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Interactive comment on "A multi-environmental tracer study to determine groundwater residence times and recharge in a structurally complex multi-aquifer system" *by* Cornelia Wilske et al.

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Dear Mr. Sheffer, we very much appreciate your interactive comment on our manuscript and would like to reply to your comments.

We thank you for your indication of missing important citations such as Laronne Ben-Itzhak and Gvirtzman 2005 and included it into the manuscript. We also carefully reviewed the manuscript for given statements as for groundwater flow directions. We absolutely agree with Laronne Ben-Itzhak and Gvirtzman and also with the results of (Gräbe et al., 2017; Hydrological Processes), who postulate the groundwater flow direction to be NE-oriented. We do not doubt about and explicitly added a respective

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Discussion paper

formulation. When describing flow within the EAB, it is generalized following gravity and the overall W-E direction, given by a N-S oriented mountain range, where the recharge occurs and a parallel oriented discharge area: the N-S trending Jordan-Dead Sea Valley. However, the presented study is not intended to give indications for flow-directions, which would be beyond the possibilities of the applied tracers. The geographic location of recharge areas of particular wells and springs is only (if at all) detectably applying numerical flow models, which are well calibrated using water table information and geochemical and isotopic trace information, such as rare earth pattern. Contamination of groundwater has been detected by organic tracers, which give indications for sources of pollutants. To differentiate between local and remote pollution sources is a difficult issue. However, indications may be carved out by the different behaviors of organic substances (affinity to adsorb, metabolism by microbes, inert traveling) in combination with water-bound and gas-bound tracer ages. for example, since NAP has the tendency to get immobilized during transfer through the aquifer by adsorption, sampling locations such as Ein Feshkha must have very low concentrations, if one expects the input in the remote recharge area. This is true for all springs in Enot Zukim, except Ein Feshkha D, which indicates a local contamination because: NAP is remarkably high and contamination is focussed to that spring. As for your comment to the number of inhabitants, who is reliant to the EAB you are most probably right and we defused the expression. Thank you for pointing to missing references, which we included in the list.

In geo-scientific literature, the term Jordan Dead Sea Rift is common, although a huge variety of terms exist to describe the active boundary between the two plates. However, we changed the term and deleted "Jordan“.

The dissolution of evaporite minerals is doubtless different starting with easily soluble halite to less easy soluble aragonite. However, the "intense dissolution“ of all the evaporite minerals in the Dead Sea Sediments is existing, since microbial produced H2SO4 intensifies the ability of pure water to dissolve these minerals (see Ionescu et al. 2012; PLoS One).

As for chlorine as input source, we assume on the long run, the major source of Cl in recharge is rainwater, which comes loaded with salinity from the Mediterranean Sea. Even if salt is precipitated at the soil due to evaporation, it is either directly precipitated from infiltrated precipitation or from irrigation water, which is groundwater and hence owns similar isotope signatures. Fertilizers containing potasium do host it either as oxide (K2O) or nitrate (KNO3), rather than as cloride, since its application would increase the speed of soil degradation. The large brands in Israel (ICL and Haifa Group) do offer K-hosting fertilizers in the given form and also fertilizers used in the Westbank are composed in that way (e.g. UNCTAD report 2015). We hence excluded potash from our considerations.

As for the typos, we thank you very much and you are right about the heterogeneity of notations of SF6, 36Cl, Table and Figure. We corrected it.

On behalf of all authors, I thank you again for reviewing the manuscript, C. Siebert

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