Analysis of Airborne Data Using Range Migration Algorithm for the Spotlight Mode of Synthetic Aperture Radar

Authors : Peter Joseph Basil Morris, Chhabi Nigam, S. Ramakrishnan, P. Radhakrishna

Abstract : This paper brings out the analysis of the airborne Synthetic Aperture Radar (SAR) data using the Range Migration Algorithm (RMA) for the spotlight mode of operation. Unlike in polar format algorithm (PFA), space-variant defocusing and geometric distortion effects are mitigated in RMA since it does not assume that the illuminating wave-fronts are planar. This facilitates the use of RMA for imaging scenarios involving severe differential range curvatures enabling the imaging of larger scenes at fine resolution and at shorter ranges with low center frequencies. The RMA algorithm for the spotlight mode of SAR is analyzed in this paper using the airborne data. Pre-processing operations viz: - range de-skew and motion compensation to a line are performed on the raw data before being fed to the RMA component. Various stages of the RMA viz:- 2D Matched Filtering, Along Track Fourier Transform and Slot Interpolation are analyzed to find the performance limits and the dependence of the imaging geometry on the resolution of the final image. The ability of RMA to compensate for severe differential range curvatures in the two-dimensional spatial frequency domain are also illustrated in this paper.

Keywords : range migration algorithm, spotlight SAR, synthetic aperture radar, matched filtering, slot interpolation
Conference Title : ICSARSS 2017 : International Conference on Synthetic Aperture Radar Systems and Subsystems
Conference Location : Venice, Italy
Conference Dates : February 16-17, 2017