Hydrol. Earth Syst. Sci. Discuss., 9, C6824–C6828, 2013
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Hydrology and Earth System Sciences Discussions

Interactive comment on "Assessing hydrological effects of human interventions on coastal systems: numerical applications to the Venice Lagoon" *by* C. Ferrarin et al.

Anonymous Referee #2

Received and published: 19 February 2013

The manuscript " Interactive comment on "Assessing hydrological effects of human interventions on coastal systems: numerical applications to the Venice Lagoon"" by C. Ferrarin et al. analyzes the spatial and temporal dynamics of water residence time in the Venice lagoon in relation to the recent and future geomorphological changes occurred in the lagoon as consequence of human activities. The work also analyzes the consequences of the management measures in response to different scenarios of Sea Level Rise and climate change consequences.

general comments

The work is interesting as to anticipate the responses of coastal lagoons to human impacts and induced transformations, is essential to manage these important ecosystems. The only way to do it is just applying models based in the knowledge of the processes involved. This paper is a good contribution to the development of this kind of tools and therefore, is worthy to be published. However, some aspects are not clear enough and should be clarified or need more discussion in the ms before publishing. In its present form the paper is quite descriptive and focus on the changes produced in the Venice lagoon, however, the paper would gain in relevance if, using the Venice lagoon as reference could relate the general geomorphologic changes to the hydrological consequences. In this context I point out here some questions:

specific comments

1. According to the abstract, "the absolute values of the exchange between the lagoon and sea increased from 1927 to 2002 (from 3900 to 4600m3 s−1), while the daily fraction of lagoon water volume exchanged decreased". Constitutes this an apparent contradiction? In the discussion is said that "From 1930 to 2002, the water renewal time decreases slightly, as well as the daily fraction of water volume exchanged with the coastal sea. This was mostly due to the deepening of the lagoon and loss of marsh areas in the inner lagoon". Therefore it means that it is attributed to the increase in volume of the lagoon, but how are related both parameters (WRT and daily fraction of water volume exchanged) to produce this result should be clarified in the text and the ecological consequences discussed.

2. In the same way, "In the future, Venice Lagoon will evolve to a more restricted environment due to sea level rise and periodical closure of the lagoon from the sea during flooding events". But however, "Simulated scenarios of sea level rise showed that under fall-winter conditions the water renewal time will increased considerably especially in the central part of the lagoon". Again, it is an apparent contradiction due probably to spatial heterogeneity, but again it should be clarified and in the abstract and general conclusions it would be more relevant to underline the process than to merely describe

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the fact in Venice.

3. The comparison between successive years is justified on "the heavily modified morphology of the Venice Lagoon" and the simulations are performed on grids with different coastline and bathymetry. These transformations are described very briefly in page 13844or are disperse. The maps on fig 4 only show some new salt marshes or reclaimed areas in the central part since 1970. This is also well described the Mose effect and figure 5 shows the surface covered by different depths. However, other geomorphologic descriptors as total surface, mean depth, perimeter, etc. are lost despite it is recognized that " The evolution of the WRTs is linked to the different situation of the bathymetry, of the lagoon perimeter and of the inlets structure " (see Chubarenko et al., 2005 for some of the more relevant geomorphologic parameters in lagoon modelling) and some of them strongly affect the lagoon ecology (see Perez-Ruzafa et al., 2007). A table summarizing the main geomorphologic changes would be useful to put in context the hydrological transformations.

4. In the same context, it is assumed that SLR will produce changes on mean depth and water volume, but no mention is made to total surface, lost of salt marshes and perimeter. Probably the assumption that these parameters are not going to change due to coastal defences built to avoid flooding could be proposed for some areas, but can it be assumed for the entire lagoon?

5. The most conspicuous changes in WRT spatial distribution showed in figure 4 are between 1970 and 2000. Which are the main geomorphologic changes related to it? The maps do not show any evident change in perimeter or surface.

6. Some aspects of the functioning of MoSE structures are not clear. It is said that "Model results show that sea level rise and the closure of the MoSE gates increase the lagoon volume and reduce water fluxes through the inlets". The reduction in water fluxes is expected, but an increase in volume seems contrary to the expected effect of MoSE which are designed to prevent increases of sea level inside the lagoon.

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7. In the same context than 6, during the flooding events MoSE will be closed to prevent sea level rise inside the lagoon. However, "the Porto di Piave Vecchia channel is not planned to be closed during high water events" How it is expected that this channel affect the mean water level in the Venice lagoon. Will no affect it to the effectiveness of MoSE?

8. In the discussion, authors relate the expected increase in WRT with changes in benthic communities that can be overlapped or hidden by changes in trophic status. Eutrophication is also related to hydrological conditions and WRT. However, in all this discussion a factor of scale is missing. Some other Mediterranean lagoons show similar patterns and changes in benthic assemblages, related to modification in the inlets and changes in water interchanges and eutrophication processes with similar consequences than in Venice lagoon (see for example descriptions for the Mar Menor lagoon in Perez-Ruzafa et al., 1991, 2012) but with a change in the scale of WRT and sea lagoon fluxes of one order of magnitude (De Pascalis et al., 2012). How two lagoons with WRT, as different as days and near a year, can be quite similar in many aspects and show similar species richness and gradients, and changes in a few days in residence time can produce similar effects than changes in months?.

9. The discussion on r vs. K strategists is interesting, but probably not too accurate in coastal lagoons (see a paper in press but on line from Perez-Ruzafa et al in press).

Cited references in citation order

Chubarenko, B., V. G. Koutitonsky, R. Neves & G. Umgiesser, 2005. Modeling concepts. In GonencÂÿ , I. E. & J. P. Wolflin (eds), Coastal Lagoons: Ecosystem Processes and Modeling for Sustainable Use and Development. CRC Press, Boca Raton: 231–306.

Author(s): Perez-Ruzafa, Angel; Mompean, Ma Carmen; Marcos, Concepcion. Hydrographic, geomorphologic and fish assemblage relationships in coastal lagoons. Source: HYDROBIOLOGIA Volume: 577 Pages: 107-125 DOI: 10.1007/s10750-006-

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9, C6824–C6828, 2013

0421-8 Published: FEB 2007

Author(s): PEREZ-RUZAFA, A; MARCOSDIEGO, C; ROS, JD. ENVIRONMENTAL AND BIOLOGICAL CHANGES RELATED TO RECENT HUMAN ACTIVITIES IN THE MAR MENOR (SE OF SPAIN) Source: MARINE POLLUTION BULLETIN Volume: 23 Pages: 747-751 DOI: 10.1016/0025-326X(91)90774-M Published: 1991

Author(s): Perez-Ruzafa, Angel; Marcos, Concepcion; Bernal, Carmen M.; et al. Cymodocea nodosa vs. Caulerpa prolifera: Causes and consequences of a long term history of interaction in macrophyte meadows in the Mar Menor coastal lagoon (Spain, southwestern Mediterranean). Source: ESTUARINE COASTAL AND SHELF SCIENCE Volume: 110 Pages: 101-115 DOI: 10.1016/j.ecss.2012.04.004 Published: SEP 10 2012

Francesca De Pascalis, Angel Pérez-Ruzafa, Javier Gilabert, Concepción Marcos, Georg Umgiesser Climate change response of the Mar Menor coastal lagoon (Spain) using a hydrodynamic finite element model Original Research Article Estuarine, Coastal and Shelf Science, Volume 114, 1 December 2012, Pages 118-129

Angel Pérez-Ruzafa, Concepción Marcos, Isabel María Pérez-Ruzafa, María Pérez-Marcos Are coastal lagoons physically or biologically controlled ecosystems? Revisiting r vs. K strategies in coastal lagoons and estuaries Original Research Article Estuarine, Coastal and Shelf Science, In Press, Corrected Proof, Available online 28 May 2012

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 13839, 2012.