Flood Area Extraction Using Synthetic Aperture Radar in the Kelani River Basin

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Among all natural disasters, flood is identified as the most frequent natural hazard in Sri Lanka, proved by its history as well. The climate of Sri Lanka is known as tropical monsoon climate with mainly two monsoons periods: southwest and northwest. We have witnessed during the period of last July 17-22, 2016 a strengthening of the upward trend, with an average rate was increased in aspect of flood disasters, such as it had a tremendously high human impact and caused high economic damages. The rapid response mapping using satellite remote sensing technology is widely used where increasingly preferred alternative option for emergency assessment and operation flood disaster management efforts.

The research is to have an accurate and reliable flood area extraction for a large urban area and extract flood area in Colombo during May 2016, using sentinel-1 C band single polarization (VV) SAR data and to characterized the performance and the ability of the C band VV polarization on flood effects. Urban flooding results in serious damages and stay as a complex phenomenon to map due to the land use heterogeneity it associates. Here the flood water is considered to be only calm water. Many flood mapping SAR algorithms model open water as a perfect smooth surface which reflects most radiance away from side-looking SAR sensors. Especially in urban areas SAR inevitably requires an oblique scene illumination resulting in undesired occlusion and layover. The sentinel-1 mission is expected to deliver a wealth of data and imagery.

In the context of floods to understand the backscatter behavior of various semantic classes a series of histograms representing the class backscatter coefficients were generated. These histograms were used to determine the backscatter threshold values between water and the non-water regions. The change detection was performed between the two images by using a contextual Mean Ratio Detector considering second order pixel neighboring system. The results were compared with the reference map generated by using field data, and the correlation coefficients for the sample area were in the range of 0.7 to 0.8 with high agreement. Further the visual interpretation suggests the level of details using the C band SAR data is significantly higher than the ground based interpretation.

Keywords: Single polarization, Flood mapping and Contextual Mean Ratio Detector