology along the river.

References

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