Review of HESS Manuscript #2019-452

Review

This manuscript describes mathematical research. The application is to a classical hydrological problem but the results are about comparing (theoretical) calculated quantities.

In more detail, the formulation of the problem addressed in described in detail on pages 2-3 (lines 77-89). The basic idea is that the standard first order expansion for a total differential does not adequately consider the order of the differentiation.

A new proposal is made that enables the first order expansion to be used. In short I did not understand the proposed formulation of the problem.

To my mind this is classical calculus and it may be better to get a professional mathematician to evaluate the work. My own evaluation is that I could not see the underlying point of the formulation. On my understanding (and remembering that I am not a professional mathematician) we use a first order expansion to get the total differential, and each of the individual differentials are considered to be infinitesimal in which it does not matter about the order. If we want more detail then we make a second order expansion, e.g., using the example from the text, i.e., R=f(x, y), we have for the relevant second order term a differential like; $\partial^2 R / (\partial x \, \partial y)$
to more fully account for the missing part. Such rigour is rarely used in Hydrological (or science) practice since we usually have finite differences (rather than differentials) and the necessary accuracy is usually only 10% or so.

Have I missed something important?

Recommend: Not much I can say here.