Review of **Assessment of Open Thermodynamic System Concepts for Fluviokarst Temperature Calculations – an example, the Cent-Fonts Resurgence (Hérault, France)**

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General comments

In this manuscript, the authors aim to quantify the error made when no heat exchange between the conduit system and the porous fraction matrix of a karstic system is taking into account. Apparently, this heat exchange is often ignored in fluviokarst studies (I am not an expert on this) and therefore this study may be worth publishing. However, I have the feeling that the state of the art in, for example, stream temperature modelling is much further and therefore the authors should better explain the novelty of this study. A second important point is that there are several shortcomings in this manuscript (including several formulas) that should be fixed (see below). This makes me advice at least major revisions (and close to rejection). I think all the 'shortcomings' could be fixed, but the authors have to explain clearly the novelty of this work.

Major issues:

1. The English is of poor quality. Often articles are missing, but also strange sentences occur that are difficult to understand. Since there are so many, I won't list them here. I advice to let the manuscript be corrected by a native speaker.
2. The manuscript is written in an unnecessary complicated manner:
   a. It sometimes reads as a mathematical paper. This is not by definition wrong, but makes it more difficult to read. For example, Eq (1) can also be replaced by a phrase like "we assumed water to be an uncompressible fluid".
   b. The introduction of the 'wall' between the CS and PFM is unnecessary. Instead of explaining that in one case the wall is only permeable to water and in the other case also to heat exchange, it is enough to explain that in one case diffusive heat exchange is not taken into account and in the other it is.
   c. The model of the CS is explained as a "sequence of open thermodynamic systems segments". Also this is not by definition wrong, but it boils down to numerical grid cells for which water flow and heat exchange is calculated. In this respect, the title was also a bit misleading to me, since the study boils down to the effect of heat diffusion with the PFM.
   d. The same is true when referring to the Ostrogradsky theorem (conservation law) and the first law of thermodynamics (conservation of energy)
   e. Is it really necessary to rewrite the formulas in terms of dimensionless numbers? The study is a sensitivity study, where (if I understand it correctly) only the radius of the CS, the thermal diffusivity and the total length of the system are changed. Since some of these parameters occur in more than one dimensionless parameter, another parameter should be changed as well in order to only change one dimensionless parameter. This makes the results fuzzier than when only the sensitivity to one physical parameter is shown.
3. There are simplifications and errors in several formulas:
   a. Eq. 3: No storage of heat is taken into account.
   b. Eq. 4:
      - R_H is not hydraulic radius, but a pipe radius. Hydraulic radius is the ration of cross-sectional area and wetted perimeter, which is for a completely filled circular pipe given by: pipe radius divided by 2.
      - make clear that the radius flux is pointed outwards (explaining the negative sign)
      - It is assumed here that with increasing flow, only the flow velocity increases, while I expect also the pipe radius to increase. This is indirectly also mentioned on P177, L3 and 4, but not taken into account in this formula
   c. Eq. 9: Units don't match: An area should be added on the right-hand side.

d. Eq. 10: Units don't match.
e. Eq. 11: Unit don't match.
f. Eq. 12: Units don't match.
g. Eq. 13: Units don't match: $T_\infty/\Delta T$ has the wrong unit. I also suggest not normalizing the error: it becomes less intuitively and it matters if temperature is given in Kelvin or Celcius.

A couple of more specific comments:

- At which distance is T_∞ taken? And how is the temperature in PFM calculated (how many grid cells, which grid size, numerical scheme)? These aspects may influence the temperature for the CW case significantly.
- P180, L10-11: This is the diffusivity for stagnant water: In moving water, heat exchange also occurs by dispersion, which is highly dependent on the turbulence of the water and is often treated as a calibration parameter.
- The figures are of poor quality and therefore difficult to read.
- Figure 2: What is on the z-axis? Also the x and y-axes are difficult to read.
- Figure 4: The error on the y-axes has a different formulation than Eq 13.