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Discussions

Interactive comment on "Numerical modelling of sediment transport in the Adriatic Sea" *by* A. Guarnieri et al.

A. Guarnieri et al.

antonio.guarnieri@bo.ingv.it

With respect to the interactive comments of Referee#2 our reply and comments follow. We are very pleased that most parts of the paper were clear and that the paper was judged interesting. We also want to thank the Referee for the several suggestions and constructive comments provided which will surely enrich the final version of the manuscript. More specific answers/comments follow: âĂć It is probably true that the main purpose of the paper doesn't emerge enough and that it might not be so straight forward to understand what we are mainly focusing on. Our main focus is: (i) the comparison with data, in particular those of sediment concentration along the whole water column (which we believe is something not very much showed in literature) and of sediment fluxes; (ii) show that for fine sediments a very sophisticated

bed model is not mandatory in order to resolve the main issues of suspended sediments and their transport; (iii) test the capability of the model of reproducing both the short time scale processes and the longer time scale processes; (iv) understand the most important mechanisms of sediment transport in the Adriatic Sea basin. All this will be re-discussed both in the introduction and in the conclusions in order to make it clearer. Moreover, acknowledging the Reviewer's suggestion proposed in the second point they arise, the revised version of the manuscript will consider also some aspects which have not been deeply analysed in the Adriatic Sea, such as the relative importance of buoyancy driven transport with respect to wind driven transport and possible long term transport related to tides. In general a deeper analysis of some mechanisms of sediment transport in the Adriatic will be performed, in order to define the importance of the different processes involved; The confine between what is already known and corroborated by our study, what our study additionally brings, and what still needs to be addressed in the future because yet unknown will also be more clearly addressed. However, the main findings and results of our manuscript generally corroborate the previous studies in the same area, as we have tried to include in the discussion and in the conclusions. In our opinion the contrasting findings with previous similar works are very few, and we will clarify them in the final version of the manuscript, suggesting the possible reasons why; âĂć The sediment flux prescribed at the Po river mouth is indeed continuous, and it is dependent on the flow intensity. Since we had not availability of realistic data of sediment concentration in the Po river we have "emulated" the results of a consolidated work (Bever et al. 2009, based on HYDROTREND) through a parameterization which might appear a little "crude", but which brings to results fairly consistent with those of the up-cited work; âĂć The comparison with data will be improved and more statistics will be included. One additional panel will be added to figure 5 showing the field of difference between modelled and observed sediment concentration. In figure 7 the plot of modelled transport and currents will be superimposed to that of observations and a panel with depth integrated sediment concentration and its RMSE will be added; âĂć The problem of the several

recalls to figures of other papers (in particular fig. 7 of this manuscript) will be mainly solved by plotting also the observed data, when available. Should this not be enough the option of a table highlighting the skills of the model will be definitely considered; âĂć The present work is essentially the prosecution of the works by Wang el. of 2002 and 2006. The hydrodynamics is similar to the one they have used, but in this work it has been deeply improved in terms of resolution, advection scheme, prescription of fresh water input from the rivers, tidal signal. The sediment transport sub-model also was born in the implementation of the works by Wang et al. (2002, 2006), but was here improved in order to limit the resuspended flux of sediment. Thus the choices of the sediment classes used here was essentially based on these studies. The calibration on the model's erodibility was mainly conducted with respect to the resulting sediment concentrations along the water column. The increase or decrease of the erodibility resulted in worst simulated concentrations when compared to those observed at the WHOI tripod. In this sense the calibration was then only locally conducted, and this may be a limit to the final results. Some specific considerations will be added in the text. âĂć We agree with the referee's comment that the fact that the initial conditions for the bed texture are not realistic might have an impact on the sediment transport patterns on the domain, even if we believe that qualitatively speaking the mainly marked regions of erosion/deposition will be preserved: we expect that the main depocenters of the Po area, Gargano area and offshore the Ancona promontory will form also with different bottom initial conditions, as well as the zone subjected to erosion within the very coastal belt of the western side of the basin. However we will perform some sensitivity tests before the submission of the final version of the manuscript and will consider them in the discussion and results. âĂć In figure 7 (which will be changed in the new version of the manuscript in order to present the observed data together with the modelled ones) the presented sediment flux is cumulated in time and integrated over the whole water column, while the current is showed only 75 centimetres above the bottom (not depth integrated), thus not necessarily the envelope of the two curves must be similar. Moreover the cross shore component of the current is generally less intense,

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especially during the most energetic events (see for example HC3, DS1, DS2); in fact the intermittence of the along shore component of the sediment flux occurs mainly during such events, or in general when the intensity of the along shore component of the current is particularly high. Finally, being the sediment flux the combination of currents and concentration of sediment it is modulated according to the presence of solid matter along the water column, which might as well result in a different envelope of the two curves; âĂć The text will be reviewed in general terms of language.