

RADARSAT-2 Image Quality and Calibration Overview

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Abstract

RADARSAT-2 continues to operate well and without degradation in image quality. Launched in December 2007, RADARSAT-2 continues to support operational imaging using approximately 300 different beams in 20 different beam modes (15 Strip-map modes, 4 ScanSAR modes, and a Spotlight mode), as well as several experimental and calibration beams. It continues to support options for different polarization selections and both left- and right-looking satellite orientation. It has performed over 750,000 successful acquisitions.

This presentation provides an update on RADARSAT-2 SAR image quality and calibration. As part of ongoing operations, images and other forms of data are systematically collected and analyzed in order to monitor the performance of the system. Calibration sites for these acquisitions include the Amazon rainforest, the Doldrums region of the Pacific Ocean, and calibrated point targets (corner reflectors, antenna dishes, transponders). The analysis yields a variety of image quality measures and antenna parameters that are tracked systematically. These activities are planned carefully in order to span the large number of beams and modes efficiently.

Results show the stability of key measures including radiometric accuracy, geolocation accuracy, impulse response statistics, noise levels, polarimetric accuracy, and precise beam pointing. Special attention is paid to beam pointing following recent on-board software updates that allow the attitude control system to operate with a reduced number of attitude knowledge gyros. In addition, SAR antenna diagnostic tests are run on an ongoing basis to monitor the health of T/R modules, both individually and grouped together by row or column.

As necessary, this combined information is used to apply ongoing calibration adjustments. Recent and planned forthcoming adjustments include selected minor refinements to phase balancing offsets between antenna wings in dual-receive-aperture modes, for ongoing correction of seasonal variations.

In addition, the RADARSAT-2 system is highly configurable and continues to be expanded with new capabilities in order to serve evolving client needs. Recently, a new experimental ground penetrating radar mode was developed and used to collect data for the Canadian Space Agency, to support studies on detecting near-surface water ice deposits for the Canadian SAR concept for Mars.

MDA also continues to collaborate with the Canadian Space Agency on understanding and mitigating the risk of image quality degradation due to inter-mission C-Band SAR interference. Predictions of interference events with Sentinel-1, Gaofen-3, and RCM satellites are generated on a weekly basis and used to identify rare cases of image artifacts caused by inter-mission interference.

Keywords - Operational quality control