TIME TREND EVALUATIONS OF ABSOLUTE ACCURACIES FOR ALOS OPTICAL INSTRUMENTS

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1. INTRODUCTION

Since January 24, 2006, the Advanced Land Observing Satellite (ALOS) is continuously operating more than three years and it is works very well. ALOS has three mission instruments i.e. an L-band Synthetic Aperture Radar called PALSAR, and two optical sensors called PRISM and AVNIR-2. The global images are acquiring and the numbers of archived images are more than 741,000 scenes by PALSAR, 948,000 scenes by PRISM and 433,000 scenes by AVNIR-2 as of March 2008, respectively, and they are using for cartography, disaster monitoring as well as forest and environmental monitoring. The sensor calibrations and accuracies evaluations are most important to use ALOS data in any application fields because they directly effect to the accuracy of the results in applications. The results of initial calibration phase (ICP) of PRISM and AVNIR-2 have been reported [1], [2], [3]. After ICP, JAXA is continuously doing calibration and validation (Cal/Val) activities e.g. accuracy evaluations of standard products in term of geometry, radiometry and image quality, and updating parameters that are used in the sensor models to generate standard products to maintain and improve absolute accuracies as operational calibration. In the case of PRISM and AVNIR-2, we have been found time trends of some parameters since launch the satellite and updating them to keep and improve absolute accuracies. This paper describes updated results of operational calibration for PRISM and AVNIR-2 with accuracies evaluation of standard products.

2. GEOMETRIC CALIBRATION

The geometric calibrations of both PRISM and AVNIR-2 were carried out as two steps i.e. relative calibration and absolute calibration. The relative geometric calibrations were done by evaluating and correcting parameters related to band-to-band registration for AVNIR-2, and relative CCD alignments for PRISM. The absolute geometric calibrations were done by evaluating the sensor alignments for both AVNIR-2 and PRISM. In this section, updated results and time trends are shown as operational calibration.

Regarding to geometric calibration of AVNIR-2, the band-to-band registration is important because if it accuracy is not sufficient the color composite image runs in level 1B2 (L1B2) standard product. The band-to-band registration is defined to adjust bands 1, 2, and 4 to band 3 that is as the base band into the geometric sensor model. We are also continuously evaluating the absolute geometric accuracy of AVNIR-2. The sensor alignment was adjustment about 20 meter gap in Y (line) direction of AVNIR-2 imageries.

Regarding to geometric calibration of PRISM, the nadir-looking radiometer of PRISM has six CCD units, which is covered 70km observation swath width. The forward- and backward-looking radiometers have eight CCD units to observe same area with nadir's one even the earth rotating on its axis due to time gaps between those observations (about 46 seconds each). One of parameters of sensor model is a relative alignment between CCD units called CCD alignment. The relative

geometric calibration of PRISM is carried out to evaluate and update CCD alignments parameters. Previous version of CCD alignments were described in [3] as version 2. Updated parameter will be presented in [4], where CCD alignments will be evaluated using interior orientation and kept the accuracies of sub-pixel level of about 0.6 to 0.7 pixels. The absolute geometric calibration is done by evaluating the pointing alignment parameters, which are calculated by the Precision Pointing and Geolocation Determination System (PPDS) that is a ground processing system to achieve determinations of precise attitude and pointing vectors for each PRISM radiometer [5]. To improve geometric absolute accuracy of PRISM, the pointing alignment parameters have to estimate precisely including variations of recurrent as well as time dependency. The current pointing alignment parameters are version 17 that released on November 2008. We will update them about each two months to keep the accuracy if accuracy degradation is confirmed.

3. RADIOMETRIC CALIBRATION AND IMAGE QUALITY EVALUATIONS

The radiometric calibration is also important for many application fields, especially vegetation, classification and ocean applications. Regarding the relative radiometric calibration, stripe noises were sometime appeared in PRISM images, therefore new algorithm was released to software to process standard products on October 2007. Absolute calibration is usually performed by vicarious calibration with ground- or airborne-based experiments. However, such experiments depend highly on weather conditions as well as the atmosphere. Therefore, cross-calibration is performed with calibrated satellite data i.e. MODIS onboard TERRA and AQUA satellites. The detail of radiometric calibration of AVNIR-2 is described in [6].

The image quality is important as another issue. Especially, PRISM has a function of onboard data compression to reduce data rate from 960Mbps to 240Mbps by JPEG algorithm to downlink mission data *via.* Japanese Data Relay Test Satellite (DRTS). As the result of compression, block noises depends on JPEG are sometime appeared into the images. The block noise reduction filter [7] was installed to the software to generate standard products on April 2008.

4. REFERENCES

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