

3D Radargrammetric Modeling and Calibration of Radarsat-2 Stereo Data

Thierry Toutin and René Chénier

Natural Resources Canada, Canada Centre for Remote Sensing

588, Booth Street, Ottawa, Ontario, K1A 0Y7, Canada

Tel: (613) 947-1293/Fax: (613) 947-1385/thierry.toutin@ccrs.nrcan.gc.ca

The geometry and the accuracy of the three-dimensional (3-D) cartographic localisation and Digital Elevation Model (DEM) generation potential of RADARSAT-2 images are being evaluated as part of the Canadian Space Agency's Science and Operational Applications Research program. In a first step, the Toutin's 3-D physical model, previously developed for Radarsat-1, was adapted to Radarsat-2 sensor and applied to two ultra-fine mode images (U2 and U25) acquired over an area in Beauport, Quebec. Afterwards, the 3-D modeling computed with only 12 ground control points and the geometric localisation were evaluated with different check data: (1) the root mean square errors computed over independent check points (1 m in planimetry and 2 m in elevation); (2) the error from the overlay of the comparison of the two quasi-epipolar images (less than 0.25 m); (3) the error from the comparison of the overlay of the two ortho-images (less than 1 m); and (4) the comparison with 1-m accurate ortho-photos (less than 1 m). All four results and validations are in agreement and confirm that the 3-D geometric localization and restitution accuracy is 1 m in planimetry and 2 m in elevation. The checked data error being included in these evaluations and the relative error computed from the quasi-epipolar comparison gave thus a high level of confidence that the precision of Toutin's 3-D radargrammetric model is better than 0.2-0.3 m. Investigations are currently being conducted to evaluate the geometric localisation and DEM generation potential of Radarsat-2 images in 3 m polarimetric and 1 m SpotLight modes.