

POINT TARGET ANALYSIS AS APPLIED TO THE CHARACTERIZATION OF LOCALIZED DEFORMATION FEATURES

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ABSTRACT

Monitoring of ground deformation is a critical component of geotechnical engineering practice. This study investigated the application of synthetic aperture radar interferometry (InSAR), using point target analysis (IPTA) for characterizing localized deformation features that are often associated with geotechnical engineering activities. In contrast to discrete point in-situ deformation measurement techniques, InSAR can be used to obtain a broader view of deformation processes at a site. Satellite data available for the time period of construction of the Los Angeles Metro Rail Red Line was utilized to characterize the technique in terms of dependence of the feasibility in its application on SAR image acquisition parameters. Additionally, a statistical assessment of the sensitivity of deformation rates and the associated standard errors to the size of the dataset analyzed was performed by analyzing randomly generated subsets of data. While the spatial and temporal signatures corresponding to tunneling during the construction of the Red Line were successfully detected, it was found that a minimum of twenty SAR acquisitions were required in order to constrain the deformation history of the study area. From the sensitivity analysis, it was found that the variability of the derived estimates of deformation parameters varied inversely as a function of the size of the dataset used for analysis.