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Ocean Science Discussions

Interactive comment on "Impact of naval traffic on the sediment transport of the Port of Genoa – a modelling study" *by* Antonio Guarnieri et al.

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We thank referee #1 for the fruitful comments and suggestions whose fulfilment will enrich the manuscript. The answers to the commens to the manuscript follow. They have been shared with th co-authors of the manuscript.

1. The comment does not require specific answers; 2. The comment does not require specific answers; 3. Answers are given within those to comments 4 to 7; 4. We agree that we introduced the three layer model without a thorough explanation of this choice, probably giving for granted the fact that a three layer bed model is more complex and potentially accurate than a one or two layer model, thus allowing intrinsically to represent the real physical processes in a more realistic way. The degree of consolidation

of the bottom sediment is time and depth dependent. The surface layer - which directly contributes to the injection of material into the water column - is consequently much less consolidated than the lower layers, since there is no matter above it and since it is composed by freshly deposited sediment due to the continuous rework it is subject to. This is even enhanced in a port environment where the bottom is continuously influenced by the propellers' induced jets acting several times per day. To account for this a multilayer bottom model would be recommended. In fact, a single layer bed representation would imply an overestimation of the bed erodibility (soft mud, thus easily reworked), resulting in unrealistic further overestimations of sediment erosion and concentration along the water column. However, we considered that a bed composed by only two layers would also not be appropriate because it would have not allowed to account for a gradual transition from unconsolidated to consolidated material, causing an unrealistic abrupt passage between erodible and stable bed. This induced us to consider an intermediate layer allowing for a smoother transition. We will argument better these concepts in the revised version of the article. For what concerns the computational effort, the time needed for a single hydrodynamic simulation is approximately 8 hours for a parallel 20-core simulation using 2.4 Ghz processors, while the time needed for a single simulation of the sediment transport model is approximately 20 minutes with the same computational configuration. For potential operational purposes the hydrodynamic model could be run once in offline mode since the vessels trajectories to and from the same docks are very similar to each other. Then, for every new passage the sediment transport model could be run again in operational model (the short simulation time allows for it) and the bottom change kept up-to-date constantly, according to the actual vessels' passages; 5. As stated in the manuscript, since the shape of the wet basins is similar for all the simulated docks, also the hydro and sediment transport dynamics is similar for all the simulations, provided that the vessels are performing similar maneuvers (all dockings are conceptually similar to each other, and so are all the undockings). This is the reason why only two docks were chosen for the presentation of the results, albeit particularly representative. However, we agree that the results of the

bed evolution can be shown for each simulation providing benefit to the manuscript and reliability to the final results. Thus, for the sake of completeness and in order to guarantee a better traceability of results we agree with the referee comment, and we will produce all the 24 maps of total bed change. Nevertheless, we think that introducing so many images in the manuscript would negatively impact the fluency of the reading, so we propose to add the missing results as supplementary material, or at the most as an additional appendix using a matrix of plots, as suggested; 6. We believe that the action to comment number 5 will fulfill also the requests of the present comment; 7. Same answer as number 6; 8. We agree that the title as is might not fully represent the focus of the paper. We will accordingly change it in the revised version referring to the novel proposed methodology and to the erosion/deposition concept, which is the final objective of the article more than sediment transport in general; 9. We agree that we used the expression sediment transport in a way that might be too large (and maybe not fully proper). The abstract should better reflect that the focus of the article is the reproduction of bed erosion and deposition, functional to an optimized management of the ports albeit relevant space was given to the description and interpretation of hydrodynamics and consequent transport of sediment. In the final version we will change the abstract in order to better reflect these concepts, as suggested by the referee; 10. We will proceed with a deep language revision in order to make it more direct, concise and concrete. Long sentences will be divided into a few shorter ones and redundant concepts will be eliminated; 11. Suggestions on the fluency of the language will be followed, the formal mistakes on citations will be corrected and the overall conclusions will be supported to the greatest extent possible. The sentence in lines 553-555 will be revised; 12. Wrong format of citations of formulae will be corrected; 13. The addressed objectives will be clarified in the abstract and better appointed in the introduction. The “Results” section will be changed into “Results and Discussion”, since much discussion is performed here, as the referee appointed; 14. The comment does not require specific answers; 15. The comment does not require specific answers.

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