

# ***Interactive comment on “Chemical characterization of Punta de Fuencaliente CO<sub>2</sub> seeps system (La Palma Island, NE Atlantic Ocean): a new natural laboratory for ocean acidification studies” by Sara González-Delgado et al.***

**Anonymous Referee #2**

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The Authors performed some measurements of the seawater carbonate chemistry around Punta de Fuencaliente CO<sub>2</sub> seeps. It focused on the role of groundwater discharge in the acidification of the local beaches. The aim was to describe a new natural analogue to study future (and past) conditions. While the description of such a system is welcome as each extreme site could add insight toward a better understanding of the mechanisms involved in the stress response, this system is far to be a natural analogue to study the effect of OA. With this in mind, I suggest the Authors to revise the ms

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according to what they recognised to be central in their study (L 273), and improve the methods description, figure legends, which make this ms hard to be follow. However, I think the data are good and merit to be published. Some suggestions in a puzzling order: I do not understand the sentence in L 20. Both CO<sub>2</sub> seeps and acid brackish water contribute to change the seawater chemistry! Wow! Authors should be more cautious about certain ideas. It is hard to think that these kind of systems could be used to understand how life persisted through past Eras. Ok for potential future scenarios, but with several assumptions.. L 31 and 34. The best references for this general sentence are Hall-Spencer et al 2008 and Dando et al 1999 respectively. Note for the Authors. It would be great to see here the relevant literature instead of Gonzales-Delgado and Hernandez 2018 only. For instance, Vizzini et al 2016, Pichler et al 2019 should be cited with regard to the potential biases of trace elements at seeps. L 64-68. This part is not clear. It suggests that the lagoons receive fresh inland ground water and a slight dilution of the seawater in the lagoons, so it receive water from both. Then the author state that "this indicate that the system is affected by the submarine groundwater, which probably originate from the thermal waters". What exactly the Authors want to say? And, without the data found (we are in the introduction) is it quite speculative, isn't it? L 65. "there are brackish lagoon located .. about 22m from the coastline", actually within 50 m in Fig. 1, and 100 m in L 229. Methods. This section needs to be deeply improved. The sampling methods and analyses need to be described. Fig. 1. I understand that panel left in c represents the lagoon, but what about panel right? The legend should contain more details and the figure should be self-explained. What is the role of the two identical stars in panel right which are repeated in fig 2 in all the sites? Are the figures with colour? It is difficult to read the pH etc. Nice work putting lat & long but meters would be better to directly appreciate the extension of the area. Authors wrote that sampling were performed between 0 and 2 m depth (need details in the methods). Is the sites so shallow everywhere? Considering the 2 m oscillation in the tide, why the Authors only sampled the intertidal zone? Fig. 1 vs results. Well it is hard. Ok, sites Playa del Faro, Los Porretos, Lagoon 1 and 2 (also Enchentive, called

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Playa Echentive in Fig 1 table b); Las Cabras?? Last eruption was in the 17th century? L 116. "In all cases, the anomalies were the highest during low tide." Please change the word anomalies. So what? Where are the seeps? On the beach? Their extensions? Their depth? Salinity was 31 in the lagoons and normal near the coast. These measurements did not suggest any link between lagoon and the beach. So, L 127-128 how the Authors can state that the SW carbonate chemistry was strongly affected by the entrance of water with less salinity? L 141. "During high tide, the anomalies almost disappeared.." which support the hypothesis about the role of the lagoon in the local beach acidification. But, if they exist, what about the CO<sub>2</sub> seeps it was supposed to acidify the area? Fig. 7 the figure is fairly useless and does not describe the role of the lagoons. L. 202. PFS. Please just write the location. L. 205. I agree with the fact that this system is similar to the Ojos in Mexico. The latter has been a highly debated "natural analogue" to future conditions since the groundwater discharge profoundly change the seawater chemistry and do not mimic what we should expect in the future. CO<sub>2</sub> seeps are more "realistic" in some ways and with limitations. I invite the Authors to pay attention about this potential caveat when using the PFS as a natural lab to study the effect of ocean acidification. Paragraph 4.3. Sorry but La Palma is not similar to other natural acidified systems, and I do not believe it is a very useful spot for large-scale and long-term adaptation experiments...to be used as an analogue of climate change scenarios. Please, be objectives. For instance, although the data are nice and I understand the effort put in such a sampling, from this data set it is not clear what is the real variability in time and space (L 238: PFS have been characterized from the shore to offshore.. is not really true, at least from what I understood by reading the few details given in the methods). The Authors suggested some of these caveats in the 20 lines from L244, which is good. In the discussion (paragraph 4.2) some speculative observations about the community are described. It is complicate to appreciate the site as a natural lab with only such a scarce description of the biota. Then, L 259 the Authors added this sentence: "only one type of rocky benthic habitat is present.." Well, we know that OA will affect the marine organisms (maybe) but I think this is too much! Maybe

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there are some caveats in using this interesting site as a natural analogue. The last sentence (L 273) is, in my opinion the best one describing the aim of this study. I invite the Authors to revise the paper in the direction they finally described. Conclusions. I disagree with most of its content.

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