

Interactive comment on “Small river plumes off the north-eastern coast of the Black Sea under average climatic and flooding discharge conditions” by Alexander Osadchiev and Evgeniya Korshenko

Anonymous Referee #2

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Summary: The authors present a comprehensive study concerning the impact of sediment and freshwater delivery from river input on freshening, plumes and sediment transport in the Russian Coast of the Black Sea. The approach used in the modelling study is to consider the influence of river input on the spread of buoyant plumes using two different scenarios: including periods of flash flooding and averaging conditions over a 10-day period. The study employs a suite of models to reproduce the discharge from the 20 largest rivers along the Russian Black Sea coast. The three models implemented are the INMOM hydrodynamic model for the entire Black Sea, with polar coordinates in the horizontal such that resolution is as high as 200m in the

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area of interest. The STRiPE model, a high resolution Lagrangian model for simulation of buoyant plumes is implemented for the river discharges. A Lagrangian particle-tracking model is employed to simulate transport and settling of fine suspended sediments discharged from river mouths. The models are well validated from available data and understanding. The INMOM model reproduced the major large and meso scale circulation patterns and features. The STRiPE reproduced the submesoscale variability of individual river plumes, and in particular the Mzymta plume, the largest of the 20 rivers included in the study. Sediment transport and distribution was validated with Ultraviolet Fluorescent LiDAR which measured TSM concentration in the upper layer. The main result is that realistic rain-induced (flash) flooding events influence considerably sediment transport and deposition along the Russian Black Sea coast, while under averaged conditions river runoff and sediment deposition and transport is dominated by the largest rivers.

Comments: This is a broad and interesting study that presents a number of novel concepts, ideas and tools, and deserves to be published in OS subject to a revision. The main issue I have concerning the manuscript is the language and style, the English. This is the weakest part of the paper. It is often awkwardly written and needs to be improved. I understand that English is not the first language of the authors. However, the good news is it can be improved. The authors would need to go through the paper thoroughly, preferably with a scientist whose first language is English. This will constitute technical corrections and minor revision. Section 5 p11 The INMOM model was initialized from climatology. Is this satisfactory? Was there any spin-up involved or considered? Please discuss. P11 line 17- 24 please provide references From p.10 on: the INMOM module should be the INMOM model, same for STRiPE module and Sediment Transport module Section 6.1 please provide references for model validation, e.g. for general Black Sea circulation and smaller eddies. p.13, line 4-5 units incorrect $\mu\hat{\text{N}}\text{kgm}^{-1}\text{s}^{-1}$ Fig. 7 – 10 captions and text. Please clarify/state what is top and bottom. From p.18 on stripe(s) should be strip(s)

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