

## Physical model of the erosion of the river bed

The intensity of mechanical erosion of a solid riverbed depends on the type, the amount and the duration of the sediment transport. Depending on the velocity and sediment grain size, the paper differentiates between the suspended load and the bed load. The greatest erosion is caused by the bed load. It is also accepted that erosion is directly dependent on the strength of the rocks that constitute the riverbed. The connection between erosion and flow velocity is regularly nonlinear. Until critical flow velocities are reached, there is virtually no motion of sediment at the bottom of the river bed (at minimum speed) and at the point when the majority of the sediment becomes the suspended phase (at top speed). At speeds higher and lower than the minimal and top speed, erosion is minimal.

In this paper erosion is studied by means of a specific experiment - the water rotating in a fixed cylinder. At the bottom of the cylinder there is a cap of eroding material. A certain amount of eroding sediment is poured into the system. By varying the speed of rotation, various flow rates are simulated and the amount of material eroded in one hour time unit is determined as a function of speed. The velocity of water in the cylinder corresponds to the actual speeds. The duration of the erosion from one hour to five hours is determined on the basis of the previously conducted hydrological analyses, which define the duration of water waves whose speeds are significant for erosion.

In this paper erosion is observed as lost mass per time unit (g/h), depending on the flow velocity, and therefore dependent on the type of the sediment, suspended or bed load. The objective of this paper is to explain the mechanism of erosion by changing just one, significant parameter in the entire process – the velocity of the sediment-filled water flow. Experiments were carried out on a limestone disk exempted from the bed of a representative stream. Also, a cross-section of the selected stream bed is typical for the region in which the stream is located by its geomorphological composition. That particular area is generally subject to erosion. A significant dispersion of the results around the mean values of the velocity can be explained by the fact that the material studied is taken from nature which, in itself, is not homogeneous. Precisely because of that, a large number of

different water waves are analyzed in order to obtain a more realistic mean value of the erosion, and the boundaries within which the results of the experiment are located.