CALIBRATION OF FORMOSAT-2 STEREO DATA OVER A CANADIAN STUDY SITE

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The first remote sensing satellite developed by National Space Organization (NSPO), FORMOSAT-2, was successfully launched on May 21, 2004. The main mission of FORMOSAT-2 is to conduct remote sensing imaging over Taiwan and on terrestrial and oceanic regions of the entire earth. The images captured by FORMOSAT-2 during daytime can be used for land distribution, natural resources research, environmental protection, disaster prevention and rescue work etc. However, Earth observation systems offer more or less broad coverage and ever-finer detail, but their revisit frequency is still limited for surveillance purposes. FORMOSAT-2, the first and only high-resolution satellite with a daily revisit capability, overcomes this obstacle to provide a new response to your surveillance needs. In addition, the in-track stereo-capability of FORMOSAT-2 enables the generation of digital elevation models (DEM) using the classical procedure developed in satellite stereo-photogrammetry.

The paper will thus present the generation and the evaluation of DEMs extracted FORMOSAT 2 (F2) stereo data acquired over a hilly test site in Canada (47º N, 71º 30' W). Due to its unique daily revisit capability, two cloud-free stereo-pairs from two successive days were thus used for DEMs generation. Two slightly similar processes were performed at Spot-Image, France (the Pixel Factory™ developped by Infoterra France) and at the Canada Centre for Remote Sensing (CCRS). Both models and methods are based on 3D physical models, which fit the FORMOSAT-2 geometry of level-1A scenes. The Pixel Factory™ method follows these different processing steps:

1. Relative bundle adjustment: co-registration of the two scenes using tie points;
2. Absolute bundle adjustment: optimization of the absolute planimetric accuracy of the block using ground control points (GCPs);
3. Calculation and generation of the epipolar images;
4. Calculation of the corresponding disparity image: several tests will be run using different range of correlation window;
5. Calculation of the geocoded DEM. At that stage, the DEM is checked and its calculation can be re-run as a function of several criteria (matching rate, characteristic lines restitution, percentage of artefacts…);
6. Correction of invalid pixel by interpolation;
7. Qualification and verification of the DEM using external cartographic sources (independent check points, DEM, digital maps, Lidar surveys…);
8. Comparison of the two DEMs extracted from the two consecutive stereo-acquisitions.

The CCRS method follows more and less the same processing steps, except that the relative and absolute bundle adjustments are performed together in one step. Preliminary results at CCRS showed a general accuracy better than 5 m with 90% level of confidence and better

than 3 m on bare soils. More results from both methods will be presented during the Conference.