Hydrol. Earth Syst. Sci. Discuss., 10, C4686–C4688, 2013
www.hydrol-earth-syst-sci-discuss.net/10/C4686/2013/

Hydrology and Earth System Sciences
Open Access
Discussions

Interactive comment on "Large-sample hydrology: a need to balance depth with breadth" *by* H. V. Gupta et al.

H. McMillan (Referee)

h.mcmillan@niwa.co.nz

Received and published: 6 September 2013

Review of the discussion paper "Large sample hydrology: a need to balance depth with breadth" by Gupta et al.

This opinion paper argues for the benefits of using large numbers of catchments for investigations which seek to understand or model the runoff generation process. It summarises the current state of play, discusses the benefits of large sample hydrology, and makes some observations on the practicalities and challenges of the approach. As it is becoming more common for hydrologists to use large samples, the paper will prove a useful resource and summary. It is well-written and clear. I recommend publication in HESS, and also have some suggestions for the authors.

1. The authors provide a review of previous studies in Section 2.2 (some of which is repeated in Section 4.1; perhaps these could be combined). It would be worth discussing here some of the more recent initiatives, such as Environmental Observatories in various guises: e.g. TERENO (http://teodoor.icg.kfa-juelich.de/overview-en?set_language=en), EVO-UK (http://www.evo-uk.org/), S – HYPE (http://www.smhi.se/en/Research/Research-departments/Hydrology/hype-in-sweden-s-hype-1.7891). Global hydrological models get a very brief mention, but they may soon be a major user of large hydrological datasets. There is an interesting discussion in Widen–Nilsson et al (2007) on the data challenges involved in applying and validating a global water–balance model. Some global runoff products are already available, e.g. Global Runoff Data Centre (http:/grdc.bafg.de; and an application by Fekete et al (2002)).

2. I was not completely convinced by the arguments in Section 3.2 that large samples help to reduce the impact of data errors. When comparing or combining large numbers of different datasets, the need for characterisation of the uncertainty in the different datasets becomes particularly strong. Different data from different parts of the world may have been collected using very different techniques and with very different quality control. Without uncertainty information, comparisons of processes or model performances between different locations may be incorrect or biased. I would be interested in the authors' comments on to what extent it is ever going to be possible to combine very diverse data in terms of temporal/spatial scales, uncertainties and collection methods.

3. It would be good to hear from the authors their recommendations for enabling large sample hydrology in the future. Should we/they be thinking big, to initiate a global database of catchment hydrology information? For example, in New Zealand we have a database which assigns every river reach over a given catchment area a unique identifier, and allows us to associate further information with the reach – should we be aiming for something similar on a global scale, which holds all our climate and

hydrometric data and which could be queried by any hydrologist? Should we be trying to combine some of the existing datasets that the authors discuss?

Minor points:

1. Section 3.3: I don't agree that a catchment classification system must be simple – given the complexities of runoff generation processes, I would be surprised if it was.

2. Section 4.3: Sharing protocols for data and models – the recent opinion paper by Beven and Young (2013) on modelling descriptions would be worth a mention here.

3. I don't think the figures are very informative, apart from fig. 4.

References:

Beven, K., and P. Young (2013), A guide to good practice in modeling semantics for authors and referees, Water Resour. Res., 49, doi:10.1002/wrcr.20393.

Fekete BM, Vorosmarty CJ. Grabs W. (2002). High-resolution fields of global runoff combining observed river discharge and simulated water balances, Glob. Biogeochem. Cycle 16(3): 1042. 10.1029/1999gb001254

Widen-Nilsson E, Halldin S, Xu CY. (2007). Global water-balance modelling with WASMOD-M: Parameter estimation and regionalisation. Journal of Hydrology 340(1–2): 105–118.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 9147, 2013.