

The Geometric Accuracy Evaluation Results of RPC (Ver.1.7)

1. Purpose

This document describes the evaluation results of geometric accuracies for RPC (Ver.1.7) produced by the ALOS-PRISM RPC generating software of JAXA/EORC and RESTEC. The updated points from the previous version (Ver.1.6 [1]) are as follows;

- The long-term trend model of PRISM sensor alignment was updated for the pitch angles of FWD/NDR/BWD images observed after Jan.29, 2010.
- The short-term (orbit cycle) trend model of PRISM sensor alignment was updated for the roll angle of BWD image observed after Mar.22, 2007. (This update was performed for the model in the ascending orbit, which the scenes observed in a polar area correspond to. The magnitude of improvement is relatively small.)

2. Method

Same as Ver.1.0 [2].

3. Data

1) PRISM Standard Product L1B1

Ten triplet data sets observed from Jan. 30 through Jun. 22, 2010 are used for the evaluation. These data sets were sampled from the calibration data archives in geometric Cal/Val activities organized by JAXA/EORC and RESTEC.

2) Geometric models

The CCD alignment data (interior orientation parameters) is version three (released at Jun.20, 2007) calibrated by JAXA/EORC and RESTEC. It has also been applied to JAXA/EOC Standard Product processing. The PRISM sensor alignment (exterior orientation parameters) is version eight calibrated by JAXA/EORC and RESTEC as well (briefly explained at section 1). No orientation processing (with GCPs) is performed.

3) GCP

Reference GCPs and their mensuration results were provided from the geometric Cal/Val activities organized by JAXA/EORC and RESTEC as well as the sample data sets.

4. Results

The number of GCPs and their error stats (Bias, SD = Standard Deviation, RMS) for each sample data set are shown in Table 1~3 (for forward, nadir, and backward respectively). These errors were calculated with “RPC for each image” data. The units of errors were converted to meters from pixels by using the default pixel spacing of 2.5m.

Table 1 The evaluation results of “RPC for each image” - forward

Scene			FWD					
			ΔP			ΔL		
Date	Site	No. of GCP	Bias[m]	SD[m]	RMS[m]	Bias[m]	SD[m]	RMS[m]
2010/01/30	Yamaguchi	5	-3.636	1.055	3.786	-3.562	0.760	3.643
2010/02/02	Seoul (South Korea)	13	-6.661	1.230	6.774	-2.102	1.554	2.614
2010/02/11	Capetown (South Africa)	5	-6.388	0.905	6.451	5.977	1.556	6.176
2010/03/02	Nagoya	6	-5.373	0.974	5.461	4.129	0.821	4.210
2010/05/20	Paris (France)	16	2.748	0.920	2.898	1.218	2.166	2.485
2010/05/26	Kenai (Alaska)	4	6.573	1.184	6.678	-3.703	1.699	4.074
2010/05/29	Brisbane (Australia)	4	-1.484	0.518	1.572	1.936	0.907	2.138
2010/06/01	Grong (Norway)	3	0.606	0.813	1.014	3.160	0.403	3.186
2010/06/05	Buenos Aires (Argentina)	7	-0.386	2.125	2.160	1.619	1.043	1.925
2010/06/22	Fukuoka	9	3.199	1.007	3.353	-3.358	1.215	3.572
RMS			4.370	1.145	4.518	3.357	1.312	3.605

Table 2 The evaluation results of “RPC for each image” - nadir

Scene			NDR					
			ΔP			ΔL		
Date	Site	No. of GCP	Bias[m]	SD[m]	RMS[m]	Bias[m]	SD[m]	RMS[m]
2010/01/30	Yamaguchi	5	-4.723	1.835	5.067	-1.854	1.008	2.110
2010/02/02	Seoul (South Korea)	13	-3.684	1.489	3.974	0.107	1.746	1.749
2010/02/11	Capetown (South Africa)	5	-9.959	0.534	9.973	0.745	1.127	1.351
2010/03/02	Nagoya	6	-7.928	1.330	8.039	6.680	0.726	6.720
2010/05/20	Paris (France)	16	6.001	1.255	6.131	3.344	1.821	3.808
2010/05/26	Kenai (Alaska)	4	6.375	1.150	6.478	1.576	1.870	2.445
2010/05/29	Brisbane (Australia)	4	-1.328	0.772	1.536	-2.794	1.292	3.079
2010/06/01	Grong (Norway)	3	3.830	0.875	3.929	4.383	0.960	4.487
2010/06/05	Buenos Aires (Argentina)	7	1.412	0.385	1.464	2.564	1.005	2.754
2010/06/22	Fukuoka	9	4.406	1.012	4.521	1.330	0.690	1.498
RMS			5.589	1.143	5.705	3.125	1.294	3.383

Table 3 The evaluation results of “RPC for each image” - backward

Scene			BWD					
			ΔP			ΔL		
Date	Site	No. of GCP	Bias[m]	SD[m]	RMS[m]	Bias[m]	SD[m]	RMS[m]
2010/01/30	Yamaguchi	5	-3.359	1.345	3.618	-1.941	1.743	2.609
2010/02/02	Seoul (South Korea)	13	-2.419	1.316	2.754	-0.678	1.751	1.878
2010/02/11	Capetown (South Africa)	5	-5.651	1.276	5.793	5.691	0.724	5.737
2010/03/02	Nagoya	6	-6.334	1.224	6.451	-0.435	1.154	1.233
2010/05/20	Paris (France)	16	1.943	1.241	2.305	1.455	1.674	2.218
2010/05/26	Kenai (Alaska)	4	1.573	1.140	1.942	-3.224	2.192	3.898
2010/05/29	Brisbane (Australia)	4	1.488	1.321	1.990	9.880	0.723	9.907
2010/06/01	Grong (Norway)	3	1.532	0.566	1.633	3.166	0.899	3.291
2010/06/05	Buenos Aires (Argentina)	7	1.101	2.336	2.583	8.748	1.258	8.838
2010/06/22	Fukuoka	9	2.542	0.544	2.599	-8.158	0.757	8.193
RMS			3.281	1.316	3.536	5.478	1.380	5.649

5. Summary of results

The results are well consistent with estimated accuracies of PRISM alignment trend model calibrated by JAXA/EORC and RESTEC.

References:

- [1] The Geometric Accuracy Evaluation Results of RPC (Ver.1.6): RESTEC, October 1, 2009.
- [2] The Geometric Accuracy Evaluation Results of RPC (Ver.1.0): RESTEC, April 5, 2007.