



Total sediment yield of the Lena River, Eastern Siberia

Lena River is one of the largest on the globe. Its length is 4400 km (world 10th), basin area is 2490000 km² (world 8th), mean discharge is 17000 m³/s (world 8-9th), maximum discharge is 178000 m³/s (world 2nd). The area of alluvial delta of the Lena River in the Laptev Sea is about 20000 km² (world 5-9th), despite a very young age (about 4000 - 6000 years) of this sedimentary body. That shows a very high rate of sediment yield from the river mouth during the second part of the Holocene.

Suspended sediment yield is measured by Russian Hydrometrical Survey beginning 1967 at Kusr station (basin area is 2430000 km², or 97.6% of the whole). With the help of sediment concentration / discharge relationship the sequence of mean annual suspended sediment yield was calculated for the whole period of hydrometrical observation in Kusr from 1935. The calculated mean annual yield is 19 10⁶ t, with the maximum 43 10⁶ t in 1961 and minimum 5 10⁶ t in 1952. For such river the suspended sediment yield to the ocean is very low, and can not explain the formation of a large river delta.

Bed load transport is very intensive at the Lena River. Bottom alluvial sediments at the lower reaches consist mainly of fine sand. It is transported in form of hierarchical system of alluvial features: ripples, dunes, bars and islands. Special measurements of ripple dynamics on the Lena River near Yakutsk (1700 km from the river mouth) showed bed load specific discharge 20-25 t/m per day. Original method to calculate sediment transport was worked out. Morphology and dynamics of the whole system of alluvial forms in the river is used for bed load calculations with this method. Calculated mean annual bottom sediment yield is about 20 10⁶ t.

Total sediment yield at the lower reaches of the Lena River is about 40 10⁶ t per annum, and 50% of this quantity is bed load. Relatively high transport of sandy sediment explains complicated alluvial relief of the Lena River channel and high rate of the river delta formation.