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

Anonymous Referee #1

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The paper describes how a sediment dynamics numerical model is applied to the Adriatic sea, in order to define erosion and deposition patterns during particular wind events (Bora and Sirocco, major wind types in the area), and over a longer time period (one year).

The authors do not cite Harris et al. (2008 : Sediment dispersal in the northwestern Adriatic Sea, JGR Vol 113, C11, doi :10.1029/2006JC003868), which is a significant paper of excellent quality describing circulation patterns in the Adriatic, wave effects, sediment coverage, and apply a sediment dynamics model to the same area (I am neither one of the authors nor in their teams !). Their model (based on ROMS) is compared to the same data set, yet : - their understanding of the processes at stake is obviously much more advanced - their expertise in sediment dynamics numerical

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modelling is undisputable.

The authors of the current paper probably want to gain local expertise in sediment dynamics modelling. However, the sediment dynamics part of their model itself is much more *Ãn rustic* *Ãž* than in Harris et al. 's paper (in term of forcing and processes), and the analysis of their model results suggests that they are not used to investigating the important outcomes of a sediment dynamics model (even if the team has definite expertise in ocean circulation modelling). The paper also suffers from some English language and scientific clumsiness (such as talking about *Ãn linearly proportional* *Ãž* variables, or detailing concepts that are basic for the sediment dynamics modelling community – formulation of the Stokes law for settling velocity or of the orbital velocity from the linear wave theory).

In some cases, using a simple model (e.g. easier to implement) may be justified, for instance because it does bring practical benefits. However, in this case, POM is similar to ROMS in its hydrodynamics complexity. SWAN is used for waves in Harris paper or this one (yet the wind forcing in the current paper is much more crude, which does have an effect on correctly representing the circulation patterns – the authors are aware of this). Both forcing models are therefore of equal complexity. The sediment transport part is different. The reason why advection is not computed in the boundary layer is not clear at all. Apart from the (restricted) area submitted to gravity flows of very high concentration, it is not justified. The paper assumes uniform sediment coverage in the whole Adriatic, and does not ever refer to the impact it may have on the simulated dynamics (since this initial bed coverage does not agree with the forcing conditions, and simulated bottom coverage will necessarily evolve with time). Yet, there is information in the literature regarding sediment patterns in the Adriatic. The relative contributions of resuspension (through bottom shear stress) and advection to suspended concentration are not at all mentioned, nor the relative contributions of waves vs. currents on the resuspension. Sensitivity to the initial condition (bottom composition), sediment settling velocity, erosion threshold, erosion flux, bottom roughness, are not at all addressed.

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Comparison to data is mentioned, but the reader has to look for figures from other published papers in order to get a feel for the results accuracy.

The paper should be more clearly organized: the model ability to reproduce the correct circulation patterns for Bora and Sirocco wind conditions should first be clearly stated (the team has already published papers about this). The consequences of all assumptions should then be explicitly assessed. Last, the paper has to bring something novel in the understanding of the local sediment dynamics, which is not really the case.

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