

Public Abstract

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Title:GROUND BASED INTERFEROMETRIC RADAR INITIAL LOOK AT LONGVIEW, BLUE SPRINGS, TUTTLE CREEK, AND MILFORD DAMS

Measuring millimeter and smaller deformation has been demonstrated in the literature using RADAR. To address in part the limitations in current commercial satellite-based SAR datasets, a University of Missouri (MU) team worked with GAMMA Remote Sensing to develop a specialized (dual-frequency, polarimetric, and interferometric) ground-based real-aperture RADAR (GBIR) instrument. The GBIR device is portable with its tripod system and control electronics. It can be deployed to obtain data with high spatial resolution (i.e. on the order of 1 meter) and high temporal resolution (i.e. on the order 1 minute). The high temporal resolution is well suited for measurements of rapid deformation. From the same geodetic position, the GBIR may collect dual frequency data set using C-band and Ku-band. The overall goal of this project is to measure the deformation from various scenarios by applying the GBIR system. Initial efforts have been focusing on testing the system performance on different types of targets.

This thesis details a number of my efforts on experimental and processing activities at the start of the MU GBIR imaging project. For improved close range capability, a wideband dual polarized antenna option was produced and tested. For GBIR calibration, several trihedral corner reflectors were designed and fabricated. In addition to experimental activities and site selection, I participated in advanced data processing activities. I processed GBIR data in several ways including single-look-complex (SLC) image generation, imagery registration, and interferometric processing. A number of initial-processed GBIR image products are presented from four dams: Longview, Blue Springs, Tuttle Creek, and Milford. Excellent imaging performance of the MU GBIR has been observed for various target types such as riprap, concrete, soil, rock, metal, and vegetation. Strong coherence of the test scene has been observed in the initial interferograms.