Dear Dr. Luca Brocca,

Thank you very much for taking the time to review our manuscript. All your comments received were tremendously helpful to improve the paper. We have responded to all the comments below. We believe that all your concerns have been now addressed.

Best regards,
Naota Hanasaki (on behalf of authors)

I read the paper with attention as the topic is highly of interest to me, and I guess to HESS readership. I believe hyper-resolution (1km) global hydrological modelling is an important topic and the number of challenges to be addressed are well underlined in the paper. Indeed, for running hyper-resolution hydrological modelling we need not only High Performance Computing and Storage but also to improve both our modelling capabilities and, likely more important, the observations capabilities at 1km scale, mainly related to the human impact on the water cycle. The paper clearly underline the huge role of water management (agricultural, industrial and domestic), water infrastructures, and the reservoir management at 1km scale and the difficulties to obtain data for that on a global scale.

Thank you for your positive evaluation to our work. We totally agree with your remarks.

I have a short comment related to the results of the hydrological simulation, i.e., river discharge simulations. By reading lines 370-375 it seems that the better performance of localized (LOC) simulation with respect to (wrt) global (GLB) simulation is related the improved spatial resolution of input meteorological data. I believe that improvements are related to: (1) better accuracy of local meteorological data wrt global reanalysis, and (2) LOC model calibration wrt observations. The spatial resolution is likely not as important as written in the paper. It can be easily tested by performing additional experiments.

(A) Calibrating the GLB model wrt observations as done for LOC model.

(B) Aggregating local observations at larger spatial scale (28x28 arcmin as GLB model input) and check if results will deteriorate (I think deterioration will be only small).

Thank you for this very helpful suggestion. Inspired by your idea, we have carried out a sensitivity simulation and added an appendix as follows.

Appendix C Sensitivity simulation

We have decomposed the differences between GLB and LOC simulations into three factors: (A) Calibration, (B) Local meteorological observation, (C) High spatial resolution of data. The combination of factors is shown in Table A1.

Table A1 Sensitivity simulation. The simulation names and the combinations of factors.

Simulation	*YYY*	*YYN*	*YNN*	*NYY*	*NYN*	*NNN*
Calibration	*Yes*	*Yes*	*Yes*	*No*	*No*	*No*
Local meteorological observation	*Yes*	*Yes*	*No*	*Yes*	*Yes*	*No*
High resolution	*Yes*	*No*	*No*	*Yes*	*No*	*No*

YYY and NNN are identical to the LOC and the GLB simulations respectively. YYY and NYY use the high-resolution daily local meteorological observation (AMeDAS). YNN and NNN use the global meteorological data WFDEI (Weedon et al. 2014). YYN and NYN use the "low-resolution AMeDAS" which was prepared as follows. We aggregated the AMeDAS data for 30 x 30 grid cells in 1 arc minute and converted them into one large grid cell in 30 arc minutes (identical to the data resolution of WFDEI) then linearly interpolated again into 30 x 30 grid cells in 1 arc minute. In this way, the only spatial resolution of AMeDAS was decayed. YNY and NNY are not available since they require global meteorological data (reanalysis) as fine as 1 arc minute spatial resolution which do not exist as of today.

The results are shown in Figure A1. In general, the calibration increases the NSE for many cases if other conditions are identical (21 out of 27) but the effect (the change in NSE) is limited. Exceptions are seen, for example, in Stations 1, 6, 8 where NYY (without calibration) performs slightly better than YYY (with calibration). This is considered that due to possible overfitting during the calibration period. Next, high spatial resolution increases the NSE for most of the cases (16 out of 18) but again the effect is limited. Exceptions are seen in Stations 2 and 5 where NYN (low resolution) outperforms NYY (high resolution). Finally, local meteorological data significantly increases the NSE for all the cases (18 out of 18, by median 0.43).

The results of sensitivity test clearly indicate that the usage of local meteorological *observation is the key factor in the simulation performance. As mentioned earlier, the timing and magnitude of sub-monthly weather events in the global meteorological data (WFDEI) are based on reanalysis which are not always successful in reproducing the timing and the location where weather events occurred.*

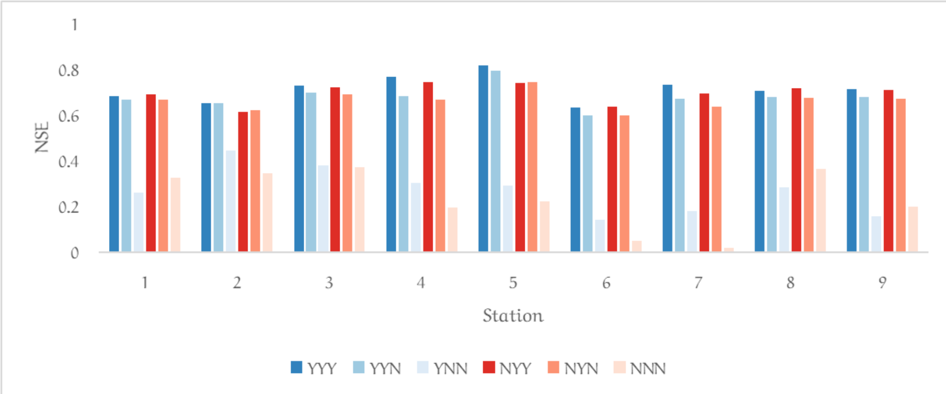

Figure A1 The results of sensitivity analysis. See Table A1 for simulation runs. YYY and NNN correspond to the GLB and LOC simulations, respectively.

Minor comment: I believe that, very likely, the use of ERA5 reanalysis (the most recent reanalysis) will improve the results wrt ERA-Interim.

Thank you for this comment. We agree with you that the new generation of reanalysis usually performs better than earlier ones. Very recently, new global meteorological data WFDE5 have been published which use the ERA5 reanalysis. The results of GLB simulation will be better by using the new data, but we speculate they would not fill the aforementioned gap between reanalysis and local meteorological observation. Since it is not practical to redo all the GLB simulations and analyses using WFDE5, let us keep using the present global meteorological data. We have added your point at the end of Appendix as follows.

The reproducibility of reanalysis is being improved generation by generation. By using the latest global meteorological data based on the latest generation of reanalysis, the GLB simulation is expected to perform better (e.g. the WFDE5 (Cucchi et al. 2020) which uses the ERA5 reanalysis (Hersbach et al. 2020).

Cucchi, M., Weedon, G. P., Amici, A., Bellouin, N., Lange, S., Müller Schmied, H., Hersbach, H., and Buontempo, C.: WFDE5: bias-adjusted ERA5 reanalysis data for impact studies, Earth Syst. Sci. Data, 12, 2097-2120, 10.5194/essd-12-2097-2020, 2020.

Hersbach, H., Bell, B., Berrisford, P., Hirahara, S., Horányi, A., Muñoz-Sabater, J., Nicolas, J., Peubey, C., Radu, R., Schepers, D., Simmons, A., Soci, C., Abdalla, S., Abellan, X., Balsamo, G., Bechtold, P., Biavati, G., Bidlot, J., Bonavita, M., De Chiara, G., Dahlgren, P., Dee, D., Diamantakis, M., Dragani, R., Flemming, J., Forbes, R., Fuentes, M., Geer, A., Haimberger, L., Healy, S., Hogan, R. J., Hólm, E., Janisková, M., Keeley, S., Laloyaux, P., Lopez, P., Lupu, C., Radnoti, G., de Rosnay, P., Rozum, I., Vamborg, F., Villaume, S., and Thépaut, J.-N.: The ERA5 global reanalysis, Quarterly Journal of the Royal Meteorological Society, 146, 1999-2049, https://doi.org/10.1002/qj.3803, 2020.