

Modeling temporal decorrelation from bistatic TanDEM-X Time-Series

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The interferometric coherence represents the normalized cross-correlation coefficient between the interferometric pair of acquired images and is the key-quantity for assessing the quality of the interferogram. Moreover, it is a valuable input for a variety of other scientific applications, such as land usage classification, biomass estimation or forest detection. TanDEM-X is currently the only spaceborne SAR system able to provide, every 11 days, high-quality single-pass interferograms, which are not affected by temporal decorrelation. The bistatic information is fundamental for properly separating all decorrelation contributions which depend on the system parameters (such as SNR, quantization, and ambiguities) and on the acquisition geometry (volume and baseline decorrelation). Furthermore, both temporal and volume decorrelation phenomena affect the coherence measurement in repeat-pass systems, such as Sentinel-1, and cannot be separated, since different combinations of the two can be ascribed to different scattering mechanisms. The aim of this work is to analyze TanDEM-X repeat-pass interferometric time-series, aimed at understanding and modeling the temporal decorrelation at X band for different land cover classes. By exploiting bistatic systems such as TanDEM-X, the combined use of single- and repeat-pass data, derived from the same multi-temporal stack, allows for the isolation of volume and temporal decorrelation contributions. In this sense, the information given by TanDEM-X is unique: for instance it could support the modeling of InSAR coherence temporal dynamic for other sensors as well, by considering the link between different bandwidths. This topic will be investigated by comparing the temporal evolution of the coherence in overlapping time-series acquired by TanDEM-X (X band) and Sentinel-1 (C band) over the same ground area. Finally, a proper modeling of temporal decorrelation can also help to improve the accuracy of the currently developed techniques based on the analysis of the repeat-pass coherence, in particular when applied to land cover classification purposes.