



## **Comparative satellite image analysis for mass movement detection: Lebanon as a case study**

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Mass movements (MM) represent a serious threat to human life and activities in most mountainous areas. However, due to the rugged nature of such terrain, it is often difficult to detect such phenomena in remote areas. Hence, satellite imagery offers many attractions for the examination of MM in such environments, especially in less developed nations in which resources are stretched and levels of environmental information are limited. There is a need to ensure that the techniques and used images are effective, reliable and cheap in terms of amount and accuracy of data that can be extracted.

Taking Lebanon as a case-study, this paper compares the applicability of different satellite data sensors (Landsat TM, IRS, SPOT4) and several image processing techniques (False Color Composite "FCC", Pan-sharpen, Principal Component Analysis "PCA", Anaglyph) for the mapping of MM recognized as landslides, rock and debris falls, and earth and debris flows. Results from the imagery have been validated by field surveys and analysis of IKONOS imagery acquired in some locations witnessing major MM during long periods. Then, levels of accuracies of detected MM from satellite imageries were plotted. This study has demonstrated that the anaglyph produced from the two panchromatic stereo-pairs SPOT4 images remains the most effective tool setting the needed 3-D properties for visual interpretation and showing maximum accuracy level of 67%. The PCA pan-sharpen Landsat TM-IRS image gave better results in detecting MM, among other processing techniques, with maximum accuracy level of 62%.