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Interactive comment on "Armor breakup and reformation in a degradational laboratory experiment: detailed measurements of spatial and temporal changes of the bed surface texture" *by* C. Orru et al.

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The experimental set-up was chosen following an earlier laboratory experiment on armor formation over a bed with an initial streamwise fining pattern. The main objective of that study was to test a new image analysis technique for detailed measurements of the bed surface texture during flow in a sand-gravel laboratory experiment. The study considers a laboratory experiment that is different from (but similar to) the one we de-

scribe in the current manuscript as in that study the sediment mixture was bimodal and the gravel fraction was much coarser and fully immobile (partial mobility). That study is described in a manuscript that is currently under review with Water Resources Research. We observed how a reach that was characterized by an initially gradual fining pattern under a limited sediment supply rate developed into a more abrupt spatial transition in grain size and slope. Partial transport conditions prevented the adjustment of the bed and the approach to normal flow conditions (i.e., a backwater was present in the equilibrium state).

We are aware that the results of the laboratory experiment suggest a similarity with a gravel-sand transition. Yet, we are hesitant to claim a similarity between the mechanisms in our experiment and a gravel-sand transition in the field since in the experiment we excluded many aspects that have been recognized to be relevant to the development of a gravel-sand transition, such as the progradation of a gravel wedge (Paola et al., 1992; Seal et al., 1997), basin subsidence (Paola, 1988; Parker and Cui, 1998), base level change (Pickup and Warner, 1984; Sambrook Smith and Ferguson, 1995), abrasion (Yatsu, 1955; Parker and Cui, 1998), and suspended load transport (Venditti and Church, 2014; Venditti et al., 2015). We have included this argumentation in the WRR manuscript and we will include it shortly in the revised version of the current manuscript.

The current manuscript shows similar results to the WRR manuscript with respect to only the initial phase of our experiment, i.e., the formation of the armor, which is described in Section 2.3 of the current manuscript. Yet in the current study our focus is on studying the mechanisms of armor breakup and its consequences, which have not been treated in the WRR manuscript. We apologize for the fact that we have provided insufficient information on the image analysis technique, as well as on the hydraulic conditions. In the above WRR manuscript we describe these points in close detail, and we did not want to repeat that part in this paper. The WRR manuscript specifically aims at describing the image analysis technique and its results and so addresses the

issues raised by the current reviewer related to the image analysis technique. The WRR manuscript also focusses on the hydraulic conditions of a different (yet similar) laboratory experiment, and on reproducing that laboratory experiment with a numerical model. We did not realize that the limited information in the current manuscript on the image analysis technique and the hydraulic conditions have made the current manuscript on armor breakup insufficiently stand-alone. We propose that we revise the current manuscript such that it becomes stand-alone and we will provide the reviewers with access to the WRR manuscript.

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