

The manuscript provides very interesting experiments and interpretations.

However, it requires revision before publication in HESS for the following reasons:

- It should contain a state of the art of the reactive transport experiments already performed in the past and better highlight the contribution of this paper (see for example additional paper listed below and references here in).
- The supplementary material should be included in the manuscript. The processes considered in the modelling should be detailed. Parameters, boundary conditions, space and time discretizations for the simulation of the flow and the transport should be given and justified. The differences between the model and the experimental data should be commented in details.
- The concentration normalization assumes a linear relationship between intensity and concentration (eq. 5). Please comment.
- What is the reliability of an experiment, i.e., what is the difference in the transverse missing/dispersion when repeating a reactive transport experiment?
- I do not understand why the distance between the two inlets is used for the computation of the ion fluxes due to non-neutral electric field generated by differences in the diffusion coefficients (Nernst-Planck equation). This gradient should be a local one (not at the scale of the setup), that can be computed using the images. Please clarify and comment.

Minor comments:

What is the pixel size of the images? What is the reliability of the concentration values (0.1 % camera noise but what about the uncertainty related to the calibration)?

Please check units through the document and use SI format.

L108: "simultaneous" -> "simultaneous"

L269: "relay" -> "rely"

L133: a character space is missing "solution(Barzan and Hajiesmaeilbaigi, 2018)". Same for L140, L194.

Two "=" in equation (8) which should be (9).

References

Huang et al., 2023, doi.org/10.5194/gmd-16-4767-2023

Loyaux-Lawniczak S. et al. (2012) DOI: 10.1016/j.jconhyd.2012.06.005

Rolle et al., 2013. doi.org/10.1016/j.gca.2013.06.031

Liu, C. et al., 2011, doi.org/10.1029/2011WR010575

Rolle et al.,2018, doi.org/10.1002/2017WR022344