

***Interactive comment on* “Technical note: Transit time distributions are not L-shaped” by Earl Bardsley**

Anonymous Referee #5

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The technical note focusses at a single point that in a pdf describing a breakthrough experiment in an catchment $f(t=0)$ must be zero by necessity. Distributions fitted to breakthrough curves not fulfilling this criterion are termed “L-shaped” by the author. He proposes to avoid them.

The argument would benefit from having its physical aspects more clearly delineated from its mathematical aspects. In many cases the problematic assumption is stationarity as a prerequisite for using pdfs for describing breakthrough curves in the first place. Furthermore, does the argument still hold when mathematical descriptions of what is termed “store” employ fractal dimensions?

In my opinion, the author does not provide a convincing argument that the situation is properly characterized as an impossibility. I propose using “inconsistency” within an

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implicitly given physical model. It can be quite hard to show that something is impossible within a given formal framework. The part of hydrology addressed by this technical does not have such an accepted theory, tracer hydrology includes many pragmatic approaches.

The most unclear point to me is the idealized catchment employed in the thought argument. The argument by the author seems to assign a physical storage to this ideal catchment with definite physical features. In the further discussion the properties of the storages are lifted to an 'ontic level' ("the true situation"). A number of questions occur: Is the idealized catchment on Earth? Then it will inevitably contain biota interacting with the forms of transport pathways. Is the idealized catchment in a unique state (by experimental preparation) or taken out of natural history?

One could envision a second thought experiment in which the boundary of a natural catchment containing biota is entirely defined by observations of fluxes across them. Its external relations are described in classes of behavioral equivalence (similar to theoretical descriptions of computer programs) and any assignment of local internal properties becomes an over-interpretation of the available data. And of course, as already brought up in the ongoing discussion, input fluxes may hit the boundary producing output.

Summarizing I do not find this argument very compelling or a helpful focus for tracer studies.

specific comments: I could not find an error in (11).

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