

The Geometric Accuracy Evaluation Results of RPC (Ver.1.6)

1. Purpose

This document describes the evaluation results of geometric accuracies for RPC (Ver.1.6) produced by the ALOS-PRISM RPC generating software of JAXA-EORC/RESTEC. The updated point from the previous version (Ver.1.5 [1]) is as follows;

- The long-term trend model of PRISM sensor alignment was updated for the pitch angles of FWD/BWD images observed after Mar.11, 2008.

2. Method

Same as Ver.1.0 [2].

3. Data

1) PRISM Standard Product L1B1

Ten triplet data sets observed from Jan. 19 through Aug. 31, 2009 are used for the evaluation. These data sets were sampled from the calibration data archives in geometric Cal/Val activities organized by JAXA-EORC/ RESTEC. The accuracies of NDR images are evaluated as well as the FWD/BWD images though this model update does not affect NDR images.

2) Geometric models

The CCD alignment data (interior orientation parameters) is version 3 (released at Jun.20, 2007) which JAXA-EORC/RESTEC calibrated and has been applied to JAXA-EOC Standard Product processing. The PRISM sensor alignment (exterior orientation parameters) is version 7 which JAXA-EORC/RESTEC calibrated 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/ 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					
Date	Site	No. of GCP	ΔP			ΔL		
			Bias[m]	SD[m]	RMS[m]	Bias[m]	SD[m]	RMS[m]
2009/01/19	Tsukuba	24	-6.099	1.461	6.271	-9.248	1.425	9.357
2009/02/09	Showa (Antarctica)	6	-4.187	1.553	4.466	2.691	0.459	2.730
2009/02/16	La Crau (France)	10	2.623	1.089	2.840	-7.056	1.649	7.246
2009/04/01	Paris (France)	16	1.163	0.991	1.528	0.621	1.607	1.723
2009/04/27	Brisbane (Australia)	14	0.939	1.077	1.429	1.410	1.391	1.981
2009/06/14	Kyushu	19	1.861	1.220	2.225	-0.994	1.363	1.687
2009/06/29	Thun (Swiss)	22	1.688	1.049	1.987	1.651	1.287	2.094
2009/07/15	Nagoya	5	3.869	1.249	4.066	-3.476	1.190	3.674
2009/08/30	Nagoya	5	4.725	1.097	4.850	1.156	1.472	1.872
2009/08/31	Ishigaki	3	1.979	0.536	2.051	1.904	0.816	2.071
RMS			3.337	1.163	3.534	4.070	1.313	4.277

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

Scene			NDR					
Date	Site	No. of GCP	ΔP			ΔL		
			Bias[m]	SD[m]	RMS[m]	Bias[m]	SD[m]	RMS[m]
2009/01/19	Tsukuba	24	1.564	1.540	2.194	-4.028	1.222	4.209
2009/02/09	Showa (Antarctica)	6	-3.987	1.527	4.269	11.505	0.740	11.529
2009/02/16	La Crau (France)	10	6.979	1.795	7.206	-3.977	1.855	4.388
2009/04/01	Paris (France)	16	1.292	0.857	1.550	-0.079	1.268	1.271
2009/04/27	Brisbane (Australia)	14	1.172	1.433	1.851	-4.302	1.060	4.430
2009/06/14	Kyushu	19	2.359	1.738	2.930	1.952	1.300	2.345
2009/06/29	Thun (Swiss)	22	2.157	1.564	2.664	1.906	1.499	2.425
2009/07/15	Nagoya	5	2.510	0.915	2.672	6.896	1.213	7.002
2009/08/30	Nagoya	5	1.287	0.539	1.395	1.262	1.190	1.735
2009/08/31	Ishigaki	3	2.758	0.236	2.768	-7.103	0.630	7.130
RMS			3.096	1.318	3.365	5.385	1.242	5.526

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

Scene			BWD					
Date	Site	No. of GCP	ΔP			ΔL		
			Bias[m]	SD[m]	RMS[m]	Bias[m]	SD[m]	RMS[m]
2009/01/19	Tsukuba	24	7.412	1.024	7.483	-10.463	1.277	10.540
2009/02/09	Showa (Antarctica)	6	-1.663	1.655	2.346	-7.225	0.706	7.259
2009/02/16	La Crau (France)	10	8.779	1.267	8.870	-10.830	1.907	10.997
2009/04/01	Paris (France)	16	0.535	1.124	1.245	2.987	2.172	3.693
2009/04/27	Brisbane (Australia)	14	-2.364	1.138	2.624	4.256	0.798	4.330
2009/06/14	Kyushu	19	-2.082	1.344	2.478	-4.221	1.629	4.524
2009/06/29	Thun (Swiss)	22	-0.400	1.370	1.427	4.072	1.656	4.396
2009/07/15	Nagoya	5	-1.635	0.653	1.761	-8.700	1.742	8.873
2009/08/30	Nagoya	5	-1.969	1.210	2.311	-1.829	0.758	1.980
2009/08/31	Ishigaki	3	-0.052	0.648	0.650	4.252	0.269	4.261
RMS			3.895	1.181	4.070	6.614	1.421	6.765

5. Summary of results

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

References:

- [1] The Geometric Accuracy Evaluation Results of RPC (Ver.1.5): RESTEC, February 9, 2009.
- [2] The Geometric Accuracy Evaluation Results of RPC (Ver.1.0): RESTEC, April 5, 2007.