

Author's response to reviewers' comments (bg-2022-148-RC1)

On behalf of the authors, I thank Reviewer #1 (Dr. Ana Silva) for the positive assessment of our manuscript, as well as the constructive comments and suggestions. On the following we provide a point-by-point response to the issues raised during the review process, and list/discuss the changes done to the revised version:

Overall this manuscript provides a short summarising view of groundwater as a linking element between land and sea. Its scope is adequate for the publication format and the argumentation is well made in several key points. The topic and scope are very timely and match a research area reaching a cumulative point of becoming useful in management contexts. Albeit of considerable utility to the target readers, the manuscript reads mostly as a summarising text, where the authors' own contributions appear very scattered and hard to find; summarising their original contributions at the end of the sections might be a simple solution to enhance the manuscript's uptake and impact. I made several annotations in the attached pdf to be considered by the authors. Most reflect a need to alter the document to become more reader-friendly and add some contribution ambition, which is somewhat limited in this version. The point made about the common language/proposed framework for existing methodologies would be a particularly desirable adding value.

Reply by authors:

Many thanks! We are glad to see that our manuscript is seen as useful for researchers from a wide range of expertise. We would like to clarify that with this manuscript we aim to present the readers our view with respect to the impelling need of developing a framework for joint, multidisciplinary studies on FSGD and OFG, rather than offering the framework itself or recommending an optimal combination of methods which should be used. We contend that identifying the current data and process understanding gaps in FSGD/OFG research (as presented in this manuscript) is precisely the author's contribution requested by Reviewer #1.

l. 74–76 This may be a limited definition as it seems to leave out the groundwater flowing at the surface from coastal aquifers into the intertidal zone. I encourage the authors to add information and arguments positioning this situation in their 2-element classification. for instance see:
<https://www.sciencedirect.com/science/article/abs/pii/S0141113622001179>

Reply by authors:

Thank you for the suggestion. We disagree in that our definition disregards FSGD into the intertidal zone, since it generally refers to flows of groundwater to the ocean, independent on the level at which this might occur. However, we would like to avoid other readers having the same impression and therefore changed slightly our formulation so that it is clear that we refer to fluxes into the ocean through the coastal zone (which by definition includes the intertidal). We hope this clarifies the confusion. The revised sentence reads as follows: “*The first comprises meteoric groundwater flux from terrestrial aquifers through the seabed (including the intertidal zone) into the coastal ocean, (...)*” (l. 75–76 of revised manuscript).

l. 103–108 given this self-proposed context I suggest for sections 1+2 have a dedicated subheading focusing on current bottlenecks/limitations/gaps so that the reader can obtain a summary of where we are now in this research, ie, state of the art. This would also help further in justifying the review pertinence.

also and importantly, given that the authors claim here existing issues related to subfield-languages heterogeneity, I would expect this review to be greatly imprived by adding the objective of creating a standardised framework integrating the most promising methodologies and proposing a common language. this would enable a practical uptake of this manuscript, enhancing its impact.

Reply by authors:

Thank you for the suggestions. We would like to clarify that our manuscript purposefully deviates from a review paper, since we think there is already an important number of excellent papers of that type which address the specifics of our current knowledge on e.g. hydrological, geological, geochemical and biological aspects of groundwater fluxes and reservoirs.

We contend that we have included information on bottlenecks/limitations/gaps throughout the different sections of the paper. Considering that these aspects can look different depending on whether we are discussing, for instance, spatial distribution or environmental impact, adding subheadings to sections 1 and 2 (as suggested by Reviewer #1) would imply adding them uniformly through all sections. Including subcategories that apply to all sections is rather unfeasible and we think the result would not be in the best interest of the reader because of an unnecessary increase in the complexity of the document.

Moreover, the main goal of our manuscript is not to provide a unique framework which can be used by all groups conducting research on FSGD and OFG, but rather to convey the need of developing it and provide examples on its added value, should it be used for future multidisciplinary studies. In summary, we hope that our contribution fosters future (international) initiatives for joint investigation of FSGD and OFG.

l. Section 3 This section requires additional sublevels of subheadings categorization given its extension and scope; as it is, the reading flow becomes very cumbersome

Reply by authors:

Thank you for the suggestion. However, we respectfully disagree. This section comprises five interrelated paragraphs which follow a logical sequence that would be interrupted by sublevels. Also in this case we do not think that separating the text would help the reader to grasp the arguments presented in this section.

l. 175–177 This requires further explanation/detail to support the argument pertinence

Reply by authors:

Thank you for the suggestion. We changed our formulation in order to strengthen our argument. The revised sentence reads as follows: *“In contrast, the role of OFG as a fresh- or brackish water habitat within a purely marine environment remains unknown and might constitute a new frontier in ocean sciences, also in view of its potential exploitation as an unconventional source of water.”* (l. 176–178 of revised manuscript).

l. 360–362 consider adding here also this alternative method based on thermal imagery: <https://www.mdpi.com/2077-1312/10/3/414>

Reply by authors:

Thanks for the suggested reference. We have added it, both within the text (l. 365–366 of revised manuscript) and the list of references.

Section 5 I strongly encourage the authors to provide here either a method-focused summarised figure or table. This section is very long, detailed and for the readers benefit, the authors should finish with their proposed (combination of methods?) solution for different scenarios

Reply by authors:

Thank you for the suggestion. As explained above, the purpose of our manuscript is not to provide an “ultimate” guideline on how to carry out joint FSGD/OFG research, but rather to identify the current gaps as well as potential ways of cooperation to address those gaps. We are reluctant to provide a “recommended” approach, since to that end a higher level of international coordination would be needed. The realization that activities to achieve that coordination is timely, is precisely what we would like to bring to the community with this manuscript. As for the length, we respectfully disagree since we see no reason why this particular section should be further shortened (it is indeed the shortest of the manuscript).

l. 466 I strongly encourage the authors to add a "conclusion" section focusing in the impacts of their analyses and discussions in the manuscript, ie, added value of the proposed tasks as a whole, contours/preliminary framework for unifying/merging methodologies and common language approach,

Reply by authors:

We respectfully disagree. In our opinion, a conclusions section is not appropriate for this type of manuscript because we are not presenting and/or discussing scientific results. Moreover, considering the length of the paper, a summary of the arguments brought about within it would not represent a significant contribution. With our last section (5), we instead hope to convey suggested ways forward which are derived from the knowledge gaps which were discussed in the previous sections.

l. 1020 For the readers' support I suggest this table to include some example references. I also leave for your consideration this reference: <https://www.sciencedirect.com/science/article/abs/pii/S0141113622001179>

Reply by authors:

Thank you for the suggestion. We added the study to the text (l. 184 of revised version) and list of references since it fits well within the context of the manuscript. As for Table 2, example references of the different approaches have been included/discussed in the manuscript. We therefore do not see necessary to include them there. Considering that there are several references that can be used for each method, we opted for avoiding the bias that would imply selecting certain studies and “recommend” them as promising.

Kind regards,

Damian L. Arévalo-Martínez