

Shining performance of RADARSAT-1 image quality and calibration in extended mission

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RADARSAT-1, the first Canadian Earth observation SAR satellite, continues to provide calibrated data to worldwide users since the start of its routine operation on April 1st, 1996, more than 10 years after its launch on November 4th, 1995. This paper discusses SAR calibration and image quality of RADARSAT-1 in extended mission, as evolved from the earlier phases of the calibration plan. The plan prescribes, for single beam as well as ScanSAR imagery, regular monitoring of radiometric calibration and image quality performance, based on images of the Amazon Rainforest, and of the four RADARSAT-1 precision transponders deployed across Canada.

Following qualification of the radiometric calibration early after commissioning, the monitoring plan was put in place. Periodic measurements showed changes in the characteristics of several previously calibrated elevation antenna patterns. Compensations for these mean-term fluctuations were, and still are, made in the processor by recalibrating the affected beams. The SAR processor, at the Canadian Data Processing Facility (CDPF), also underwent a major upgrade in 2002, which led to significant improvements in image quality and radiometry. After 5 and a quarter years of nominal mission lifetime and then about 5 years of extended mission presently, the CDPF continues to provide calibrated products whose imagery still remains within the original specifications, despite payload aging.

In mid 2002, aging considerations for the on-board recorder led to a site survey within masks of Canadian data reception facilities, for potential support for radiometric calibration monitoring, as an alternative to the Amazon, where images are recorded. Following this survey, a Canadian boreal forest location is now used as an auxiliary reference. Additionally, image-planning system for image quality and radiometric performance monitoring gradually evolved since commissioning. Even after many years of operations, the RADARSAT-1 SAR system still excels through its extended mission. As system-aging considerations have led to successful experiments, it is hoped that RADARSAT-1 will continue to pave the way for the advent of the RADARSAT-2 era.