Briggs *et al.* (HESS) review

First, thank you for the opportunity to review this paper. I really enjoyed reading it. In their paper, Briggs *et al.* collated geophysical surveys, remote sensing data, and stream temperature and discharge loggers to reveal the role of bedrock depth, in catchments underlain by low hydraulic conductance bedrock, on stream dewatering and thermal resilience. The authors have done an excellent job in highlighting the role of fine-scale hydrogeological setting on the aforementioned hydrological processes. Further, the authors revealed that global scale datasets of depth to bedrock (DTB) largely overestimate this critical parameter, by as much as 12 m. Ultimately, this piece is very timely, and adds a nice story to the hydrology puzzle. I especially applaud the authors in identifying some complex processes that really drive home the importance of surface water - groundwater interactions.

I am happy to recommend this paper for publication after what I consider minor to moderate revisions. This dataset is incredibly rich, and whilst I understand it is not possible to do everything, I do think there is some bandwidth for the authors to dig a bit deeper into what is at play in Staunton. I think given the density of these data, a few things may be conceptualized. For instance, wider valleys will have high solar loading, and the recharge will be spread over a larger area. What role might this have on thermal and discharge regimes?

Thanks again, and nice work!
Antóin O'Sullivan

Apologies for grammatical errors herein.

Specific comments:

L 134: True, however, could this also be a function of bedrock *K*? For bedrock with a relatively high *K* (karst for instance), a duality may exist where a portion of the water is driven laterally - as stated - whilst another portion may be recharging the bedrock aquifer. These mechanisms are also likely temporally dynamic. In the setting of this study, I agree that lateral flow with bedrock shallowing seems most likely given low *K*. However, in the introduction, it may be best to speak exclusively to the conceptual controls in general.

L 162: Not sure if it is worthwhile stating consolidated sediments, e.g., clay, may dampen the signal too (see Haefner, R.J., Sheets, R.A. and Andrews, R.E., 2010. Evaluation of the horizontal-to-vertical spectral ratio (HVSR) seismic method to determine sediment thickness in the vicinity of the South Well Field, Franklin County, OH.). If one assumes macro-pores in the clay are limited, this may also lead to low storage capacity in areas of shallow depth to low hydraulic conductance layer?

L 187: this is an awesome study site overview. nice job!

L232: maybe spell out the acronym here as it is the first time it appears in a caption.

L244: nice study sites!

L253: this progression seems logical

L270: typo “bedrock”. This aligns to my prior comment on the assumption the signal to being changed by bedrock. Hardpan or clay may also do this? This does not distract from the study, just worth a nod to the potential limitations of passive stratigraphy mapping

L 271: and here is the answer, awesome :) Could there be an *n* shown for number of these boreholes? Looks to be *n*=6 from Goodling et al. report?

L 290: typo ‘teams’

L301: nice!

L329: are these gauges co-located with temperature sensors as displayed in Figure 5?

Figure 4 – this is a serious dataset, folks. Nice study design!

L352: smallest seems like an odd word for describing DTB, maybe lowest? This is not a game-changer, just a style thing.

Table 1 - a quick regression of valley width to median bedrock depth illustrates a power law relationship (R^2 ~0.62). Given how poor the broad scale depth to bedrock maps were at predicting bedrock depth, it may be useful to illustrate here that using high res LiDAR and valley morphology as controls on bedrock rock may provide a more realistic view of bedrock depth in these areas. See Figure 1 below. Something for appendix maybe, but I think you have shown in a remarkably clear way that we need better geophysical data. Awesome stuff.

Figure 5 – nice

L386 – might rephrase this sentence for clarity.

Figure 7 - this is a powerful figure. It brings a lot of questions to mind. I wonder how this would look if one added another 2 panels that plotted the same dewatering observations and sub DTB with valley width? The reason I suggest this, the valley is 3D, by accounting for this 3D space, and given the authors have this amazing data set, it may point towards a more robust understanding of x,y,z space on these hydro processes. See Figures 2 and 3 below.

L 435 – nice

L482 – typo ‘HVSR’

L483 - this is an excellent finding. I think even more important given the findings of bedrock depth controls in this study.

L545 – this echoes my prior comment about 3D Valley composition.

L559 - I think the authors have enough data within this study to conceptualize a 'why'. Why does Staunton not dewater? I compiled some simple plots to illustrate potential interactions of interest. For instance, Staunton has both the deepest median DTB, but also the most confined valley (see Figures 1 to 3).

An additional plot of dtb, valley width, and volume of deposit in valley (dtb*width) reveals a negative correlation of temperature with dtb, a positive correlation of temperature with width and a strong negative correlation with volume. As such, it would seem the authors have stumble upon some zone of width/dtb ratio that offsets dewatering? I encourage the authors to dive a bit 'deeper' here, as I think they may have something novel to report here.

L574 – this is awesome!

L585 – okay, this is what I was speaking to earlier.

L597 - also, Paine run has median valley width 5 m > Staunton.

Figure 11 - might say GW influence 'prediction' in the legend too.

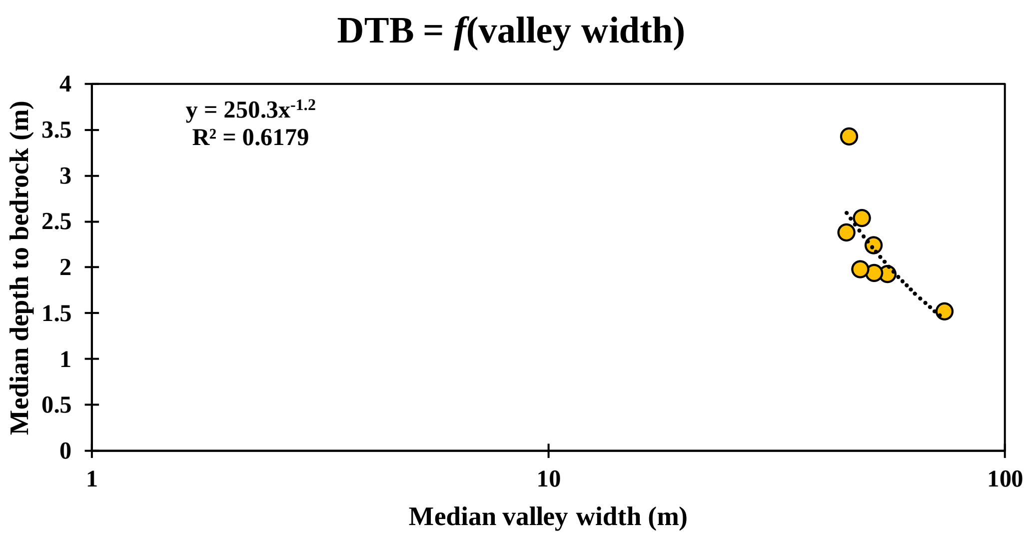

Figure 1 plotted relationship between depth to bedrock (DTB) and valley width for the Briggs et al. study. Where a strong negative correlation is found between DTB and valley width. I understand valley width is taken ~ 2 m above the valley floor, but this is still a meaningful measure.

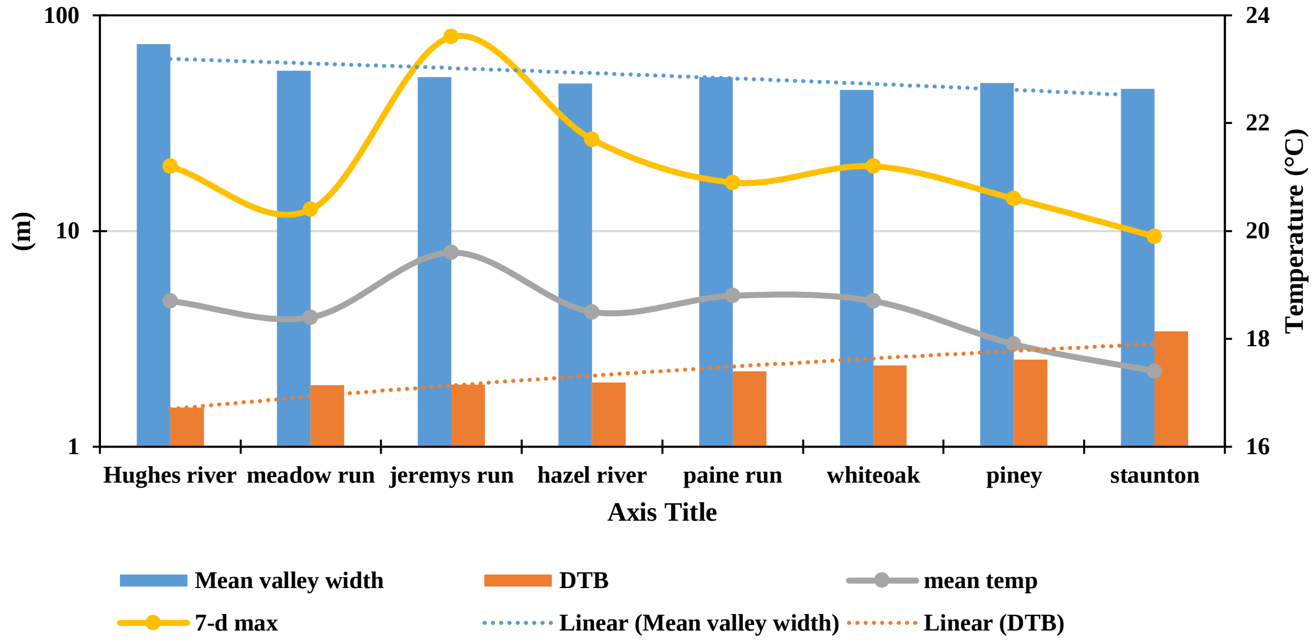

Figure 2 An overview of parameters for each study stream as per Table 1 in the MS

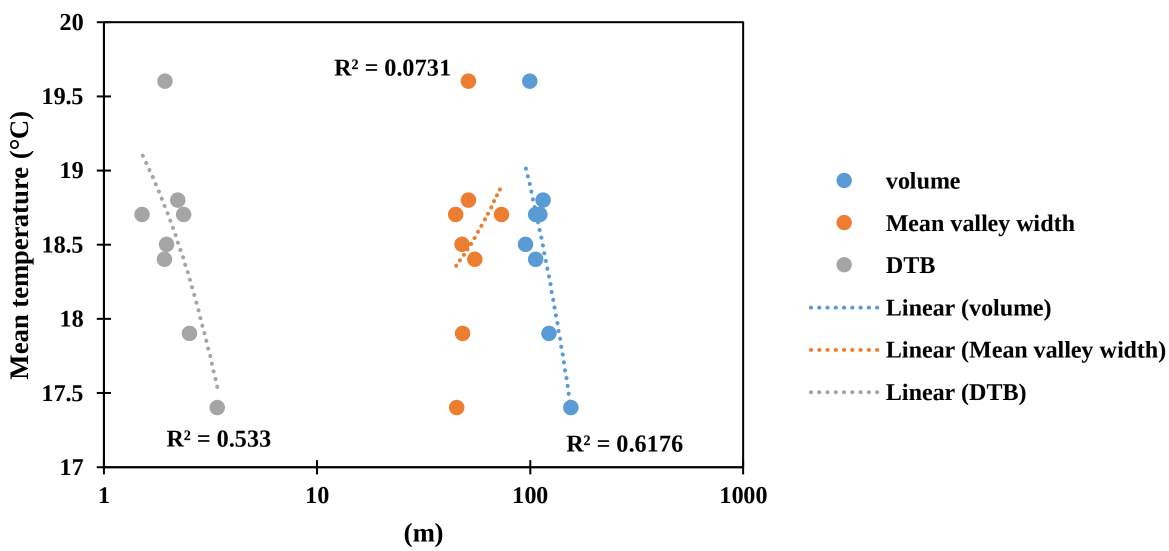

Figure 3 I encourage the authors to think about the relationship between volume (storage) and the incised natured of the coldest streams, such as Staunton. Given these rich datasets the authors have generated, I think there is bandwidth to conceptualize what may be at play here. This will also allow the testing of these conceptual models in different settings.