AIRBORNE D-INSAR AT X-BAND: RESULTS WITH THE COMPLETE REPEAT-PASS PROCESSING METHODOLOGY

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1. EXTENDED ABSTRACT (PROPOSED FOR ORAL SESSION)

Differential Interferometry (D-InSAR) is a technique that estimates terrain movements at the sub-wavelength scale using repeat-pass interferometry. In order to obtain such precision, the phase errors due to motion (uncorrelated for each pass) shall be known and compensated also within this accuracy. For airborne systems this becomes a challenging task due to the instablity of the flights. Recently there were significant advancements in SAR processing in order to perform accurate differential interferometry. It has been shown that the airborne SAR processing chain for D-InSAR applications requires in principle [1, 2]:

- topography- and aperture-dependent motion compensation.
- residual motion error estimation and compensation

The first requirement can be resolved by applying the algorithm PTA (Precise Topography- and aperture-dependent) or SATA (Sub-Aperture Topography- and aperture-dependent) MoComp [3, 4]. The second requirement can be resolved by applying the algorithm Multisquint or WPCA (Weighted-Phase Curvature Autofocus) [5, 6].

First X-band D-InSAR results were presented in [7] with data acquired by the OrbiSAR sensor from OrbiSat with satisfactory results. The D-InSAR campaign consisted of eleven flights distributed over 2 days of acquistions over a mountain region of Perugia. The first X-band results were obtained by focusing the SAR data with a smoothed DEM and by applying a subsequent first-order phase correction.

Now, for this paper we will apply to the same X-band data the complete repeat-pass processing methodology, which has shown to bring significant improvement for D-InSAR at L- and C-bands [8, 9]. More specifically, we will apply the topography- and aperture depedent MoComp and estimation of residual motion errors as follows:

- SAR focusing/processing with phase-preserving algorithm, smoothed DEM, and accurate navigation data coming from up-to-date navigation systems, INS/GPS.
- Topography- and aperture-dependent MoComp with PTA.
- Estimation of residual motion errors independently for each track with WPCA and subsequent removal.

The differential interferograms and coherence map obtained after the above steps will be compared to the formerly results in order to analyse the degree of improvement in the accuracy and discuss the need of applying a complete processing methodology for X-Band D-InSAR applications. In particular, the paper intends to open the possibility to fully exploit the accuracy of X-band D-InSAR measurements, which is able to sense more precisely the terrain motions due to its smaller wavelength compared to L- and C-bands.

2. REFERENCES

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