



Dynamic impact on open check dams: effect of the opening and of the debris flow breaker

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Open check dams are check dams characterized by an opening usually situated in their central part. There are many types of open check dams, which differ in the cover of the opening: beam dams, slit dams, sectional dams, lattice dams, net dams (Wehrmann, 2006).

Literature often attributes to these structures the purpose of retention of part of the sediments (coarser fraction), with the idea that the fine material passes through the opening. In this way the effect of deposition of the material caused by the slowing of the flow induced by the restriction of the section is substantially ignored. This effect is, on the contrary, very important in particular in the slit check dams (Armanini and Larcher, 2001).

The slit check dams, in fact, are characterized by one or more vertical opening, which start from the basis of the dam up to the weir. The functioning of this type of opening is based on the backwater effect that allows the deposition of part of the sediments upstream of the dam (i.e. hydrodynamic sorting).

We focused our study on the dynamic impact of a debris flow surge against a slit check dam, investigating different ratio between the channel width and the opening width. We performed several experiments on a laboratory channel, with a slit dam at its end, equipped with load cells. The impact force has been then compared to that predicted by the momentum balance: the experimental data revealed that the coefficient which account for the presence of the opening in the momentum balance is not simply proportional to the ratio between the width of the opening and the channel width. A correction coefficient must be introduced, which accounts for the further reduction of the impact force, due to the deviation of the streamlines in proximity of the opening, and depending again on the ratio between the channel and the opening width.

Furthermore, the impact force on the dam has been compared between the case of a single opening and the case in which the opening has the same width but there is debris breaker in the middle. The results indicate that the impact force on the dam increases, so that regarding this aspect, the debris flow breaker do not make any advantage.