



The influence of volcanic activity on suspended sediment yield of rivers (Kamchatka, Russia)

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Kamchatka is specific region of suspended sediment yield formation. This fact is particularly connected with active volcanism in the territory.

The influence of volcanism on suspended sediment yield characteristics was studied in various time scales – into-diurnal, seasonal and long-term ones. The study of spatial variability of these characteristics reveals the maximum values characterize river basins in zones of strong impact of volcanic eruptions, especially, rivers draining slopes and flanks of active volcanoes.

Into-diurnal fluctuations were studied for rivers in volcanic areas. They are characterized by synchronous changes of water flow and turbidity. It's determined by weak erosion-preventive capacity of friable volcanic deposits and big slopes of channels (2.5 – 6.0 %). The maximum of water flow and turbidity is observed at the period between 12 and 6 pm. The air temperature reaches its maximum by that time, and consequently, the intensity of snow melting is also maximum one. The maximum of turbidity advances diurnal maximum of water flow a little, and it's connected with the features of flood wave moving and consecutive maximums of slopes, turbidity, velocity, water flow, and capacity of stream during flush. Into-diurnal fluctuations are determined by complicated and little-studied processes of mass transfer between stream and channel deposits. These processes are connected with into-diurnal changes of stream capacity and water transfer between channel and underflow. As the result water regime is pulsating.

Rivers under the influence of volcanic eruptions transport the main amount of sediments during floods which usually occur in summer-autumn period (in the absence of extreme floods in winter-spring period during volcanic eruptions). Combination of maximum snow supply, significant precipitation in warm part of the year and weak erosion-preventive capacity of friable volcanic deposits on volcanoes slopes is the reason of the most intense erosion in this period. Water turbidity reaches values of 1 – 6 kg/m³ for rivers with basin area of about 1000 km² and 600 kg/m³ for rivers with basin area of about 100 km².

The maximum turbidity is observed in the eastern coast of Kamchatka, where the most active volcanoes are situated. Content of suspended particles decreases with the increase of distance from river basin to the active volcanoes. Zone of maximum turbidity in Kamchatka coincides with the Kliuchevskoy volcano group location, because there is no vegetation on active volcanoes, soils erodibility and rain-fall indexes are characterized by maximum values in this territory.

Long-term regime of suspended sediment yield of rivers under influence of volcanism depends on volcanic eruptions. The maximum sediment yield in the Kamchatka River and in the Tolbachick River was formed after the most significant volcanic eruptions in 1956 (Bezmyanny volcano), 1964 (Shiveluch volcano) and 1975 – 1976 (Tolbachick volcano).

On the basis of Wischmeier&Smith conception (Wischmeier, Smith, 1978) potential washout of suspended sediments and its transformation into suspended sediment yield were estimated for Kamchatka. The minimum transformation occurs in volcanic areas.