Topographic changes of Kinugawa Lowland caused by the flood in September, 2015, Joso City, Ibaraki Prefecture

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The banks of the Kinu River were damaged by the 2015 heavy rain, with seven overtopping points and one bank breachment point. In this study, we researched the relationship of topographic changes and flood deposits around the bank breachment point in Misaka town, Joso city, Ibaraki prefecture. Also, we researched the sediment at an overtopping point in Wakamiyado, 4 km upstream of the Misaka town to make a comparison.
The Kinu River is one of the major rivers in the Kanto Plain and is a tributary of Tone River now, but originally was an independent river flowing to the Pacific Ocean. Research areas are located in the lower part of the present the Kinu River. In this region the Kinu River flows in the western edge of an alluvial lowland, which is 4 - 5 km wide in east and west, limited by Pleistocene terraces and is elongated in north and south direction. Misaka town is located on natural levees of the Kinu River, and river bank dunes are developed at Wakamiyado.
After the flood occurred, surveying of the crevasse topography was conducted using a total station and GNSS with VRS corrections to draw cross sections. 5 m mesh DEM (served by GSI) was used to draw ones of original topography, too. In laboratory, grain size distributions were measured with SHIMADZU, SALD-3000S, a laser diffraction particle size analyzer. Particle size analysis was carried out in both location, but surveying was conducted only in Misaka town.
In bank breachment area, pool rags with more than 2 m depth were formed in the center path of the flood. Over 150 m along the downstream path of the flood erosive process was prior, and the elevation was lowered by 30 –40 cm, although flood sediment was deposited by 5 –30 cm in thickness. The deposit was generally divided into two parts. The lower part consisted of upward coarsening muddy fine to very fine sand, and the upper part well sorted medium sand.
The figure shows the relationship between topographic changes and grain sizes of flood deposits in side path. Erosive interval was limited close to the collapsed bank, and topographic changes was small downstream of its path. The surface sediment in this interval was muddy sand, while subsurface sediment was finer, probably containing some field soil. A lobe-shaped depositional landform which had a sharp edge with 30 –40 cm height was formed halfway in the path. The thickness of the lobe sand was over 60 cm, and it had parallel or cross lamination. A muddy sand bed existed between the lobe sand and the original field soil.
General succession of flood deposits, lower muddy fine sand and upper well sorted medium sand, may reflect transportation order of flood deposits, namely, bank body or original ground of pool rags, or suspension materials in flood water may be the sources of the early fine particles, and that of later medium sand may be river bed sand.
At the overtopping point of Wakamiyado, we gathered surface and subsurface (20 cm) flood deposits and measured their particle size with SALD-3000S. In both depths the median particle size was ca. 500 –800 μm, and they were well sorted. The median size of sand at a sand bar in the river channel there was ca. 700 μm, so this sand may be transported outside the channel. However, it is possible that sand of river bank dunes was redeposited by the flood.
There was a difference in the amount of fine particles between the two regions. It probably is due to occurrence of bank collapse or forming of pool rags, although investigation of Wakamiyado may be

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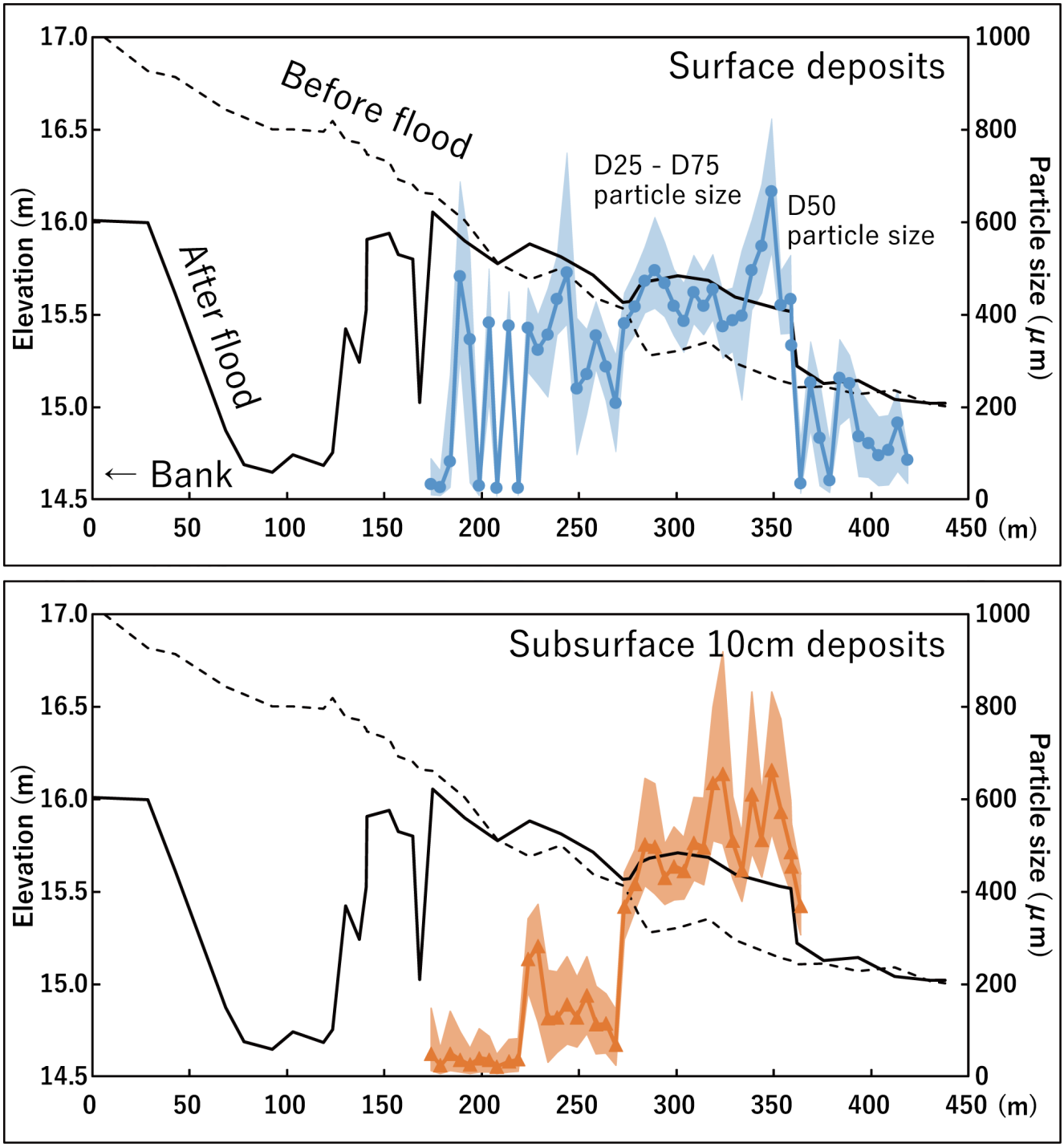
insufficient.
It is rare to be able to research original topography formed by the flood. Moreover, this study can help consideration on developing processes of floodplain because formation of crevasse splays and crevasse channels may trigger channel avulsion and formation of natural levee. In other words, this flood event might be an elementary process of floodplain development.

Keywords: the 2015 heavy rain, Crevasse splay, Inundation by river water



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