

Biogeosciences Discuss., referee comment RC1
<https://doi.org/10.5194/bg-2021-90-RC1>, 2021
© Author(s) 2021. This work is distributed under
the Creative Commons Attribution 4.0 License.

Comment on bg-2021-90

Anonymous Referee #1

Referee comment on "The Bouraké semi-enclosed lagoon (New Caledonia) – a natural laboratory to study the lifelong adaptation of a coral reef ecosystem to extreme environmental conditions" by Federica Maggioni et al., Biogeosciences Discuss., <https://doi.org/10.5194/bg-2021-90-RC1>, 2021

This work is very detailed chemically, physically and biologically. It provides very accurate temporal measurements and data that characterize the Bouraké semi-enclosed lagoon of New Caledonia quite well. Consequently, although quite extensive, it seems a good paper that addresses relevant scientific questions for this journal. However, based on their results, I do not agree with the authors' assertion that this area is a natural analogue to the future affected by climate change.

Specific comments

The methods used here are well developed and valid. The results support most of the conclusions (see comment below). The authors describe in great detail the measurements taken and the calculations performed, sufficiently for reproduction, and generate interesting results that are well represented by the corresponding figures and tables.

As the authors have pointed out, this work describes a "natural laboratory" of great scientific interest. However, the authors have described the mangrove of New Caledonia as a place with the characteristics "analogous to future climate change" and in my opinion this term is incorrect.

Although the CO₂ seeps are considered to be analogous to future conditions, due to the extra input of CO₂-rich volcanic gases. This does not apply to the mangrove described in this paper. The results presented in this paper affirm that in addition to the chemical parameters typical of climate change (CC) studies, there are numerous external elements that are affecting the living things that live in the mangrove. When we talk about a natural laboratory to study the effect of climate change, we are talking about a place where we can study the future effect of CC on organisms *in situ* and in my opinion it is not possible

to do this in mangrove areas.

That said, it is still a very interesting place as a natural laboratory. I agree that it is a special place to see the adaptation of corals and other living organisms to extreme environments. Therefore, I suggest that the authors change the comments related to being "analogous to future climate change", both in the title (see below), abstract (e.g. lines 17-19), introduction (e. g. lines 50-51), discussion (e.g. 562, 788) and conclusions (lines 804-805).

Again, I want to emphasize the idea that these mangroves can be considered as tools for species conservation in the future that we will face due to climate change and human activity, and this can be commented on in the discussion perfectly well (which the authors have already done).

Ergo, after reading the content of the article and knowing its results, I recommend to the authors a change of title: "The Bouraké semi- enclosed lagoon (New Caledonia). A natural laboratory to study the life-long adaptation of a coral reef ecosystem to *extreme ambient conditions*" or something like that.

On the other hand, I have noticed some lack of bibliography in the discussion, as in the lines 562, 564, 610, 623, 653 comments that would be better if they were supported by the corresponding literature. I would also like to add my recommendation in line 657, I could replace the citation from Teixidó (paper on species diversity in the Mediterranean) by any other work related to corals or sponges in tropical seas, for examples, Enochs et al., 2015 nature climate change letters.

Technical corrections:

Although Figure 10 is added at the end with which the map was made and the source of the photographs, this information is missing in Figure 1. It is recommended to add the following information to Figure 1.

Lines 236 and 237, *in situ* and *in vitro* should be in italic.

Line 589 remove additional "(".