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# *Interactive comment on* "A NEMO-based model of *Sargassum* distribution in the Tropical Atlantic: description of the model and sensitivity analysis (NEMO-Sarg1.0)" *by* Julien Jouanno et al.

**Anonymous Referee #1**

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This paper proposes a first attempt at 2D biogeochemical modelling of an important present example of pelagic algal mass proliferation, due to the Sargassum genus in the tropical Atlantic area. As mass strandings of these floating Pheophyceae are very harmful for the Carribean economy and, potentially, for human populations, trying to deterministically explain this phenomenon and to assess the respective roles of several potential causes appears to be fully required. By using a deterministic modelling approach, the authors have taken the right path, but some questions remain unsolved in this first model. 1/ Why is the Sargassum module not embedded in the global biogeochemical model? The present model is a 2D layer of surface water (thickness = 1m), in which the nutrient pools (as well as the concentrations of the various phyto-



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planktonic competitors of the macrophytes) are forced daily from a pre-existing model of pelagic ecosystem in which Sargassum was absent! So, nutrient depletion is not induced by Sargassum mass proliferation and Sargassum cannot win any competition with phytoplankton. In classical eutrophication models, a feedback from the growing macrophytes towards dissolved nutrients is considered as a key control of the process. In order to make their assumption of no feed-back more acceptable, the authors should at least provide in their discussion a quantitative estimation of the daily consumption of inorganic nutrients N and P by Sargassum mean biomass and compare it to the phytoplanktonic consumption and the existing dissolved stock. If the Sargassum uptake should appear to be of same order of the phytoplankton one, the model should be re-run with the Sargassum module included in the biogeochemical model. 2/ The simulated Sargassum compares favorably with satellite observations in July-October, but shows heavy proliferations in March-June which seem not to be observed. Why ? Is the temperature the main driver for that ? 3/ The most interesting (and “hot”) question lies in the role of recently increased river inputs of nutrients. The paper should show more clearly the extension of the main river plumes, not in terms of salinity, but perhaps in terms of %of increase of ambient natural nutrients. Moreover, numerous eutrophication models (Radtke et al., 2012; . Troost et al., 2013; . Dulière et al., 2017; Große et al., 2017; Lenhart and Große, 2018) have now used the numerical tracer method initially proposed by Ménesguen et al. (2006) to track in the whole biogeochemical net the nitrogen or the phosphorus coming from any source. Application to the Amazon could for instance quantify its effective role in the Sargassum mass proliferation. 4/ As indicated lines 144-145, this paper is not the first one taking into account the drift of macroalgae in eutrophication modelling. See Bergamasco and Zago (1999), Brush and Nixon (2010) or Ménesguen et al. (2006), 5/ Some Sargassum parameters must be more precisely founded âĂć The values of the half saturation constant for N uptake (NO3+NH4) (0.0014 mmol m-3) and the half saturation constant for P uptake (0.0044 mmol m-3) seem to be very very low, so that the ambient nutrient increase by river loadings can be expected to exert no influence on the Sargassum nutrient limitation. The

authors should find measured values in the literature, and compare their half saturation constants to the mean ambient concentrations of dissolved nutrients. âĂć Maximum sinking rate is not correctly defined in Table 1 : 0.0.057 (probably 0.057 d-1)

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