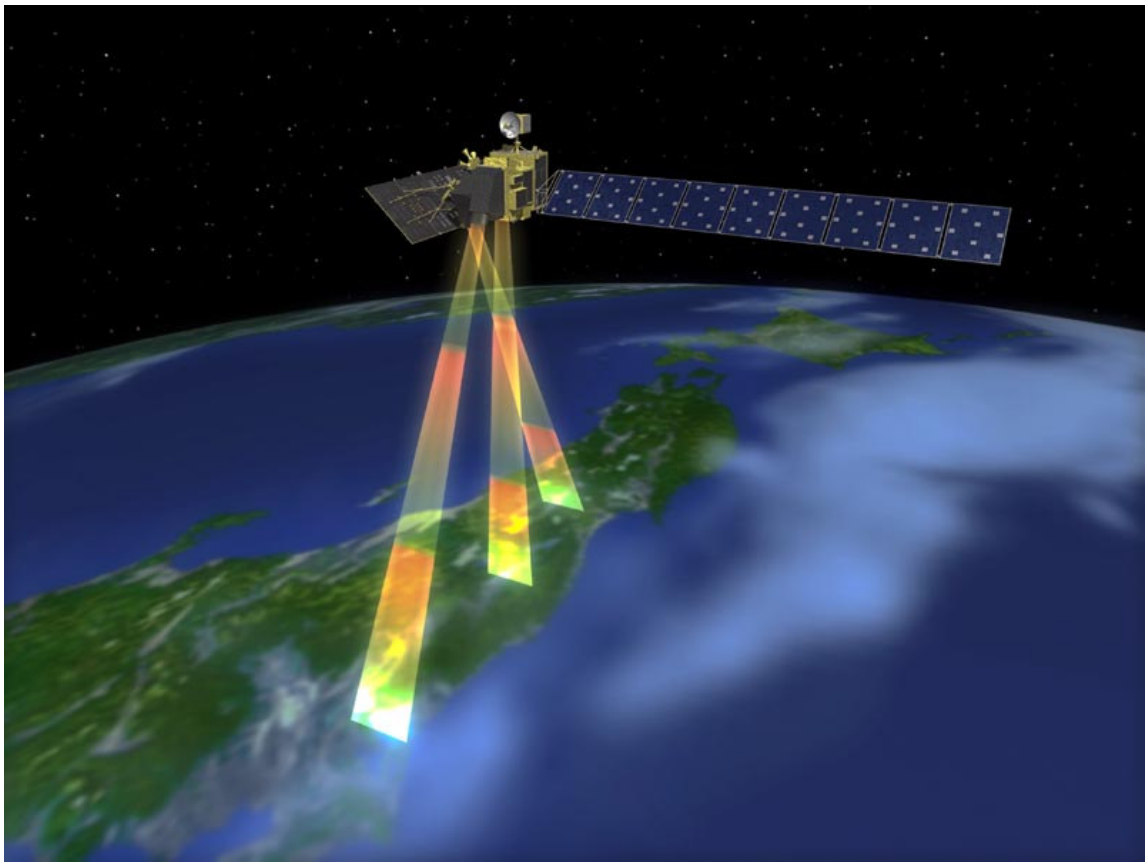
ADEN ALOS – PRISM CYCLIC REPORT

CYCLIC REPORT #20

09 JUNE 2008 TO 25 JULY 2008



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PRISM CYCLIC REPORT # 20

1 INTRODUCTION

The PRISM Cyclic Report is distributed by the IDEAS PRISM team to keep the PRISM community informed of any modification regarding quality control, instrument performance, the data production chain and the results of calibration and validation campaigns at the end of each ALOS cycle, which represents 671 orbits, or 46 days.

The PRISM instrument is on board the Japanese JAXA ALOS mission. The ALOS mission falls down the ESA third party mission category. The data is routinely received and processed by the ESA's ADEN ground segment across Europe. This is done through an agreement between JAXA and ESA, where ALOS is classed as an ESA Third Party Mission, for which it is responsible for data reception and product dissemination across the European and African regions. A series of quality checks are undertaken in order to assess the ground segment, the instrument performance and the product quality.

Checks are currently made on a weekly (header parameters, PDS status) or bi-monthly (visual report) basis to have a constant view on the mission status. The cyclic report presents the results of the analysis for the different part of the chain, from satellite to end-user product.

This document is available online at:
http://earth.esa.int/pcs/alos/prism/reports/cyclic/

1.1 Acronyms and Abbreviations

ADEN	ALOS Data European Node
ALOS	Advanced Land Observing Satellite
CEOS	Committee on Earth Observation Satellites
DoM	Day of Mission
EO Help	Earth Observation Help Desk
GCP	Ground Control Points
IDEAS	Instrument Data quality Evaluation and Analysis Service
JAXA	Japan Aerospace Exploration Agency
OCM	Orbit Control Manoeuvre
PCS	Product Control Service
PDS	Payload Data Segment
PI	Principal Investigator
PRISM	Panchromatic Remote-sensing Instrument Stereo Mapping
QC	Quality Control

SPPA	Sensor Performance Products Algorithms
TOA	Top of Atmosphere
UT	Universal Time

1.2 Reference Documents

RD.1	ALOS/AVNIR-2 Level 1 product format description Rev J - October, 2006 JAXA (NEB 00016)
RD.2	Bouvet M., Goryl. P.,Santer R., Chander G., Saunier S, Preliminary radiometric calibration assessment of ALOS AVNIR-2 IGARSS 2007 proceedings
RD.3	Saunier S., Goryl. P and al The contribution of ESA to the ALOS PRISM / AVNIR-2 commissioning phase IGARSS 2007 proceedings.
RD.4	Saunier S., Goryl P Final calibration / Validation report: PRISM Instrument Issue 1 Rev 0 – July 2007
RD.5	JAXA ALOS User Handbook November, 03, 2007 (NDX 070015)
RD.6	Gruen A., Kocaman S., Wolff K., 2007. Calibration and Validation of Early ALOS/PRISM Images. The Journal of the Japan Society of Photogrammetry and Remote Sensing, Vol 46, No. 1, pp. 24-38.

1.3 Background information

The PRISM instrument is an optical instrument which forms part of the ALOS mission built by the Japan Aerospace eXploration Agency (JAXA).

The ALOS mission data is produced and disseminated through geographical nodes. The European node (ADEN) was set up and is operated by ESA through the Tromso, Matera, Mas Palomas and Frascati ground stations. As a third party mission (TPM), only the ground segment and data processing are dealt with by ESA, the platform being the responsibility of the owner: JAXA. Each node operates their ground segment independently and shares results with JAXA when required in the frame of the Calibration Validation Science Team (CVST).

The ADEN team is responsible for the operation and maintenance of the node that receives data acquired over Europe and North Africa. The ADEN team took part in the Calibration/Validation activities during the ALOS commissioning phase (January to October 2006). The methodologies used and results obtained are documented (RD.3 and RD.4) and made available to the user through the site:
http://earth.esa.int/object/index.cfm?fobjectid=3738

As part of the ADEN operations, a series of quality checks are undertaken in order to assess the ground segment and instrument performance and the product quality for products requested by European users. Checks are currently made on a weekly basis (header parameters, PDS status) to have a constant view on the mission status.

2 SUMMARY

Cyclic Report: 20

Cycle Start: 09 June 2008

Cycle End: 25 July 2008

The main issues during the cycle have been as follows:

- **Processor Version**

  Current PRISM processor version: 3.00 (Tromso)

  See Section 3 for more information

3 SOFTWARE & AUX FILE VERSION CONFIGURATION

The PRISM processor is currently undergoing an upgrade at all processing stations to version 4.05. Once precise installation dates are available this information will be reported.

A history of the ADEN optical processor release notes will be made available on the ALOS ADEN PCS website, location: http://earth.esa.int/pcs/alos/avnir/userinfo/

4 PDS STATUS

Please note; one source of information for this document is the ALOS monthly report provided by JAXA. The monthly reporting timescale means that data concerning events conducted within this cycle may not be available at the time of writing. In this event, information will be included in the next report.

4.1 Planned Instrument Unavailability

For the periods described in Table 4-1, JAXA has announced planned instrument unavailability.

From (UT)		To (UT)		Reason
Date	Time	Date	Time	
Jun. 14th, 2008	18:11	Jun. 15th, 2008	00:45	In plane OCM
Jun. 17th, 2008	16:45	Jun. 17th, 2008	21:03	In plane OCM
Jun. 20th, 2008	17:20	Jun. 20th, 2008	21:27	In plane OCM
Jun. 23rd, 2008	19:36	Jun. 23rd, 2008	22:54	In plane OCM
Jun. 11th, 2008	04:37	Jun. 12th, 2008	00:22	Inclination Manoeuvres

Table 4-1 Planned instrument unavailability

4.2 Unplanned Instrument Unavailability

None reported during this cycle.

4.3 Current Platform Status

Information on the platform provided by JAXA:

Current platform status: Normal.
JAXA information reported on in this document cover the period 01/6/2008 to 30/06/2008.

4.4 Upcoming Instrument Unavailability

For the periods described in Table 4-2, JAXA has announced planned instrument unavailability.

From (UT)		To (UT)		Reason
Date	Time	Date	Time	
Jul. 30th, 2008	-	Jul. 30th, 2008	-	Inclination Manoeuvres
Aug. 2nd, 2008	-	Aug. 2nd, 2008	-	In-plane OCM
Aug. 5th, 2008	-	Aug. 5th, 2008	-	In-plane OCM
Aug. 8th, 2008	-	Aug. 8th, 2008	-	In-plane OCM
Aug. 11th, 2008	-	Aug. 11th, 2008	-	In-plane OCM

Table 4-2 Upcoming instrument unavailability

4.5 ADEN PDS Unavailability

None reported during this cycle.

4.6 Periods of missing precision orbit data

For the periods described in Table 4-3, JAXA has announced that precision orbit data is missing.

From (UT)		To (UT)		Reason
Date	Time	Date	Time	
May. 16th, 2008	07:20:00.00	May. 16th, 2008	21:40:00.00	OCM
Jun. 9th, 2008	08:30:00.00	Jun. 10th, ,2008	23:59:00.00	LSSR Acquisition Failure
Jun. 11, 2008	00:00:00.00	Jun. 11, 2008	22:01:00.00	Due to LSSR Acquisition Failure and orbit maneuvering
Jun. 14th, 2008	18:51:00.00	Jun. 14th, 2008	20:51:00.00	OCM
Jun. 17th, 2008	18:05:00.00	Jun. 17th, 2008	19:09:00.00	OCM
Jun. 20th, 2008	18:24:00.00	Jun. 20th, 2008	19:28:00.00	OCM
Jul. 19th, 2008	10:00:00.00	Jul. 19th, 2008	11:04:00.00	OCM

Table 4-3 Missing Precision Orbit Data

4.7 Periods of missing precision attitude data

For the periods described in Table 4-4, JAXA has announced that precision attitude data is missing.

From (UT)		To (UT)		Reason
Date	Time	Date	Time	
Jun. 14th, 2008	18:09:01	Jun. 14th, 2008	23:59:59	OCM
Jun. 11th, 2008	01:58:16	Jun. 11th, 2008	22:52:00	Alteration of satellite's mode
Jun. 09th, 2008	08:13:24	Jun. 10th, 2008	10:32:50	LSSR Acquisition Failure

Table 4-4 Missing Precision Attitude Data

4.8 Periods lacking Yaw steering

For the periods described in Table 4-5, JAXA has announced that Yaw steering was not available.

From (UT)		To (UT)		Reason
Date	Time	Date	Time	
Jun. 11th, 2008	00:45:00	Jun. 12th, 2008	01:15:00	OCM
Jun. 14th, 2008	15:50:00	Jun. 15th, 2008	01:35:30	OCM

Table 4-5 No Yaw steering

4.9 JAXA Observation Strategy

The JAXA observation strategy can be found at:
http://www.eorc.jaxa.jp/ALOS/obs/overview.htm

4.10 Artefact repositories

A number of instrument artefacts are not due to instrument or processing chain malfunctions. These are fully documented in the following JAXA web pages.

http://www.eorc.jaxa.jp/en/about/distribution/info/alos/characteristics.html

5 DATA QUALITY CONTROL

5.1 Instrument Related Anomalies

No reported anomalies this cycle.

5.2 Processor Related Anomalies

The PRISM processor remains at version 3.00.
SS/ YOUR MESSAGE: July, 22 "Tromsoe has been upgraded to 4.05"

5.3 Daily Report Issues

During the past cycle, daily checks have been undertaken on all PRISM products generated by ADEN, although these are reported on a weekly basis due to current data volumes.

Browse products for all optical images are visually inspected and reported on in each daily report.

139 products have been examined during the course of this cycle, and no issues have arisen from either the daily QC or browse product checks.

5.4 Visual Inspection Report Issues

During the past cycle, visual inspections have been undertaken on a selected sample of PRISM products. The following issues have been identified:

- We continue to observe JPEG compression artefacts, all ccds ?, all views ? which are expected as a result of PRISM processing. For which compression rate ?
- Image 'Smearing' has been observed, see section 4.10, further details on specific smearing will be available after processing of necessary product levels.
- CCD Boundaries have been observed in 1B2R products, an example of which is given in Figure 5.1. This image is taken from frame 2620 of orbit 6234 in the backward view.
- **Your QL is not a 1B2R product but more likely 1B2G?**
- It is important to propose a Full view with a QL and aside your image of the AOI.
- There is an important stage that consist to find for which ccd the issue occurs and why.
- You can order 1B1 and transmit a request to GAEL.
- The misalignment is radiometric (visually) but can be due to a geometric shift.

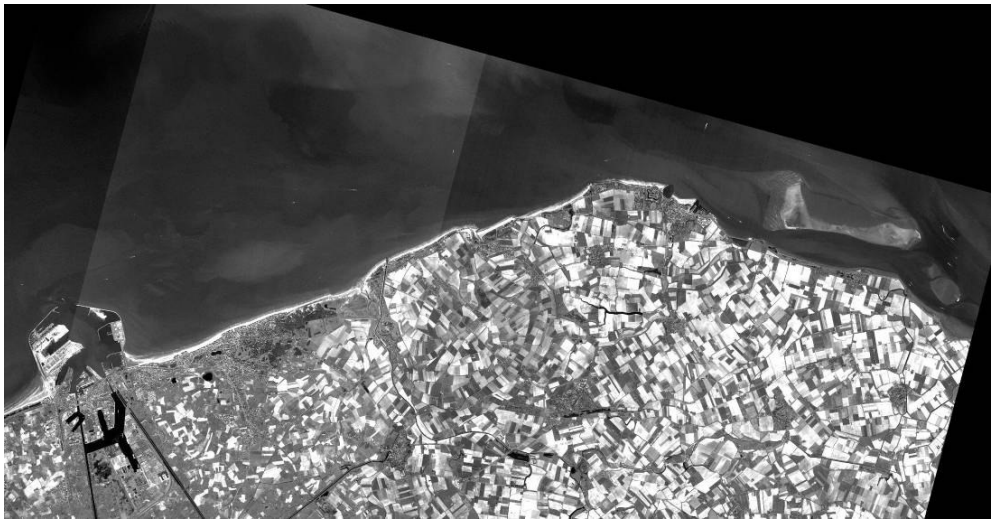


Figure 5.1 - Intercamera boundaries can be observed.

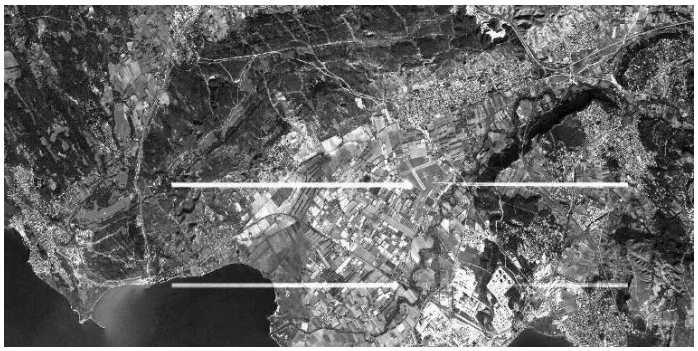


Figure 5.2 - Extreme smearing observed in product from orbit 10960, frame 2665

These anomalies are undergoing investigation, the results of which will be reported on in future cyclic reports. The smearing shown in Figure 5.2 occurred during an acquisition with a gain setting of 0.5410 (to check if high or low) and is restricted to CCD 7. The effect extends across the entire CCD and contaminates approximately 50 image records.

There were no image anomalies detected that have not already been documented by JAXA.

5.5 User Queries

All common queries received from users are placed in the PRISM FAQ, which can be found at: http://earth.esa.int/pcs/alos/prism/userinfo/

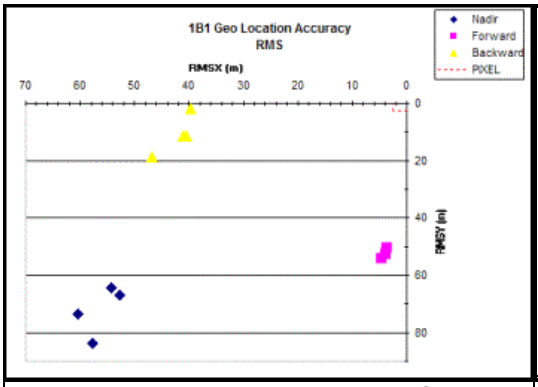
5.6 Product Performance Monitoring

5.6.1 1B1 PRODUCT GEOLOCATION RESULTS

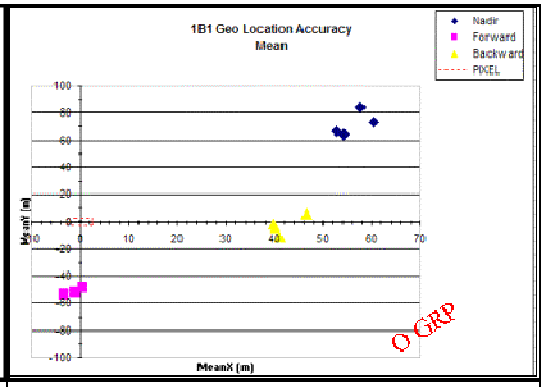
This analysis of the geolocation accuracy of the 1B1 triplet product which has been observed on February 08, orbit 1096 and frame 2720 provides results within the specification since the beginning of the mission.
The geo location is predicted using a direct model. The coefficients of this model are stored with the product format.
The exercise is performed on a ccd per ccd basis. The mean results of the product accuracy are listed in table just hereafter.

View	Back	Nadir	For
Mean RMS	43.61 m	91.6 m	111 m
Mean RMSx (pixel)	41.97 m	56.26 m	3.9 m
Mean RMSy(line)	10.73 m	72.02 m	52.472

Mean results of triplet product (1b1) geolocation accuracy.



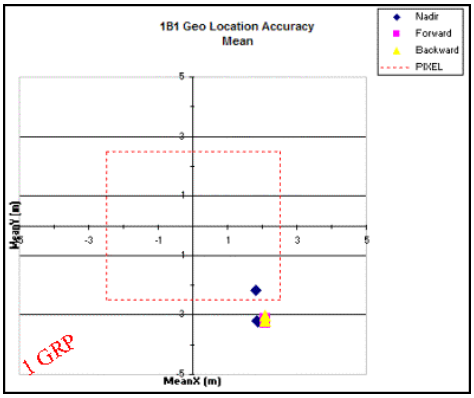
The geolocation accuracy (RMS) of the triplet product – the three views



The mean displacement error of the triplet product – the three views.

1b1 geolocation accuracy, RMS and Mean, no grp.

When adding one ground reference point in order to refine the direct geometric model provided using information embeds within the product format, the mean error for the whole of PRISM views is below 2.1 pixels in pixel direction and 3 pixels in line direction.



1b1 geolocation accuracy,1b1

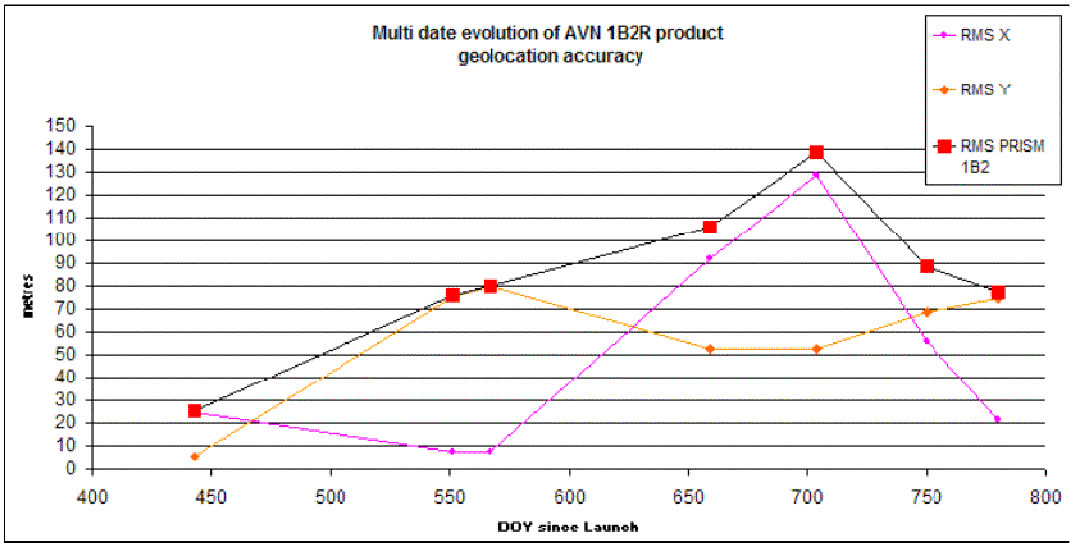
5.6.2 1B2 PRODUCT GEOLOCATION TREND

For the data measurement collection that define the trend, a same test site is used, the same ground control points are used. The PRISM nadir view is controlled and only.

Just here after is the evolution the geolocation accuracy of products processed at ADEN. The first measurement is related to a JAXA product processed with an higher software version.

From this figure the following remarks can be formulated:

- A peak around the day of year 700 is observed (as for AVNIR)
- The variation of error is due to the cross track shift contributions,
- The accuracy in along track remains stable between 50 and 70 m,
- The accuracy of ADEN products remains above the JAXA one.



5.6.3 MTF MONITORING

The objective was to play back the MTF measurement procedure on data recently acquired. The first results have been computed for the backward view and not for the forward and nadir for product dated of Y2006.

The AL MTF at nyquist frequency measured on the image from the backward view (Back 11) is consistent with the measurement we got for the nadir and forward views.

The AC MTF at nyquist frequency results remains not consistent together. We note that the result for the nadir and forward views is significantly below the back one (0.25).

	MTF @ Nyquit		FWHM	
MTF @ Nyquit	AC	AL	AC	AL
Back 06	0,2565	0,07945	1,1	1,65
Back 11	0,2565	0,12412	1,15	1,45
Nadir	0,15586	0,1345	1,35	1,4
For	0,15226	0,14868	1,35	1,35

MTF results.

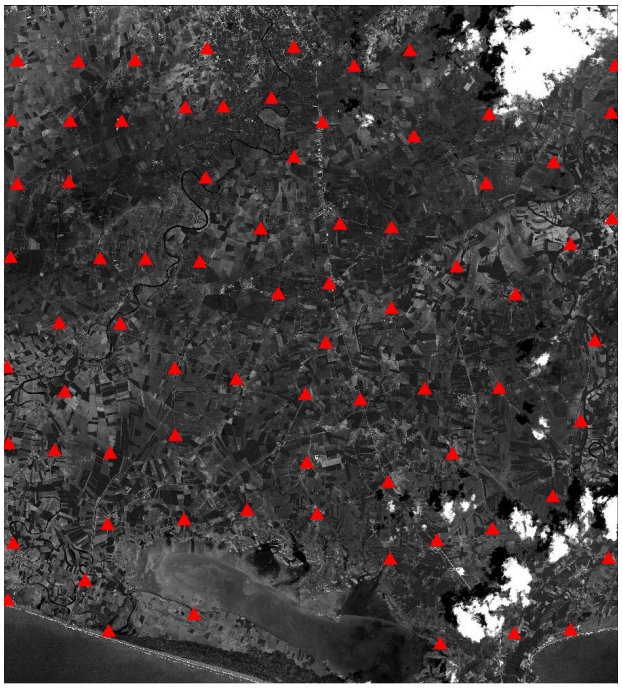
The MTF measurements is depending on the CCD number. So that, the methodology should be improved to account for this aspect.

6 CALIBRATION/VALIDATION ACTIVITIES & RESULTS

6.1 Geometry and orbit stability

Within the ALOS-QC project framework, two testfields with high accuracy ground control points (GCPs) are established in the Northern (Adana, Turkey) and Southern (Wellington, South Africa) hemispheres. Two ALOS/PRISM image triplets acquired along the same orbital path are processed within this framework.

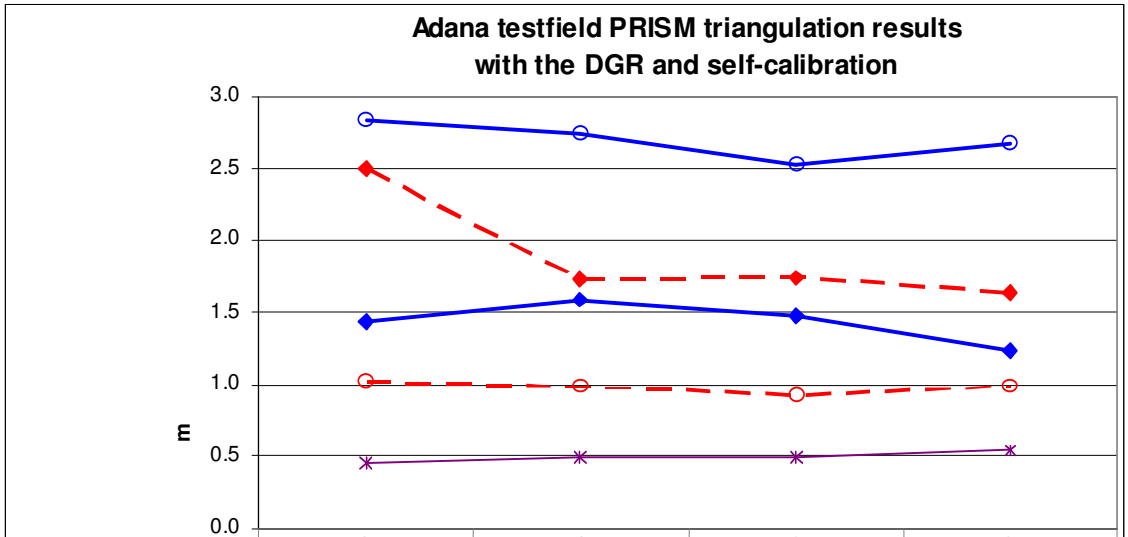
The initial results of the Adana testfield PRISM dataset are presented here. The images are tested with the DGR model of the IGP, ETH Zurich, including self-calibration. For the algorithmic details see Gruen et al. (2007). 75 ground control points are used in the georeferencing tests.



ADANA (Turkey) test fields and ground control point distribution.

The georeferencing results are presented in the next figure, and 9 GCP configurations were tested with the DGR model and with self-calibration. The results are assessed in terms of RMSEs and standard deviations, which are obtained from the covariance matrix. The a posteriori estimated accuracy of the image coordinates is expressed by Sigma naught (given in pixels). The a priori standard deviations, which are used to compute the weight coefficients in the adjustment with the DGR model, are given in Table 1.
The results are at a good level of accuracy even when **only 2 GCPs are used.** However, there are still some local systematic errors in the object space residuals, even when 9 GCPs are used (Figure 4).

Overall, these results are consistent with our former findings in other testfields (see Gruen et al., 2007). **All RMSEs are at sub-pixel level**. Again **we note the very good accuracy of RMSE (Z)**, in particular if compared with the related standard deviations Sigma (Z).



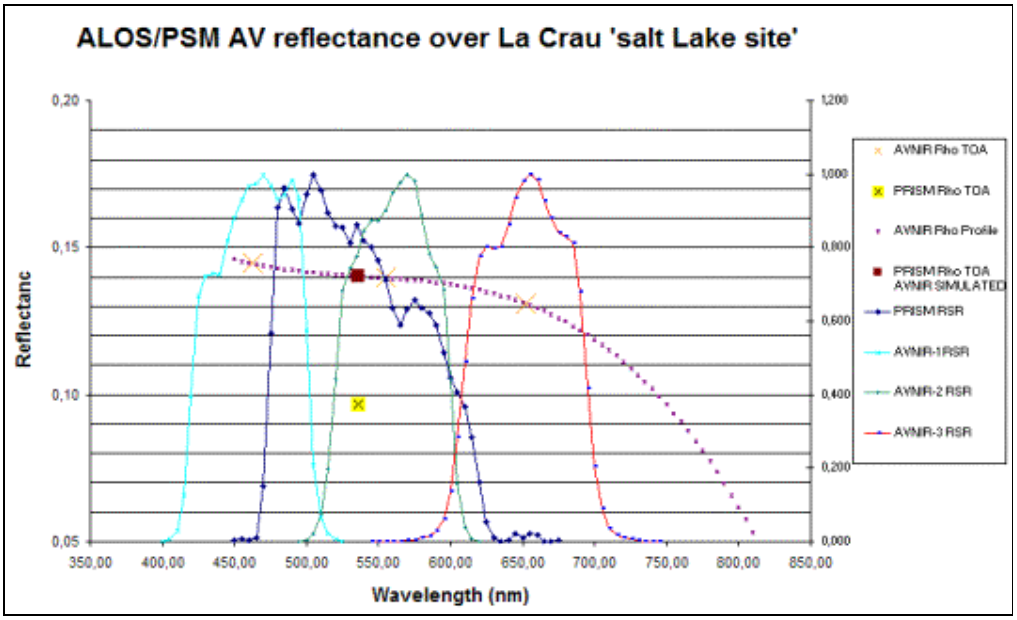
GCP no	2	4	6	9
RMSE(XY)	2.5	1.7	1.7	1.6
RMSE(Z)	1.4	1.6	1.5	1.2
Sigma(XY)	1.0	1.0	0.9	1.0
Sigma(Z)	2.8	2.7	2.5	2.7
Sigma0 (pixels)	0.45	0.50	0.49	0.54

Overview of the DGR results

As a next task of the project, the results of the Adana and the Wellington testfields will be investigated in more detail, in order to have a better insight in the behavior of the navigation and image data over a longer trajectory.

6.2 Cross calibration PRISM / AVNIR-2

The cross calibration of PRISM with AVNI-2 as a reference has been performed.
The matching between the PRISM signal simulated using AVNIR-2 and the PRISM signal it self has not been demonstrated. This result is not in agreement with the first one we got the last year
The reason of the discrepancy is still in investigation, more likely the methodology. Another attempt will be done soon using an other dataset.



PRISM / AVNIR-2 cross calibration

7 DISCLAIMERS

No new disclaimers have been issued during this cycle.

A list of known product errors caused by image processing algorithm errors is listed on the JAXA site at:

http://www.eorc.jaxa.jp/hatoyama/satellite/data_tekyo_setsumei/alos_renraku_e.html

8 EVENTS

The following section details events that may be of interest to ALOS data users.

- The second ALOS PI Symposium will be taking place from the 3rd to the 7th of November in Rhodes, Greece. For more information, please see http:/earth.esa.int/ALOS2008.
  - Note that the deadline for abstract submission was June 15 2008.
  - The deadline for full paper submission is November 3 2008.

- ALOS Simulations:
  - Analysis report and Adoption/Rejection information of simulation 9 were released by JAXA on 09/06/2008.

8.1 Past Events:

- The submission of request files for ALOS simulation number 10 was due by 20th of June.

- The submission of request files for ALOS simulation number 9 was due by March 21, 2008

- The ALOS PCS Site is available at: http://earth.esa.int/pcs/alos/

- 29 January 2008: Users are now able to submit orders for ALOS future acquisitions via EOLI-SA (email eohelp@esa.int for more information)

- ALOS simulation #8 for Cycle 18-21
  - The results of the second stage simulation were made available by JAXA on Feb.4th.
  - The Analysis Report on ALOS simulation #8 was delivered by JAXA on Feb.12th.

APPENDIX A PRODUCT SPECIFICATION AS DETERMINED DURING THE ADEN VERIFICATION PERIOD

<table>
<tr><th>PRISM</th><th>Radiometric accuracy</th><th colspan="4">Geometric accuracy</th></tr>
<tr><td rowspan="5">Level1B2R</td><td rowspan="4">Absolute:
5% (1σ)</td><td colspan="4"></td></tr>
<tr><td>RMS</td><td>Pixel (CT)</td><td>Line (AT)</td><td>Norm</td></tr>
<tr><td>Nadir</td><td>5.9 m</td><td>3.4 m</td><td>6.8 m</td></tr>
<tr><td>Forward</td><td>33 m</td><td>85 m</td><td>92.5 m</td></tr>
<tr><td>Backward</td><td>6.8 m</td><td>49.3 m</td><td>49.7 m</td></tr>
<tr><td>Intercomparison with AVNIR-2 (GAEL).</td><td colspan="4">Polynomial coefficients embedded within product are used to predict geo location (GAEL).</td></tr>
<tr><td>Digital surface model</td><td></td><td colspan="4">Vertical: 1.05m (1σ)
Horizontal: 2.34m (1σ)

Results obtained with five(5) ground control points and the used of Direct Georeferencing Model (ETH).</td></tr>
</table>

PRISM Product specifications, radiometric and geometric accuracy

<table>
<tr><th>PRISM</th><th colspan="3">Image Quality</th></tr>
<tr><td rowspan="4">Level 1B1</td><td colspan="3"></td></tr>
<tr><td>MTF@Nyquist</td><td>Pixel (CT)</td><td>Line (AT)</td></tr>
<tr><td>Backward View</td><td>0.07</td><td>0.25</td></tr>
<tr><td colspan="3">Non-parameteric approach - (ONERA).</td></tr>
</table>

PRISM Product specifications, image quality

APPENDIX B INSTRUMENT ANOMALIES

Below is a list of ALOS anomalies that may have an impact on image quality, radiometric calibration or localisation accuracy (from 24th October 2006).

- LSSR acquisition failure 11th June 2008,
- Orbit manoeuvres conducted on 19th July 2008,
- Orbit manoeuvres conducted on 11th, 14th, 17th, 20th, 23rd June 2008,
- Calibration operations for Star Tracker conducted on 11th and 13th of May 2008,
- Orbit manoeuvres conducted on 16th May 2008,
- Orbit manoeuvres conducted on 26th April 2008,
- Orbit manoeuvres conducted on 4th April 2008.
- Orbit manoeuvres conducted on 26th January and 2nd, 15th, 29th February 2008.
- YAW steering was suspended on 28th January 2008
- Orbit manoeuvres conducted on 15th December 2007, 4th, 11th & 18th January 2008.
- Observation, yaw steering, and precision attitude system suspended on 31st October 2006 between 03:50 and 15:50 UT due to change AOCS on-board orbit model to that of 15th order.
- Yaw steering suspended during 23rd February 00:12 UT to 24th February 2007 23:01 UT (yaw steering suspended due to calibrating operations for Star Tracker (STT) and Precision Attitude Determination).
- Yaw steering suspended during 22nd March 00:24 UT to 23rd March 2007 23:17 UT (yaw steering suspended due to calibrating operations for Star Tracker (STT) and Precision Attitude Determination).
- Yaw steering on/off switching on 10th April 2007:
  Yaw steering on to off: 12:57 – 13:22 UT (data unavailable)
  No yaw steering operation: 13:22 – 14:42 UT (data available)

Yaw steering off to on: 14:42 – 15:45 UT (data unavailable)

- Orbit manoeuvres on 25th, 27th and 29th April 2007.
- Orbit manoeuvres on 8th and 22nd June 2007.
- Orbit manoeuvres conducted on 7th and 20th July 2007.
- Yaw steering on/off switching on 31st July 2007:
  Switching in progress: 00:00 – 00:30, 21:57 – 22:46 UT (Observation suspended)
  No yaw steering observation: 00:30 – 21:57UT (Data available)
- Orbit manoeuvres conducted on 3rd and 25th August 2007.
- Orbit manoeuvres conducted on 6th, 12th and 26th October 2007.
- Orbit manoeuvres conducted on 10th and 23rd November 2007.
- Orbit manoeuvres conducted on 7th and 15th December 2007.
- Orbit manoeuvres conducted on 4th, 11th, 18th and 26th January 2008.
- Orbit manoeuvres conducted on 2nd, 15th and 29th February 2008.
- Orbit manoeuvres conducted on 8th March 2008.