

Response to Referee #1

Dear Referee,

thank you for the comments and suggestions for improvement of the manuscript. We have considered all recommendations and answer in detail below.

Please note that we found a slight inconsistency between the measured ranges shown in Fig. 7 and 8. this was corrected in the revised Fig. 8 (see last comment).

Page 1

Line 9. I don't like "precision of detection". Either precision of some measurement or threshold of detection.

Changed to "precision of measurement".

Line 11-12. This sentence lacks mention of variations to which "up to a factor of two" applies.

Context for "factor of two" added:

"... by up to a factor of two between the traditional statistical estimate and a full evaluation of the spatial bathymetry."

Line 20-21. "expressed . . parameter" gets in the way of the rest of this sentence. It could be a separate sentence (in parentheses).

The sentence was rearranged with parentheses as suggested:

"If the threshold of motion (expressed as the critical bed shear stress or the dimensionless Shields parameter) for a characteristic grain size is exceeded, sediment is transported and bedforms develop."

Page 2

Line 16. ". . modelling and assessment . ."

Changed.

Page 3

Somewhere near the end of the Introduction (top of page 3) should be a more explicit statement about the aim of this paper (before lines 4-9 saying what was done).

The aims of the work have been stated more explicitly:

"The overall aims of this study are

1. An assessment of the precision of different methods for the detection and measurement of small scale bedforms from high resolution sonar data in a shelf sea environment
2. The comparison of the measurement precision to the dimensions of small scale bedforms calculated by different wave and current ripple predictors"

Line 15. Unclear why Fig. 1 is referred to here.

Unnecessary reference to Fig. 1 removed.

Page 5

Line 3-5. This sentence is too complex and (I think) grammatically incorrect: "is exceeded" is redundant given the symbols " \geq "? "respectively" is too far from the things being ordered. Break up the sentence, perhaps by defining l_p and l_{max} in a separate sentence.

The sentence was rewritten as follows: "Threshold-level methods for bed detection in echo data acquired by similar sonars have been implemented by Smyth and Li (2005) and by Lefebvre (2009).

These authors detect the bed level at the depth where a certain percentage of the maximum ping-wise echo intensity I_{\max} is exceeded: $I_p \geq 0.6 I_{\max}$ (Smyth and Li, 2005) and $I_p \geq 0.8 I_{\max}$ (Lefebvre, 2009)."

Line 6. Re-arrange (maybe split) this sentence. I think "where . . . time" refers to the target shape and not to nadir.

Part of the sentence was removed:

"These approaches are extended to account for the widening of the along-beam target shape with increasing grazing angles γ ."

Line 12,13. Echos do not have "slopes". Are you referring to the intensity as a function of distance as plotted in figure 3.

Changed to: "... rising slope of the echo intensity signal."

Line 20. "can be" – "was" if this is what you actually did. It reads like a good idea deserving careful description.

Changed to show that the idea of a data-derived model bed echo was introduced here.

Page 6

Line 4. I don't think η , λ have been defined; they could probably be replaced by words, or bring forward the definitions from line 16.

Mentioning of dimension was removed here. Dimensions are introduced in "2.6 Ripple geometry".

Line 15. The "phi" symbol should immediately follow "orientation".

Changed.

Line 30. "every deployment" is unclear. Probably not "deployment" but a briefest statement of what is the "ensemble".

Changed to: "...for the complete deployment period".

Page 7

Line 8. "(trough)" (typo).

Corrected.

Line 10-12. This could be clearer. Is a crest the extreme maximum between any up-crossing and the next down-crossing of zero? If crests are defined dependent on zero-crossings, why not more directly use the average of distance between successive up-crossings of zero (or down-crossings of zero)? Presumably the result would be almost the same.

The sentence was changed to clarify the procedure:

"The computed bedform height η_t is the average range between the elevations of detected maxima and minima per transect."

The use of average crest heights and trough depths makes removes the need to track successive crests and troughs within a transect.

Line 28-29. So12w and So12c terminology implies separate predictors for ripples under waves and for ripples under currents. Then (line 29) "are used" but what exactly is applicable to mixed forcing conditions?

The sentence was reformulated to clarify the procedure:

"For mixed forcing conditions, the recent wave and current ripple predictors of Soulsby et al. (2012) (So12w, So12c) are used by defining the prevailing dominant forcing and selecting the appropriate predictor."

Page 8. Units need to be stated for the dimensionally inconsistent equations (4), (5).

A sentence was added to clarify units for the empirical relation:

"SI-units are used in the equations for the following dimensionally inconsistent predictors."

Page 11.

Line 4. "... more pronounced than for Nikuradse roughness using (11); (12) results in .."

Sentence rewritten for clarity:

"Due to the squared ripple height in Eq. 17, the difference between the methods is more pronounced for this than for Nikuradse's roughness using Eq. 16; and results in..."

Line 23. This sentence is incorrect. Replace one "of" by ","?

Corrected.

Figure 8. There are two lines for Fl88 in (a) and Ya85 in (b). Please explain in caption – refer to (4), (5) and (3)?

The figure was restructured. The two values for Fl88 correspond to mean and maximum height and the two values for Ya85 correspond to the range of 600-2000 d_{50} . This will be added to the figure caption.

