

Dear Editor and Reviewers,

Thank you and reviewer for giving constructive comments for our manuscript. Our manuscript entitled “A joint method for wave and wind field parameter inversion combined SAR with wave spectrometer data” has been revised in response to the comments. Thank you for the opportunity to resubmit this revision manuscript for possible publication in the journal.

We have given serious consideration to Editor’s and Reviewer’s comments and suggestions and have revised the manuscript carefully. In order to make your review easy, we have reworked the content and format of the manuscript and have marked all modified sections by using red text in the file “Revised Manuscript with changes Marked”. Manuscript revisions are addressed in detail below.

**Reviewer:**

General comment: all the equations are poorly written: integrals should be bigger. The MDPI template is very good (LaTeX even better) with equations.

**Revision detail:**

Sorry for our carelessness. Thank you for your careful review. We have checked and modified all the equations in the manuscript.

General comments: plot are also generally poor. For example, in Figure 5 a much better visualization can be done by interpolating the spectra (simple 2D FFT with an higher number of frequency points). This can eventually also improve the results.

**Revision detail:**

Thank you for your professional suggestion. We have modified some of the plots in the manuscript. Because figure 5 is the four process diagrams generated in MPI method, it is mainly to make the SAR azimuth cut-off wavelength be compensated by comparing Figure 5a and Figure 5d in the manuscript. Although we did not use interpolation spectroscopy, we replaced the SAR image of 128\*128 pixels with that of 256\*256 pixels based on your suggestion, which can make our wave-number interval smaller and the inversion result more accurate. This also allows for better visualization.

General comments: Equations in general seems to come from nowhere. Are there other works that use these formulae? If yes, please cite them. If no, please explain better the formulae.

**Revision detail:**

Thank you for your professional suggestion. We have marked the source of the formulas in this manuscript. Formula 9 is the calculation formula of wave height of sky bottom point of spectrometer, which is from SWIM products users guide.

**Specific Comments:**

1. Page 1, line 13: it is not clear what do you mean by azimuth cut-off phenomenon and by velocity bunching modulation. It is highly suggested to introduce in an analytical way the problem that the manuscript wants to solve.

**Revision detail:**

Thank you for your professional suggestion. Due to the nonlinear effect of velocity bunching modulation, there is azimuth cut-off phenomenon in SAR wave observation, which is the inherent defect of SAR wave observation. As a result, SAR cannot observe the complete wave information, and the accuracy of wave observation is limited, which greatly restricts the ability of SAR wave observation and the realization of commercial application. As the abstract should not be too many

words, we have introduced it in the introduction with references [6, 9].

2. Page 1, line 16: “although wave spectrometer doesn’t exist azimuth cut-off”. This is not correct English. As a general comment I think that it is ok if the paper is not written in perfect English (I’m also non-native English speaker as it is clear by my poor English). In this paper, however, I think that the language barrier is preventing the reader to properly understand the paper. I highly suggest doing a professional review of the English of the entire paper.

**Revision detail:**

Sorry for our carelessness. Thank you for your professional comments. We have carefully checked the English of the manuscript and modified it. Thank you again for your advice.

3. Page 1, line 20-23: the word “wave” is repeated 9 times in 3 lines. I suggest to use a synonym or somehow simplify the sentence.

**Revision detail:**

Thank you very much for your careful review. Due to some of them are specialized words, and each “wave” stands for a different meaning, “**wave** parameters” represent effective wave height, average wave period and other parameters, “**wave** spectrometer” represents a type of radar, and “**wave** spectrum” is mainly used to calculate wave parameters. Therefore, we are sorry that we cannot change all of them, but we have checked it carefully and modified it as much as possible. Thank you again for your advice.

4. Page 2, line 52: “all day long” is not scientific. Revisit frequency or repetition interval should be used.

**Revision detail:**

Thank you for your extremely useful comment. We have reviewed the manuscript and adjusted the unscientific sentences and vocabulary.

5. Page 2, line 53: again, it is not clear what is azimuth cut-off. References to previous paper are also suggested.

**Revision detail:**

Thank you for your professional suggestion. We have introduced it in the introduction with references. We hope it will give you a better understanding of the azimuth cut-off phenomenon of SAR.

6. Page 2, line 67: “domestic and foreign” depends on your country. You should write for all the scientists, not only for the Chinese community. A more proper sentence could be “After years of development, a large number of scientists engaged in SAR wave inversion”.

**Revision detail:**

Thank you for your very careful review. We have corrected the grammatical mistakes in this manuscript as you suggested.

7. Page 3, line 110-113: the key problems that you are mentioning are not clear from the references. “As can be seen from the above inversion methods...”. I personally can’t see the problem from the cited methods.

**Revision detail:**

Thank you for your professional suggestion. The azimuth cut-off problem of SAR and the low azimuth resolution of spectrometer are inherent defects, and the inversion method mentioned in this paper cannot avoid the above problems. This is also a key issue that we want to address. Therefore, based on the existing inversion methods of SAR and spectrometer, we establish two radar joint inversion methods for wave and wind field parameters. We have introduced the problems with SAR

and wave spectrometer before introducing the key issues, hoping to give you a better understanding of the key issues addressed in this article. Thank you again for your thoughtful advice.

8. Page 3, line 121: please add the sections index like “In section 2 we discuss...”.

**Revision detail:**

Thank you very much for your helpful comment. We have added content according to your suggestion in our revised manuscript. We hope that this content will help you and readers understand the chapter distribution of this paper more quickly.

9. Page 4: the Section 2.2 is generally confusing. Block diagrams are not clear, they waste a lot of space in the page. My suggestion is to write a good block diagram and then explain each block of the diagram with a section. Here 2.2 seems a partial explanation of the whole procedure, then there are more details in 2.2.1, 2.2.2, etc. is it correct?

**Revision detail:**

We are very sorry that we did not notice this problem. Thank you for your careful suggestion. Section 2.2.1 mainly introduces the pretreatment of SWIM wave spectrum. The processed wave spectrum can be used as an input of MPI method. Section 2.2.2 mainly introduces the MPI method that the wave spectrum of the spectrometer as first guess spectrum. We have modified it in the manuscript and we believe that it can make you better understand the method proposed in this manuscript.

10. Page 5, line 192-193: the word “wave” is used again 7 times in 2 lines of text.

**Revision detail:**

Thank you very much for your careful review. Due to some of them are specialized words, and each “wave” stands for a different meaning, “two dimensional **wavenumber** spectrum” and “**wavenumber** direction spectrum” represent the horizontal and vertical form of the SWIM wave spectrum, “**wave** spectrometer” represents a type of radar, and “**wave** spectrum” is mainly used to calculate wave parameters. Therefore, we are sorry that we cannot change all of them, but we have checked it carefully and modified it as much as possible. Thank you again for your advice.

11. Page 6, equation 3: why the first term of the equation is different from the second one? Why there is no denominator in the first?

**Revision detail:**

Thank you very much for your professional suggestion. This formula is the cost function established by Hasselmann, K and Hasselmann, S according to the characteristics of SAR in sea surface detection [9]. Due to the 180° ambiguity of SAR images and the information loss caused by azimuth cut-off, the only normal inversion form of forward mapping relationship does not exist. The standard way to deal with this kind of uncertain inversion problem is to introduce the regular term to use the extra information in the first guess spectrum  $F(k)$ . The two terms of the formula have different information to obtain, so the two terms are different.

We would like to express special thanks to the editor and reviewer for their constructive comments on this manuscript again. Please tell us some shortcoming again about this manuscript when reviewing. We hope this manuscript will be accepted by **Remote Sensing**.

Thanks again, we look forward to your reply.

Best Regards.

Sincerely,

Dr. Yong Wan