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Channel response to an intense storm event in Tottabetsu River in eastern Hokkaido, Japan

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This study introduces channel change in Tottabetsu River (catchment area: 269.6 km2; channel length: 48 km) in eastern Hokkaido, Japan, caused by an intense storm in August 2016 (450 mm/day at max, RI = 130-180 years), by analyzing pre- and post- event LiDAR data. The upper half of the river runs through in the mountain, along which three tributary catchments underlain by granite supplied a large amount of sediment to the river to induce major sediment deposition at the outlets. High transport capacity of the reaches, represented by stream power every 500 m in this study, then encouraged channel erosion and sediment to travel into the lower half of the river on the floodplain. While a series of groundsills installed in the upstream part of the floodplain section trapped some of sediment, the flow path laterally shifted by avoiding deposited sediment, subsequently promoting bank erosion to yield sediment travelling further downstream. In the downstream underlain by unconsolidated quaternary bedrock, sediment deposition was promoted in reaches where stream power gradient was negative, as suggested by Gartner et al. (2015). However, similarly to the upstream, sediment deposition was accompanied with bank erosion, together with channel incision into soft bedrock. In total, sediment erosion was dominant in Tottabetsu River in the event, indicating that sufficient stream power was given through the course to keep eroding channel beds. Sediment yielded by erosion was in turn deposited in the downstream during the flood. Stream power gradient every 500 m was compatible with local change in sediment deposition along the course, without hydraulic structure and major sediment input from tributaries. In addition, stream power gradient over 10 km also agreed with change in the amount of sediment deposition as well as erosion on the spatial scale. At the scale, the effect of hydraulic structure and sediment input from tributaries can be negated.