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ORIGINAL PAPER

Assessment of ASTER satellite images in landslide inventory mapping: Yenice-Gökçebey (Western Black Sea Region, Turkey)

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Abstract In the last two decades, developments in Geographic Information Systems and Remote Sensing have allowed rapid and detailed analysis of natural hazards. The Western Black Sea region of Turkey is a major landslide prone area. Landslides in a selected area were assessed using Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) satellite imagery. Stereoscopic and two-dimensional visual image interpretations were performed at different scales and field studies were carried out such that the landslide inventories could be compared. The study indicated the best approach was stereoscopic image analysis for visual interpretations. The smallest landslide area realistically mapped using the ASTER image was 58,885 m^2. It is considered that ASTER satellite images provide useful information particularly in regional and/or medium scale landslide inventory studies.

Keywords ASTER · Landslide · Landslide inventory · Satellite image

Résumé Dans les deux dernières décennies, des développements dans les Systèmes d'Information Géographique et la télédétection ont permis des analyses rapides et détaillées des aléas naturels. La région ouest de la Mer Noire en Turquie est une région fortement sensible aux glissements de terrain. Les glissements dans une région sélectionnée ont été évalués utilisant l'imagerie satellitaire ASTER. L'interprétation d'images stéréoscopiques a été réalisée à différentes échelles et des études de terrain entreprises en vue d'une comparaison des inventaires. L'étude montre que la meilleure approche était l'interprétation visuelle d'images stéréoscopiques. Le glissement le plus petit cartographié à partir des images ASTER présentait une surface de 58885 m^2. On considère que les images satellitaires ASTER donnent des informations utiles en particulier pour les études d'inventaire de glissements à des échelles régionales.

Mots clés ASTER · Glissement de terrain · Inventaire de glissements · Image satellitaire

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Introduction

The term landslide describes the movement of a mass of rock, debris or earth down a slope (Cruden 1991). The materials subjected to a landslide may move by falling, toppling, sliding, spreading, flowing or a combination of these. Landslide occurence depends upon different parameters such as geological and/or geomorphological processes, changes in vegetation cover and land use and can be triggered by heavy precipitation, earthquakes and human activity. In addition to loss of lives, landslides destroy residential and industrial areas as well as agricultural and forest lands, and negatively affect water quality in rivers and streams (Schuster 1996). From another aspect, landslides are natural events and play an important role in the evolution of landforms (Harmon and Doe 2001). Remote Sensing (RS) techniques are important in landslide assessments as landslides directly affect the earth's surface and cause changes on it. Furthermore, RS techniques are preferable for landslide assessments because of their

4. As the M value only relates to the boundaries of the two landslide inventories, in order to get a better indication of the landslide types the two maps are overlaid. Figure 10 shows that in addition to compatible areas between the two maps, there are also ill-matched areas. For example, #31 flow type landslide in Map 1 is almost compatible with g15 flow landslide in Map 7 (see Fig. 10). Individual flows with #16, 18, and 19 (Map 1) are again compatible with g14 (Map 7), but the latter was mapped as a flow zone during the field studies. However, the landslides at the top (NE) of Map 7 (y143, y144, y145, y146, y147, and y148) were not idenified in any of the stereoscopic visual interpretations, as is also the case with the landslides at the eastern edge (e.g. y100, y89, y99, and so on). Such incompatibilities may be related to such factors as new landslide occurrence (i.e. after the acqusition date of satellite image) or landslide features were obscured/not identifiable at the selected scales.
5. The most significant finding was the compatibility between the smallest mapped landslide (#20) on Map 1 and the g7 landslide of Map 7 (see Fig. 10). The size of this landslide was calculated as 58,885 m^2. The type was not clear, although in the field it was classified as a rotational earth slide. The smallest identified and interpreted landslide was on Map 2 (see Fig. 7b, #13) which was produced by 1/25,000 scale stereoscopic image assessments. This flow type landslide was 70,861 m^2 in size; the location and the type were confirmed by the fieldwork (y17 in the Map 7). Therefore, it can be concluded that the MIDA is 58,885 m^2 and the MINA is 70,861 m^2 for the ASTER Level 3A data. It should be noted that these values are only valid for the landslides and landslide characteristics of the present study area.
6. Based on the results obtained from the present study, stereoscopic visual assessments performed on ASTER images to prepare landslide inventory maps provide valuable and useful information, particularly for medium or regional scale landslide assessments. If these studies are combined, more accurate results can be achieved.

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