Laurent et al., 'Simulating the effects of phosphorus limitation on the Mississippi and Atchafalaya River plumes'

General Comments - This paper uses a modeling approach to investigate nutrient limitation on the heavily eutrophied Louisiana continental shelf. It is a follow-up to an earlier paper by Fennel at al. which initially used a similar approach in this area. The major advances here are that Laurent et al have 1. included inorganic phosphorus cycling in their model whereas the earlier model included only inorganic nitrogen, and 2. have included two additional regions in their model, Atchafalaya Delta and Atchafalaya Intermediate. This allows Laurent et al. to look at the effect of the Atchafalaya River on nutrient limitation in the area. Both these additions are significant enough to warrant an entirely new manuscript. Additionally, while there is quite a bit of field data from this region, it is spotty in nature and the modelling data presented here fills in the gaps for where there is no data. The manuscript is well written, the model works well and generally mimics results from field data, and overall I found the work to be excellent, relevant and needed (there is little to no work modeling the effects of P-cycling in this area, despite it's importance, and the effects of the Atchafalaya River has also only recently been investigated).

Specific comments -
1. In the abstract, on line 4, please add "in marine waters" after While phytoplankton growth is considered to be typically nitrogen-limited"

2. line 107 - how were k_{NO3} and k_{NH4} chosen? This is explained for k_{PO4} but not the N compounds.

3. this may be me missing something, but could you add a sentence explaining $min(L_N, L_P)$?

4. line 170 - can you name one or two of the unresolved processes controlling chlorophyll biomass? this is a bit vague.

5. line 190 - are the LUMCON observations shelf-wide or just Line P? if just a few stations, this could be why agreement with that data is not as good...

6. line 292 - can you reword the first sentence of the discussion to include that variability in the delivery of nitrogen is the most important factor limiting phytoplankton growth in the NGOM? it is really the change in DIN load over the year that drives the patterns in nutrient limitation seen here.

7. light limitation is not part of your model - this is fine, but can you make any inferences about it's potential (or not) importance?

8. Figs. 8 & 9 - are the values in the columns summed? i'm not sure i understand the stacked columns. for example, in Month 2, Fig. 8, is Miss. intermediate 25? and far field 40? perhaps this data could be presented in a more intuitive way...