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Comment

## ***Interactive comment on “Relationships between substrate, surface characteristics, and vegetation in an initial ecosystem” by P. Biber et al.***

### **Anonymous Referee #2**

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**General comments** This is an interesting and thorough study of plant-environment interactions in the early stages of primary succession. As the authors mention, high resolution, spatiotemporal studies of initial ecosystem development are rare. Studies based on direct observations are vital to complement chronosequence studies, and, as a consequence, the findings of this paper have great value. Interactions between vegetation and geomorphological processes are frequently alluded to in research articles, but rarely have they been studied in such detail. The research methodology is sound and the combination of techniques used (particularly the laser scanning) is innovative. The results are not revolutionary (e.g. it is well established that vegetation growth stabilises slopes) but the careful integration of a wide range of factors make this important research.

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I think the hypotheses, whilst generally sound, could have been framed more precisely (see Specific Comments, below). Clarifying the goals of the research, perhaps by including predicted responses, might have been useful. The formulation of models is commendable, but I felt that this data could have been deployed more effectively. Specifically, I felt the selection of response variables should have been accompanied by an a priori ecological justification (this could have been done in the Introduction, for example). The response variables studied seem to have been selected by EDA, rather than a careful consideration of ecologically meaningful criteria. The proliferation of response variables, and the complexity of the resulting models (e.g. equation 17), sometimes obscures the underlying ecological processes and makes the Methods and Results sections hard work to read. The inclusion of some basic summary statistics (e.g. showing the relationships between key variables) would have helped. The situation is redeemed somewhat by a clear, well-argued Discussion.

#### Specific comments

P4735, line 4: I do not believe degraded ecosystems are inherently unstable, as a disturbed ecosystem can be simple but stable. However, land surfaces in these areas are likely to be unstable.

P4736, line 2: The authors include pedogenesis, but they only measured soil properties once, so cannot really talk about the development of the soils.

P4736, lines 6-7: I think a precise definition of what the authors mean by “surface structure and properties of the terrain” would have been useful (e.g. mentioning the importance of rills). The authors seem to use ‘surface structure’ to mean small-scale features and ‘geomorphology’ to mean large scale topographic variation. I would argue that the term ‘geomorphology’ encompasses all surface features, regardless of scale.

P4736, line 9-10: A deterministic response to the environment seems reasonable, but I wonder if spatial differentiation/segregation is necessarily expected on young terrain? Pioneer species are, by necessity, very tolerant of stressful conditions, and spatially

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random distributions (a null model) might be more realistic on relatively homogeneous terrain such as this.

P4744, line 1 onwards: I think the significance of rills could have been briefly discussed in the Introduction, to justify why so much emphasis is placed on this landscape component. Furthermore, some basic graphs showing the empirical relationships between variables (e.g. rill density vs DISTA) would have been helpful.

P4747, line 5: Does the increase in surface elevation with increasing DISTA equate to deposition? It might be worth making this explicit.

P4749, line 10: The Authors should say why the peak coverage of Fabaceae in 2008 and 2009 was remarkable (this isn't self evident).

P4752, line 18: Can soil processes really be regarded as exogenous to ecosystem development? I have to say that it is a shame soil properties were not monitored along with vegetation change because, as the Authors point out, the soil is the interface between the atmosphere/biosphere and substrate.

P4753, line 9: It isn't clear to me what the term 'preferential cover range' means in this context.

P4753, line 15: Disproportionately high, or disproportionately low?

P4753, line 27: What do the Authors mean by 'severely habitable'? Stressful, perhaps?

P4755, lines 1-7: How were the heights of individual plant species measured? The Authors only mention measuring the height of vegetation, not individual taxa.

P4755, line 21: Why is the connection between skeletal content and the incidence of Fabaceae plausible?

Fig. 1: Changes in surface elevation are frequently referred to in the manuscript. I think Fig. 1 would have benefitted from a cross section showing the slope from A to Q.

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## Technical points

P4736, line 1: Replace 'since nearly seven years' with 'over a period of seven years'?

P4740, line 3: Replace 'Despite' with 'Although'?

P4740, line 6: Replace 'vegetation period' with 'growing season'?

P4740, line 9: Replace 'leaser' with 'laser'.

P4741, line 14: What is meant by the term 'or seed'? Consider omitting this?

P4741, line 17: Replace 'cells further on' with 'cells for further analysis'?

P4742, line 23: Replace 'how' with 'in which'?

P4743, line 20: Replace 'the question if' with 'i.e. that'?

P4746, line 5: Replace 'probability to encounter rills' with 'probability of encountering rills'? Similar comments apply whether the term 'probability to' is used (e.g. P4747, line 21: 'probability of finding').

P4747, line 2: Replace 'where 2005 more medium sand has been found' with 'where more medium sand was found in 2005'?

P4752, line 10: Replace 'prove' with 'match'? The term 'prove' seems a bit strong.

P4754, line 5: Replace 'latest' with 'in the later stages of succession' or 'in the future'?

P4754, line 7: Replace 'prevail about' with 'prevail over'?

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