

Interactive comment on “Yardangs and Dunes: Minimum- and Maximum-Dissipation Aeolian Landforms” by Ralph D. Lorenz

Anonymous Referee #2

Received and published: 23 February 2020

General comments:

This manuscript discusses the role of thermodynamics in shaping yardang and dune landforms. Yardang is formed by erosion that minimizes the dissipation whereas dunes are formed by the accumulation of sand that maximizes the dissipation. Both of them are contrasting landforms that are mainly shaped by wind. The author describes their individual characteristics very well with captivating pictures, although it is difficult to demarcate the author's edition to the figures that are adapted from literature. Understanding these landforms with examples from other aspects of thermodynamics especially in atmospheric and oceanic science is effectively done. Reading the manuscript feels like reading a book chapter on 'thermodynamic of landforms'. However, the manuscript needs to be clearer on the novelty of the research. Also, the manuscript targets read-

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ers from the multidisciplinary background so the author must simplify his explanation and elaborate more on the connection and analogy provided in the introduction. The reader finds it difficult to get the actual message and new findings but the basics and connection to old literature are well presented. This manuscript serves, as a good review on the role of thermodynamics for yardangs and dunes but additional information is needed to transform it into an informative manuscript. I suggest a major revision in the manuscript especially highlighting the main message.

Specific comments:

1) Title: If the aim of the manuscript is to present contrasting thermodynamic of two landforms one can replace “and” with “versus” such that the title is “Yardangs versus Dunes: Minimum- and Maximum-Dissipation Aeolian Landforms”. If not then it needs to be clarified why these two landforms are chosen, what is common and distinctive between them in the introduction.

2) Abstract: The abstract needs to discuss less of the literature but more of the author's findings and interpretation. Currently, the first 6 lines are defining the two landforms and other 4 lines present the ideas of the author, but nothing concrete comes out from it. It might be helpful to write “ Here I show. . . already in 3rd line”.

3) Introduction: The introduction is attractive however it lacks to connect the author's work to the given examples. Only line 41-43 speaks author's aim. The second paragraph (lines 25 to 34) can be condensed to two sentences and the author can already introduce landforms in the second paragraph by associating it with examples.

4) Introduction: Line (37 to 39) “MaxEP seems to apply where the system has many degrees of freedom, and many possible steady states, among which MaxEP may be a usefully predictive selection Criterion”, It will be helpful if you can explain what are the degree of freedoms and steady states for yardangs and dunes?

5) Introduction and figure: (line 42) “these two landforms can locally coexist”. Can you

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elaborate on why it is remarkable? Also please editing, what feature is yardang, what is a dune and how they are oriented orthogonally in figure 1. I suggest inside the image mention these features and draw their orientation within the figure. This can make the images scientifically important.

6) Line (50 to 51)“(Not only must thereby mobile particles to acts wind-driven tools of erosion, but wind-blown erosive processes must be more effective than fluvial erosion which would otherwise dominate to form more familiar valley systems.)” I wonder why it is inside bracket. Can you transform it into a sentence?

7) Line 51, you refer to figure 2, It will be good to illustrate the aspect ratio in the figure also for each picture (a, b, c). The figure caption (line 251) “Star Wars: Episode 1”, please provide reference and time of the clip. Explain the relevance to it in the text.

8) I particularly like the inclusion of other planets (Mars and Venus) in the text. Additional attention is needed in the transition from line 55 to 60. For example Line 60, “A wide range of scales of yardangs are found, from a couple of meters to many kilometers long” I guess this statement was for Earth.

9) The methodology part of the paper is missing. I suggest to write it briefly after the introduction where you explain, where you take pictures, what is the aspect ratio, GBNF and mainly what is your approach

10) Figure 3, you write in the text an aspect ratio of 4:1 but in the figure, it appears in decimals. Consistency is required.

11) Line 113, this can be elaborated better with a figure, maybe one of the images you clicked?

12) The paragraph, especially lines 135 to 147, is great to bring the attention to maximum entropy production but requires a connection to yardang and dunes. Maybe you can discuss how one can interpret it for landforms.

13) Lines 156 to 158 are useful; I would like this kind of information related to fluvial

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landforms to be reported more often as it really connects to your approach.

14) I like how you end the conclusion (Line 172 to 173). Can you add future outlooks to it to make it more effective?

15) Figure 6, what is on the y-axis? Is it theoretical or based on some numbers from the literature? How did you draw the Gaussian curve?

Technical comments:

Overall the writing is attractive and has no technical errors. But figures need additional technical information or description in the text (as mentioned above). In some figures, the subfigures are illustrated by a, b and c but in some figures, they are not.

Interactive comment on Earth Syst. Dynam. Discuss., <https://doi.org/10.5194/esd-2019-73>, 2019.