Geophysical Research Abstracts
Vol. 14, EGU2012-11254, 2012
EGU General Assembly 2012

A change detection approach to flood mapping in urban areas using very high-resolution microwave remote sensing imagery

L. Giustarini (1), R. Hostache (1), P. Matgen (1), G. Schumann (2), P.D. Bates (2), and D.C. Mason (3)

(1) CRP - Gabriel Lippmann, EVA, Luxembourg (giustari@lippmann.lu), (2) School of Geographical Sciences, University of Bristol, BS8 1SS Bristol, United Kingdom, (3) Environmental System Science Centre, University of Reading, RG6 6AL Reading, United Kingdom

Very high-resolution Synthetic Aperture Radar sensors represent an alternative to aerial photography for delineating floods in built-up environments where flood risk is highest. However, even with currently available SAR image resolutions of 3 m and higher, signal returns from man-made structures hamper the accurate mapping of flooded areas. Enhanced image processing algorithms and a better exploitation of image archives are required to facilitate the use of microwave remote sensing data for monitoring flood dynamics in urban areas.
This work presents a new way to efficiently process SAR data for enhanced flood detection. The purpose is to develop a fully automatic image classification method based on image statistics that can be applied to all existing SAR data sets and to different types of flooded regions, including urban settlements.
A hybrid methodology combining radiometric thresholding, region growing and change detection is introduced as an approach enabling the automated, objective and reliable flood extent extraction from very high-resolution urban SAR images. The method is based on the calibration of a statistical distribution of "open water" backscatter values inferred from SAR images of floods. SAR images acquired during dry conditions enable the identification of i) areas that are located in "shadow" regions and are therefore not visible to the sensor and ii) areas that systematically behave as specular reflectors (e.g. smooth tarmac, permanent water bodies). Change detection with respect to a pre-flood reference image thereby reduces over-detection of inundated areas.
A case study of the July 2007 Severn River flood (UK) observed by the very high-resolution SAR sensor on board TerraSAR-X as well as airborne photography highlights advantages and limitations of the proposed method. We conclude that the fully automated SAR-based flood mapping technique overcomes some limitations of state-of-the-art methods normally used. However, further technological and methodological improvements are necessary for SAR-based flood detection in urban areas to match the flood mapping capability of high quality aerial photography.