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Ocean Science
Discussions

Interactive comment on "River bulge evolution and dynamics in a non-tidal sea – Daugava River plume in the Gulf of Riga, Baltic Sea" *by* E. Soosaar et al.

Anonymous Referee #1

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Manuscript: River bulge evolution and dynamics in a non-tidal sea – Daugava River plume in the Gulf of Riga, Baltic Sea Authors: E. Soosaar, I. Maljutenko, R. Uiboupin, M. Skudra, and U. Raudsepp

This manuscript studies the Daugava river plume evolution and dynamics in a non-tidal sea in the Gulf of Riga (Baltic Sea), using satellite remote sensing imagery and numerical modelling methods. This topic in my opinion is scientifically relevant and fits within the scope of Ocean Science journal. The paper would present novel concepts and data regarding the dynamics of river plumes, that would contribute to improve not only the knowledge about the Daugava river plume but also the understanding of plumes

dynamics in non-tidal seas, and therefore would allow reaching substantial conclusions about these subjects. However, the main and capital flaw of this work regards the validity of the scientific methods and assumptions followed, that in my opinion compromise all the results obtained. In fact, neither the methodologies used were demonstrated to be validated for the study area through comparison with real data. Therefore at this stage the results obtained are purely speculative. Consequently, although most the results would be sufficient to support the interpretations and conclusions, they cannot be considered proved and consequently they are not reliable. Therefore it is my opinion that this manuscript should be deeply revised in order to include validation procedures for both methodologies, through comparison with in situ data. The description of the methodology followed both through satellite remote sensing imagery and numerical modellingit is not sufficiently complete and precise to allow their comprehension and reproduction by other experts and therefore the results are not traceable. The authors revealed an excellent knowledge about the state of the art regarding this difficult subject, using appropriated references (in number and quality) and give proper credit to related work and clearly indicate their own original contributions. The manuscript title clearly reflects the contents of the paper, which is very well structured and clear, with a fluent and precise language. The abstract provide a concise and complete summary of its content and the mathematical formulae, symbols, abbreviations, and units are correctly defined and used. However, several parts of the methodology section should be further developed and details should be given about some choices performed. The validity of the satellite remote sensing imagery and numerical modelling methods followed should be proved to accurately detect and reproduce the plume dynamics.

Specifically: - Section 2.1: the methods to distinguish the turbid water from the clear sea water should be scientifically and precisely defined to allow the application of satellite remote sensing imagery to plume detection; - Section 2.2: It is essential to perform a comparison between satellite imagery results and observations to prove the adequacy and validity of the methods applied; - Section 2.2: Why the measurements of Gauja and Lielupe rivers flows were multiplied by 1.05 and 1.87, respectively? How

were obtained these numbers? The use of this numbers has to be justified; - Section 2.3: model calibration and validations results must be presented through comparison with in situ field data, and the model predictions accuracy has to be quantified; additionally, the comparison should prove the models accuracy in simulating the local river plumes dynamics; - Section 2.3: The model TSM input used for the river discharges should be characterized (Realistic values? Real values measured in situ? Where? - Section 3.1: the analysis presented should start before the plume establishment (maybe on $\sim$17th March) in order to allow the understanding of the plume dynamics in response to the high freshwater discharge event; - Section 3.3: Why was used an ambient water salinity of 6? Please justify this assumption; - Section 3.3: simulations of rivers discharge into a homogeneous GoR with an ambient water salinity should also be performed considering idealized winds of growing intensity to analyze the wind effect in the evolution of the river bulge; without this the discussion and conclusions about the wind effect on the river bulge establishment and evolution are not solid; - Section 3.4: without comparison with in situ field data it is impossible to prove that model results are describing the local patterns and physics of the river bulge dynamics; - Section 3.4: the selection of threshold values based on visual inspection of TSM concentration maps on the satellite images is subjective and therefore not scientific; moreover, it is not acceptable that this threshold varied from image to image; methods such as those developed by Horner-Devine et al. (2008) or more recently by Mendes et al (2014) based on the normalized water-leaving radiance should be developed and applied for plume detection; - Section 3.4: Why was assumed that the bulge has a circular shape (equation 2)? This should be justified; - Remaining results, discussion and conclusion sections: as the results are all unproved due to the major flaws previously referred these sections are purely speculative.

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