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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Discharge measurement with salt dilution method in irrigation canals: direct sampling and geophysical controls" *by* C. Comina et al.

Anonymous Referee #1

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General Comments

This is a potentially interesting study but one that would greatly benefit from more details and more work. The paper is logically and well written but there is a distinct lack of data presented in the text of the paper, so for example, I am not sure whether given our understanding on mixing lengths whether the salt dilution should have worked better than it did as it is not clear what the predicted mixing length was and how it related to the separation of measuring and sampling points. In a similar vein the abstract and text are almost devoid of details (distances, concentrations etc) and the discharge from the FERT measurements were never specified.

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I have two major issues that are more important and which detract from the study.

a) There only seems to be one set of measurements (one canal on one day under one set of flow conditions). If a study such of this is to have impact there needs to be more – for example what would happen if you sited the measurement site at a different place, what happens at different flows? At the moment, there is no indication of whether this information is transferable.

b) Both techniques provide estimates of discharge that may or may not be realistic. I am not sure why these experiments were not run in a setting where flow is already known (via gauges or V-notches); in which case we could assess not only the comparison between the techniques but how close each one gets to the correct value.

As it is, the paper is based on limited data and while interesting it probably does not go far enough in proving that this technique is worth investing in. ERT is in itself not new (although this type of application is not common) and for the paper to have impact, there needs to be more than the one experiment presented here.

The comments below are more minor.

Specific Comments

1. Abstract. While this is a good summary of what the study set out to achieve, you should also use this to explain the key results.

2. P10037, lines 12-16. Are there any more useful details? For example can you specify what a peak to background ratio of EC should ideally be? Alternatively do we know how the relative errors scale to the peak:background ratio?

3. P10037, line 24 onwards. The discussion of mixing lengths could do with a few more details. I expect that there have been some measurements of characteristic lengths for different stream geometries and flow rates, a few values would make this discussion a bit more valuable.

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4. P10040, line 20. Not sure how the comment on turbulence relates to Fig. 2?

5. P10040, line 24. Did you measure the background EC during the course of the experiment?

6. P10040, line 25. As above the manuscript would benefit from a few more details – what you say is that there is an optimum length without ever telling us what it is (or how it relates to your actual separation of measuring points which is partially governed by accessibility).

7. Section 3, general comment. While this section is easy to follow, it would benefit from some more details. Frequently you describe the data in general terms and the reader has to look at the figures for the details. It would be much better to include more details in the text (e.g., report concentration ranges, velocities, distances etc). This little extra effort would help the reader follow what is going on much better.

8. P10045, lines 3-13. There are a few interpretations in this section that I am not sure how were arrived at from the data.

a. The flow in the canal is described as laminar – is that assumption or did you determine this (with dyes etc)

b. Do you know what the velocities are independently of what you can calculate in this study?

c. Not sure what you mean by “coda”.

d. The comment that the direct sampling may sample one of the peaks may not be the case – your sampling equipment has only a few ports and would be unlikely to well replicate the actual pattern no matter where it was located.

9. P10045, lines 14 onward. I am not really familiar with the FERT technique but it seems that you have two measurements to take into account. There is the conversion of EC to a concentration of Cl but there is the comparison of the FERT measurement

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to that of the EC meter. Do you have any idea if the two are comparable across the range of EC, and what types of uncertainty this might introduce.

10. P10045, lines 14 to 20. Is the distribution of values in the tomographic images Gaussian (i.e. is a standard deviation the best measure of variability?)

11. P10045, line 19. How much higher? This could use more detail.

12. P10045, lines 21-24. Was there any reason that you did not sample the geochemistry in your experiment of 30 seconds (it looks as if it should have been possible)?

13. P10045, lines 25 onward. I am not sure whether this should affect the results. If you produce a smoother peak shouldn't the net Cl concentration remain the same (i.e., the algorithm will produce a peak with a lower centre but higher values around the centre – or did I misunderstand something here?)

14. P10046, lines 7-18. These two paragraphs are not well written, needs clarification.

15. I got to this point without ever finding out whether the spacing of sampling points was sufficient such that complete mixing should have been achieved – again more details are needed.

16. Additionally, I am not sure what the actual comparison between the techniques are – you reported the discharge from the salt gauging, but not the comparison from FERT (given that this is a paper largely about determining discharge, some comparison so that we can judge if it worth the effort is warranted).

17. Conclusions. These are too brief and parochial; they just reiterate some of the specific points from the study. If you want the paper to have more impact, try to discuss the general points – what are the limitations of the method, what are the optimal conditions required to use it, is it really going to replace salt dilution?

18. Fig. 9. Is it possible to calibrate the time axis?

Minor Corrections

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P10036, line 7. Not sure what “accurate precautions” means, can you be more specific?

P10037 line 21. “made” should be “measured”

P10039, lines 1-16. The numerous uses of “real” are not needed (it is evident from your descriptions that you are describing a case study)

P10040, line 2. “m” missing from water level.

P10040, line 11. “Apart” not “A part”

P10042, line 17. “canals’ discharge”

Fig. 3. Need to specify concentration of what (presumably NaCl) and use same terminology on X-axis as in the caption.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 10035, 2013.