

## ***Interactive comment on “Conditioning rainfall-runoff model parameters for ungauged catchments and land management impacts analysis” by N. Bulygina et al.***

**Anonymous Referee #1**

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### **General comments**

This paper illustrates an interesting approach of calibrating a conceptual rainfall-runoff model to regionalised hydrological statistics, in this case the baseflow index estimate available in the HOST database. The paper is well written and presents results clearly. I wish to make a couple of general comments before a series of specific comments and clarifications.

First, I feel the results are limited to a significant degree by the choice of study catchment. The model application is to a wet catchment with “relatively impermeable sub-soil” during the winter period and thus there should be limited challenge in predicting

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the overall runoff volume. Hence the challenge reduces towards simulating the timing, which the information used should inform (at least in terms of volume of slow versus fast response and timing of high flow). While not invalidating the results, this does limit their generality, which to be fair, the authors acknowledge implicitly, though this should be spelt out in more detail. The key concern is how well will the approach perform in the many environments where estimating the water balance is more challenging? In relation to how easily the catchment can be modelled, it would at least be good to see how well a traditionally calibrated model would perform on this catchment.

Second, there is no testing of the approach advanced for predicting change due to afforestation or grazing intensification. This needs to be spelt out very clearly. There is a clear opportunity to test this approach using paired catchment experimental data (see review by (Brown et al., 2005)).

### **Specific comments**

1911 line 19-20. For a general model, simulated BFI will depend on the model forcing. In general that forcing will be spatially variable over any particular soil type. However the method as presented develops one distribution of parameter sets based on the response from one model unit. Is the method generalisable to say larger scales where spatially variable forcing becomes important?

1913 line 1-3. (Brown et al., 2005) discuss the evidence for changes in baseflow following forest cover change arising from paired catchment experiments around the globe.

1916-1917. The model description is pretty short. There is no mention of how actual evapotranspiration is calculated for example or how this might link to soil moisture, or how any ET parameters were set. Some additional detail would be useful.

1918, line 14. Top-down models such as (Zhang et al., 2001) could also a useful source of conditioning information.

1918, lines 15-19. It should be explicitly stated that the method was uninformative for

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the remaining parameters (as would be expected from the model structure and the information used). It would also be useful to show the prior distributions on Figure 5.

#### **Technical corrections**

1910 line 8. I assume there is not interaction between model elements?

1914 Equation 4, define  $q$ .

1916 line 5. Can you clarify whether there was only one rain gauge used, even though there are multiple stream gauges installed throughout the catchment.

1919 lines 7-10 discuss flow rates for which the model was calibrated. This is slightly confusing to the reader as the model wasn't calibrated to flows in the usual sense. Some re-wording would improve this.

#### **References**

Brown, A.E., Zhang, L., McMahon, T.A., Western, A.W. and Vertessy, R.A., 2005. A review of paired catchment studies with reference to seasonal flows and climatic variability. *Journal of Hydrology*, 310(1-4): 28-61.

Zhang, L., Dawes, W.R. and Walker, G.R., 2001. Response of mean annual evapotranspiration to vegetation changes at catchment scale. *Water Resources Research*, 37(3): 701-708.

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