Hydrol. Earth Syst. Sci. Discuss., 10, C45–C48, 2013
www.hydrol-earth-syst-sci-discuss.net/10/C45/2013/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Disinformative data in large-scale hydrological modelling" *by* A. Kauffeldt et al.

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Received and published: 4 February 2013

[General Comment]

The consistency of the large-scale hydrological data was analyzed in the proposed manuscript. The research is well structured, and the result shown in the paper is quite informative for hydrological community, especially for global hydrological model users. I recommend some more discussions (suggested below) to be included in the manuscript, but the paper is worth being published in HESS after the minor revision.

[Specific Comments]

–P491.L2: the possibility to use high-resolution topographic data in global modelling, e.g. for runoff routing (Gong et al., 2011) > There also exists a recently-developed

method which automatically delineates a global gridded hydrography and its sub-grid topographic parameters from the high-resolution hydrographic datasets [Yamazaki et al. 2009]. It allows the representation of sub-grid-scale basins within a framework of GHM river routing [e.g. Yamazaki et al., 2011].

– P492.L18: the CRU and the GPCC bias-corrected WATCH forcing data

> Please describe what is the baseline data of these precipitation data, and what type of bias correction was performed. Given that the precipitation data are of the most important dataset of this study, a detailed explanation is better to be added to the manuscript.

– P493.L18: the symmetric error

> Why the term "symmetric" is used? The errors must be randomly distributed.

– P495.L10: In reality, a long-term basin RC even close to unity is implausible

> Please add some explanation (or reference) to this sentence.

– P495.L13: In order to. . .

> I recommend to start a new paragraph from this sentence, because the topic has changed.

– P496.L9: it was decided to limit the study to basins larger than 5000 km

> The area of 5000 km approximately accounts for 2 cells of 0.5x0.5 degree grid. In this small case, sub-grid-scale variability of precipitation and evaporation within a single grid may cause an error in water balance analysis. Though I don't think the error due to the sub-grid variability of precipitation/evaporation is not so significant because we can see a similar trend in water balance errors for gauges located in a certain areas (Fig. 8), but I recommend to write the uncertainty due to the sub-grid variability of precipitation/evaporation.

– P496.L21: There was little consistency in the errors between datasets except for a few largely over- and underestimated stations in DDM30 and STN-30p.

> What is a possible cause of the large errors consistent between DDM30 and STN-30p. I suppose this is caused by the errors in reported drainage area of GRDC gauges, given that the river networks of DDM30 is modified to fit the reported drainage area of GRDC gauges.

– P497.L6: To minimize the effect of area discrepancies, results shown are based on the GIS-polygon basin delineation.

> How the gridded precipitation and evaporation are compared against the polygon-based runoff? Did the comparison consider the sub-grid-scale overlap between a 0.5deg grid box and a polygon boundary? In case of gauges with small drainage areas, the interpolation of precipitation/evaporation considering sub-grid-scale distribution may be important (though it may not be significant in long-term analysis.)

– P499.L22: Hence, many small catchments were well represented even in the 0.5âŮę grid.

> This is generally true, but strictly we cannot say a catchment is correctly represented on a river network map only from the comparison of the drainage areas. Even though the drainage area on the river network map is close to the reported area of GRDC, the actual shape of the catchment (on polygon data) may not be correctly represented by rectangular grid boxes.

– P500.L14: This could be possible for individual basins by considering e.g. irrigation and inter-basin transfers, not accounted for in this study.

> Moreover, in case of the basins in arid area (like the Niger), the actual evaporation higher than the potential evaporation is possible. The water precipitated in humid region can be transferred downstream via river networks, and then can be evaporated from the floodplains in arid region [e.g. Pedinotti et al., 2012]. This kind of horizontal

transfer process by river s may increase the actual evaporation. In such a case, the discrepancy between the actual and potential evaporation is not disinformation, but can be an indicator of the occurrence of floodplain evaporation.

– P500.L15: However, the clear geographical patterns found in this study indicated that there were whole regions such as the Amazon basin where the inconsistencies were likely a result of systematic problems in the climate data.

> Was the dependency of the potential evaporation to land surface type (i.e. open water, vegetation) considered in the dataset? The potential evaporation can be increased in the Amazon due to open waters in floodplains and dense forest canopy.

[Citation]

– Yamazaki, D., T. Oki., and S. Kanae (2009), Deriving a global river network map and its sub-grid topographic characteristics from a fine-resolution flow direction map, Hydrol. Earth Syst. Sci., 13, 2241–2251.

– Yamazaki, D., S. Kanae, H. Kim, and T. Oki (2011), A physically-based description of floodplain inundation dynamics in a global river routing model. Water Resour. Res. 47, W04501, doi:10.1029/2010WR009726.

– Pedinotti, V., A. Boone, B. Decharme, J. F. Cretaux, N. Mognard, G. Panthou, F. Papa, and B. A. Tanimoun (2012), Evaluation of the ISBA-TRIP continental hydrologic system over the Niger basin using in situ and satellite derived datasets, Hydrol. Earth Syst. Sci., 16, 1745-1773, doi:10.5194/hess-16-1745-2012.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 487, 2013.