
North-South ground displacement retrieval with burst-mode SAR Systems: Experimental modes and results with TerraSAR-X.

Nestor Yague-Martinez^{*1}, Pau Prats-Iraola , and Steffen Wollstadt

¹German Aerospace Center (DLR) – Münchener Straße 20 82234 Wessling, Allemagne

Résumé

This contribution will present the investigations carried out with burst-mode acquisitions that achieve a wide area coverage and simultaneously an enhanced performance on the retrieval of the ground deformation in the along-track direction with respect to conventional burst-mode acquisitions.

A review of experimental acquisition modes made with TerraSAR-X will be in first place exposed: The BiDirectional SAR [1][2], Two-looks TOPS [3] and pi-shifted TOPS[4][2] in case of using a constellation of two platforms.

The focus of this contribution will be given to the Two-looks TOPS mode. A description of the mode will be presented providing the achievable performances in case of using pairs of images or stacks. The main advantage of using the 2-looks TOPS mode is the ability to estimate the scene motion in a repeat-pass configuration in the azimuth direction over non-stationary areas with a similar accuracy to the one given by the StripMap mode but providing wide coverage.

Results over the Petermann glacier in Greenland with pairs of TerraSAR-X images acquired in 2015 will show the potential of this mode to map scenarios which present large deformation in the north-south direction. The evaluation of stacked time-series of TerraSAR-X 2-looks images over Balochistan, Pakistan spanning a time interval of almost one and a half year will demonstrate the capability of this mode to study scenarios with slow azimuthal motion as the post-seismic deformation of this site after the 2013 M7.7 and M6.8 earthquakes. Several aspects will be analyzed. In first place, the impact of the tropospheric delay on the azimuthal measurements is reviewed. The achievable accuracy employing a time series is presented for the along-track direction and compared to the accuracy achievable in the across-track direction. Moreover the achievable 3D performance when combining ascending and descending acquisitions will be exposed.

J. Mittermayer, S. Wollstadt, P. Prats-Iraola, P. López-Dekker, G. Krieger, A. Moreira. Bidirectional SAR Imaging Mode. IEEE TRANSACTIONS ON GEOSCIENCE AND REMOTE SENSING, VOL. 51, NO. 1, January 2013.

P. Prats-Iraola, M. Rodriguez-Cassola, N. Yague-Martinez, P. Lopez-Dekker, R. Scheiber, F. D. Zan, T. Kraus, and S. Wollstadt, "Repeat pass interferometric experiments with the

^{*}Intervenant

TanDEM-X constellation for accurate along-track motion estimation,” in IEEE International Geoscience and Remote Sensing Symposium (IGARSS), July 2015.

P. Prats-Iraola, N. Yague-Martinez, S. Wollstadt, T. Kraus and R. Scheiber. Demonstration of the Applicability of 2-Look Burst Modes in Non-Stationary Scenarios with TerraSAR-X, in Proceedings of EUSAR 2016: 11th European Conference on Synthetic Aperture Radar, June 2016

F. Rocca, R. Hanssen, and A. Monti Guarnieri. ”Perspectives of Sentinel-1 for InSAR applications,” in Living Planet Symposium, 2013