Earth Surf. Dynam. Discuss.,
https://doi.org/10.5194/esurf-2019-58-RC1, 2020

Earth Surface Dynamics Discussions
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EGU

Interactive comment on "Identifying sediment transport mechanisms from grain size-shape distributions" *by* Johannes Albert van Hateren et al.

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Received and published: 8 January 2020

General notes

The paper entitled 'Identifying sediment transport mechanisms from grain size-shape distributions' by van Hateren et al. deals with a new methodological approach to determine different transport processes of dune formation in an active aeolian system in The Netherlands. The authors applied particle size and shape data from dynamic image analysis and end-member modelling. The measurements techniques, data handling and data process approaches, as well as the end-member modelling technique are excellent examples from the modern sedimentology and geomorphology. As dynamic image analysis (and automated image analysis, in general)-based approaches

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are quite new methods in land surface process investigations and sedimentary studies, a more detailed description of the technique is suggested (Some suggested points: Why are these methods better than previous sizing techniques? What are the advantages and drawbacks compared to other imaging approaches? The repeated pumping of the sample causes data redundancy [one particle will appear on more than one captured frames]. Is it a problem, or not?).

Direct and objective granulometric (size and shape) measurement of large number (n>10ˆ5-10ˆ6) of sedimentary particles is only feasible by using automated image analysis techniques. The applied dynamic image analysis settings provide valuable information on size and shape of randomly oriented (relatively coarse: medium, coarse silt and sand) grains. The description and the presented flow diagram ensure the reproducibility of the introduced measurement and data processing approach for experts of the field, but researchers without deeper knowledge on image analysis-based grain size and shape characterization may have trouble to understand the key steps of the method.

The applied self-written Matlab script (with imfill, regionprops and convhull functions) is using the raw images of the acquired frames not processed data of the Sympatec Qicpic's software, allowing a more detailed and freely customizable data handling. Are there any differences among the results of your own calculations (by using 'regionprops') and ones by the device software?

The presented size-shape distributions are equivalent to volume-weighted scatter plots of size and different shape parameters of individual particles. (It is a relatively well known approach of image analysis-based granulometric characterization, actually, a default data visualization mode in the software of Malvern Morphologi automated static image analyser device).

End-member modelling to separate the different transport processes is applied on the size-shape distributions. The appropriateness of this unique (and great) approach

is also demonstrated by unmixing of three artificial datasets results of increasingly complex mixing scenarios (3-4 EMs with/without added noise). The results are presented clearly and are expressing undoubtedly the correctness of the newly introduced methodology. Limitations of the method were also discussed in detail.

Comparisons of end-members of the size-shape distributions (convexity, circularity and aspect-ratio) with traditional grain size EMs also confirmed the accuracy of the novel approach. The remarkable similarity of size-aspect ratio and size EMs is quite surprising, especially because (as it was also noted by the authors) other studies (e.g., Shang et al. 2018) reported sorting of aspect ratio during transport, but in that case long-distance transport of silt-sized material was analysed (by using different magnification and aspect ratio definition).

All in all, the authors introduce successfully a new method and a new way of data processing of particle size and shape data. The new approach was effectively applied to determine major aeolian processes of the investigation area.

Minor comments:

Last columns of Table 2 are not visible in the manuscript.

The overall structure of the paper is good, however, figure from the Appendix A could be moved into the main text.

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