The sources of sediment and chemical matters in the glacial Tanana River, Alaska

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The drainage basin of the Yukon River, Alaska, consists of discontinuous permafrost regions and glacial mountain regions. The water discharge from the Yukon River flows into the Bering Sea and organic matters with suspended sediment in the discharge could affect marine primary production. The discharge from glacial regions contains much suspended sediment produced by glacial erosion. Thus, global warming can cause a great suspended sediment load change.

Temporal variations of suspended sediment concentration (SSC), loss on ignition, particulate organic carbon (POC) and particulate organic nitrogen (PON) in river water were obtained by frequent water sampling at the Tanana River (TNN), the Phelan Creek (PC), the Salcha River and the Chena River (S&C), tributaries of the Yukon River, in 2007 from June to September. The Tanana River, occupied by 5.6% glacier region, is the mainstream of the Phelan creek, the Salcha River and the Chena River. The Phelan Creek is a glacial river and the Salcha River and the Chena River are 'permafrost rivers'. Hourly discharge data sets were supplied from US Geological Survey and used to calculate yields of suspended sediment in glacier and permafrost regions.

The calculated suspended sediment yields were $4.2*10^4$ kg/day km^2 in the glacial PC basin, and 30 kg/day km^2 in the non-glacial S&C basins. In the TNN basin, the suspended sediment yield was $2.2*10^3$ kg/day km^2. The suspended sediment yield in the glacial region was of 10^3 order higher than in the permafrost regions. Hence, most of suspended sediments at TNN were yielded in the glacier regions, which occupy only 5.6% of the TNN basin. Mean ignition losses of suspended sediment were 2.7% at glacial PC, ca. 17% at permafrost S&C and ca. 5% at TNN. Averaged rates of POC and PON content were 0.45% and 0.02% at PC, ca. 4% and 0.3% at S&C and 0.84% and 0.04% at TNN, respectively. C-N ratios were 19.1 at PC, 11.8 at S&C and 19.4 at TNN. The above values at TNN, being similar to those at PC, shows that the glacier regions are the main sediment source. The rates of POC and PON content at PC are of 10 order lower than at S&C, but the suspended sediment yield at PC is much higher. Thus, the glacier regions are important as POC and PON sources.