Response to the comments after the revision made by the editor: Matjaž Mikoš

We would like to thank the Editor for the time spent revising the manuscript. Please find below responses to the each of your remarks about the manuscript in a comment-by-comment basis.

Editor-Comment 1: p. 2, line 10 - the number of inhabitants/population in the City of Guayaquil would be nice to read.

According to the editor suggestion we modified the text in p.2 line 10 as follows:

Guayaquil, "La Perla del Pacífico" (The Pearl of the Pacific), is the most populated city (2,644,891 inhabitants) (INEC,2017) and the industrial and commercial capital of Ecuador.

Editor -Comment 2: p. 2, line 25 - could you add the height of the dam? Any discussion on the dam operation on flushing (yes/no) and the siltation rate of the reservoir would add to the paper.

According to the editor suggestion we modified the text in p.2 line 26 as follows:

The 78 m high and 250 m long earthfill dam creates an impoundment that covers 34,000 ha and stores over 6.0 km^3 (CELEC, 2013).

Editor-Comment 3: p. 4, line 9 - could you also give specific sediment production in t/km2 or kg/ha, we do not know exactly to what area we should use the average of 15 million tons of sediment per year.

There is no exact estimation of the sediment production in the upper basin, so instead of value in t/km^2 we added the extension area of the Guayas River basin for reference. According to the editor suggestion we modified the text in p.4 line 9 as follows:

The Guayas River basin covers 34,500 km^2, and according to CAMAE (2013), it is estimated that on average 15 million tons of sediment are produced annually as a result of logging, changes in land use and landslides.

Editor-Comment 4: p. 9, line 8 - could you comment on the value of the Manning friction coefficient of 0.0129 (low value) how good this values corresponds to other similar cases in the world?

According to the editor suggestion we added the following the text in p.10 line 4:

This value agrees with what is often found in large rivers and estuaries, where bedform roughness is low if bedforms are elongated and mildly sloped. According to the formula ascribed to Strickler (1923) by Henderson (1966), the lower limit where flow resistance would be governed by grain roughness only yields $n=0.034$ $D_{50}^{1/6} = 0.009$ $s.m^{-1/3}$. Hence, the Manning value employed in the computations is above the minimum value for physically realistic hydraulic resistance. In other words, grain roughness is found to form about 70% of the total roughness and bedform roughness about 30%.

References

CAMAE: Problemas que afectan la Navegabilidad en el Río Guayas, Informar, pp. 4–7, 2013.

CELEC: Revista 25 Años de la presa Daule - Peripa, Tech. rep., CELEC EP-HIDRONACIÓN, 2013.

Henderson, F. M.: Open Channel Flow, Macmillan series in civil engineering, Macmillan, New York, 1966.

INEC: Guayaquil en cifras, http://www.ecuadorencifras.gob.ec/guayaquil-en-cifras/, 2017.

Strickler, A.: Beiträge zur Frage der Geschwindigkeitsformel und der Rauhigkeitszahlen für Ströme, Kanäle und geschlossene Leitungen, Communications de l'Office fédéral de l'économie hydraulique, Mitteilungen des eidgenossischen Amtes für Wasserwirtschaft, Bern, No.16, 1923.

Response to the comments after the revision made by Reviewer 1: Mick van der Wegen

We would like to thank the Reviewer for the time spent revising the manuscript and the detailed comments provided. Please find below responses to the each of your remarks about the manuscript in a comment-by-comment basis.

R1-Comment 1: My first comment was related to the clarity of the methodology and you did not provide a response (" 1) Your methodology is as follows . 1-derive a 'realistic' bathymetry starting from a flat bed. 2- validate hydrodynamics-sediment dynamics and morphodynamics. 3- evaluate model results and scenarios. Update your methodology section so that it reads like this (especially wrt the morphodynamic validation)"). Maybe you overlooked. I still find that you do not explain your methodology clearly in the introduction. I think that it should be made clear just after the aim of the paper otherwise it only becomes clear at the end of the paper what you did (conclusions) which should not be the case.

According to the reviewer suggestion we added the following text in p.4 line 28:

2.1 Outline

A process-based numerical model was implemented in order to reproduce the morphological development of the Guayas River and the processes behind its evolution. The implementation of the model requires data of different nature that describe the boundary conditions and the geometry of the river. Among these data, the bed topography poses a particular problem, since information in a suitable resolution is lacking. Therefore, prior the analysis, the derivation of a realistic initial bed topography was performed with the aid of a long-term morphodynamic simulation. The respective validation of hydrodynamics, sediment dynamics and morphodynamics followed. Finally, according to the major developments carried out in the estuary, a number of scenarios was defined. The analysis is focused on evaluating the effects on the sediment budget of each of the individual scenarios, by comparison with a reference case that aims to mimic the actual situation.

R1-Comment 2: My second comment was related to a description of the initial bathymetry generation; You responded by a clear description of how the initial bathymetry was generated, but I fail to see this description in the manuscript. I think it is essential and that you have to include it since it is a crucial aspect of your work. Also this publication should be self explanatory..... "Available journal space" should not be the leading argument here. The text could read (based on your explanation text):

According to the reviewer suggestion we added the following text in p.10 line 11:

In relation to morphodynamics, since bed level data were lacking for a significant part of the inner estuary, a long-term morphological simulation was performed in order to derive the missing information, as mentioned in subsection 2.1. In that regard, the topography for the entire Guayas River was initially set as a flat bed. A corresponding initial level of 6.00 m below mean sea level was determined based on the theory posed by Savenije (2006), that describes a general equilibrium state for alluvial estuaries in which the mean depth and the tidal amplitude remain constant along the estuary. The model then is run until some stable

patterns are generated. The development of the estuary's depth (averaged over the domain) was used to assess the stability condition. In total, the morphodynamic simulation took about 200 years to reach the equilibrium, i.e., when the evolution of the estuary's depth remains constant. The obtained topography was contrasted against the few areas where information was available. It could then be verified that some characteristic observable features such as the formation of the "El Palmar Islet" were properly captured by the generated bed. As a final stage to validate the topography, the computed water levels were compared with those pertaining to measurements at the Guayaquil tidal station over a spring-neap tidal cycle. A similar model performance in relation to the results of the other tidal stations could be achieved. In addition, after performing a tidal analysis for both measured and modeled water levels, a generally good agreement could be verified for the amplitude and phases of the most energetic components. See Barrera Crespo (2016) for more detailed information.

References

Barrera Crespo, P. D. (2016). "Delft3D Flexible Mesh modelling of the Guayas River and Estuary system in Ecuador." Delft University of Technology, National University of Singapore, Delft. (http://resolver.tudelft.nl/uuid:c8a4c2f1-208b-4332-a17f-8afb28ec71e6).

Savenije, H. H. G. (2006). Salinity and tides in alluvial estuaries. Elsevier.

Response to the comments made by Reviewer 2: Dušan Žagar

We thank the Reviewer for the revision of the manuscript. Please find below responses to the each of your remarks in a comment-by-comment basis.

R2-Comment 1: P9-line15: please replace "somewhat constant" with a more suitable formulation; something (tidal amplitude) can be either constant or variable..

According to the reviewer suggestion we replaced the text "somewhat constant" with "constant" in p.10 line 10.