Hydrol. Earth Syst. Sci. Discuss., 12, C6140–C6143, 2016
www.hydrol-earth-syst-sci-discuss.net/12/C6140/2016/

Hydrology and Earth System Sciences
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Discussions

Interactive comment on "Modeling 25 years of spatio-temporal surface water and inundation dynamics on large river basin scale using time series of earth observation data" *by* V. Heimhuber et al.

Anonymous Referee #2

Received and published: 14 January 2016

Heimhuber et al. produce a statistical method to model inundation extent of floodplains and wetlands. Run on a 10 km grid, the method predicts inundation extent on a given day as the inundation measured on the previous Landsat overpass, lagged discharge, and precipitation and evapotranspiration. The data-driven approach, and simplicity of the methods, as compared with large-scale physically-based simulations, make this an intriguing contribution. Some addition minor clarifications and discussion of physically-based inundation and hydrologic models would improve the manuscript.

1. Page 11852 line 15. Jung et al. also included lag times, though they were between

measured elevation and inundated area. So while your statement is technically true, I think it's a little misleading. Please rephrase. 2. Figure 2: It's impossible that there's 1 Gauge per 10 km cell, correct? Please clarify what is meant; maybe 1 gauge per zone? 3. Page 11854, lines 14-21. How many gauges were used, in all? Would be great to see them mapped on Figure 1, if they will all fit. 4. Page 11856, lines 9-12. Do not need to list methods that were considered and discarded. Maybe just state the tradeoffs between different cell sizes, and the final size used. 5. Page 11856 lines 21-22 & lines 6-7 Page 11857 & Figure 2 & elsewhere: It's not necessary to provide the computer languages in which some of the processing steps were done, as the steps (such as spatial averaging) do not depend on any language-specific capabilities. Recommend removing the "R" and "Python" labels, and the outer boxes in Figure 2. 6. Page 11857 Equation 1: Differentiating using "SWD" (a quite nebulous term) vs. "SWE" is quite confusing, in my opinion. Both quantities are surface water extent, after all, it's just that one is predicted, and one is observed, and they are at different times. Can you maybe make it: SWE_t = \beta_0 + \beta_1 Lag(Q) + \beta_2 SWE_{(t-1)}ˆ{obs} . . . or something like that? 7. 11859 âĂŤ Recommend changing "SWD" to "SWE", here. You're starting with your error statistics to refer to numerical predictions of SWE (although because Equation 1 is likely incorrect, it's tough to be totally sure what's going on!), rather than the more nebulous "surface water dynamics". 8. Page 11860, line 15 "discharges" should be "discharge values" 9. Table 4: Here and elsewhere: recommend putting Discharge units into more standard units of m3/s. I find it difficult to think in terms of millions of liters in a day. 10. Figure 4 helps to illustrate how the uniform 10 km square grid does not really respect the river structure. For example, different pages are calculated for different parts of the river when it is split in two parts along its centerline. The 10 km grid may be a necessary evil, rather than e.g. splitting up this area using the river as an organizing unit, and mapping units based on their distance to the outlet. Please justify the choice of the 10 km grid; pragmatism is ok, but some comments on this would be good. 11. Page 11862 line 26 & elsewhere: What does "externally validated" mean, exactly? 12. Page 11865, line 28. What does it mean to “show similar SWD”? A similar temporal pattern? Spatial pattern? Please clarify. Maybe “. . . showed SWE timeseries similar to. . .” 13. Page 11868, line 10-12. Calculating a cross-correlation is just a couple of lines of code. No need to cite the language in which this was performed. 14. Section 4.4. One thing not discussed is that the effect of a P or ET flux within a 16 day window is almost certainly a function of the given SWE. You might expect P to produce almost no SWE change if SWE is low, while during an event, or after significant P in previous timesteps leading to saturated soils, the same P might well lead to a significant increase in SWE. Similar reasoning for ET. These dynamics are exactly are what dynamic hydrologic models try to take into account. 15. Page 11878, line 21-23. Well, you should here and elsewhere really be acknowledging the continental-scale inundation dynamics models. There are quite a number of these, and they are getting more and more skillful. I know you say that this analysis is easier to do than theirs, but additional distinguishing characteristics of this analysis vis-a-vis the existing physically-based models would be really useful. Here are a few obvious ones to cite:

Neal, J. C., N. A. Odoni, M. A. Trigg, J. E. Freer, J. Garcia-Pintado, D. C. Mason, M. Wood, and P. D. Bates (2015), Efficient incorporation of channel cross-section geometry uncertainty into regional and global scale flood inundation models, Journal of Hydrology, 529(P1), 169–183, doi:10.1016/j.jhydrol.2015.07.026.

de Paiva, R. C. D., D. C. Buarque, W. Collischonn, M.-P. Bonnet, F. Frappart, S. Calmant, and C. A. Bulhões Mendes (2013), Large-scale hydrologic and hydrodynamic modeling of the Amazon River basin, Water Resources Research, 49(3), 1226–1243, doi:10.1002/wrcr.20067.

Sampson, C. C., A. M. Smith, P. B. Bates, J. C. Neal, L. Alfieri, and J. E. Freer (2015), A high-resolution global flood hazard model, Water Resources Research, 51(9), 7358–7381, doi:10.1002/2015WR016954.

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 Resources Research, 47(4), doi:10.1029/2010WR009726.

Getirana, A. C. V., A. Boone, D. Yamazaki, B. Decharme, F. Papa, and N. Mognard (2012), The Hydrological Modeling and Analysis Platform (HyMAP): Evaluation in the Amazon Basin, Journal of Hydrometeorology, 13(6), 1641–1665, doi:10.1175/JHM-D-12-021.1.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 11847, 2015.