APPLICATION OF RADAR TO DISASTER MANAGEMENT

WOLDAI, T., VAN WESTEN, C. J. and RENGERS, N.The International Institute For Aerospace Survey & Earth Sciences (ITC), Enschede, The Netherlands

ABSTRACTWe are confronted almost daily on our television screen with the devastating effects of natural disasters such as earthquakes, floods, volcanic eruptions, windstorms, landslides, subsidence etc. Disaster managers and environmental decision-makers at all levels require rapid and efficient tools to assess the impact of such disasters, and to mitigate the effect of them in future. Geoinformation tools, such as Geographic Information Systems (GIS) and Remote Sensing, have become indispensable in this process. In the last few years we have witnesses the active and effective usage of a new Geoinformation tool in Disaster Management: synthetic Aperture Radar (SAR) data.Unimpeded by haze and most cloud conditions and equally suitable in day- and night-time, SAR has been used to survey, map and monitor various forms of natural disasters and processes that have long frustrated optical remote sensing. SAR generates its own coded signal and measures the echo from the surface allowing for any subtle movement to be registered. This has allowed mapping of recent fault movements and any dynamic processes taking place in areas prone to earthquakes or volcanic eruptions. In the case of man-made oil pollution (accidental spills or deliberate dumping), SAR data has helped to detect oil slicks and indicates the magnitude of spills their extent and approximate thickness. In managing flood hazard, timely availability of processed images is critical. Unfortunately, flooded areas are mostly cloud-covered. Where optical remote sensing data has failed, the all-weather capability of SAR in this case offers the solution. SAR also offers promising methods to detect the two-dimensional spectra of long ocean surface waves and to investigate oceanfronts, currents and so on.Pioneering studies so far carried out using SAR interferometry (InSAR) have already being earmarked as a new development in understanding our earth and its dynamics. By evaluating the scene coherence measured from consecutive SAR data (taken just before and immediately after the event has taken place), a reliable mapping of the flood extent is feasible, even in case of rough water surfaces where the analysis of conventional SAR intensity and multi-temporal images may fail. InSAR can provide with unprecedented precision, high-resolution imagery of earthquake-prone areas, high-resolution topographic data, and a high-resolution map of coseismic deformation generated by an earthquake. The precise monitoring of surface deformation allows accurate zoning, mapping and prediction of volcanic eruptions, landslides and ground subsidence. The ability to make these measurements from space without ground control is a fundamental advance in our monitoring capability. This paper explores the various uses of SAR and InSAR data in understanding natural disasters. The current trend and future prospects of radar and its application in environmental hazards zoning are also discussed.