Author Comment on behalf of all Co-Authors

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General: We thank the referee for his comments that helped us improve the present manuscript. The referee had two main concerns:

- The referee argue that including an explicit zooplankton compartments would change the results of the present study.

- The referee questions the validity of the hypothesis concerning constant osmotrophs abundances in varying TN and TP conditions.

In the present response we will try to clarify what we intended to represent with our model and how it is relevant for the observed DOC dynamics at the surface of the ocean. We will also try to convince the referee that given the question addressed in this paper, the consideration of an explicit zooplankton stock is not essential to the present study. We however agree that the influence of zooplankton should be at least discussed more extensively in the discussion section.

Assuming that the surface water of the Mediterranean Sea during summer could be considered at steady state is a strong hypothesis. However, we believed that it is not entirely unreasonable given the rather constant biomass/cell abundance observed during this period compared to autumn/winter or spring periods. If we consider our steady state assumption as a valid hypothesis, two questions could be addressed separately:

- What are the factor influencing the steady state values of the different stocks (in terms of C, N and P) during the stratified period ?

- What is the influence of the inorganic nutrient concentrations on the accumulation of DOC during the stratified period ? (considering algal bacterial competition for N and P and commensalism for C)

In order to address the first question, we agree that an explicit zooplankton compartment is required, as it would influence the steady state concentrations of inorganic N and P. The general idea being that part of TN and TP would be stored in the zooplankton biomass making it unavailable to osmotrophs. The exact effect of grazers on the steady state concentrations of N and P will however strongly depend on the assumptions made concerning their stoichiometry and on their ability to store N and P.

For the second question (which is the question addressed in our study), it did not appear necessary to us to explicitly represent a zooplankton compartments since from a carbon point of view it will only act as sink (a process implicitly

taken into account in our simplified model when we stated that only 50 % of the carbon biomass produced in the system is return as DOC assuming that the remaining 50 % was respired by zooplankton). By addressing both question separately, we can deconvolute the bottom up effects from the top down effects and look at their influence on the DOC dynamic separately. This paper was the first step toward a complete study of DOC dynamics and focused on bottom up effects.

Concerning our choice of constant cell abundances in varying TN and TP concentrations. We agree that this hypothesis is counter intuitive since many studies show a correlation between living biomass and the total amount of the limiting element (N or P). If we consider constant elemental contents per cell, then a relationship between cell abundances and the limiting element must also exist. However, in our approach we assume that the N (or P) cellular content of osmotrophs was variable. As a result, although the relationship between TP or TN) and cell abundances is not verified, the observed relationship between TP and the biomass in term of P (or TN and the biomass in terms of N) is reproduce in the model (see figure 1). We agree that we could only have consider the results for which a linear relationship between biomass and limiting element was verified but it does not change the conclusion of the present study. We however propose in the revised version of the manuscript to consider only the simulations for which the relationship between biomass and the limiting element is verified. In this case, TP would range between 10 and 25 nM and TN between 160 and 400 nM.

Figure 1: Phosphorous biomass as a function of total phosphorous (top), Nitrogen biomass as a function of total nitrogen (bottom). All results are from the model simulations presented in our paper