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Hydrology and Earth System Sciences Discussions

Interactive comment on "The significance and lag-time of deep throughflow: an example from a small, ephemeral catchment with contrasting soil types in the Adelaide Hills, South Australia" *by* E. Bestland et al.

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Responses to Comments by D. Burns:

This interactive comment was largely supportive. D. Burns stated that the most novel data concerns the different regolith material with distinct hydrochemistries.

The comment on how the flow system was viewed prior to this work has been addressed in the re-write of the paper. There is no hard data on our previous conceptual

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model except basic soil and groundwater hydrologic generalisations concerning fine-grained material compared to coarse-grained material. A paragraph has been added explaining our previous concepts in regard to how sandy and clayey hill-slope soil-regolith systems were expected to behave. There has been data and conceptual models around about the importance and rapid response of macropore flow in the clayey soils (Leaney et al., 1993). Thus, the part of our model which states that the clayey system is rapid has been observed in the Mt Lofty Ranges previously. However, the sandy soil system, although extensive in the Mount Lofty Ranges, has had little soil hydrologic work done on it, thus the comparison between clayey and sandy soils is novel.

The reviewer suggest to remove tables 1 (elemental data) and table 2 (DOC data) and even table 3 (water isotopes). We disagree. Other workers may want to use this data sometime in their comparisons with similar catchments. Most readers will skip over the tables and will not let tables disturb their focus. Publishing data is important as an archive. We note that other journals that were considered for this work such as Chemical Geology, Applied Geochemistry, and Geochemistry Cosmochemistry publish extensive tables of data.

In regard to mineral weathering and environmental tracers, the reasoning behind how different elements can be used as tracers is required and does not take up much space. Therefore we disagree with the reviewer that this material should be omitted. It is part of the hydropedologic story we are attempting to explain.

A clearer description of Phase I, II, and II has been added to the text.

Changing over to molar concentrations from mass concentration diagrams does not make a significant difference. We have compared these two versions of this data as well as for other projects and it make little difference. The analyses were done in mg/l and that is what is reported and graphed.

Regarding the peaks in Al and Fe in the stream flow, the reviewer makes the point about

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the lack of Fe and Al peaks in stream flow in April and May (2007). No concentrations of elements are presented for April and May flows. There was NO flow in the stream until late May. Regarding the origin of the peaks, a sentence has been added discussing a possible source of the peaks being re-mobilised colloids left by higher stream flow from previous events. It should be noted that prior to the event examined, the previous high flow similar to this one took place 11 months prior. The authors admit that the origin of the colloids can not be proven, however, the very high Fe and Al concentrations in some of the sandy through flow, especially during Phase I and the comparison of these values to the clayey system does support an origin of these colloids from the sandy system. That is, high concentrations of Al and Fe in sandy through flow in Phase I corresponds to the peak in stream Al and Fe during phase II. DOC concentrations, which are much higher in the clayey system through flow, peak early in Phase II. This is an important point which we interpret to indicate the more rapid response of the clayey system to event waters. By contrast the sandy system lagged by 2 to 3 days compared to stream flow.

Pre-Event Water: The reviewer makes the point that if the pre-event water was much older, there would be an evaporation signature in the water isotopes. In order to more clearly show that there is not an evaporation signature, we have added all of the data to Fig. 9, not just show the averages. We have addressed this point more extensively in the response to the other review as well.

Response to other minor comments have been made in the text. The abstract wording has been changed to explain the sequence of rain events.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 2599, 2009.