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InSAR-ICA technique for the elimination of atmospheric and other spurious artifacts

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A new technique has recently been developed for separating spurious artifacts from arrays of InSAR by using none or minimal ground data information through Blind Source Separation (BSS) and, specifically, Independent Component Analysis (ICA) [1]. The initial hypothesis of possible applicability is based on the consideration that the observed interferometric phase shifts can be modeled as the overlapping of components resulting from different phenomena and, in particular, topographical altitude, terrain displacements, fluctuations in atmosphere between acquisition times and other possible minor spurious signals. The specific ICA algorithm that has been employed for this InSAR processing is the FastICA [2]. Although the application of this algorithm is immediate on arrays of interferograms, the geophysical interpretation of the sources extracted and their elaboration for deriving information on topography or surface deformations is not banal. For example, the sources extracted are defined a minus of an additional and multiplicative constant. Moreover, overlapping components which are largely correlated are generally extracted as one single component. These and other aspects of the processing have been discussed and solved in subsequent steps. In particular,the shift from relative to absolute geophysical values is achieved by employing even only two ground points of precise knowledge. At present time, the applicability on ERS SAR experimental data has been defined and validated for this technique, named 'InSAR-ICA' in recent papers. In particular, this method can be employed for deriving the topography [3] or even the nominal surface deformations [4], with especially usefulness in cases of lack or approximative ground based and meteorological data. This presentation reports a summary of the validation of the

InSAR-ICA method on experimental data. Moreover, considering that previous applications were centered on specific sub-areas of tests, recent results obtained on large spatial and temporal scales are illustrated.

References.

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