IAF EARTH OBSERVATION SYMPOSIUM (B1)
Interactive Presentations - IAF EARTH OBSERVATION SYMPOSIUM (IP)

Author: Dr. Davide Oscar Nitti
Geophysical Applications Processing, Italy

Dr. Raffaele Nutricato
Geophysical Applications Processing, Italy
Dr. Alessandro Parisi
Geophysical Applications Processing, Italy
Dr. Khalid Tijani
Geophysical Applications Processing, Italy
Dr. Fabio Bovenga
National Research Council (CNR-IREA), Italy

# INVESTIGATING AMPLITUDE AND INSAR PHASE FROM PASSIVE AND ACTIVE ARTIFICIAL REFLECTORS

**Abstract**

The work is aimed at assessing reliability, precision and limitations of using artificial reflectors (ARs) for supporting the ground displacement monitoring based on spaceborne Interferometric Synthetic Aperture Radar (InSAR) data. ARs are usually deployed in order to: i) calibrate SAR spaceborne sensors; ii) increase the spatial density of displacement measurements in areas lacking coherent targets such as rural, forested, and mountainous areas; iii) target and monitor the stability of specific parts of buildings and infrastructures. Urban context poses some additional challenges such as the interaction with surrounding structures, which may corrupt both amplitude and phase signals. An experimental site has been set up by deploying two passive corner reflectors (CRs) and three active reflectors over a building roof. Each CR consists of three triangular metal panels welded perpendicularly to each other to form a trihedral shape whose internal edge is respectively 69.5 cm (CR0) and 1.05 m (CR1). Concerning the active reflectors, one is the Electronic Corner Reflector at C-band (ECR-C) produced by MetaSensing, which is compatible with operating frequencies of Sentinel-1 and RADARSAT-2. The other two were designed in the early '90s for supporting the calibration of SAR sensors operating at C-band (ARC-C) and X-band (ARC-X). ECR-C and ARC-C have been tuned to work with the Sentinel-1 C-band SAR mission, while ARC-X has been exploited for working with COSMO-SkyMED X-band constellation. ECR-C works with both ascending and descending orbits, through software switching, while ARC-C and ARC-X have to be re-oriented mechanically to be pointed towards either ascending or descending passes. CR0 and ARC-X are oriented to be visible from ascending passes and the former can be lifted upward to simulate millimetric displacements along the sensor line of sight. CR1 and the ARC-C are pointed towards descending passes. The deployment site and the AR's locations have been selected with the specific aim of evaluating the impact of signals coming from surrounding structures, which is a relevant issue when using ARs for monitoring the stability of specific parts of a building. The proposed experimental set up allows comparing results obtained by using both CRs and active reflectors, as well as results obtained by using CRs of different sizes, which means different SNR conditions for both amplitude and phase signals. Moreover, we investigated the interaction between Sentinel-1 signals coming from CR-1 and ARC-C positioned at different mutual distances and working at different polarizations.