

Interactive comment on “Measuring ocean surface velocities with the KuROS and KaRADOc airborne near-nadir Doppler radars: a multi-scale analysis in preparation of the SKIM mission” by Louis Marié et al.

Louis Marié et al.

fabrice.ardhuin@ifremer.fr

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The comments of the reviewer are copied in bold and our replies are in normal font.

This paper presents the technique and examples of current velocity measurements from an airborne platform carrying two radars. The data acquisition was performed at a site located off the western coast of France where the surface currents are continuously monitored by two HF radars. Surface drifters were deployed for validation of airborne velocity measurements. The paper provides a

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detailed discussion of the experimental setup, measurement technique, errors, and comparison of the velocity data from different sensors. I find the paper very deep, well worth publishing, providing very valuable information for developers of radars for velocity measurements from space. All figures are of excellent quality. Congratulations to the authors on a good paper, but an even more impressive field campaign.

We thank the referee for his/her careful reading of our manuscript, and for taking the time to contribute this positive appraisal of our work to the interactive discussion of the article. We are currently drafting a revised version to address a number of issues raised by him and the other reviewer. In the following we detail what modifications we have performed, or intend to perform, in response to his comments.

However, the paper would benefit from the following changes (not only minor):

– The text needs a substantial reduction: 33 pages and 15 pages in Appendix, this is too much. Please make sure authors are happy with this?

We understand the concern expressed by the reviewer, and will do our best to strike a balance between the need to make this article shorter and easier to read and a conflicting request from reviewer 1 which would on the opposite require us to add significant new material. We will do our best to streamline the flow of the paper and avoid unnecessary duplication. As for the length, we prefer to have longer appendices and a shorter main text in order to keep all the material in the same document without requiring the reader to go back to reports and grey literature. In fact, the present manuscript is the first time that the science behind near-nadir Doppler scatterometry for surface current is explained and demonstrated on real data. There are indeed some common aspects with higher incidences treated in Rodriguez (2018) and Nouguier et al. (2018), but the difference in incidence angle makes some of our analysis very specific. Also, the very broad radiation diagram of the KuROS instrument was the occasion for a detailed analysis of the averaging process by which the line-of-sight

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Doppler shift emerges from an extended field-of-view. This research, summarized in Appendix A, is original, and may be relevant for future satellite instruments, for which the radiation diagram will be better controlled, but for which the very large platform velocity will make the requirements much more stringent.

Many formulas and demonstrations come from the paper of Nouguier et al., 2018 and Rodriguez et al., 2018. The saving is worth it.

As mentioned above, though the cited articles have been an important source of inspiration, we had to adapt significantly the concepts they developed to the near-nadir observations performed during Drift4SKIM. We will do our best to remove any duplication of these articles and to shorten our text wherever possible in our revised version.

–The text needs a closer proof reading. There are some typos (altitude/attitude in page 39, 40; are/is following the word data within the whole paper, Appendixes/appendices in page 16, ...

A thorough search of the text for such issues is ongoing.

–The main body of the paper requires a number of changes to the text where it appears confused while Appendixes are well written and very clear.

We are in the process of streamlining and clarifying the main text, which may have suffered from the large time allocation devoted to the Appendixes for the original submission. ...

Specific points. Abstract: what is the major finding in this study? Only an estimate of C0? The description of the experiment should be shortened giving the place to the main results.

We agree the abstract is currently not suitable, and will rephrase it in our revised version, taking into account the comments from the referee as well the evolution of the text.

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P3 L15 something is wrong with the English of this sentence? The contribution ... of contributions

This sentence has been corrected.

P4 L2 measurement equation. Maybe measurement is not necessary?

This sentence has been corrected.

P9 Figure 4 caption: contribute to or contribution to. “to” is missed.

This sentence has been corrected.

P10 Some problems with the English in many places. L1-2: the sentence seems not finished. L7: U is the current speed ... L8 wave slope variability? spectrum. L16 While the incidence angle increases ... the backscatter becomes dominated L27,30. eq. 14 contains ϕ or ϕ_s ? it is confusing.

On the basis of the comments from both referees, we intend to thoroughly rearrange the text of section 2. We will be very careful to make that important section clear, easy to read, and syntactically correct.

P11 L24: something gone wrong in this sentence. ... work was focused in two boxes. Perhaps, work performed in locations matching by two boxes in Figure 6

...

We have removed references to “boxes”, and used the word “area” instead in the text.

P13-P14. The text is very confusing and should be re-written.

We have done our best to clarify the text of sections 3.1 and 3.2.

P16 L8. Please check for frequency and remove band if only one frequency is used.

This sentence has been corrected.

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L12 How to understand the ambiguity of 126 m/s ?

We have been more explicit in our discussion of ambiguity in section A1.4. 126 m/s is equal to the upper bound of the unambiguous velocity interval at the KuROS wavelength and PRI.

P17 L8 Consider: observations corresponding to $\Phi=12\text{deg}$ are reported.

This sentence has been corrected.

P19 L1-4. Please remove repetition in this sentence: 30 seconds

This sentence has been corrected.

P21 L12: Consider: Due to the narrower radar beam, the data from Karadoc are easier to interpret than the data from Kuros.

We have implemented the referee's suggestion.

P21 L14 and P22 L1-2: something is wrong with the English in these lines.

This paragraph has been rephrased.

P23 Figure 13 caption: remove one "blue" and complete the sentence.

The caption of Figure 13 has been corrected.

P26 L1 Consider ... spectra estimated from measurements on November 2 ...

This sentence has been corrected.

P26 L4 energy is much lower than

This sentence has been corrected.

P31 L7 Perhaps: Regarding the radar measurements, ...

This sentence has been corrected.

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P33 L19-21. This conclusion is confusing and should be re-written

We agree the conclusion is currently not suitable, and will rephrase it in our revised version, taking into account the comments from the referee as well the evolution of the text.

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