

Author's Reply to the Referee Comments on

Brief Communication: Contrast stretching and histogram smoothness based flood detection

We are thankful to the anonymous referees for useful comments/suggestions. We have revised our paper keeping in view the referees comments/suggestions. The revisions are marked with blue color in revised manuscript. In this document, we quote in bold face statements from the reviewer, our replies follow in ordinary print (with blue color). Following is the point wise response to the reviewer comments/suggestions.

I. ANONYMOUS REFEREE # 1

Comments/Suggestions: Paper has been written well and is relevant to the field.

Response: We are thankful to the anonymous reviewer for appreciating our work.

II. ANONYMOUS REFEREE # 2

Comments/Suggestions: The paper presents an advancement to and a comparison with an existing methodology of contrast stretching (Dellepiane and Angiati, 2012). It contributes to the field of SAR image processing for flood detection. The methodology which is based on contrast stretching of pre- and post-flood SAR images seems promising. It aims at visualizing the relevant information from the difference image of the two SAR acquisition dates in such a way to provide ready-to-use flood maps.

Generally, the paper is rather brief and in some parts it lacks a proper explanation and illustration of what the authors propose and what is the difference to the existing methodology on which their approach is based. The paper is sometimes difficult to read due to poor grammar and language. English language has to be revised and improved.

Response: We are thankful to the anonymous reviewer for kind appreciation. We have revised the paper by adding proper explanation, and difference between existing and proposed schemes. We have now also revised/improved English language as per suggestion.

A few detailed comments and suggestions:

- **Comment: P5038 line 12: delete undated → the SAR acquisition should have a date so that it can be proved that it shows a non flooded state, whereas an undated image could also show a flood situation (not desirable); the sentence should be: to classify non flooded and flooded (inundated) areas...**

Response: The reviewer suggestion has been incorporated in the revised manuscript.

- **Comment: line 15: not true → region growing techniques with empirical seed point selection are only one method that can be summarized as semi-automatic segmentation based flood detection techniques (see for example the method proposed by Martinis, Tuele & Voigt, 2011)**
References: Martinis, S.; Tuele, A.; Voigt, S., 2011: Unsupervised extraction of flood-induced backscatter changes in SAR data using Markov image modeling on irregular graphs, IEEE Transactions on Geoscience and Remote Sensing, 49 (1), 251-263.

Response: We have revised the statement as per reviewer suggestion.

- **Comment: Same line: flood detection techniques (plural)**

Response: The typo has been incorporated in the revised manuscript.

- **Comment: line 17: delete monitoring → it should be either unsupervised flood classification or change detection**

Response: The reviewer suggestion has been incorporated in the revised manuscript.

- **Comment: line 22: maps (plural)**

Response: The typo has been incorporated in the revised manuscript.

- **Comment: line 25: Chain of processing based method. . . what is meant here? Processing chain?**

Response: We have now replaced “Change of processing based method” with “Dellepiane and Angiati (2012) flood monitoring technique” to add clarity.

- **Comment: What is the exact name of the cited method?**

Response: The exact name of the cited method has been mentioned in the revised manuscript.

- **Comment: Line 26: include the, delete image; suggestion: in the flood map.**

Response: The reviewer suggestion has been incorporated in the revised manuscript.

- **Comment: P5039 line 5: difference images (plural). A (article) fast ready flood map...**

Response: The reviewer suggestion has been incorporated in the revised manuscript.

- **Comment: line 7: show (without s); of the (article) proposed technique**

Response: The reviewer suggestion has been incorporated in the revised manuscript.

- **Comment: P5041 line 5: to their respective RGB image (not in)**

Response: The reviewer suggestion has been incorporated in the revised manuscript.

- **Comment: line 9: of the image (article)**

Response: The reviewer suggestion has been incorporated in the revised manuscript.

- **Comment: line 14: at the right center of the image (article)**

Response: The reviewer suggestion has been incorporated in the revised manuscript.

- **Comment: line 15: using the proposed technique (article)**

Response: The reviewer suggestion has been incorporated in the revised manuscript.

III. ANONYMOUS REFEREE # 3

Comments/Suggestions: This paper deals with an interesting. However, it only presents a pre-processing approach for flood detection using SAR image. Indeed, the output of the proposed method is not a flood map, but a RGB composition based on SAR images. In this context the title is not adapted.

Response: We are thankful to the anonymous reviewer for useful comments and suggestions. The paper deals with generation of a RGB flood map using pre and post flooded registered images of same region. To clarify, we have now further elaborated the proposed scheme in the revised manuscript. We can also change the title to “Contrast stretching and histogram smoothness based flood map generation” if the editor allows.

Comments/Suggestions: In this context the introduction is not really relevant here. Indeed methods for detecting flooded pixels on SAR images are presented in the introduction while the proposed method does not go that far. It could be worth to mention as an alternative also fully automatic method as the ones proposed by Matgen et al. and Giustarini et al. (see below).

P. Matgen, R. Hostache, G. Schumann, L. Pfister, L. Hoffmann, and H.H.G. Savenije. Towards an automated SAR-based flood monitoring system: Lessons learned from two case studies. *Physics and Chemistry of the Earth*, 36(7-8):241-252, 2011.

L. Giustarini, R. Hostache, G.J.-P. Schumann, P. Matgen, P.D. Bates, and D.C. Mason. A change detection approach to flood mapping in urban areas using TerraSAR-X. *IEEE Transactions on Geoscience and Remote Sensing*, 51(4):2417-2430, 2013.

Response: We have revised the introduction section of paper and also included the alternative methods (as pointed out by the reviewer).

Comments/Suggestions: More important, in the introduction, the authors might tell something about the speckle and its processing (filters) since this could be responsible for contrast issues.

Response: We have now also added some sentences related to speckle noise and its pre-processing in the revised manuscript as suggested by the reviewer.

Comments/Suggestions: The proposed method is not really clear to me due maybe to the way of writing. I think this part might be a bit detailed. It is also not 100% clear to me how the proposed method is different from the one proposed by Dellepiane.

Response: We have revised the proposed section to make it more readable/understandable. The difference between existing and proposed schemes are now also elaborated in the revised manuscript.

Comments/Suggestions: Moreover, pre and post flood images are not really correct since one of the two images might have been acquired during a flood event.

Response: Date of pre and post flood images are now also mentioned in the revised manuscript to add clarity.

Comments/Suggestions: The visual comparison based on figures 2 and 3 is not sufficient even for a brief communication in my opinion.

Response: Since the aim of flood map generation is to have better visualization of flooded and non-flooded areas therefore many state of art techniques have not presented any quantitative comparison including the one on which proposed technique is based (few more papers include [1]-[3]). However, if the reviewer still insists and given the page limitations of brief communication, we can add some quantitative comparison of different steps.

REFERENCES

- [1] S. Dellepiane, E. Angiati, and G. Vernazza, "Processing and segmentation of COSMO-SkyMed images for flood monitoring," *IEEE International Geoscience and Remote Sensing Symposium*, pp. 4807-4810, 2010.
- [2] N. Chaouch, M. Temimi, S. Hagen, J. Weishampel, S. Medeiros, and R. Khanbilvardi, "A synergetic use of satellite imagery from SAR and optical sensors to improve coastal flood mapping in the Gulf of Mexico," *Hydrological Processes*, vol. 26, no. 11, pp. 1617-1628, 2012.
- [3] S. Dellepiane, and E. Angiati, "A new method for cross-normalization and multitemporal visualization of SAR images for the detection of flooded areas," *IEEE Transactions on Geoscience and Remote Sensing*, vol. 50, no. 7, pp. 2765-2779, 2012.