

Interactive comment on “Automated global water mapping based on wide-swath orbital synthetic aperture radar” by R. S. Westerhoff et al.

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GENERAL COMMENTS

Remote sensing imagery from both optical and SAR satellites have for long been used for mapping water surfaces and inundation. Unfortunately, it normally takes a long time from image acquisition to the delivery of flood maps to the affected population as flood mapping services usually rely on remote sensing experts to carry out manual image analysis and processing. Systematic and fully automatic water mapping capabilities could be expected to shorten the data latency significantly, hence having a significant potential for enhancing the value of remote sensing data for supporting flood relief efforts. Thus, this paper by Westerhoff et al. is very welcome as it presents, to my

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knowledge, the first global water mapping system based on SAR observations. The algorithm for performing the flood mapping is innovative, providing also a quality indicator to signal the expected reliability of the derived water maps. Yet, I agree with the review by Patrick Matgen that the authors probably would have done better to concentrate more on the scientific aspects of this service rather than discussing system characteristics. My recommendation is to shorten the discussions of the system properties (e.g. drop sections 8 and 12) and add a much more detailed discussion of the strength and weaknesses of the approach. This shall be done by carrying out additional validation activities. Also, the authors may consider to compare their results with the ones obtained by other published algorithms. I realize that it is quite difficult to obtain reliable reference data for validating SAR derived water maps, yet one advantage that the authors may make use of is the fact that their system allow global processing of the complete ENVISAT ASAR archive. This should allow them to identify a number of floods, for which reference data and flood maps have been published.

The paper is generally well written and easy to follow. However the appearance of the figures should be improved in my view. Overall, I recommend a major revision of the manuscript.

SPECIFIC COMMENTS

One assumption made by the authors is that temporarily flooded areas have the same backscatter distribution as permanent water bodies. However, it should be expected that the extracted water class histograms are heavily influenced by large water bodies. Wind probably has a stronger impact on large water bodies than on smaller ones so therefore the histograms derived for those water bodies are probably not representative for small flooded areas. While the authors made the decision to leave out oceans from the training dataset they used measurements from large lakes which arguably are more similar to coastal waters of oceans than to relatively small scale flood events. Because of these reasons, it would be imaginable to derive water histograms for different climate zones and to mask out very large water bodies.

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p. 7805, l. 1: “unless an army of human operators” is too colloquial

p. 7806, l. 11: only altimeters looks straight down, so this statement does not seem to be relevant here.

p. 7806, l. 27.: The authors state that empirical distribution functions were estimated for “pixels within a 1 x 1 degree tile, which are permanently wet”. This contradicts p. 7808, l. 9-10 according to which one global histogram for the freshwater class is made. P. 7807, l. 15: “in between 1.55 and 4.25”: are these numbers correct, or maybe I do not understand the meaning of this sentence.

p. 7810, l. 9 ff.: The histograms are derived for each 1x1-degree tile. Does this mean there is only one quality indicator q per tile and polarisation? In fig. 8 (right) q is presented for each pixel. Please make this clearer.

p. 7813, l. 19 ff.: Is this supposed to validate the HAND index or to show the plausibility of the resulting flood maps? Validation of HAND is not the focus of this paper, what is missing is rather a proper validation of the flood mapping algorithm.

p. 7813, l. 15: Did you expect to be able to detect floods in urban areas? Although the moderate resolution hardly permits mapping floods here flooded urban areas would be expected to show higher backscatter values due to double-bounce effects (Mason et al. 2010). The algorithm does not explicitly address this possibility.

Fig 8 left: a more linearly spaced colour table would be desirable here. The colour table in use here is actually more of a threshold.

Fig. 9: From a scientific point of view it would be more interesting to show the flood probability than the thresholded map. Also the quality indicator would be useful.

REFERENCES

D. C. Mason, R. Speck, B. Devereux, G. J. Schumann, A. Member, J. C. Neal, and P. D. Bates, “Flood Detection in Urban Areas Using TerraSAR-X,” IEEE TRANSACTIONS

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