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Ocean Science
Discussions

# *Interactive comment on* "Seasonal renewal time variability in the Curonian Lagoon caused by atmospheric and hydrographical forcing" *by* G. Umgiesser et al.

**G. Umgiesser et al.**

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This is a good research article where the authors present the results of the validated hydrodynamic model (the 3-D SHYFEM) applied to the Curonian Lagoon to simulate the circulation patterns for ten years (2004-2013), forced by river runoff, wind and Baltic Sea level fluctuations. The main results are well explained briefly in the abstract – and later explained in further detail in Section 4 (Discussion and conclusions). Two main mechanics under wind forcing were identified (exchange with Baltic Sea, and internal mixing within the lagoon). The effect of the Nemunas River is discussed: a low effect on the internal water circulation but a strong influence of the river forcing on



the water renewal time (WRT). The WRT at different seasons is compared, and the authors showed a low WRT in spring close to the Nemunas outflow and a high WRT in summer in the southern basin. Inter-annual low WRT are in winter and spring and highest in summer.

In lines 3-5 of page 2057, the authors refer to high WRT in the southern basin (and a minor increase in the northern part) – can they perhaps explain why?

Answer: In the northern part there is always a strong forcing of the Nemunas River that drives the water out from the lagoon. Therefore, even with lower winds the renewal times of the northern part are less affected. In the south, however, there is only wind forcing, and the Nemunas River does hardly influence the situation. Therefore, stronger effects can be found here, and higher renewal times are the consequence.

The ice cover during long strong winters increases the WRT in the south and decreases in the north. Here the authors provide a possible explanation which explains such result. Finally, the strongest impact on the WRT distribution is shown to be the Nemunas inflow (7 months WRT for northern lagoon and 5 years for the southern part) – with the authors justifying such result. Section 1 (introduction) provides a good introduction to the Curonian Lagoon and a review of past numerical studies on the lagoon.

In line 28 page 2045 maybe the authors meant "... Lagoon is also characterised by ..." or "Also the Curonian Lagoon is characterized by ..."?

Answer: it is the first choice. We adjusted the sentence.

In Section 2 the authors described the study area (the lagoon), the different sources of data for boundary conditions to the model and numerical modeling framework (the title in section 2.3 should read "modelling" [is using UK English]).

Answer: we were always trying to use US English. We would prefer to continue to do so, unless the editor has some specific requests.

Furthermore, the WRT computation is clearly explained in section 2.4, with reference

to other articles for further details on the algorithm. In line 24 of page 2050, are there references or reasons for fixing the parameter of the Smagorinsky type closure to 0.2?

Answer: In another paper (Zemlys et al., 2013) we have used this value and had good agreement with data. We will insert a reference to this paper in the text.

Interesting to note the energy budget being symmetric with wind speeds of opposite direction, followed by an explanation. Table 1 explains well to the reader a summary of simulations carried out. The WRT for different seasons and different regions (northern and southern parts of the lagoon) are compared over the 10 years period.

Reviewer's Conclusion: The article is well structured: approaches are explained and results are identified and discussed. General comments are positive

Answer: We are pleased with the positive comments of the referee and thank him/her for his review.

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Interactive comment on Ocean Sci. Discuss., 12, 2043, 2015.