Reviewer G

Hess article MS No.: hess-2016-295: **Hydraulic and transport parameter assessment using column infiltration experiments** by Younes et al. 2017 Iteration: Major Revision a manuscript after major revision

The manuscript is deficient in the abstract, introduction, and conclusion, and lack of method session. At this late stage of the review process, the reviewer still finds it is hard to find a correct concept of what this paper about, after having finished looking through the abstract, conclusion, tables and figures, and the introduction. This reviewer gets an impression that "we" have done this but without why, how and so what. This underlined issue is in missing a conceptual model leading the discussions.

This reviewer was good with the first impressions of the article having a fine topic and of a manuscript with plenty of tables and figures, and all the mathematics. However, as he got through the reviewing process, after the first 10 minutes, he was lost in trying to find there is no description of an actual column experiment or whatever. In the text, mentioning of measurement and observations, again and again, makes this even more confusing.

In light of that the problems become so severe in structuring the text, this paper is immature. This reviewer would opt for recommending a rejection for the paper.

Detailed comments:
1. In the abstract, there is no mention of the related issues or problems with flows and transports in general. What is the approach used and what is the advantage of the approach? In the introduction section, there is no mentioning of backgrounds, the research problem, and the method. So it is not clear why such a work is needed.

2. There is lack of discussion of method. In the beginning of the abstract, it clearly states statistically calibration of hydraulic and transport properties using an infiltration experiment with a laboratory column filled with a homogeneous soil. And then follows with "Several state variables (e.g., water content, solute concentration, pressure head) are measured during the experiment." This review would expect to see conceptually a setup of the experimental column.

3. In the modeling session, it is one-dimensional grid for the model. How wide is the column along with the length of 1.2 meters? Any discussion how the width direction would have on tracer transport?

4. In the conclusion session, only see the list of points but no discussions on the limitations or shortcoming, and possible implications (if any).

5. There are too many figures, which some of them can be combined to be shown. Some of the figures are poor in quality with very small font sizes.

6. Section 2. A few lines below Eq. 5: $q_{inj} = 0.015$ cm/min; injection concentration $C_{inj} = 1$ g/cm^3. Is not this concentration too high?

The q_{inj} is the Darcy velocity (Eq. 1) and is used to define the injection rate. At this rate of injection $q_{inj} = 0.015$ cm/min at the end of injection 5000 min, the water should have flown for about 75 cm. This is fine.

7. Section 3 mentions observations and measurements. Again there is no description of the "experiment"

8. Section 4.1 Reference solution and data measurements
"The pressure head at 5 cm, at the top of the column (Fig.1), increases quickly form its initial hydrostatic negative value (approximately -115 cm) and reaches a plateau (-1.75 cm) during the injection period. After the injection is finished, it progressively decreases due to the drainage caused by the gravity effect."

9. Fig. 1 has a few problems: where is the initial -115 cm shown? No time stages marked.

Fig.1 title   The wording "reference pressure head at 5 cm from the soil surface" is confusing. Above or below?

10. Fig.3 Cumulative outflow   The outflow has significant presence at 1000 min in the plot. But based on injection rate 0.015 cm/min, the flow should have traveled for 15 cm at the time 1000 minutes. So the cumulative flow shown has a problem.

11. Fig.4 Retention curve. There is no showing for the time factor in the plot. Since it mentions reference retention curve, what is the meaning for showing suction for saturation up to 0.9? (Fig. 2 has water content about .44 at its maximum.) Is this figure showing results from one of the equation?