

Geosci. Model Dev. Discuss., referee comment RC1
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Comment on gmd-2020-438

Anonymous Referee #1

Referee comment on "Plume spreading test case for coastal ocean models" by Vera Fofonova et al., Geosci. Model Dev. Discuss.,
<https://doi.org/10.5194/gmd-2020-438-RC1>, 2021

General Comments

This work is a detailed study of the reproduction of a river plume by some state-of-the-art unstructured mesh models. The problem is introduced with an excellent analysis of the analytical solution and the results show the reproduction of various characteristics of the plume by the models. The use of different numerical schemes and other model parameters is discussed. The paper presents a considerable amount of work of very good quality and of great interest. However, although the first part is well written, the second part with results and discussion needs a substantial revision. Below are the main comments, which refer from section 5 onwards.

- This part of the paper is written as a technical report. The authors speak to a reader interested in reproducing their experiments. This greatly limits the paper and makes it less useful for readers interested in applying a model in a real situation. In particular, the paper should answer questions such as: what is the best numerical scheme for reproducing a river plume? What are the minimum horizontal and vertical resolutions still good? I would suggest adding a section of conclusions after section 6, which answers these questions, those posed in the Introduction (p.3, r80-83) and discusses the last sentence of the abstract;
- The part of the results is too long and difficult to read, it should be reduced where possible. Furthermore, after section 4, the English must be carefully checked and improved (you could contact a native English speaker), trying to use shorter sentences, better use of punctuation and to extend the explanation of some parts with complex concepts which, sometimes, are sketched out;
- I would move section 7 to the appendix, trying to use some tables. I would finish the paper, in a more traditional way, with the Conclusions.

Specific Comments

- Throughout the paper, references should be made to the numbers of the sections, not to their name;
- Table 1 would be more convenient at the beginning of section 5, where it is cited many times;
- From section 5 the Authors use "second (first) inertial period", which is a bit misleading. I would use "two (one) inertial periods" or "two rotational periods", in accordance with the first part of the paper;
- I think that the comparison with analytical results and laboratory studies should be used more, both in the text and in the figures. In the figures, it would be useful to see these quantities. In any case, I leave the decision to the authors;
- The figures with the vertical profiles have the x-axis inverted. I find this unintuitive; anyway, it is not so important;
- p21r465-467: Explain more;
- Fig. 6: Explain the various panels more. A line $Fr = 1$ would be useful;
- p23r478-479: Explain more;
- p24r495-500: Explain better;
- Section 5.3: Some parts of the text are missing (p27r516). Another error in r522. The text describes the differences in a concise way, with short comments. Sometimes it is difficult to understand;
- Section 5.4: Like the previous one, it is hard to understand. Use shorter sentences and describe better the methodology;
- p29r557: not clear;
- p30r563-564: explain better;
- p30r569: why? Explain more;
- Fig.11 The curves are different in the panels, use the legends in each panel;
- p32 605-615 Not clear, write better;
- p34r650: compared to? Run 1?
- p35r669: First explain the purpose and then describe the runs.
- p36r688: Remove the text in brackets, it is not clear;
- p37r690: Where? Explain better where the reader should look;
- p38r726: Rephrase the sentence describing your findings not your suggestion.

Technical Corrections

- p3r74: the
- fig1: r is r_0 ?
- p5r131: brackish -> fresh
- p5r142: we recommend.. -> we increased ... Describe the set-up, don't give recommendations.
- p5r146: we suggest -> What did you use? As before, describe the set-up.
- p7r158: below. Specify the section number.
- p9r200: a

- p12r302-305: u_b and h_0 are defined in sec2.1, say it somewhere or remember their definitions;
- p14r357: angel...
- p21r464: typo
- p23r490: there
- Fig. 7: surface v -component?
- p24r505: Fig3, which panel?
- p28r547: intervening? I don't understand this sentence;
- p23r550:.) ->).
- p30r559 signaling?
- p32r591 than
- p39r752 general