This paper represents another in an ever-expanding mass of really comprehensive assessments of groundwater flow, transport, and sometimes, storage, in karst aquifers based on tracer studies and related techniques. In this particular paper, the authors combine dye-tracing studies from land surface and from within two caves within the same drainage basin to demonstrate that the groundwater basin may be realistically subdivided into two subbasins prior to a downstream confluence of the two cave streams near the resurgence of the conjoined phreatic conduits.

Overall, the scientific significance and scientific quality are quite good. I did not detect any major technical problems with the study or presentation. However, I do have a number of questions/concerns related to selected statements in the manuscript and did detect several grammatical and/or typographical problems that should be addressed prior to publication.

Because I feel that some parts of this manuscript need either clarification, correction, or more explanation, I have labeled this manuscript as needing "major revisions." However, "major revisions" may be too strong a designation for this excellent manuscript.

Major/Minor Problems

Page 11312

Line 5 – I know what is meant by the term "black box" and I suspect most readers will have some concept of the meaning. However, it might be appropriate to be more explicit to ensure that readers know exactly what is meant by the term "black box." Wikipedia defines black box as "In science and engineering, a black box is a device, system or object which can be viewed in terms of its input, output and transfer characteristics without any knowledge of its internal workings."

Page 11313

Line 16 – I recommend changing "difficult accessibility" to "difficult to near impossible access" (the term "near" can be retained or dropped).

Line 17 – I recommend changing "high experimental efforts" to "difficult, costly, and sometimes dangerous efforts"

Line 20 – I recommend changing "variations" to "variability"

Page 11314

Line 5 – Change "as test" to "as a test"

Line 21 – Change "phreatic zones; (5)" to "phreatic zones; and (5)"

Page 11315

Line 7 – Change "Waste water" to "Wastewater"

Lines 7-9 – I recommend rewording the sentence that reads "Waste … supply." To read something like "Blautopf spring cannot safely be used for drinking-water supply because wastewater sewage and agricultural runoff have adversely affected the water quality of the spring."

Line 15 – Change "10 km" to "10-km" and change "consist" to "consists"

Line 16 – You may want to consider changing "dry passages" to "vadose passages"

Line 17 – Change "3.5 km" to "3.5-km"

Page 11316

Line 2 – Delete "has"

Line 6 – Change "in a doline" to "into a doline"

Lines 13-14 – Change "taken manually" to "collected"

Line 27 – You mention that velocities were calculated "on the basis of peak transit times" but you do not explain why. I know that it has been argued that peak time is more "robust" than mean time, but the robustness has never been properly defined. (In this context, robust is supposed to negate the effects of long tails in the breakthrough curves, but robust is a statistical terms with a very specific definition.) Peak velocity will nearly always slightly overestimate actual transit velocity so you should explain your reasoning if you are going to use peak velocity.

Page 11317

Lines 4-5 – The ADM and CXTFIT calculate mean velocity so how do you equate the model calculations with your use of peak velocity.

Line 8 – Change "As the" to "Because the"

Line 11 – You report an RMSE of 0.931, but Table 1 lists this value as a coefficient of determination. The RMSE and coefficient of determination are not the same thing even though they represent the same type of statistical measure. Please correct your wording in the correct location.

Line 22 – Change "in the cave stream" to "into the cave stream"

Page 11319

Line 6 – Delete "have"

Lines 7-9 – The sentences that read "Due … tracer." and "Maximum … 45 m h^{-1}." do not read well. I suggest "The rainfall event caused spring discharge to increase to 1.25 m^3 s^{-1} after peak 1 resulting in additional dilution of the tracer." "Maximum flow velocity from IP-4 to SP-4 was 53 m h^{-1}, and mean flow velocity for the first peak was 45 m h^{-1}." (NOTE: mean flow velocity and peak time are not synonymous — please resolve this discrepancy. Also, maximum flow velocity has little theoretical or physical meaning because it is entirely based on sampling frequency and the sensitivity of the instruments used for analysis.)

Line 10 – Change "as a" to "because a"

Lines 19-21 – You state "Results from charcoal bags make it possible to further constrain the location of the connecting conduit …" which is problematic. First, what results!? You don't report the results. Second, if you are basing any of your velocities calculations on the results of charcoal bags then your calculations are in error. Third, assuming that your velocity calculations and your basic assessments of flow trajectories and connects are based on water samples (which I believe to be the case) then what was the purpose of the charcoal bags, which are never as reliable or scientifically valid as water samples.

Lines 26-27 – The last two sentences of the page should be joined together to read something like "At that time, discharge at the spring was 1.30 m^3 s^{-1} so each cave stream contributes approximately 50% of the total flow to the spring."

Page 11320

Line 5 – Change "In" to "At"

Line 6 – Change "confluence" to "join together"

Line 8 – No matching reference is provided for the citation to Worthington and Ford, 2009.

Line 18 – Use of the permil symbol, e.g., "40 0/00" (40 per 1000) isn't very commonly used. You may want to think about another way of describing the gradient.

Line 23 – You begin a sentence with "There, …" and I respond with where?. Presumably, you mean the "phreatic cave passage between SP-3 and the spring." from the previous sentence, but writing in this matter is grammatically incorrect and forces the reader to reread the previous sentence so that the term "There" makes sense. Rephrase the sentence to remove the term "There" and be more explicit about the location you are referring to.

Line 25 – Change "or to a high conductivity" to "to a high hydraulic conductivity"

Lines 26-27 – The sentence that reads "This gives rise to impoundment in the phreatic zone and the formation of underground lakes in the nearby epiphreatic cave passages." needs explaining. Please elaborate.

Page 11321

Line 5 – Again, you start off a sentence with "There, …" which is grammatically incorrect for the way it is used. In this instance, I have no idea where "There" is supposed to be unless you mean the nebulous "remote parts" of the cave system mentioned in the preceding sentence.

Line 11 – Change "flow through" to "flow through the"

Line 17 – The sentence that begins "But also may be a scale" is grammatically incorrect and makes no sense because there is nothing to connect the "But" with (sentence should never begin with "But" or "And"). Rephrase this sentence so that it make grammatical and readable sense.

Line 19 – Change "flow two times " to "twice flow"

Line 20 – Change "which has" to "which was"

Line 23 – The sentence that reads "Dispersion … partly different." makes no sense to me. I have no idea what partly different means; either the dispersions coefficients were different or they were the same. Did you mean to imply that they were similar?

Page 11322

Line 1 – Change "through unsaturated" to "through the unsaturated" or "through the vadose"

Lines 5-6 – Change "contrary" to "contrast"

Lines 14-15 – Change "fit well to" to "match" and change through unsaturated" to "through the unsaturated" or "through the vadose" and change "increase of" to "increase in"

Lines 14-17 – The sentence that reads "It seems … karstified zones." needs explaining and/or clarification; it makes little sense as written. How do an extreme karstified zones and a major influence (IP-4) cause a little increase in dispersivity (IP-3) with less karstified zones? What constitutes "extreme karstified zones" and what constitutes "less karstified zones."

Line 18 – Change "with 2RNE-model" to "with the 2RNE-model"

Line 22 – Change "phase in epiphreatic" to "phases in the epiphreatic"

Line 25 – I recommend changing "areas" to "portions"

Line 27 – Change "fractured" to "fractured-rock matrix'

Line 29 – The term "denote" usually means to indicate or reveal" and thus does not fit the in this sentence. I suggest a more appropriate term, such as "estimated to be" replace "denoted with." Change "was calculated with" to "was calculated"

Page 11323

Line 1 – Write out "resp." — I have no idea what "resp." is supposed to mean in this context so you may want to consider a different term.

Line 5 – Delete "therewith"

Line 8 – Change "enable detailed" to "enabled obtaining detailed'

Line 17 – Change "In a" to "At a" and change "to the spring" to "the spring"

Line 19 – I have not know what "high resolved" means. I suggest changing "high resolved" to "detailed" if that is what you mean by "high resolved."

Line 20 – Change "single cave passages" to "two individual cave passages prior to their confluence"

Line 25 – The statement "Dispersion is highly variable due to flow velocities." needs explaining and clarification. By "flow velocities" do you mean low-flow velocities, high-flow velocities, or variable-flow velocities? How do flow velocities cause highly variable dispersions?

Page 11324

Line 4 – Change "Water volume" to "The volume" and change "correlates" to "correlated"

Line 5 – Change "low flow conditions' to "low-flow conditions"

Line 8 – Again, I do not know what is meant by "high resolved." I suggested replacing "high resolved" with "detailed."

References

I tried to check all the references but was not able to check the German references thoroughly. However, because this manuscript is to be published online, it seems appropriate that references with doi numbers actually include the doi numbers so that readers may directly obtain the references of interest to them. Below contains my efforts at locating doi numbers for all the references listed in this paper (note doi numbers appear in red font):

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Page 11327

Table 1 – In the table caption change "without/with" to "with/without"

Page 11329

Fig. 2 – Consider changing "dry cave passages" in the caption to "vadose passages" Move "mapping of caves by Arge Blautopf and Arge Blaukarst" to the Acknowledgements or just delete because these two people have already been acknowledged (this latter statement should never appear in figure or table captions in scientific manuscripts).

Pages 11333 and 11334

Figs. 6 and 7 – These two figures are really significant and would benefit from more comprehensive captions. Every figure and table in any scientific publication should be able to stand on its own (i.e., without the benefit of descriptions in the manuscript text) so I think that you should add more detail to the two captions.

Malcolm Field