Anonymous Referee #2

You state that you would need only two parameters to implicitly define all elements of the carbonate system, which is basically correct. But you say you would use DIC and TA for that. You could use DIC and carbonate alkalinity to calculate CO2 concentrations, for instance. But using TA instead would lead to erroneous result because of the non-carbonate contributions to TA. I see that you are representing ammonium and phosphate in your model, and it seems like they are included in TA in the model. But It is not clear to me whether you subtract ammonium and phosphate from TA to calculate carbonate alkalinity, and use that to calculate CO2. Here, I would like to see a much more detailed description of how you actually calculate CO2 concentrations and pH, including equations.

Additional answers to the previous answer A3

We completed new simulations and recalculated the CO₂ emissions to take into account the remarks on the TA. Indeed, we removed ammonium and phosphate from the total alkalinity when calculating the pH.

Scenario	CO ₂ emissions (See Table 4)
	$kgC km^{-2} yr^{-1}$
Reference (see Table 4 of the MS)	5619
Using (CA = Total alkalinity – ammonium – phosphate) to calculate the pH	5733

The new simulation showed that taking into account TA or "TA - ammonium - phosphate" to calculate pH (Culberson, 1980) led to a difference in CO₂ emissions of less than 2%. This small difference is related to the fact that the Seine basin is a highly carbonated basin where carbonate alkalinity can be approximated by total alkalinity.