Analysis of the flooded area in the Great East Japan Earthquake by MODIS thermal infrared data

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In the past several years, many previous studies have been conducted by the researches to analyze the backscattering differences of the synthetic aperture radar (SAR) data between pre- and post-event to estimate the flooded area. However, the data acquisitions were restricted only after the occurrence of the event in general. On the contrary, low-resolution optical sensor such as MODIS acquires images every day although the objects on the ground are visible only during clear days. The goal of this study was to monitor the flooded area continuously till the recovery phase, and determine to utilization of the optical Earth Observation (EO) satellite data.
The purpose of this study was to obtain the knowledge for estimating the wide flooded area from satellite thermal infrared data. We developed the methodology to estimate the flooded area using land surface temperature (LST) data, and evaluated the area by applying it to the case of the Great East Japan Earthquake. The test sites were Ishinomaki-shi, Sendai-shi of Miyagi Prefecture, and Souma-shi of Fukushima Prefecture. Firstly, the analysis of LST just after the earthquake was conducted both daytime and nighttime. Subsequently, we found that the LST of the flooded area at nighttime was higher than unflooded area. Secondly, we conducted the unsupervised classification in extracting the flooded area utilizing LST data of only after the earthquake. From the analysis of the threshold temperature, we revealed that it was different about 1 degree by the area. Finally, we evaluated the classification accuracy both qualitatively and quantitatively. By comparing the referenced data, the producer’s accuracy, user’s accuracy, and total accuracy were revealed for each site. The outcome of this study suggests that the observation of the temporal changes of the flooded area is possible by the continuous monitoring by the EO satellite data.

