

Earth Surf. Dynam. Discuss., referee comment RC2  
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## **Comment on esurf-2021-98**

Ray Kostaschuk (Referee)

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Referee comment on "Short communication: A tool for determining multiscale bedform characteristics from bed elevation data" by Judith Y. Zomer et al., Earth Surf. Dynam. Discuss., <https://doi.org/10.5194/esurf-2021-98-RC2>, 2022

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### **GENERAL COMMENTS**

The manuscript provides a novel and valuable technique for determining the morphological characteristics of river dunes and is well within the scope of Earth Surface Dynamics. The sigmoid-fit methodology for the lee side of primary dunes is particularly valuable. The approach and methods employed by the authors are valid and discussed in a balanced way. I provide a couple of additional references for the authors to consider but in general their assessment of the literature is very thorough. This is a very clear, concise and well-written manuscript that is supported with good quality figures. I have made a few specific comments and editorial suggestions to remove some ambiguity in the text and on figures.

### **CRITICAL ASPECTS**

- The paper directly addresses an important methodological issue in the study of river dunes and is well within the scope of ESurf.
- The manuscript presents a tool for determining river dune morphology that in my opinion is much clearer and more accessible than previously published methods. The sigmoid fit for the steep lee side is particularly useful.
- The methods and assumptions are generally clearly outlined although I think some clarification is needed in terminology.
- Substantial conclusions are provided but as I noted in 3. above, care is needed in some of the terminology.
- The results are sufficient to support the interpretations and conclusions.
- The description of the methodologies associated with the tool requires some additional explanation but in general is sufficiently complete and precise to allow their reproduction by fellow scientists. I believe that additional explanation is required on some issues however.
- The authors appropriately credit related work. The authors present their own

contributions throughout the text and in the Abstract and Conclusions, although I think both of these need some clarification in places.

- The title clearly reflects the contents of the paper.
- The abstract needs some revision as outlined below.
- The overall presentation well structured and clear.
- The language is fluent and precise, with a few minor editorial revisions.
- Mathematical formulae, symbols, abbreviations, and units are correctly defined and used.
- "As noted in 7. and 9. above, some clarification in the text is required. I also think some minor alterations to the figures would remove ambiguity in the presentation of the results.
- The number and quality of references is appropriate although I recommend two additional references as detailed below.
- "The only supplementary material referred to is the Matlab code- I haven't looked at the code however. I think the data used for Figure 3 should be provided as well.

## **SPECIFIC COMMENTS**

line 56: The LOESS method, as I understand it, is used on bed profiles so prior to the 'first step' profiles must be selected. There seems to be little or no agreement in the literature on how or where profiles are selected - however this is beyond the scope of the present paper, which assumes profiles are already made. So there should be an opening sentence(s) such that pre-selected profiles are required and how these were collected in this study.

lines 121-122: Clarification is required at the end of this paragraph. My understanding is that a sigmoid function is used to isolate the steep downstream-facing slope of primary dunes, as shown on Figure 1. The sigmoid function is not used on secondary dunes however so the sigmoid slope is an additional parameter.

line 151: I think it might be useful to have a sentence here on the position of the 2 sets of measurements on the hydrograph - e.g. on the falling or rising limb, at the peak etc. in order to better understand the data. This paper may be helpful: Bradley, R. W., & Venditti, J. G. (2021). Mechanisms of dune growth and decay in rivers. *Geophysical Research Letters*, 48, e2021GL094572. <https://doi.org/10.1029/2021GL094572>

line 191 (also see comments on lines 121-122): A short paragraph should be added to the end of the Discussion clarifying 'lee side slope', with particular reference to Figure 4. The plots of the primary lee slope on Figure 4 are the 'sigmoid' fit, which is equivalent to the 'slipface' as defined by Kostaschuk, R.A., and Venditti, J.G., 2019, Why do large, deep rivers have low-angle dune beds?: *Geology*, v. 47, p. 919–922, <https://doi.org/10.1130/G46460.1>. I think this is important because the slipface angle is a critical diagnostic parameter for lee side processes. Also, the secondary lee side slope seems to be the 'mean leeside' angle from the crest to the downstream trough, which is a different measurement than the sigmoid/slipface angle for the primary dunes.

**Figure 4:** Add the number of observations N for each histogram. Also, 'lee slope' should be defined clearly in the text and/or the caption, as noted with reference to line 191 above.

**Figure 5:** The number of observations N should be included on each histogram. Also define D50 (median?) and D98 (coarse percentile?) in the caption.

**Supplementary Material.** The data for Figure 4 should be provided so that other researchers can use it in their studies.

## TECHNICAL CORRECTIONS

### Abstract

I think the Abstract needs some revision in order to more accurately reflect the content of the paper. Here are some suggestions:

lines 1-2: delete "focused on" and replace with 'of'

lines 4-5: delete "multiple dune scales" and replace with 'of large primary and smaller, superimposed, secondary dunes'; delete "based on" and replace with 'using'

line 5: delete "dune" (in "Steep **dune** lee side); delete "are accounted for" and replace with 'of primary dunes are identified'

line 6: delete ", often occurring" and "of dunes" (the latter at the end of the sentence)

line 8: delete the ", and the relevant" and replace with 'and morphological'

lines 8-9: delete "decompose bedforms adopted in the presented tool" with 'bedform decomposition presented herein'

lines 10-11: delete "the decomposition and identification are successful, as the lee side slopes are better preserved" and replace with 'it successfully decomposes bathymetric data, identifies primary and secondary dunes, and preserves steeper lee side slopes of primary dunes.'

## **Introduction**

line 15: delete "More, in general" and replace with 'Moreover'

line 16: delete ", associated with this, "

line 28: delete "those" and replace with 'these'.

line 44: delete "These" and replace with 'However, these'

line 45: delete "In case" and replace with 'In the case'

line 50: add the following sentence after the sentence that ends with "including the primary dunes": 'LOESS regression is a nonparametric technique that uses local weighted regression to fit a smooth curve through points in a scatter plot.'

line 50: delete "Different" and replace with 'LOESS differs'

line 51: add 'in that' in front of "no continuously"

line 51: add 'rather' in between the words "but" and " breaks"

line 52: delete "implemented" and replace with 'used'

line 52: delete "feature" and replace with 'contain'

## Methods

line 62: how is the "user-defined" determined?

line 83: delete "explained below"

line 90: should "lower" be 'larger'?

line 93: 'central' should be defined. e.g., 'central 50%', or 10% etc.

line 101: delete "are" and replace with 'is'

line 109: delete "Subsequently, bedform properties are being determined. Properties" and replace with 'Secondary bedform properties'

lines 108-116: This paragraph could be added to the previous paragraph since both paragraphs are about secondary bedforms.

line 110: delete "trough" and replace with 'troughs'

line 120: delete ". Again, we iterate" with 'iterating once'

line 120: does "smaller than 0.25 m" refer to height or length?

line 123: delete "identified"

line 124: delete " e.g. as a result of" and replace with 'such as'

lines 125-136: These filters are subjective but I see no way of getting around this. It might be useful to add 'and site-specific' after "user-defined"

line 133: delete "then" and replace with 'than'

line 143: delete "trough" and replace with 'through'

lines 146-147: I don't think 'dx' has been defined previously so it should be done so here.

## **Results**

line150: delete "Especially in" and replace with 'In'.

line 151: delete the comma after "section"

line 154: delete "tops" and replace with 'crests'

line 162: delete "substantially"

## **Discussion**

line 170: delete the period at the end of the sentence

line 171: delete "A" at the beginning of the first sentence and replace with 'because a' - merging this sentence with the sentence on line 170

line 172: delete "indicates" in the second sentence and replace with 'shows'

line 174: delete "in many studies" and replace with 'because'

line 177: delete "illustrating" and replace with 'indicating'

line 178: add 'However' to the beginning of this sentence

lines 182-183: delete ", and in using the tool, the" and replace with 'and'

line 184: delete "downside" and replace with 'limitation'

line 188: the statement "data resolution" needs clarification, e.g., is this the horizontal or vertical resolution

line 188: delete " symmetrical and asymmetrical" and replace with 'primary' - I think the authors are referring to primary, not secondary, dunes here.

line 189: what is meant by "steep lee side slopes" here? Is this referring to the sigmoid fit of primary dunes?

line 189: delete ",potentially,"

## **Conclusion**

line 193: delete "two scales of" and replace with 'large primary and smaller secondary, superimposed,'

line 193: delete "the highest scale" and replace with 'primary'

line 194: delete "primary' in "steep **primary** lee side angles"

line 194: delete "immediately downstream of the breaks" and replace with 'of primary dunes'

