Processing low noise interferograms from ERS1 - SLC radar images

Remi MICHEL[1], Jean-Philippe AVOUAC[1] and Jean TABOURY[2]

1 Laboratoire de Detection et de Geophysique, CEA, BP 12, 91680 Bruyeres le Chatel Cedex, FRANCE. email: michel@ldg.bruyeres.cea.fr . tel: 33-01-69-26-62-76. fax: 33-01-69-26-70-23.

2 Institut díOptique- SupOptique, 91403 ORSAY Cedex, FRANCE.

Abstract

We propose a method to compute interferograms from Synthetic Aperture Radar images that significantly reduce the phase noise while preserving spatial resolution. The procedure starts from two Single Look Complex images noted a and b. We give usefull results about interferometry with ERS-1. The non common spectral bands of the images are suppressed. Disparities between the two images are computed using the Fourier transform of the images amplitudes within a slidding window. The images are then registred within 1/10 of pixel using an exact formulation for resampling. The images are over-sampled by a factor two and a raw interferogram is computed. We show that the main source of noise is due to the poorly constrained phase at points where the amplitude of the interferogram is low, i.e. at the speckle grains boundaries. We therefore filter the interferometric phase using a weighting function that depends on the amplitude of the interferogram. The adaptative filtering also takes into account the local slope. The averaging window is choosen in order to preserve the maximum spatial resolution. The filter remains efficient on areas of narrow fringes and high temporal decorrelation. Example using ERS-1 SAR data are discussed.

keywords: SAR interferometry, image registration, adaptive phase filtering