# PARALLEL COMPUTING IMPLEMENTATION FOR ScanSAR MODE DATA†

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Synthetic aperture radar (SAR) data processing has matured over the past decade with advances in the traditional time-domain, the more popular and efficient frequency-domain, and the relatively new and more precise chirp-scaling processing approaches. Each of these approaches has spawn a multitude of processing algorithms with different attributes in terms of accuracy and computational complexity that make them best suited for specific applications. One common trait amongst all SAR data processing algorithms, however, is their iterative and repetitive nature that makes them amenable to parallel computing implementation, With SAR'S contribution to remote sensing now well-established, the processing throughput demand has increased steadily with each new mission and each new application such as Earth resource management via polarization and frequency diversity and terrain information extraction via interferometry. Parallel computing implementation of SAR processing algorithms therefore is becoming an important means of attaining high SAR data processing throughput to help satisfy Science demand.

This paper concerns parallel computing implementation of a mode of data called ScanSAR. ScanSAR has the unique advantage of yielding wide swath coverage with a single data collection pass. This mode of data collection has been demonstrated on SIR-C and is being used operationally for the first time on Radarsat. The burst nature of ScanSAR data is a natural candidate for parallel computing implementation. At the Alaska SAR Facility (ASF) at the University of Alaska Fairbanks, a ScanSAR processor has been developed that fully demonstrates the applicability of modern parallel computing to achieving near real-time SAR processing throughput performance. With the expanding role of ASF in acquiring, processing and archiving data from a fleet of international polar orbiting satellites including ERS - 1/2, JERS - 1 and Radarsat, the SAR processing system at ASF has expanded its processing capability with the introduction of this new Radarsat ScanSAR data processing system that is capable of processing a minimum of 42 minutes of ScanSAR data in an 11-hour day; effectively translating into a processing throughput of -1/16th real-time. This paper describes the implementation requirements for the Radarsat ScanSAR data processing system at ASF, the ScanSAR data processing algorithm, the hardware platform evaluation and selection process, and the implementation details associated with parallelizing the processing algorithm on the selected platform. A practical concurrent processing technique is also described that allows an additional 20% improvement in throughput at a marginal increase in system cost,

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