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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Evaluation of the satellite-based Global Flood Detection System for measuring river discharge: influence of local factors" *by* B. Revilla-Romero et al.

Anonymous Referee #1

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General comments

This paper is an interesting evaluation of the skill of the Global Flood Detection System to measure river discharge from satellite passive microwave signals, and is certainly worthy of publication after some correction.

The correlation between the daily ground station-measured water discharge and the satellite signal is measured for a range of rivers with different widths, floodplain areas, land cover types, climatic regions and other factors. For African, Asian and North American rivers, the mean R values are less than 0.5, and the correlation is only medium.

Only European and South American rivers give high correlation (>0.5). It might be argued that a judicious set of ranges of R has been employed (R < 0.3, 0.3 – 0.7, >0.7), in which many rivers lie in the middle range, but still may have R values < 0.5, so that the correlation is only medium. The authors should comment on this. The relatively low R values show the difficulty of obtaining a reasonable signal-to-noise ratio from a 10km pixel when the flood width is often substantially less than the pixel width. As a result, it is obviously a sensible idea to identify sites where the method will work because of the associated site variables, and use these for future studies, rather than trying to make the method work for all sites. The method would also appear to work best for detecting floods rather than forecasting them, since a 4-day average signal is used, partly to cope with the time lag between changes in stage at a gauging station and associated changes in flood extent.

Specific comments

7333/14: Make it clear that you are talking about river floods (or does this include deaths in the tsunami of 2001?). 7337/6 In a flood situation, is the error on the observed discharge not higher than the 5–20% quoted? 7342/13 What was the spread of the R2 values for the fits? In Fig. 3b, please make it clearer that different rating equations are being used for different months, not simply that in fig. 3a. In fig. 3a, why aren't there 15 points on the graph, one for each March between 1998-2002? 7344/20 A little more description of the Gini index might help the reader. How does the Random Forest method cope if the variables are correlated (as e.g. discharge and river width probably are)? Is the correlation between variables output from the method as they would be from a principal component analysis? If so, it would be useful in the subsequent analysis to know the correlations between variables to know which were most significant. 7345/25 Do you really mean that the signal may have a large natural variation, or that the noise is instrument noise? 73446/8 R = 0.3 is chosen as a threshold in fig. 4, yet this is only a medium correlation. What happens if you chose R = 0.5 as the threshold, are there too few sites satisfying this criterion then? 7346/23 In fig. 5, in the eastern USA, many stations had R > 0.3 in the calibration (fig. 4), but have NSE < 0 in validation. Why is this? The rivers are presumably often wide and on floodplains near the sea at these observation points? 7347/10 It is probably true that locations with a river width higher than 1 km are more likely to score an R larger than 0.3, but it would be worth quantifying R for widths > 1km and showing that it's significantly larger than 0.3. A related point is, in fig. 6a, could you explain why some rivers of 100m or less width have R values as high as the widest rivers? Intuitively you would have thought the brightness temperature for a pixel containing water would depend on the river width (perhaps I'm confusing the river width with the flood width here?). 7347/24 might not provide reliable results... It would be better to quantify this rather than just stating it. You could use a statistical test to compare the rivers with Q < 500m3/s that have R < 0.3 with rivers with Q > 500 that have R > 0.3, and show that they were significantly different.

Technical corrections

7333/16 Golnaraghi 2009 and Kundzewicz 2012 refs missing /28 UNOSAT 2013 ref missing. 7335/20 climate-drive -> climate-driven /27 global -> a global 7337/9 us -> as 7340/4 Example -> Examples /17 define M/C signals /22 split sentence at 'an array' 7345/8 as validated -> were validated /13 calibrate -> calibrated /14 discharge satellites -> satellite discharge 7346/16 two-years -> two years /20 shorted -> shorter 7348/8 25 x 25 pixel -> 25 x 25 km pixel /28 To note -> Note 7349/22 Where highest -> The highest 7350/8 presence or not -> presence or absence /20 for - the most of – the -> for most of the 7351/12 in some -> on some 7352/2 test -> tested 7354/ fig 12 caption: was chose -> was chosen; of the stations -> or the stations; station -> stations 7353/2 replace the semicolons with commas in this long sentence /20 satellite measured -> satellite-measured 7354/10 no verb in sentence /15 a more -> more

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