

COMPARISON OF SPOT AND SAR ERS-1 DATA
IN MAPPING OF VOLCANIC DEPOSITS ON THE WESTERN FLANK OF PINATUBO VOLCANO

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Abstract

Optical SPOT and SAR ERS-1 images taken over the western side of Pinatubo Volcano in 1993 and 1995 were analysed and compared with field data. The objective of the analysis is to assess the usefulness of stereoscopic application of SPOT images to geological mapping of the pre-1991 (ancient) and recent lahar and pyroclastic flow deposits and their extent based on differences in morphology, texture, and brightness. Both SPOT and SAR ERS-1 images can also show temporal and spatial development of lahars since the eruption of Pinatubo in June 1991.

Analysis of SPOT images acquired on 12 February and 14 March 1995, with 31 day interval, shows particular textural and morphological features which can be used to differentiate various types of volcanic deposits and even assign relative dating. This is specially applicable to ancient deposits. However, there seems to be no distinction between lahar deposits of 1991 to 1995 because they have similar spectral response. The only way that the different lahar terraces can be dated is through verification with existing field data and comparison with SAR ERS-1 data. Furthermore, comparison of the two SPOT images cannot provide significant lahar development since both images were taken during the relatively dry season. However, the high level of the normal stream flow in the February image, manifested by darker color along the main active channel, emphasized the distinct boundary of the existing high lahar terraces.

The use of remote sensing data, specifically stereoscopic SPOT images, has been proven to be effective in mapping lahar and pyroclastic flow deposits in the western side of Pinatubo Volcano, especially in sections not accessible in the field or aerial surveys. However, cartography on optical data are limited by frequent cloud cover in tropical and volcanic areas like the Philippines. On the other hand, SAR ERS-1 images can recognize the morphological and surface features even during cloud cover because they are acquired by all-weather instruments. The comparison of ERS-1 and SPOT images are useful in verifying relief features, identifying active lahars, and delineating areas affected by flooding and formation of lahar-dammed lakes. These mapping tools still need to be verified with available field data.

Keywords: ESA European Space Agency - Agence spatiale europeenne, observation de la terre, earth observation, satellite remote sensing, teledetection, geophysique, altimetrie, radar, chimique atmospherique, geophysics, altimetry, radar, atmospheric chemistry