Point by point reply to the comments of Referee #2

Flow dynamics in hyper-saline aquifers: hydro-geophysical monitoring and modelling

submitted to *Hydrology and Earth System Sciences*

by

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For the sake of clarity, the original comments are shown in *italic*, while our replies are **bold** Arial.

Anonymous Referee #2

In general the structure of the article is quite good, but sometimes it is a bit repetitive, so I think the text should be reviewed to avoid this. In my opinion in the introduction, the objective, (what is new or what you want to demonstrate) should be much clearer. It seems the writer is not being clear about what he wants to achieve, consequently, the idea of what is going to be developed in the following points is too superficial.

The conclusions are a bit weak, they should be improved.

We partly agree with the reviewer. Introduction, discussion and conclusions have been tided up to focus more clearly on the assumptions, aims and results of the study.

Line 26: From my point of view, I do not agree when you say that what is presented in this paper is a methodology, in any case it could be called demonstration or application (see Line 507, when you are saying that the objective of the study was to assess, in my opinion this makes more sense)

Maybe the term "methodology" may sound too formal and may be seem to refer to something fully coded. In this respect, we agree with the referee. The paper presents a possible approach to this type of problems, with no ambition to construct a formal methodology. This is now made clearer in the revised paper.

Lines 114-116: Here you are saying which is the goal of the article, what is correct, but, I think as I said above, that it is not clear what's new, what you are offering new to this field of study. Please, be more precise to capture reader's interest.

In the revised paper we made the statements clearer and the focus better defined.

Line 116: When you say: 'Accurate numerical modelling', I do not know what you mean with this, then you are not specifying anything about it.

Details are given in the ensuing text.

Line 151: When you are referring to figure 3, you are not describing the type of injection realized (freshwater or saltwater, volume or time of injection) in the text or in the figure's text. Then you describe it in the next point 2.2, but if you are doing a reference to the figure (injection evolution) before, you should describe the injection in the point 2.1 or you can put the figure then, in the point 2.2, or if you prefer you can do a better description of the figure in the text of it.

We have fixed the order problem in the revised version of the manuscript.

Line 153: In my opinion, when you are saying 'to a depth of 7.5 m the water electrical conductivity is about 2 S/m' the value is not correct or at least, it does not correspond to the graphic in the figure 3, where it seems it is 6.5 m, so, which one is correct? The text or the figure?

This has been fixed in the revised manuscript. The figure is correct, of course.

Line 306: I have seen in several sentences like this (line 32), that you refer to a simulator and then you indicate the reference of the article, I suggest, that if the code used has a name, it should be indicated, it will be easier to the reader find it, if he/she is interested on it or has a doubt about how it works.

The code is a research code, not a commercial product. So it has no name. The application of this code is one of the novel aspects of the paper.

Line 332: When you say 'the best compromise between mesh resolution and computational effort', I would like to know how you know that, have you done some checking to decide it? I think that if you are not giving data about that affirmation, you should avoid it.

While there has been no specific numerical study conducted solely to define in absolute terms the "best" compromise between resolution and computational time, we can safely state that the one adopted is a "good" compromise. So it is now stated in the revised paper.

Line 379: I think the sentence: 'This is not surprising' is not necessary, I would remove it.

We changed this in "it is expected". Maybe the meaning is clearer in this manner.

Line 448: I have a question about your sentence here: Why was not possible to entirely stop the freshwater injection in your simulation? It sounds not good, it is really strange. Your code should give you the possibility of doing that, in any case you have an important problem.

The boundary condition is imposed as a Dirichlet (head) condition so flux is computed depending on the applied head. We applied the head as actually measured in the injection tank. Consequently, the flow is never zero, not even at the end of the experiment. This is definitely not a problem, as it reproduces reality. The original statement in the paper was misleading, it has been corrected now.

Line 471: When you say: see Section 4.4, I think there is an error, I cannot find that section.

This is a mistake; this shall refer to the moment analysis section which is section 3.3. We changed this in the revised version of the manuscript.

Line 540: Review some sentences, for example in this case, this sentence it seems not to be correct (I think it should be more like: among these, there are.... , or do you want to say other thing? It is confusing)

We changed the sentence as suggested.

Figure 4: When you describe the dipole-dipole measurement, I have a doubt, in the picture, you are indicating that both dipoles are in the same borehole, but if I read the text of the same picture you are saying the contrary. So, both things should be concordant.

The text and the figure are not in contradiction.