

## ***Interactive comment on “Vegetation controls on maximum coastal foredune “hummockiness” and annealing time” by Evan B. Goldstein et al.***

### **Anonymous Referee #1**

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#### General comments

This paper makes use of a model to examine the way growth of vegetation leads to development of a continuous foredune ridge. The paper could use a better balance in its presentation of the need for the model and its application to resolve the research issues. The research issues where the model can potentially be of use are now introduced in better detail in the discussion and implications section. Godfrey has already explained much of the reason for hummockiness. His work should be presented in detail up front and discussed in terms of modern needs to demonstrate that there is a need to subject his insightful conceptual model to a test. The discussion of the mechanics of the model occupies most of the paper. The results section is actually an extension of the methods because it tell how the model is to be used rather than what use of the model tells us.

The conclusion that given sufficient time and lack of external forcing, hummocky dunes can form dune ridges seems self evident if the model is designed to get to this stage. What are the practical implications of this statement? Is there evidence that this kind of end stage can be achieved in nature, especially for species that now tend to form hummocky dunes and in light of sea level rise and potential increase in storminess? Even *Ammophila*-dominated dunes may tend toward hummockiness rather than a linear form, with an increase in frequency/magnitude of storms. This concept is introduced at the end of the paper but not used to determine the applicability of the model or its use.

The word “annealing” is not intuitively obvious from a standard definition of the term. In any case, the word should be eliminated from the title, where it cannot be defined in the context used here. The title should be reworded in any case. The paper is not actually about vegetation controls, which would involve a much more comprehensive discussion of growth patterns, rates, etc. related to specific vegetation types. The title should reflect the use of the model, if the model remains the primary focus of the paper.

### Specific comments

**Abstract** The first sentence is misleading because this paper is not about building dunes for shore protection. The implication is that hummockiness is a bad thing, when it may represent a balanced geomorphic-ecologic condition. The goal expressed on lines 14 and 15 should be more specific to the paper because the causes and dynamics of hummocky foredunes have already been examined in terms of vegetation characteristics. Lines 18-19: Why not state the predictive rule right in the abstract and specifically identify the two parameters that control lateral and vertical vegetation growth? The findings and explanation for the findings identified in Lines 20-23 are already documented in the literature. More original findings of this study should be identified.

First paragraph of the introduction: Coastal dunes can be initiated without colonizing

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plants. It may be useful to identify the starting condition for incipient dune formation (e.g. overwash), or is the discussion about new dunes forming seaward of an existing foredune?

Discussion of the cross-shore component would be important in the shore protection context. The word “hummocky” is introduced, and apparently evaluated (Fig. 2) as a two-dimensional concept, but it has cross-shore expression as well. A sentence or two dismissing or assuming away the cross-shore aspects should be inserted, but that may require eliminating the shore-protection context as well because volume is critical to shore protection.

First complete paragraph page 2 (beginning Line 8). This would be a good place to introduce the Godfrey model in greater detail and identify how this paper will expand or refine it.

Lines 26-28 on Page 2: This is not an open question, which is why the Godfrey model should be introduced in sufficient detail to identify what the remaining open question is and how the model can answer it.

Last paragraph of paper: I suggest eliminating this paragraph because it implies that the model is not ready for use.

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