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Ocean Science Discussions

Interactive comment on "Study on the Tidal Dynamics of the Korea Strait Using the Extended Taylor Method" *by* Di Wu et al.

Di Wu et al.

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Response to Dr. David Webb (Referee) by Guohong Fang and Di Wu

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Overview This is a classic semi-analytical study of a partially enclosed tidal system. The mathematics is fairly straightforward but the authors use the results to obtain a better physical understanding for the position of the amphidromes in the strait between Korea and Japan. The paper is well laid out and easy to read and understand. I think that in principal it should be published.

Reply: We sincerely thank Dr.Webb for his careful reading of our manuscript and constructive comments and suggestions, which are of great help in improving our study.

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Discussion paper

We have addressed all these comments; our responses are given below.

Main suggestions As I said the mathematics is fairly straightforward (maybe that is why JPO rejected the m/s), so I do not think all the details are needed in the final paper. In particular I think that the content of the appendices may be better placed in a separate document as supplementary material (a possibility with Ocean Science).

Reply: The appendix has been deleted and will be submitted separately in the form of supplementary material.

I am also concerned that this branch of oceanic literature always ignores similar studies that have occurred in related fields of physics - in particular microwave wave guides. There used to be a complaint about the different branches of physics reinventing the wheel and to a certain extent this is true here as the Coriolis term does not necessarily introduce major changes. For that reason I suggest that the authors, who appear to be applied mathematicians, talk to someone with a physics or microwave background about reflections from discontinuities in impedance (refractive index in the case of light). This should give a bit more insight which they could usefully add to their conclusions.

Reply: The behaviour of water wave reflection in a nonrotating channel is indeed similar to the microwave reflection, or the light refraction. However, when the wave propagates in a rotating channel and the period of the wave is comparable to that of Earth's rotation the Coriolis force will have significant influence on the wave propagation and reflection. As an example, we revisit the problem of the reflection of the Kelvin wave in a semi-infinite channel first studied by Taylor (1922). Taylor' result shows that when the incident Kelvin wave is reflected at the southern shore of the North Sea, a time lag of 1.4 hr occurs due to the Coriolis force. The details are given in the appendix (submitted as a Supplement). The main conclusion is that the Coriolis parameter has significant influence on the tidal wave reflection in a semi-infinite channel. This conclusion should also hold for the case studied in the present paper.

As another possibility for future work I would also suggest treating all variables as

complex and investigating how the solutions at key points change with complex angular velocity - to understand how the resonant properties of the system affect the solution.

Reply: This is a very useful suggestion for our future work. We will try to apply the complex angular velocity to the Taylor method.

Detailed comments

1. Title I suggest "Study of the ..."

Reply: Revised as suggested.

2. Page 1, line 9 Similarly "studies of the tides ..."

Reply: Revised as suggested.

3. Page 1, line 23 " ... the Yellow Sea ..."

Reply: Revised as suggested.

4. Page 1, line 26 Delete 'vast'.

Reply: Revised as suggested.

5. Page 1, line 27 Knives are sharp, continental slopes are steep.

Reply: The word "sharp" has been replaced with "steep" in page 1, line 27 and page 16, line 4.

6. Page 2, line 18 I disagree with 'analytical', this is a semi-analytical method, using the numerical solution of a large set of equations.

Reply: The word "analytical" has been replaced with "semi-analytical".

7. Page 4, line 21 This is angular velocity (radians per second) Anything with frequency refers to full cycles of something.

Reply: The term "angular frequency" has been replaced with "angular velocity" in page

4, line 21 and page 5, line 13. (Please note that angular frequency is a synonym of angular velocity, see Weik M.H. (2000) angular frequency. In: Computer Science and Communications Dictionary. Springer, Boston, MA. https://doi.org/10.1007/1-4020-0613-6_670).

8. Page 5, line 8 Change to 'with momentum ... "

Reply: The article "the" has been deleted.

9. Page 16, lines 10 onwards. This is all very standard in other areas of physics as well, so I do not think the work of Dean and Dalrymple needs to be spelt out in such detail. I suggest that you just give the results you need.

Reply: According to this comment, we have revised this paragraph as follows: "If the second area is semi-infinitely long, allowing for the wave to radiate out from the second area freely, then a part of the wave is reflected at the connecting point and another part is transmitted into the second area. The amplitude of the transmitted wave is (see e. g. Dean and Dalrymple (1984))"

10. Page 17, line 1 You do not make clear which case you are writing about - yours or that of Dean and Dalrymple.

Reply: This equation is the same as that given by Dean and Dalrymple (1984), but in a more understandable form. In order to clarify this the words "(see also Dean and Dalrymple (1984))" have been added above this equation.

11. Page 18, line 9 and following "can be attributed to ...". This is a bit of a cop out, the classic response of a committee shirking responsibility. It would read better if you were disappointed about the discrepancy but that it may be due to ... .

Reply: The words "can be attributed to" have been replaced with "may be duo to".

12. Page 19, Line 21. I would suggest you delete this line. It is doing nothing useful.

Reply: This line has been deleted.

Please also note the supplement to this comment:
https://os.copernicus.org/preprints/os-2020-86/os-2020-86-AC1-supplement.pdf

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