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Comment on bg-2021-90

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Community 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-CC1>, 2021

The authors examine temporal and spatial variability in environmental conditions in a semi-enclosed mangrove lagoon in New Caledonia. Their results show that this system experiences extreme fluctuations in key environmental parameters mainly explained by tidal variations. I acknowledge the amount of work presented here that is especially useful and relevant to study the impact of temporal scale variability in ecosystems and its role in future global environmental change. However, this manuscript has substantial issues, and my main comment concerns the use of the literature. It is unfortunate that the authors fail to acknowledge important existing literature directly relevant to their study. For instance, a large gap in their discussion concerns the explanation of why environmental conditions fluctuate in such way. Even if they acknowledge the role played by the mangrove forest in explaining the recorded variability, they mostly fail to provide a mechanistic explanation. Intertidal areas, especially mangrove habitats, are well known to experience fluctuations in environmental parameters such as conditions described here. Please refer to key papers such as Alongi et al., 2004 and Dittmar et al., 2006 explaining the role of the large amount of organic matter in driving deoxygenation and acidification of water in productive environments such as mangrove areas. Also, please refer to Li et al., 2009; Bouillon et al., 2007; Gleeson et al., 2013; Call et al., 2015 for an explanation concerning the tidal pumping, a well-known mechanism responsible for deoxygenation and acidification during the ebbing tide. Therefore, their results are not surprising and expected for an area like this semi-enclosed mangrove lagoon.

Additionally, authors claim to have discovered this system which provides new means to study the future impact of climate change; however, this is not true, and previous works should be acknowledged. This site has indeed already received considerable attention starting as early as in 1988, regarding the environmental conditions (Komornicki, 1988; Thollot, 1992; Dubuc et al., 2019a) but also the benthic composition (Thollot, 1992) and fish assemblage composition (Komornicki, 1988; Thollot, 1992, Thollot et al., 1999; Dubuc et al., 2019b). These studies need to be acknowledged and the novelty of their own work considerably toned down.

Other minor comments:

Authors mention that they have collected environmental data from YSI probes starting in February 2016; however, their time series start from October 2018 and there is no further mention of recordings during 2016. This issue should be addressed by either providing the data, or by correcting the start year if this is a mistake.

The manuscript could benefit from additional work to correct for language mistakes and clumsy phrasing, see below for a few examples:

l.79: subject(ed)

l.87: to understand better; to better understand

l.94: were exposed 44 % of (the) time

l.100: remain(s) unclear

l.169: diel tide cycles: it can either be tidal or diel cycle one referring to a 24h cycle and the other referring to the tidal cycle of 12h observed in New Caledonia.

l.125: the spring tidal cycle; simply say spring tides

l.734: hypoxia is species-specific and cannot be determined by a single value. I suggest changing the wording.

735: The natural laboratory of Bouraké, where DO fluctuates with the tide, in combination with other environmental stressors, offers a perfect setting to test the practically unknown effects of deoxygenation and hypoxia thresholds in reef-building corals exposed to acid and hot conditions (Nelson and Altieri, 2019; Hughes et al., 2020). This sentence needs rewriting. I suggest deleting hypoxia thresholds.

l.739: Besides the hypothesis that environmental variability improves the metabolism of organisms, particularly their resilience to extreme conditions, a series of other physical and chemical parameters in the Bouraké lagoon may work in combination to offset or enhance these effects. This sentence is confusing.