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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Turbidity in the fluvial Gironde Estuary (S–W France) based on 10 year continuous monitoring: sensitivity to hydrological conditions" *by* I. Jalón-Rojas et al.

Anonymous Referee #1

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The manuscript is based on a very detailed and extended data set, covering 10 years of monitoring at different stations in an estuary and tidal river. The data set is worthwhile to be published and the analysis of it reveals very interesting results. These results should convince authorities to extend monitoring of key ecological parameters, such as turbidity in other estuaries! The manuscript is (generally) well written and reasonably well structured. I recommend a publication of the manuscript in HESS after some revisions.

General comments

1) I was a little confused by the use of the terms 'low water' and 'high water' for discharge conditions. Usually they are used to indicate tidal elevation. I would therefore suggest replacing these words by 'low discharge' and 'high discharge' or 'low fresh water discharge' and 'high fresh water discharge'.

2) The abstract starts with 'climate change and human activities'. I was immediately focused on these terms, but only very limited information was presented in the ms on these subjects. What do you mean by climate change? Is it global warming and its effect on e.g. precipitation or do you mean climate variability, such as the NAO? Regarding the latter, the changes in e.g. duration of LW (low discharge) in Fig 15 correspond at a quick view (see http://www.cpc.ncep.noaa.gov/data/teledoc/nao_ts.shtml) with the variations in NAO index. The increase of LW duration in the 80's is correlated partly with a period (79/80-94/95) of positive NAO index. What is the effect of human impact (water usage for irrigation)? Do you have data that show the amount used for this purpose?

3) How do you define 'mobile mud'? Is this the same as fluid mud, high concentrated mud suspension or are these low consolidated mud deposits? Are the data given any direct clue for the occurrence of these 'mobile muds', do you have other data that confirm the existence of these features or is their existence derived from the behavior of the turbidity variations?

4) I was not completely convinced by the definition of TMZ that you use, ie NTU>1000. A TMZ in an estuary can be present even if the overall turbidity is lower than this value as it depends on the turbidity more upstream and downstream of it. The occurrence of TMZ in estuaries has been discussed a lot in literature, but I don't think that a certain turbidity value was proposed in order to have have a TMZ. You refer to 'old' papers from Allen et al (1977) and Allen & Castaing (1981) where they have used a threshold for turbidity in a TMZ. What is the scientific basis of using such a threshold?

Specific comments

1) p2846 line 18-19: Mention here that the tides are semi-diurnal.

2) p2847 line 17-18: 'However, the suspended sediments dynamics in this estuarine region are largely unknown': this should not be in the a chapter that is intended to present facts.

3) p2848: I can live with NTU, but why are you not using mass concentration (mg/l). Is it because of a lack of calibration data? What Is the correlation between NTU and mg/l? Is the correlation varying with season/discharge?

4) p 2848 line 27-28 to p2489 line 1: Not clear what you mean with "to at least 70% of measured values for the considered period of time". Is it that 70% of the data during a tidal cycle have to be of good quality?

5) p2849 Fig 2 is not necessary.

6) p2849 line 5: "Previous works have defined the TMZ in the Gironde estuary by a SPM concentration> 1 $gL-1$" Is this near-bed, surface or vertical averaged SPM concentration?

7) Last paragraph of §3.2: the results of the statistical analysis you describe here are not presented and discussed in the ms.

8) 4.1 Hydrological trends: the paragraph is better suited in chapter 2 (study site) and chapter 3.2 (data treatment).

9) Figure 3: quiet small and difficult to see. Possibly the figure will be more clear in the final version.

10) Figure 4: Indicate the date of the example and the location in the caption of the figure. The figure is small and therefore not clear, e.g. sub-figure 4c (right) is hard to understand.

11) p2851 line 1: how do you know that 9999NTU is > 6g/l? Add reference or explain.

12) p2851 line 7: Do you mean by mid-flood/mid-ebb mean water elevation? Is ebb and flood nicely correlated with tides, i.e. between LW–>HW/HW–>LW or is there a time shift? Maybe indicate in 'study site' to which part of the tidal cycle ebb and flood correspond.

13) p2851 line 12: is the discharge peak for the Garonne?

14) p2851 line 16: why do you call some floods 'peculiar' Is there not always a first flood after LW-periods? Better skip 'peculiar'. Can you show such a flood in a Figure?

15) p2852 line 1-2: sentence is not needed.

16) p2852 line 15 and Fig 5: in the text you mention 'contrasting hydrological periods' in the figure you mention 'season'. I agree that hydrological regime is strongly seasonal, but are there not also wet periods in summer and dry ones in winter? Is the behavior of the TMZ in the estuary similar in a wet/dry summer and a wet/dry winter period?

17) p 2854 line 7: showed –> shown

18) p2855 line 7-8: 'probably remained TMZ-originated mud' –> 'probably remains of a previous TMZ period'

19) p2855 line 27-28: What is different in 2010 as compared with dry and wet years? In the Table 1 several M(CC) pattern are indicated, however, in the text you write 'absence of CC pattern'.

20) p2856 line 9-10: "The prediction of TMZ location is a challenge in the fluvial Gironde estuary". I would suggest to skip this part, especially the 'challenge'.

21) p2856 line 12: 'presence of the TMZ': is it the presence or the position? See also my comment on the 1000 NTU as definition of TMZ. Possibly a weak TMZ is occurring?

22) Figure 3 caption: missing (e) Portets

23) Figure 4 caption: add date. What is a 'mean time step of river flow'? Do you mean

measuring time interval? add 'one' before 'hour'.

24) Figure 9: Not clear, especially part B.

25) p2857 line 3-4: "On the opposite, the effect of tidal range is null during floods, when turbidity is associated to sediments transported from the watershed." Replace 'null' by 'small', not very clear from the figure 9.

26) p2858 line 12: "discharges between 200-300 m^3/s". From the figure I would say discharges < 300 m^3/s.

27) p2859 line 3: 'may lead' –> 'may have lead'

28) p2860 line 7: 'especially since the 90': I see the duration increasing since the 80s.

29) p2860, line 9: see the general comment on climate change above. What is more important here climate change, climate variability (NAO) or human activity?

30) p2860 line 11: The volumes are 10 times smaller in Fig 15. what is the unit 'H m^3'?

31) p2860 line 15: " As the TMZ is concentrated and persistent, the required water volume to expel it increases". Do you mean that the SPM concentration/turbidity is higher in the TMZ or that the length of the TMZ is smaller?

32) p2860, line 20: has there been a deepening in the estuary and a change in tidal range and asymmetry? Not clear from the sentence. If yes, then an increase of SPM concentration in the estuary or the TMZ could also be due to a higher import from the sea. Is the origin of the mud terrestrial or also marine?

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