Hydrology and
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Sciences

Discussions

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Interactive comment on "An approach for data-driven characterization of tide and current fluxes in coastal basins" *by* Elvira Armenio et al.

Anonymous Referee #3

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The manuscript describes a field study of the dynamics of a semi-enclosed basin, influenced by waves and tides. The basin connects to the Gulf of Taranto through two main connections, an artificial one used for navigation and a natural one. The measurements focussed on the artificial channel where a bottom mounted ADCP, a wave array, and an acoustic level sensor were used to study the dynamics of the system. The flow in the channel are dominated by the semi-diurnal tidal forcing. Phase differences are found in depth, with a nearly progressive wave occurring at the surface, while near the bed the flow shows a phase difference of two hours with the water levels.

My main problem with the present manuscript is that its objective is unclear and not in line with the rest of the manuscript. The title, introduction abstract and conclusions seem to suggest that the manuscript introduces a novel data-driven methodology, or some unprecedented level of detail in the data collection. In the abstract the authors

state that the "work aims to demonstrate that a data driven approach [...] allows to directly identify key physical processes driving a coastal systems ...". Besides the ambiguous use of "data-driven" approach, I really do not see why we need a manuscript showing that collection of field data allows to identify key physical processes. Also, the measuring techniques used and the processing methods are not new and not particularly innovative or exceptionally detailed. This notwithstanding, I think the added value is in the potential insights it might give concerning the specific functioning of the "Mar piccolo" system. Focussing on this aspect the authors might rework the manuscript such that it is clear what it contributes.

Another major remark concerns the analysis of the bridge vibrations and the discussion about whether or not this will affect the measured tidal signal. If anything, bridges might vibrate with waves, but I have never heard of a bridge vibrating at frequencies close to tidal frequencies and I cannot think of how traffic induced vibrations would affect the measurements of tidal water levels. I suggest the authors leave out this part of the manuscript.

Detailed comments: The introduction is very general, and could be the introduction of any article in which data is collected in a coastal environment. I do not think that collecting data (or data-driven approach, as the authors call it) is the novelty of the manuscript. I agree with the authors about the need for intensive field monitoring to complement numerical modeling, but I do not see how this manuscript is bringing new insights here.

Section 2.1 Line 14: The two bays named "I Inlet" and "II Inlet" are not indicated in Figure 1 (Anyway I would not call give a bay the name "inlet"). Line 18: Please indicate location of the "Porta Napoli" channel in Figure 1 (does it correspond to St. Eligio pier?) Line 20: Funding information is typically included in the acknowledgments, consider removing it from here. Line 28: Please detail how the bias from waves was determined and how the effect of side-lobes was considered in the exclusion of the upper layer Line 29: ...profiles have been collected... (instead of collecting) Line 31: ...wave height

Hs have been acquired... (instead of acquiring) Line 32: move funding information to acknowledgments Lines 37-39: I do not think it is relevant to the manuscript who owns or manages the instruments

Section 2.2 Title: I suggest "data processing" Line 6: The first sentence seems a bit out of place, since the rest of the Section does not seem a logical follow up of that first sentence Section 2.2 already explains something about the processing of water level and current data. Subsequently paragraphs 2.2.1 and 2.2.2 give more details on these data, making it a bit confusing what exactly is explained in 2.2. Is this preliminary processing, or giving an overview of what is explained in greater detail afterwards?

Section 2.2.1 Line 22: Tidal data were first examined (instead of firstly examined) Line 22: Once blanks were removed the data were checked ... (instead of Preliminary, once checked...) Line 31: "The assessment on possible traffic induced vibrations [...] was considered necessary and appropriate". Please elaborate on why this analysis was considered appropriate. I have difficulty to see the necessity for such analysis as explained above.

Section 2.2.2 Lines 13-15 ... the net flows were estimated [...] it was approximated that the flow was uniform along the transversal axis... This is a questionable assumption, since significant variation can occur over the cross-section, comparable to the variations the authors observe in the vertical. Both the amplitude and phasing of the tide can strongly vary over the cross-section.

Section 3.1 Line 4 ...semidiurnal tide, with two typical crests and troughs each day...: remove the sentence after "semidiurnal tide". This sentence is just repeating that the tide is semi-diurnal. Line 7: "frequencies" should be "periods" Line 11: "increased due to rainfall contribution": Please explain why this discrepancy promptly attributed to rainfall. Line 11: "about twice" is a bit strange in this context since it strongly depends on the reference of the levels measured. Twice the depth makes sense, but I doubt twice the level makes sense Line 18: "the frequencies of the two signals are not compara-

ble, falling in completely different ranges": does it really need measurements to see that traffic induced bridge fluctuation are in a completely different frequency range than tides? I suggest this analysis is removed from the manuscript.

Section 3.2 Line 39: "monthly averaged" what the authors I trying to determine here, I guess, is the residual flow. Doing this with a monthly average might not result in the right figures, since spring-neap effects might still be in the residual. Why not do some low-pass filtering?

Section 3.3 Line 22: "the direction of the tide level reversed": The direction of a water level is undefined.

Section 4 (Discussion) It seems the authors continue discussing more results in the discussion section. Give the content, I suggest the discussion is merged with the results and a proper discussion is included where the study is placed in a broader context discussing its relations to existing literature on the topic of the manuscript.

Section 4 (Conclusions): Change section number to 5 Line 3: "Our approach has significance due to the unique high quality/high resolution collected data set". I think the authors collected a rather ordinary set of data. Although strong indication of stratification is present in the data, no information on salinity and temperature is presented. In what way do the authors think the data set is unique?

Figure 3: Indicate the diurnal and semidiurnal period

Figure 9: "current-velocities": add "(blue line)"

Figure 11: Exclude negative values from the ordinates axis, since R cannot become negative and add an R=1 line to clearly demarcate the ebb dominated from the flood dominated part

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