

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

Anonymous Referee #2

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General comments: The authors discuss an interesting and important problem: proper positioning of sampling points in channels. If the sampling points do not capture a representative section of the tracer plume, the experimental results are not valid. However, it is difficult to know a priori exactly where to take samples. Thus, typically, researchers take a single sample from the center of the channel or take multiple samples spaced at regular intervals across the channel. In both cases, study results can have significant, unknown error. It may be that this error could be reduced if a preliminary study is done

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and the plume visualized with the use of FERT.

However, the study suffers from significant shortcomings. The FERT results and direct measurement results are significantly different and the difference is not adequately explained. The authors should consider conducting additional experiments in which the FERT measurements and direct measurements are both taken across the complete cross section. Alternatively, the FERT data from the current study should be reanalyzed to include only the data collected within the same cross sectional area as the direct measurements (ie 0.5m-1.5m from left bank). In either case, the authors should conduct additional experiments under different flow regimes in order to demonstrate the robustness of their conclusions.

Specific Comments: Abstract: Flows in the natural environment are rarely laminar. What is Reynold's number in the canal?

The last sentence of the abstract is an interesting concept, but the paper does not clearly discuss this issue in depth.

P10038, Line 6: I don't see the need for multiple samples within a cross section if adequate mixing is truly known to exist. Perhaps the authors meant to say that multiple samples are needed if adequate mixing is not known to exist?

P10039, Line 9-10: In order to adequately evaluate the effect of monitoring point location in the evaluation of a non-uniform tracer cloud, I think you need to perform multiple experiments with different tracer clouds and monitoring locations.

P10039, Line 16: The phrase '...contemporary water picking up.' is not clear.

P10040, Line 2: units for water level are missing.

P10040, Line 21-23: In bullet point c, what criteria is used to determine if there is enough turbulence to achieve adequate mixing?

P10040, Line 25-27: In bullet point e, a discussion of why a short distance results in

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inaccurate accounting of the tracer would be helpful.

P10042, Line 21-23 and P10045, Line 16-17: Does the sampling apparatus collect and composite all 9 samples resulting in one data point at each sample interval? or were the samples analyzed independently resulting in 9 data points at each sample interval?

P10042, Line 24-28: What is the effect of having only sampled part of the cross section? I don't see any values of EC reported in the paper.

P10045, Line 6-8: If laminar flow existed in the canal, the leading edge of the plume would be expected to arrive sooner in the center of the channel and later along the edges. The leading edge appears relatively uniform and in fact the plume arrives slightly early along the side of the canal. This suggests that turbulence exists such that mixing is fairly uniform. The trailing edge may suggest laminar flow, but may also suggest storage in dead zones along the canal edge.

P10045, Line 9: What is meant by the 'coda' of the plume?

P10045, Line 21-24: The mean FERT data is much lower than the direct measurements and it is not likely the sampling interval can explain this discrepancy. Additional experiments should be conducted or the direct measurement data should be analyzed at a 30 s interval in order to better understand the influence that sampling interval has.

P10045, Line 25-P10046 Line 3: The inversion algorithm should be checked very carefully. If the inversion algorithm did indeed induce this level of error, it suggests that FERT is not appropriate for this type of work.

P10046, Line 4-10: The conclusions here seem a bit too strong. Isn't it just as likely that the direct measurement missed most of the low concentration area of the canal along the left side and right side? A better comparison would be the direct measurement data compared to the FERT data collected with the canal from 0.5 m from left bank to 1.5 m from left bank (the area actually sampled by the direct measurement technique).

P10046, Line 14-15: This appears to be a bit of an overstatement. Of the 9 sample

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points, 2 are clearly in low concentration areas, 2 (or 3) others are in areas with moderate concentration. It is not obvious that the sample points used would yield an average concentration 2-3 times the value obtained using FERT.

Figure 3: It would be helpful to show the regression equation and r^2 value.

Figure 6: While the resistivity data is useful for comparison to the FERT data, it would be helpful to show the actual measured EC/NaCl breakthrough curve.

Figure 10: Legend indicates cross-flow ERT, caption indicated cross-flow FERT.

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