

Interactive comment on “Controls on the rates and products of particle attrition by bed-load collisions” by Kimberly Litwin Miller and Douglas Jerolmack

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The authors present a very interesting contribution on pebble attrition. Based on a large number of pebble impact experiments, the authors conclude that size reduction rate is proportional to energy and occurs mainly during elastic impacts rather than by damage, with the production of a fairly fine material whose grain size is distributed as a heavy-tailed power law. This paper is very well written and illustrated and the conclusions are supported by robust statistics over a large number of samples. In particular, Figure 7b illustrates the main conclusion. I have only minor remarks.

The first concerns the relationship between the experimental set-up and the transport

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of pebbles in a river. From what I understand (but I may be wrong) the shock is frontal in the experiments even if there is a certain degree of freedom in the pendulum movement. In rivers the pebbles can roll and rotate, with a tangential component in the shock. So I wonder if this difference may affect the transposition of the experimental results to natural rivers.

Looking at the pictures in thin sections, it seems that a damage zone forms well with a width that seems to be greater than the (potentially future) "grains" delimited by the fractures. This suggests that the formation of this band still partly controls the detachment of grains, and thus that damage plays a role. I recognize the hypothesis test on the basis of the Ab (brittle) and As (damage) parameters in Figure 7b, but I have difficulty in linking a purely brittle behaviour to this band which could be related to damage, although the authors recognize that more work is needed to verify that this band corresponds to a Hertzian fracture band.

Line 58 should be (e.g., Shipway and Hutchings, 1993).

Line 92. If deformation is "purely elastic" it would be reversible and thus without perennial cracks or fractures.

Line 355-358 A little more explanation of this difference here might help to better understand.

Line 408 See also Jones and Humphrey, 1997.

Best wishes, Sebastien Carretier

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