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Classification of slope failures caused by the Mid Niigata Prefecture Earthquake by using composed satellite data

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The Mid Niigata Prefecture Earthquake in 2004 caused various scales many slope failures in the Chuetsu area. The distribution of them was interpreted by aerial photographs and the disaster condition maps of the earthquake were published by the Geospatial Information Authority of Japan. In this study, we discussed on an efficient classification method of slope failures by using satellite data of two periods before and after the earthquake. We prepared two ASTER data composed of band 1, 2, 3 and 4 acquired in 3 June 2004 and 10 November 2004, and polygon or polyline data indicating the slope failures such as scarps, landslide masses and the small scale slope failures triggered by the earthquake in the disaster condition maps. We prepared three 5-band data composed of the ASTER data after the earthquake and one data of band 2 to 4 before it, three 6-band data composed of ASTER data after the earthquake and two data of band 2 to 4 before it, and one 7-band data composed of ASTER data after the earthquake and all data of band 2 to 4 before it. Study area was classified into 8 items such as scarp, landslide dam, river, grass land, urban area, bare land, broad leaf, needle leaf by the supervised maximum likelihood classification based on these composed satellite data.

The averages of classification accuracy that is percentage of correct answers in the training area were 93.2% in the ASTER data after the earthquake, 95.9% in the 5-band data, 96.6% in the 6-band data and 97.2% in the 7-band data. The accuracies on scarp and landslide dam relating slope failures were better in the 5-band data composed of band 4, the 6-band data composed of band 2 and 4 and the 7-band data. Then the distribution of slope failures triggered by the earthquake was overlaid on the classified images by GIS. As a result of the overlays, it was found that the areas of classified scarp coincide well with the distribution of slope failures and the scarp is rarely misclassified at the valley floor in the images by the 5-band data composed of band 4 and the 6-band data composed of band 2 and 4. Consequently, we clarified in this study that the classification accuracy is higher using composed satellite data of two periods than using single satellite data, and increases the larger the number of composed bands in the maximum likelihood classification. In addition, if the target of the classification is slope failure, the accuracy might increase by composing band 4 data before the earthquake in preference to the satellite data after it.

Keywords: composed satellite data, maximum likelihood classification, slope failure, The Mid Niigata Prefecture Earthquake in 2004