

## ***Interactive comment on “Estimating Sand Bedload in Rivers by Tracking Dunes: a comparison of methods based on bed elevation time-series” by Kate C. P. Leary and Daniel Buscombe***

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Received and published: 1 October 2019

In "Estimating Sand Bedload in Rivers by Tracking Dunes: a comparison of methods based on bed elevation time-series", the authors present a systematic comparison for different approaches for estimating bedload transport based on dune migration. The methods compared rely on repeat multibeam echo sounding surveys from a reach of the Colorado River during two different field campaigns that exhibit different discharges. The multibeam surveys provide the base data, and three different subsets from the data are selected. The three datasets used in the comparison are, 1) longitudinal transects of bed elevation from the full multibeam surveys, which provide spatial data series, 2)

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extraction of bed elevation at a single point over time (temporal), and 3) extraction of bed elevation at multiple points over time (temporal). The authors also include synthetic sinusoidal signals that are used to evaluate bedform dynamic of growing/shrinking size that would occur during unsteady flows.

Overall the paper is well written and organized, and the presentation of the results is very clear. The topic of this paper is also of great importance as river scientists still struggle with determining best practices for quantifying bedload transport rates. However, I would recommend addressing a few issues related to the methods and discussion before the manuscript should be accepted for final publication. I outline these below.

Although the data are measured using a multibeam echo sounder, the dataset is not fully utilized and instead only bed elevation profiles are extracted. Thus, the comparisons are essentially spatial series of single beam, stationary single beam, and stationary multi-single beam. It is stated that the reason for this is to account for anisotropy among the different methods equally (page 4, lines 11-14), which is understandable. However, as is stated more than twice throughout the manuscript, multibeam surveys are considered the most accurate due to the high spatio-temporal resolution, yet are not being used to their full potential. Why have you decided not to include the full three-dimensionality of the multibeam survey when considering sediment transport? If you consider this to be most accurate, then you could conceivably have a fourth method using the repeat multibeam surveys as two dimensional differencing compared to the three "single beam" methods presented in the paper.

Similarly, it appears as though all the repeat multibeam bed elevation profiles have been averaged into a single value for the area of interest. Why not keep these separate and evaluate the comparisons spatially? From the bed elevation raster shown in figure 1 there appears to be quite a difference in elevation and bedform size from the left bank (higher bed elevation) to right bank (lower bed elevation). Is there a systematic difference in the comparisons from left to right? If so, is it related to bedform

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dimensions?

This spatial information would be extremely relevant for the discussion section. In particular, one of the topics I felt was missing from the discussion was how the findings of this study can be used to provide insight on where stationary single beam sensors could be installed. My understanding is that most single beam sonars are attached to bridge piers or off banks/docks. If a spatial component of comparison is included in this paper, it would be possible to inform deployments in future studies. Do your comparisons show less agreement between the methods closer to the bank? These are questions easily answered from your dataset without much additional analyses.

Could you provide more information on how the cumulative density plots are prepared? It is stated on page 4 line 30 that Eq. 1 is averaged over a dune field. There is no mention of how the CDF are prepared. How many bed elevation profiles are needed before a 'stationary' average bedload transport rate is obtained? How far apart do the lines need to be? Answers to these questions could help guide surveys using boat-mounted single beam sonars. (it is stated that this is not of concern for the paper, however the extracted profiles from the multibeam survey is essential that).

There is reference to a figure 5 and figure 6 on page 6, but figures are only 1-4. I have attached an annotated pdf with other technical issues. Please see for grammar and other comments.

Please also note the supplement to this comment:

<https://www.earth-surf-dynam-discuss.net/esurf-2019-38/esurf-2019-38-RC3-supplement.pdf>

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Interactive comment on Earth Surf. Dynam. Discuss., <https://doi.org/10.5194/esurf-2019-38>, 2019.