** The author(s) of each abstract is/are solely responsible for the content.*

ABSTRACTS

Variance analysis of 3D-displacement extracted from GB-SAR measurements

Aiham Hassan(Germany)**, Jinjun Xu**(China)**, Cheng Xing**(China)**, Volker Schwieger**(Germany)

Keywords: Engineering survey, GB-SAR, Monitoring, Error Propagation

Abstract

The ground-based Synthetic Aperture radar (GB-SAR) is a remote sensing technique, which has been used in the last two decades for many monitoring tasks of both man- made and natural objects. The advantages of GB-SAR are its high temporal and spatial resolution and its high accuracy in detection of displacements in the line of sight (LOS) direction for the whole illuminated area.

The accuracy of these Los-displacements is usually in sub-millimetre range and depends on the wave length of the used radar-signal and on the accuracy of the displacement interferometric phase, which in its order also depends on the accuracy of the correction of atmospheric phase and on the topographic and radiometric properties of the illuminated area.

However the Los-displacement is just a projection of the real displacement on the LOS-direction, and therefore just a part of it. In order to get the real displacement from GB-SAR data the LOS-direction and the direction of the real displacement vector should be determined in a 3D coordinate system. For this purpose the position of the GB-SAR instrument and of the pixel under investigation should be measured using further measurement technique i.e. GNSS or total station. The direction of the real displacement vector should be also measured using the same technique. Using these additional information the angle between LOS-direction and the direction of the real displacement could be determined and the LOS-displacement can be transformed to the direction of the real displacement.

The accuracy of the transformed displacement will be affected by the uncertainties of the additional information needed for this transformation. This accuracy was been investigated in this study under different configuration in order to quantify it and to determine the main influence factors on it. The results show that the main influence factor is the angle between LOS and real displacement vector. The standard deviation of the transformed displacement increased from a value almost equal to the standard deviation of the LOS-displacement, when both directions are parallel, to a value of almost 35 times the standard deviation of the LOS-displacement, when the angle between both directions equals 80°. For this reason it is recommended to choose the measurement configuration in the way that the GB-SAR instruments looks in the direction of the expected displacement.