

***Interactive comment on “Landscape scale remediation reduces concentrations of suspended sediment and associated nutrients in alluvial gullies of a Great Barrier Reef catchment: evidence from a novel intensive monitoring approach” by Nicholas J. C. Doriean et al.***

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Overall, I considered this paper to be a suitable study for HESS and a useful contribution to our knowledge of alluvial gully remediation strategies. In my opinion this is suitable for publication with minor/moderate revisions.

What was the cost of remediation? I think for a global audience this is important.

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Placement of devices in the gully catchments: catchment 3 PASS is not on a drainage line but catchment 1 and 2 are (assuming blue lines in Figure 1 are drainage lines found using some routing method?). This seems to have an impact on measured sediment concentrations (for catchment 3 the upper SSC is 3556 while catchment 1 and 2 are 563 and 1517, respectively). Given the focus of the paper is on measurement methods I think a little more discussion about the placement of sensors would be good. I think some more discussion of this is important because it seems to have important implications for your conclusions. Taking the lower end estimate of TWA SSC from the control gully gives 4453 and the upper estimate from the hillslope in catchment 3 is 3556 which is ~80% of what is seen in the control gully. Without a larger sample it's hard to know whether this is representative or not but for me it suggests the possibility that hillslope erosion, in this environment, is a considerable source of fine sediment (potentially almost equal to gully erosion?). Given that, I think it warrants a little more discussion around possible ways to address the influence of sensor locations with respect to process interpretation.

Also, how do the catchment areas compare? The total catchment area of the remediated gully is ~13ha but what is the catchment area above each PASS sensor in the sub-catchments and how does this play into the results? And the catchment area for each sub-catchment of the remediated gully.

What other studies have looked at results of similar remediation works on gullies (if any) and what are some of the possible post-remediation issues either currently observable or expected? In other cases (e.g. China, Africa) there is often a focus on gully remediation for land reclamation/conservation purposes more so than sediment runoff reduction. In that case I think there will be more interested in long-term stability of the measures, especially if the cost is high.

If possible, I think a before remediation and after remediation DEM image (or DEM of difference maybe) would be a useful addition.

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Figure 7 and 8 seem to suggest that the fine fraction is coming from the catchments more so than the gullies? But there isn't much discussion about this? Maybe I'm interpreting the results wrong but if this is the case, I think it's one of the more interesting findings for discussion.

In your abstract and conclusions you present a value of 80% as the sediment reduction achieved but it's not clear how this number is calculated? Is it the  $(SSC \text{ control} - SSC \text{ remediated}) / (SSC \text{ control})$ ? Or some other number?

52: "There are various types of gullies present in the GBR catchment region (e.g., hillslope, colluvial, ephemeral, and soft-rock badlands), however, alluvial gullies likely represent the largest source of sediment, accelerated by land use change, to the GBR."  
- Reference?

90: "The study site topography is relatively flat." - Would be good to know average slope?

101: "Erosion rates derived from repeated airborne LiDAR between 2009 and 2015 (before remediation activity), indicate the control gully produced slightly more sediment ( $61 \text{ t}^{-1} \text{ ha}^{-1} \text{ yr}^{-1}$ ) compared to the remediated gully ( $50 \text{ t}^{-1} \text{ ha}^{-1} \text{ yr}^{-1}$ ), based on gully catchment area." - Per unit area of gully or catchment?

102 – 103:  $\text{t}^{-1} \text{ ha}^{-1} \text{ yr}^{-1} \gg \text{t} \cdot \text{ha}^{-1} \cdot \text{yr}^{-1}$  mass shouldn't be a reciprocal here.

103: "Note, LiDAR does not account for the surface erosion generated from the catchment area of each gully, which would be expected to be comparable on an area normalised basis. Hence, the difference in specific yields between the treatment and control would be less than indicated by the LiDAR data alone (Brooks et al., 2016)." - I find this statement a little confusing. I think you either need to be clearer about what this means or not include it.

169: "time weighted average (TWA) SSC" – I can take a guess at what this is but it would be nice to have an equation.

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