CHANGE DETECTION OF THE TANGJIASHAN BARRIER LAKE BASED ON MULTISOURCE REMOTE SENSING DATA

Min Xu[1,2], Chunxiang Cao[1], Hao Zhang[1], Yong Xue[1], Yingjie Li[1,2], JianPing Guo [3], Caoyi Chang [1,2], Qisheng He[1,2], Mengxu Gao[1,2], Xiaowen Li[1]

1 State Key Laboratory of Remote Sensing Science, Jointly Sponsored by the Institute of Remote Sensing Applications of Chinese Academy of Sciences and Beijing Normal University, Beijing 100101, P.R. China

2 Graduate School of the Chinese Academy of Sciences, Beijing 100049, P.R. China

3 Centre for Atmosphere Watch and Service, Chinese Academy of Meteorological Sciences, China Meteorological Administration, Beijing 100081, P.R. China

(cao413@irsa.ac.cn, xumin818@126.com)

1. INTRODUCTION

The earthquake-induced barrier lakes which are caused by landslides that blocked rivers and reservoirs are at risk of bursting after excessive rainfall and serious threat to people living in the surrounding. The traditional method of fields survey is not sufficient to monitor the barrier lakes due to the time and resources limits. The satellite can give a continual observation to the land cover of the earth. Howerver, because of the periodicity of the satellite, single sensor data are still not sufficient to circularly monitor the barrier lakes in a short time. The paper proposed an approach of change detection of barrier lake using the method of post-classification comparison combined with background subtraction using the multisource and multitemporal remote sensing data. The case studied in the paper is the detection of the Tangjiashan barrier lake which is one of the largest lakes that induced by the Wenchuan earthquake in China on May 12, 2008.

2. METHODOLOGY

The changes is clearly observed after comparing of the pre- and post-earthquake images, the changes in surface water is clearly seen visually. However, for computer automatic detection, it can not recognize the type and the boundary of each object in images. A classification method is necessary and important for the automatic detection of changes in features. Before classification, the image registration is required using toposheets and ground information. After classification, for the main objective of the paper is to detect the changes of the barrier lake, not all the categories that has been classified are necessary to be detected. Therefore, the paper introduced the approach of background subtraction into the method of post-classification comparison, all the other categories excluding water in the classified images are masked as background. The comparison is between the classified images which has been subtracted the background.

Image classification is very crucial in the approach of change detection, for the accuracy of classification has a direct effect on the result of the changed areas detection. Therefore, an appropriate method of classification is much requisite in change detection. The paper chooses a classifier that uses hypotheses, rules and variables to create classes of interest and to make a rule-based classification through an implementation in a decision tree.

Unlike the traditional unsupervised and supervised classification methods which are directly based on the spectra values of multispectral images, the rule-based classification usually introduces NDVI (Normalized Difference Vegetation Index),

DEM (Digital Elevation Model), texture and other features to realize the separation of diverse objects. In our case, no DEM or other topographic features of the study area are available in a short time after the earthquake, and the only cartographic information is ALOS AVNIR-2 images. Thereby, the paper selected some appropriate features including NDVI (Mainly used to distinguish vegetation from the other objects.), NDWI (Normalized Difference Water Index, which is very sensitive to water.) and PC-1 (The 1st Principal Component, which contains most information of the multispectral images.) to construct the decision tree for image classification.

3. RESULT

The result shows that the ground objects change significantly which are very clearly seen from pre- and post-earthquake images. From the images, it is clearly seen that a large-scale landslide took place around the Tangjiashan Mountain and the slide soil blocked the river through the mountain valley, the water level rose and submerged a large amount of surrounding areas. And the river widen through Yuli town increased from 90 m per-earthquake to 545 m post-earthquake. Here we also computed the area of water in the study area, and concluded that it increased from an area of 0.858 km^2 to 1.471 km^2**.** It proves that the approach is feasible to automatically and quantificationally detect and analyze the barrier lake.