

## ***Interactive comment on “Implications of different nitrogen input sources for potential production and carbon flux estimates in the coastal Gulf of Mexico (GOM) and Korean coastal waters” by Jongsun Kim et al.***

**Anonymous Referee #2**

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General The authors use a simple box model to estimate the potential primary production and associated oxygen demand in to region, the Gulf of Mexico and Korean coastal waters. The aim and scope of the paper seem interesting and valuable for the scientific community. The method, a box model driven by observational data, is generally valid and has been used in numerous publications before. However, the authors apply several simplifying assumptions that could flaw the study: 1) DIN removal equals potential primary production – the ratio of this assumption should at least be explained and critically discussed, 2) assumption of absence of denitrification (even though at

C1

least in GOM there is large hypoxia reported). Thirdly, the hydrodynamical background of mixing between the different compartments/boxes has not been made clear. The authors should think of taking into account modelling works or extensive measuring campaigns presented in the literature in order to deliver a decent foundation for their numbers.

Details - P. 10, II. 150-152: How are ‘output terms for water mixing’ calculated in detail? Table 3 says  $\lambda_{Mix}$  equals the ‘reciprocal of residence time’. Is this a realistic approach? In a tidal environment the work done by ‘mixing’ (dispersion would be more appropriate) increases with residence time instead of being a reciprocal. Maybe this does not apply to GOM and Korean waters but this must be described in detail (dependence of horizontal mixing, i.e. dispersion, on river run-off). - P. 10-11, II. 160-161: How can gradient of N-concentration between boxes affect the exchange rate? N cannot drive a flow (affect equation of state). - P. 17, II. 317-318: Why different threshold for ‘brown zone’ in case of GOM and CSK? “We defined” should result in one definition applying to both regions, otherwise zones can be adjusted by tuning thresholds to give geographically sound ‘results’ for each region. - P. 18, I. 333: MCK or CSK, what is the correct abbreviation? - Figure 1: Please increase font size of axis tick labels, use approximately same size for all panels - Eq. 1-3: Please include units. - Figure 3: The conditions of “Export N (Mixing)” need some fundamental discussion in the text - Figure 4: This figure is difficult to read. Authors should think of a way to show spatial and dynamical information in one figure; for example they could show a map of GOM (like Fig. 6) with a polar graph representing current speed and direction during one season. The current figure does not really help understand what is happening in time and space. - Table 4: How can EPP be higher than PPP? What does this mean? - Please check citation “Rowe and Capman (2002)”. Authors seem to cite wrong title which should read “Continental Shelf Hypoxia: Some nagging questions”.