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Development of numerical simulation method of topographic change considering grain-size distribution of fluvial gravels

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Topographic development, such as crustal movement (uplift/subsidence) and erosion/ sedimentation, cause changes of geological environment, including changes of flow characteristic (hydraulic gradient and permeability) and water quality of subsurface water. Therefore, it is an important task to evaluate the effect of topographic development for geological disposal system of HLW.
In this study, we developed the algorithm which simulates fluvial sediment transportation based on grain-size distribution in actual fluvial gravels, to improve the sediment transportation efficiency in existing simulation method of topographic change (Nogami, 2005; Sanga and Yasue, 2008). Then we examined the validity of this algorithm with two examples, simplified topography and Toki (Shonai) River basin (south-eastern region of Gifu Prefecture). First, it was confirmed that simplified simulation of the hypothetical topography showed concave shape of a riverbed as seen in nature, which is controlled mainly by the parameter of fluvial transport distance. Then, on the scale of climate fluctuation of Quaternary, simulated topography was compared with actual data. Parameters of algorithm were set based on field data, such as grain-size distribution of fluvial gravels, which was acquired at Toki River. After the simulation during 125,000 years with DEM data of Toki River basin, it was confirmed that the simulated results, such as the relative height of fluvial terraces (topography formed by climate fluctuation), and the average erosion rate, were at the same level as actual data of Toki River basin.
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Keywords: topographic change, simulation, fluvial topography, fluvial sediment transportation, grain-size distribution