FAST EXTRACTING AND CHANGE DETECTION OF DAMMED LAKES USING HIGH-RESOLUTION SAR IMAGES: A CASE STUDY OF TANGJIASHAN DAMMED LAKE

*Yun Shao [1], Shiang Wang [*1, 2], Wei Tian [1, 2], Huaze Gong [1, 2], Fengli Zhang [1]*

1: Institute of Remote Sensing Applications, Chinese Academy of Sciences
P.O. Box 9718, Beijing, 100101, China
2: Graduate University of Chinese Academy of Sciences, Beijing, 100049, China
*Email: wsa@irsa.ac.cn

ABSTRACT

A large earthquake with 8.0 magnitude took place in the southwestern Chinese city of Wenchuan in Sichuan Province at 2:28 p.m on May 12th, 2008. Wenchuan Earthquake has caused many huge landslides in the rivers in Sichuan Province. As a result, a large amount of water were blocked in the rivers and numerous dammed lakes appeared in the following days, which could result in inundation in the lake area and flooding disaster in the lower reaches. Therefore, it is urgent to reconnoitre the existed dammed lakes and their spatial distribution.

Synthetic Aperture Radar (SAR) technology played an irreplaceable role in rapid response to Wenchuan Earthquake monitoring and damage assessment. Based on SAR images' significant advantages in disaster monitoring that are all-weather, independent of illumination imaging capabilities and intense stereoscopic sense, we conducted systematic and periodic emergency monitoring and evaluating for towns and key mountain regions after Wenchuan Earthquake, following quantitative evaluation for Building Damage, Landslides and Dammed Lakes. The microwave remote sensing division in Institute of Remote Sensing Applications made 7 reports on Tangjiashan Landslide and Dammed Lake. All the reports were delivered to central and local government, ministries and rescue teams. All the information extracted and evaluation delivered from SAR images made great contribution to the decision making and rescuing action.

In this paper, Tangjiashan Dammed Lake was taken as a case study area for fast extracting and change detection with continuously acquired multi-temporal SAR images, including TerraSAR-X and COSMO-SkyMed satellite SAR images, about 3~5m resolution. In order to make a scientific evaluation of the disaster situation and provide scientific basis for rescue action in the future, an effective and rapid extraction method of Dammed Lakes was developed. Masking was firstly adopted to eliminate the abnormal dark patches on the SAR images. The input calibrated SAR image in GeoTIFF format was then segmented with an adapted threshold according to a sliding window across the image. For the separated dark patches, the clustering was finally adopted to discriminate between Dammed Lake candidates and natural dark objectives on the SAR image. As a result of the extraction, sets of vector polygon representing the Dammed Lakes were automatically generated by a vectorization from raster data using the Fast Extraction of Dammed Lakes System (FEDLS 1.0) we developed.

We can also track the development and calculate the area of a dammed lake such as Tangjiashan Dammed Lake by using FEDLS 1.0. As water level rising, the small towns such as Xuan Ping, Zhicheng and the Sheng Kenzi village were

inundated. The Xuan Ping Town was total underwater at last. Many roads along the Jian River were inundated as well. The tail of Tangjiashan Dammed Lake extended toward upstream gradually, and widened the river channel obviously.

High-resolution SAR images as well as appropriate information extraction methods were used to acquire the distribution information of other dammed lakes. Up to June 12, 2008, we had identified dozens of dammed lakes in heavily affected area of Wenchuan Earthquake using high-resolution SAR images. In the state of emergency, high-resolution SAR images are very important for rescuing actions in disaster area, and FEDLS should be contained by Headquarters System for Earthquake Disaster Mitigation.