
International Laser Ranging Service Data Formats & Procedures Working Group

Agenda

Tuesday, September 15, 2009, 19:00-20:00, Metsovo, Greece

1. Welcome and Introduction

Wolfgang Seemüller

2. Membership

Wolfgang Seemüller

3. Refraction Study Group

Erricos Pavlis

4. Formats Study Group

- CRD implementation status
- tracking restrictions (update on station response)
- Consolidation of CDDIS/EDC directory structures
- Implementing the new CRD data format
- Validating the new CRD data format
- EDC OC Activities - CRD

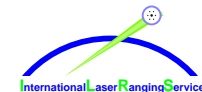
Randy Ricklefs
Randy Ricklefs
Randy Ricklefs
C. Noll, R. Ricklefs
E. Pavlis, M. Cieslak
E. Pavlis, M. Cieslak
Wolfgang Seemüller

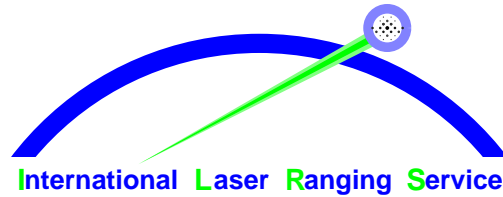
5. Mis-numbering of the REFLECTOR satellite

Mike Pearlman, Carey Noll

6. Other Business, next meeting

All





International Laser Ranging Service

Data Formats & Procedures Working Group

Participants

Tuesday, September 15, 2009, 19:00-20:30
Metsovo, Greece

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Data Formats and Procedures Working Group

Metsovo, Greece
15 September 2009

R. Ricklefs

1. CRD status
2. Tracking Restrictions Questionnaire

CRD format status

- 13 stations are now producing CRD-formatted normal points
- 2 stations have been validated (MLRS and Zimmerwald)
- 11 stations are awaiting analyst validation
- There are now 3-4 analysis centers participating in validation: ASI, DGFI, GFZ, and JCET
- ~7 stations are submitting CRD full rate data to T2L2 experiment
- Sample data and manual are being updated to version 1.01 to reflect contents of errata page

Current status

- Stations sending CRD npts:
 - 1831 (Lviv)
 - 1873 (Simeiz)
 - 7080 (McDonald) Production
 - 7237 (Changchun)
 - 7405 (Concepcion)
 - 7810 (Zimmerwald) Validated
 - 7811 (Borowiec)
 - 7821 (Shanghai)
 - 7825 (Mount Stromlo)
 - 7829 (Grasse/FTLRS)
 - 7840 (Herstmonceux)
 - 7941 (Matera)
 - 8834 (Wetzell)
- Stations known to be in coding:
 - 7 MOBLAS and T systems
 - Riga (1884)
 - Koganei (7308) (JAXA) [ready to submit data?]
 - San Fernando (7824)
 - Potsdam (7841)
 - FTLRS (7848)

CRD format implementation

- EDC has developed web-based CRD QC software which stations are encouraged to use
- Blocks of met and cal records (and other) record types must be handled by interpolation (crd_to_merit, etc.)
- Have been glitches with bad content (not disallowed) getting through – how do we check for this? e.g., bad format version.
- Stations should not innovate data field values not already available in old format, e.g. 2 digits values in “Station Epoch Time Scales”

Data Formats and Procedures Working Group

Metsovo, Greece
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R. Ricklefs

1. CRD status
2. Tracking Restrictions Questionnaire

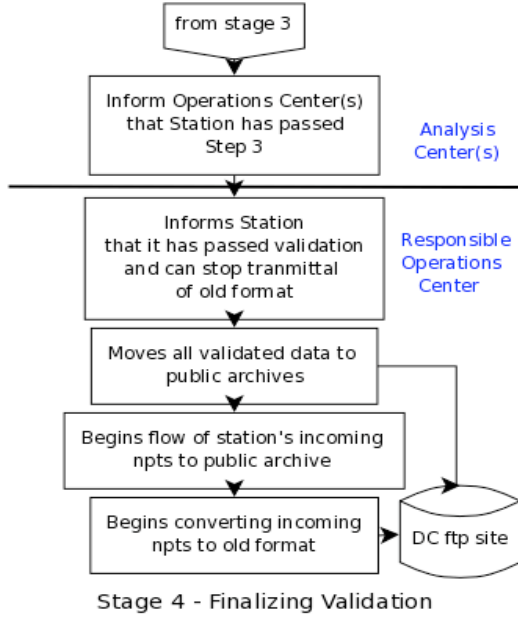
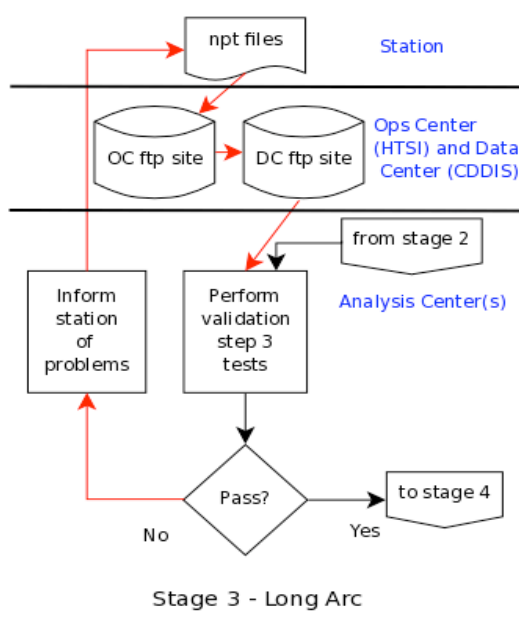
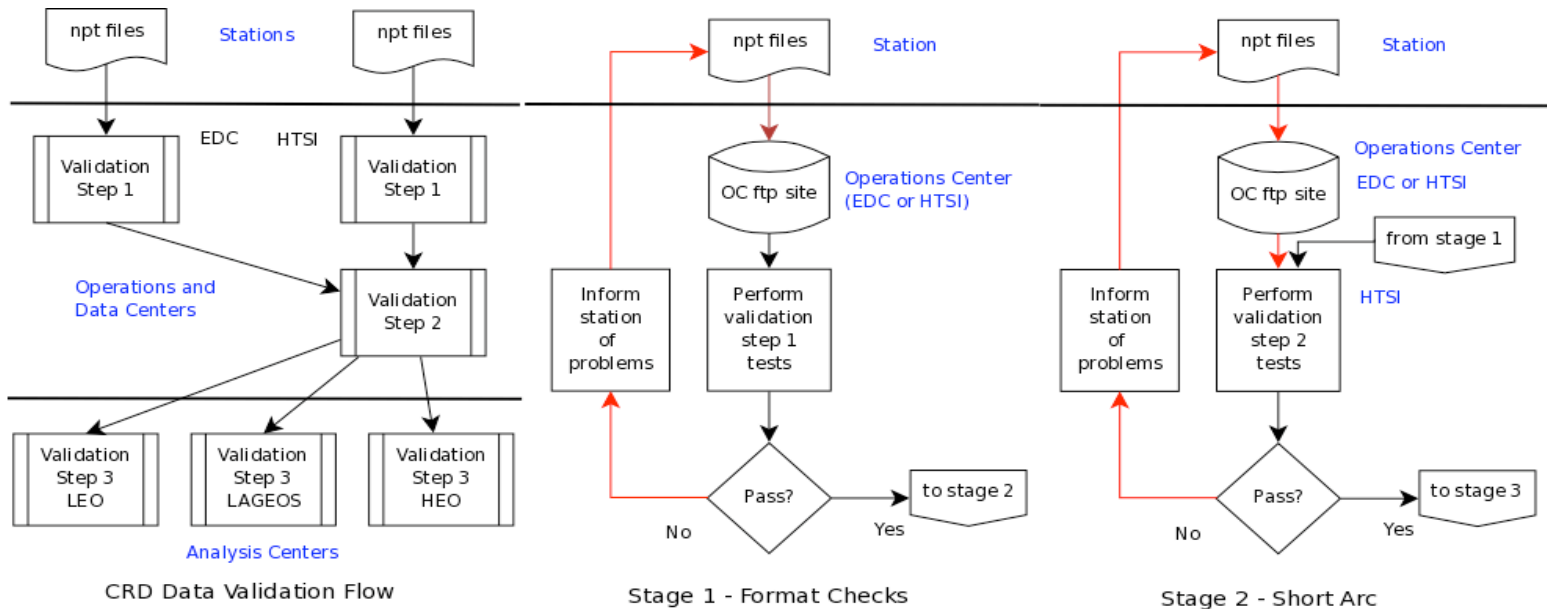
Satellite tracking restrictions

- Missions using restrictions (a reminder...):
 - Elevation: ICESat
 - Go/no-go: ICESat, ALOS, LRO, LLR
 - Pass segments: GP-B, ALOS
 - Power: LRO
- LLR go/no-go not yet implemented: A list of avoidance times for each reflector is distributed, often on a daily basis.
- Survey was sent by CB to all ranging stations in January; there have been at least 4 reminders
- Survey results are on the ILRS web site

Satellite tracking restrictions status

- 28 ILRS stations responded (plus Mark Davis for Stafford)
- 15 have automated elevation restrictions implemented
 - 9 plan to implement
- 15 have automated go/no-go implemented
 - 10 plan to implement
- 14 have automated pass segments implemented
 - 10 plan to implement
- 2 has automated power restrictions implemented
 - 11 plan to implement
 - 15 have some level of manual control of laser power or beam divergence.
- Some have promised to implement certain restriction when it becomes necessary.

Backup Slides...



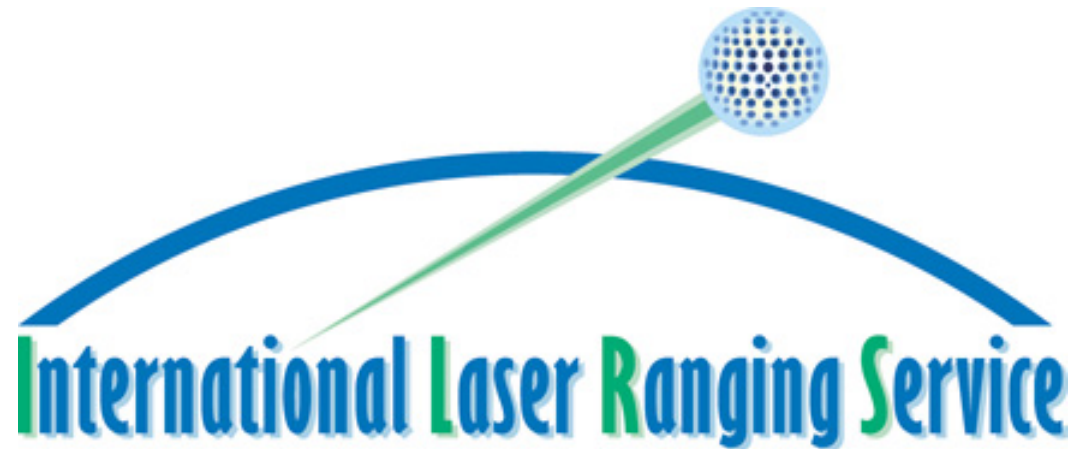
SLR Tracking Restriction Summary by Station

Type of restriction

Site	ID	Code	Elevation			Go/Nogo Flag				Pass Segment				Maximum Power					Comments						
			Y/N	Tests	Missions	Plans?	Y/N	Tests	Missions	Plans?	Y/N	Tests	Missions	Plans?	Y/N	Tests	Missions	Plans?		of laser power?	of Divergence?				
Golosiv	1824	GLSL	Y				N			Y months	N			Y months	N			N	>year	N					
Lviv	1831	LVIV	N			Y: 2-3 mon	N											N	N	N				Power restrictions "impossible"	
Maidanak 1	1863	MAID																							
Maidanak 2	1864	MAIL																							
Komsomolsk	1868	KOML																							
Mendeleevo	1870	MDVL																							
Simeiz	1873	SIML	N			Y: 1 mon	N						Y: 1 mon	N				N	N	N					03/18/09
Riga	1884	RIGL	N			N	Y	ALOS	ALOS		Y	ALOS	ALOS	-	N				N						Elevation and Power restrictions possible to add
Katsively	1893	KTZL																							
McDonald	7080	MDOL	Y	Ajtsai	ICE Sat	-	Y	Ajtsai	ICE Sat	-	Y	simulation	none	-	M	simulation	LRO	Y	Soon	Y					
Yarragadee	7090	YARL	Y	Ajtsai	ICE Sat	-	Y	Ajtsai	S	-	Y	Ajtsai	ALOS	-	N			N	N	N					Manual control over power and divergence
Greenbelt	7105	GODL	Y	Ajtsai	ICE Sat	-	Y	Ajtsai	S	-	Y	Ajtsai	ALOS	-	N			N	N	N					Manual control over power and divergence
Peak	7110	MONL	Y	Ajtsai	ICE Sat	-	Y	Ajtsai	S	-	Y	Ajtsai	ALOS	-	N			N	N	N					Manual control over power and divergence
Haleakala, HI	7119	HA46	Y	Ajtsai	ICE Sat	-	Y	Ajtsai	S	-	Y	Ajtsai	ALOS	-	N			N	N	N					Manual control over power and divergence
Tahiti	7124	THTL	Y	Ajtsai	ICE Sat	-	Y	Ajtsai	S	-	Y	Ajtsai	ALOS	-	N			N	N	N					Manual control over power and divergence
Wuhan	7231	WUHL																							
Changchun	7237	CHAL																							
Beijing	7249	BEIL																							
Koganei	7308	KOGC	N				M	Ajtsai	ALOS		M	Ajtsai	ALOS		N			N	N - Manual	N					Restriction implemented for ALOS only; no automated restrictions
Tanegashima	7358	GMSL	M			Y	Y	ALOS tests	ALOS	-	M			Y	M			Y	Y	Y					Manual control over power and divergence
Arequipa	7403	AREL	Y	Ajtsai	ICE Sat	-	Y	Ajtsai	S	-	Y	Ajtsai	ALOS	-	N			N	N	N					two manual power settings; no plans for other implementation
Concepcion	7405	CONL	Y	Visual test of shutter	all		N							Y: 3-6 mon	N			Y: 1-2 mon	Y (control of Nds)	Y					
San Juan	7406	SJUL	N			Y - 1.5 yr	N							Y - 1.5 yr	N			N	N	N					Submitted 06/09/2009
Hartebeesthoek	7501	HARL	Y	Ajtsai	ICE Sat	-	Y	Ajtsai	ICE Sat/ALOS	-	Y	Ajtsai	ALOS	-	N			N	N	N					Manual control over power and divergence
Metsahovi2	7806	METL																							
Zimmerwald	7810	ZIML	Y		ICE Sat	-	Y		ICE Sat	-	Y			-	Y		LRO	Y	Y	N					Software-controller attenuator in laser beam
Borowiec	7811	BORL	N			Y end 2009	N							Y end 2009	N			Y end 2009	N	N					Manual control currently; station undergoing modernization
Kunming	7820	KUNL																							
Shanghai	7821	SHA2																							
San Fernando	7824	SFEL	N			N	N				N			N	N			N	N	N					
Mt. Stromlo	7825	STL3	N			Y; undefined	Y	1)JAXA demo, 2)formal tests	1)ALOS, 2)Debris tracking	-	Y	1)JAXA demo, 2)formal tests	1)ALOS, 2)Debris tracking	-	N			not planned	manual, preconfigured	Y; needs study					
Helwan	7831	HLWL																							
Riyadh	7832	RIYL																							
Simosato	7838	SISL	N			Y-week	N				Y	Ajtsai	ALOS	-	N	ground		Y - soon	N	Y					When resources are available
Graz	7839	GRZL	Y	Ajtsai	ICE Sat	-	Y	Ajtsai	ICE Sat	-	N			N	N			Y when needed	automation possible	yes automation possible					
Herstmonceux	7840	HERL	Y	Ajtsai	ICE Sat	-	Y	Ajtsai	ICE Sat/ALOS	-	Y	Ajtsai	ALOS	-	N					20mj@ 10Hz; 40mj@ 1kHz	yes				Power controlled by choice of laser and beam divergence
Potsdam	7841	POT3	N			tbd	N				N			tbs	N			tbd	yes, now	yes					Will consider implementation after major station upgrade starting mid-2009
Grasse	7845	GRSM	N			Y	N				N			Y	N			Y	Y	Y					To implement in "some months"
Matera	7941	MATM	Y	Ajtsai	none	-	N				N			Y - April 30, 09	N			tbd	N	Y					
Wetzell	8834	WETL	Y	Simulation and LRO with closed Dome			Y	Simulation and LRO with closed Dome			Y	Simulation and LRO with closed Dome		Y	Y		LRO	N	Y	Y					
FTLRS	--	--	N				N				N				N			Y	Y	N					To implement in "some months"

LLR Reflector Avoidance List

```
# Lunar Retro Reflector Avoidance data - LOLA7 product
#
Retro-reflectors : Luna 21 (2), Apollo 11 (3), Apollo 14 (4), Apollo 15 (5)
# Generated Tue Sep  8 12:30:00 EDT 2009
# START = 2009-09-08T00:00:00.0 , 2009-251T00:00:00.0 , 305640066.18
# STOP = 2009-09-23T00:00:00.0 , 2009-266T00:00:00.0 , 306936066.18
# EventStart      Duration      ReflectorID
2009-260-19:22:03, 46,2
2009-260-21:15:06, 41,2
2009-261-06:32:56, 30,3
2009-261-08:25:52, 45,3
2009-261-10:19:08, 20,3
2009-262-18:28:21, 47,5
2009-262-20:21:27, 42,5
2009-264-08:00:46, 22,4
2009-264-09:53:35, 47,4
2009-264-11:46:42, 36,4
```



Consolidation of CDDIS/EDC Directory Structures

ILRS CB

Data Formats and Procedures Working Group Meeting

September 15, 2009

Metsovo, Greece

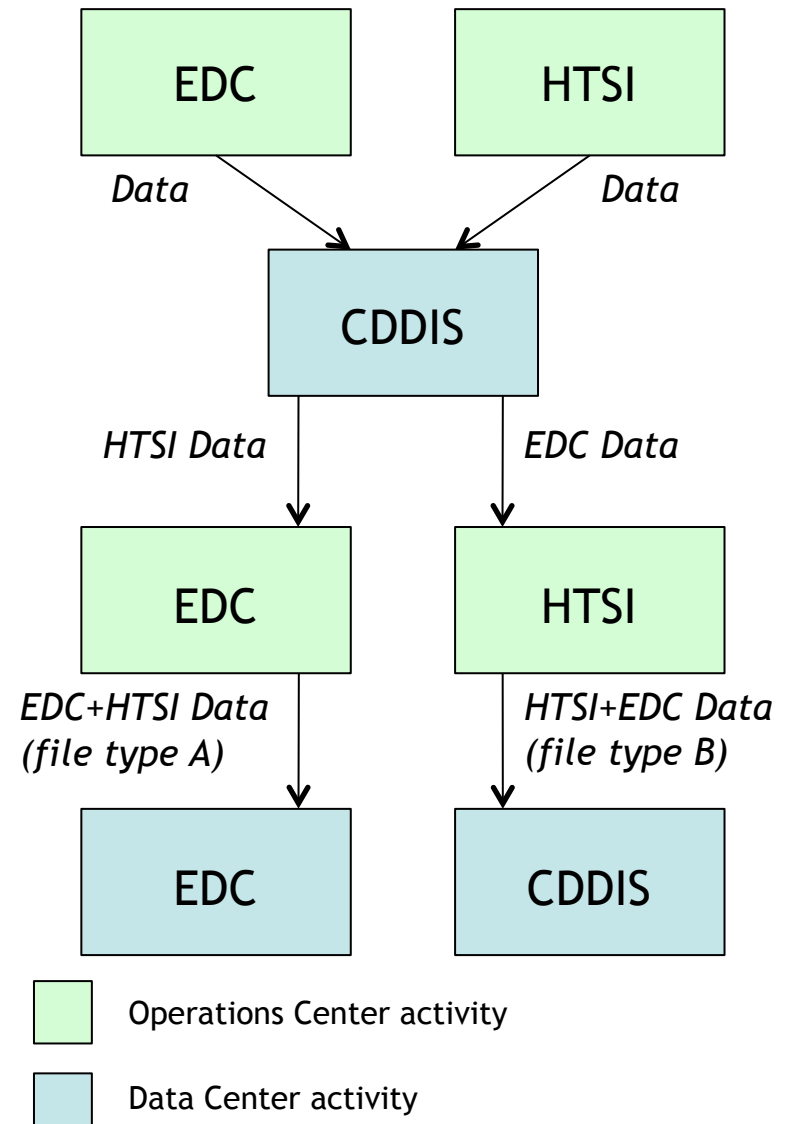


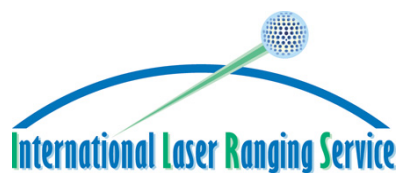
Background

- Two ILRS Operational Data Centers (ODCs): HTSI and EDC
 - ◆ Collect data from sub-networks
- Two ILRS Global Data Centers (GDCs): CDDIS and EDC
 - ◆ Provide backup archives of ILRS data and products
- Today, the data portion of the archives are not identical:
 - ◆ Different directory structures
 - ◆ Different filenaming conventions
 - ◆ Different file contents
 - EDC releases data from un-validated sites
 - CDDIS archives daily NPT files by release date; EDC archives daily files by date of data
- Questions:
 - ◆ Should the archives be mirrors (identical structure, identical filenaming, etc.)?
 - ◆ Do the differences provide users with options for data retrievals or do they confuse the user?

Data Flow

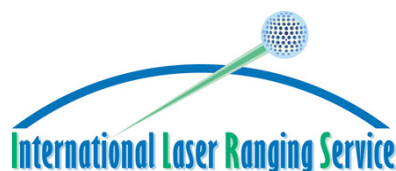
- EDC and HTSI delivery data received in previous time interval (1 hour or 24 hours) to CDDIS
- CDDIS provides access to allow each operations center (EDC and HTSI) to access the other's data
- EDC and HTSI merge each others files to create combined file (type A or type B) for archive
- EDC archives type A file
 - ◆ Daily file contains all data FOR a given date
 - ◆ May contain data that did not pass HTSI QC process
- CDDIS archives type B file
 - ◆ Daily file contains all data received BY a given date
 - ◆ Data has passed HTSI QC process
- Type A and Type B files are not identical





EDC and CDDIS Directory Structure

- SLR products:
 - ◆ Both CDDIS and EDC: /slr/products
- CPF predictions:
 - ◆ Both CDDIS and EDC: /slr/cpf_predicts
- SLR data:
 - ◆ Initial directories same: /slr/data/npt, /slr/data/fr
 - ◆ At CDDIS, ../npt and ../fr have further subdirectories by satellite and year
 - ◆ At EDC, actual data are located /slr/data/npt/qldata by satellite in monthly files (past years)



Recommendations/Discussion

- Operational data centers:
 - ◆ HTSI and EDC should use the same data screening process
- Global data centers:
 - ◆ CDDIS and EDC should have same directory structure
- CDDIS and EDC data holdings **SHOULD** be the same
 - ◆ Data that fail QC tests should not be released
- Discuss: Should GDCs have identical data archive structures to:
 - ◆ Aid users in switching between archives if necessary
 - ◆ Ensure data archives are true backups of each other

Implementing the new CRD data format

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Tests performed

- Test data provided by stations: 7810, 7825, 7840, 7941, 8834 in CRD and ILRS NP format for the months of April to August 2009.
- In a first step, we generated s/w that converted the CRD data back to ILRS FR format, which is directly readable by our analysis s/w (GEODYN), we also used provided s/w from DF&P WG
 - All quantities were converted using the IFRF precision
 - We “extended” the IFRF to allow the same precision as CRD
- Both data formats used in reductions (together and separately) and residuals of individual ranges examined pass-by-pass

RMS of fit Jul '09 arc 090726

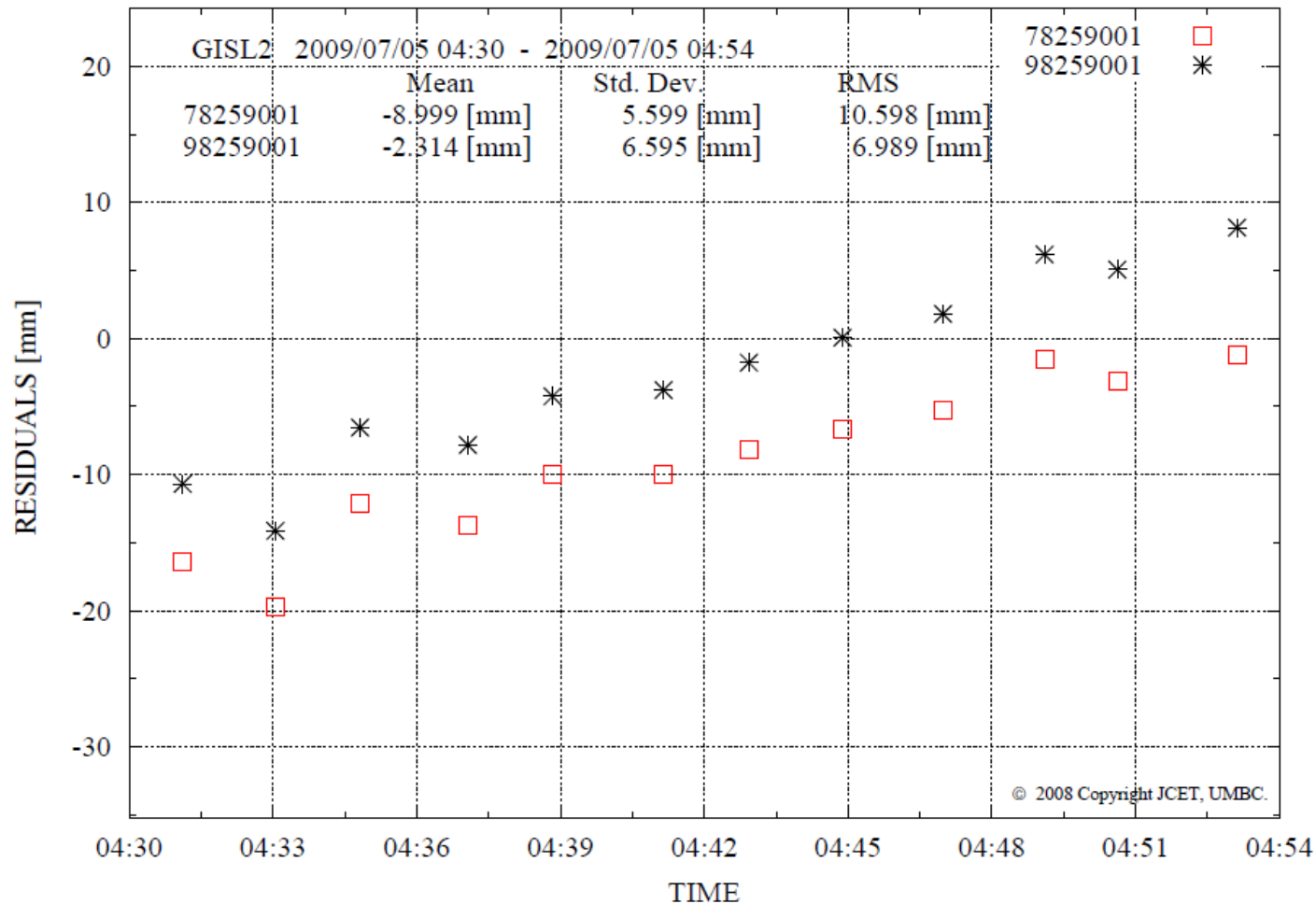
	NO. -WTD	WTD-MEAN	WTD-RMS	CONFIGURATION		
				TYPE	STATION	SATELLITE
L1	261	0.0101	0.0131	CRD	7810	Zimm@532 7603901
	262	0.0103	0.0132	NP	7810	Zimm@532 7603901
	75	0.0039	0.0082	CRD	7825	Mount_St 7603901
	92	0.0047	0.0087	NP	7825	Mount St 7603901
	128	0.0026	0.0104	CRD	7840	Herstmon 7603901
	128	0.0025	0.0104	NP	7840	Herstmon 7603901
L2	198	0.0150	0.0156	CRD	7810	Zimm@532 9207002
	202	0.0151	0.0157	NP	7810	Zimm@532 9207002
	90	0.0085	0.0129	CRD	7825	Mount_St 9207002
	84	0.0081	0.0129	NP	7825	Mount St 9207002
	65	0.0069	0.0091	CRD	7840	Herstmon 9207002
	70	0.0070	0.0091	NP	7840	Herstmon 9207002
	130	0.0294	0.0314	CRD	8834	Wettzell 9207002
	130	0.0294	0.0314	NP	8834	Wettzell 9207002

RMS of fit Jul '09

	NO.-WTD	WTD-MEAN	WTD-RMS	TYPE	CONFIGURATION	
					STATION	SATELLITE
E1	24	0.0100	0.0154	CRD	7810 Zimm@532	8900103
	24	0.0101	0.0156	NP	7810 Zimm@532	8900103
	13	0.0103	0.0229	CRD	7825 Mount_St	8900103
	13	0.0110	0.0220	NP	7825 Mount_St	8900103
	11	0.0232	0.0270	CRD	8834 Wettzell	8900103
	11	0.0232	0.0270	NP	8834 Wettzell	8900103
E2	22	0.0051	0.0101	CRD	7810 Zimm@532	8903903
	21	0.0047	0.0099	NP	7810 Zimm@532	8903903
	9	0.0218	0.0261	CRD	7840 Herstmon	8903903
	9	0.0007	0.0114	NP	7840 Herstmon	8903903
	9	0.0201	0.0220	CRD	8834 Wettzell	8903903
	9	0.0201	0.0220	NP	8834 Wettzell	8903903

Problem with Meteo Record 7825 Mt. Stromlo

LAGEOS 2



MERIT OLD

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92070020918630409808163478259001 0460637878350000004053200 92592790074
92070020918630548072314378259001 0443024183290000004953200 92592790074
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92070020918631148413509478259001 0394231662550000004853200 92592790075
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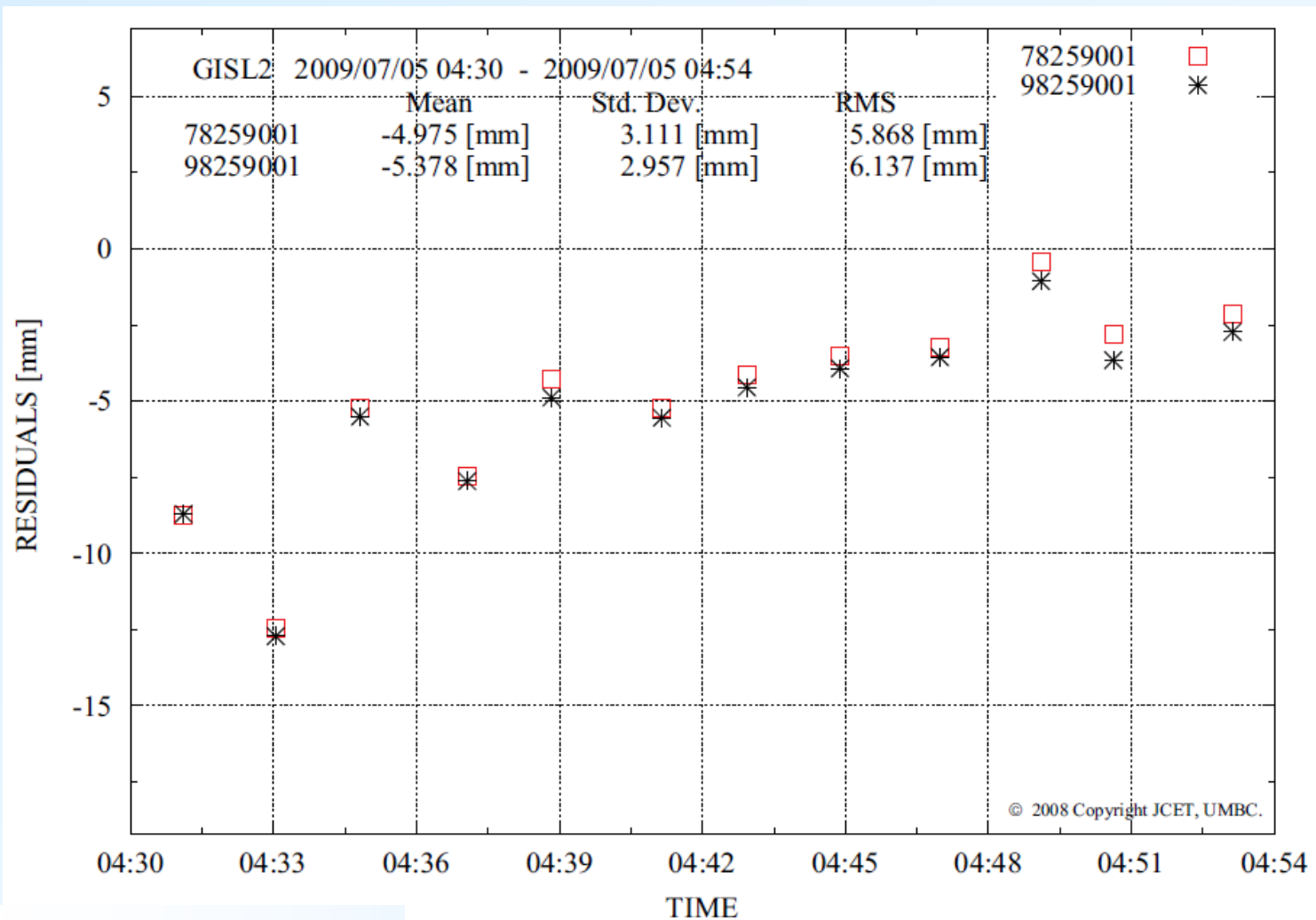
MERIT NEW no interpolation

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92070020918 CRD :0000926302785507700000000
h1 CRD 0 2009 07 05 10
92070020918 h2 Stromlo 9825 90 01 4 :0000926302785507700000000
92070020918 h3 Lageos2 9207002 5986 000000 0 1 :0000926302785507700000000
92070020918 C0 0 532.0 IDAL IDAM IDAU IDAA :0000926302785507700000000
92070020918 C1 0 IDAM Nd-Yag 532.00 60.0 20.800 12.0 30.0 1 :0000 9263 027855 0770 0000000
C2 0 IDAU CSPAD 532.0 20 0.0 0.0 ECL 0.0 1.0 100.0 15.0 eosPostProcessingServer_
C3 0 IDAA TrueTime_XLi TrueTime_OCXO MRCS NA 0.2322
h4 1 2009 07 05 08 19 39 2009 07 05 08 57 07 0 0 0 1 0 2 2
20 30018.600616243944 925.9 278.95 75 0
20 30268.6383520401 925.9 278.85 76 0
20 30543.69495583913 926.0 278.75 77 0
20 31044.346842743045 926.1 278.85 75 0
20 31094.71350944195 926.1 278.85 76 0
20 31169.780176040392 926.1 278.65 77 0
20 31224.93017604792 926.1 278.55 76 0
20 31290.096842648763 926.1 278.55 77 0
20 31605.746842742872 926.2 278.55 76 0
20 31775.713509448182 926.1 278.55 75 0
20 31815.74684274474 926.2 278.65 76 0
20 31950.730176041132 926.3 278.55 77 0
40 29980 0 IDAL 9139 2672 632.663 168393.00 -3.00 20.00 0.1 -0.5 0.00 2 2 0
40 29980 0 IDAL 9139 2672 632.663 168393.00 -3.00 20.00 0.1 -0.5 0.00 2 2 0
50 IDAL 42.50 0.07 -0.69 32.10 0
11 30101.977974746 0.050578515744 IDAL 2 120 15 19.50 -0.25 -1.09 0.00 3.36 0
11 30189.449672843 0.049224365248 IDAL 2 120 63 34.00 0.20 -0.83 4.30 7.95 0
11 30290.544012443 0.047725997707 IDAL 2 120 58 49.50 0.06 -0.87 58.60 8.67 0

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Problem with Meteo Record 7825 Mt. Stromlo LAGEOS 2



MERIT OLD

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92070020918630290544012478259001 04772599770700000505320092592790074
92070020918630409808163478259001 04606378783500000405320092592790074
92070020918630548072314378259001 04430241832900000495320092592790074
92070020918630660317597378259001 043022736816000004153200 92592780074
92070020918631148413509478259001 03942316625500000485320092592790075
92070020918631268996842778259001 03910875569800000375320092592790075
92070020918631390846842778259001 03904372733400000365320092592790075
92070020918631503663509478259001 03921159765300000325320092592790075
92070020918631621030175978259001 03961571609600000475320092592790075
92070020918631757030175978259001 04036605676700000475320092592790075
92070020918631864963509478259001 04116513030700000475320092592788075
92070020918631965830176078259001 042063374839000004353200 92592788075
92070020918632079363509478259001 04323560340600000455320092592788075
92070020918632180546842778259001 04441131713200000355320092592790075

```

MERIT NEW meteo interpolation

```

920700209186030101977974746000000098259001 5057851574400000042005320000 92590278920753300
920700209186030189449672843000000098259001 4922436524800000042005320000 92590278880756800
920700209186030290544012443000000098259001 4772599770700000042005320000 92591278840760800
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9207002091860 CRD 04200532000092619278550759100
9207002091860 h1 CRD 0 2009 07 05 10 04200532000092611278550751100
9207002091860 h2 Stromlo 9825 90 01 4 04200532000092624278610763600
9207002091860 h3 Lageos2 9207002 5986 000000 0 1 04200532000092624278610763600
9207002091860 C0 0 532.0 IDAL IDAM IDAU IDAA 04200532000092630278550770000
9207002091860 C1 0 IDAM Nd-Yag 532.00 60.0 20.800 12.0 30.0 1 04200532000092630278550770000
9207002091860 C2 0 IDAU CSPAD 532.0 20 0.0 0.0 ECL 0.0 1.0 100.0 15.0 eosPostProcessingServer 04200532000092630278550770000
9207002091860 C3 0 IDAA TrueTime_XLi TrueTime_OCXO MRCS NA 0.2322 04200532000092630278550770000
h4 1 2009 07 05 08 19 39 2009 07 05 08 57 07 0 0 0 0 1 0 2 2
20 30018.600616243944 925.9 278.95 75 0
20 30268.6383520401 925.9 278.85 76 0
20 30543.69495583913 926.0 278.75 77 0
20 31044.346842743045 926.1 278.85 75 0
20 31094.71350944195 926.1 278.85 76 0
20 31169.780176040392 926.1 278.65 77 0
20 31224.93017604792 926.1 278.55 76 0
20 31290.096842648763 926.1 278.55 77 0
20 31605.746842742872 926.2 278.55 76 0
20 31775.713509448182 926.1 278.55 75 0
20 31815.74684274474 926.2 278.65 76 0
20 31950.730176041132 926.3 278.55 77 0
40 29980 0 IDAL 9139 2672 632.663 168393.00 -3.00 20.00 0.1 -0.5 0.00 2 2 0
40 29980 0 IDAL 9139 2672 632.663 168393.00 -3.00 20.00 0.1 -0.5 0.00 2 2 0
50 IDAL 42.50 0.07 -0.69 32.10 0
11 30101.977974746 0.050578515744 IDAL 2 120 15 19.50 -0.25 -1.09 0.00 3.36 0
11 30189.449672843 0.049224365248 IDAL 2 120 63 34.00 0.20 -0.83 4.30 7.95 0
11 30290.544012443 0.047725997707 IDAL 2 120 58 49.50 0.06 -0.87 58.60 8.67 0

```



Problem with Meteo Record 7825 Mt. Stromlo



LAGEOS 2

Record Structure

Session Header (normal point)

Mets Record

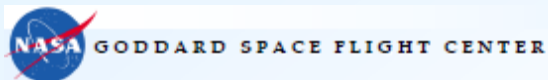
Data Record for S1 and/or S2(normal point)
(repeated)

Mets Record

Data Record for S1 and/or S2 (normal point)
(repeated)

Mets Record

End of session Header



Problem with Epoch Time Scale Record 7941 Matera

CRD

h1 crd 1 2009 5 20 11
h2 MATM 9941 77 1 10

QL

99999
7603901091407941770153200023538300000000127308100320371
348818040000054848767888000004009607300102700520000055
349991040000052642947630000003109608300102701440000036

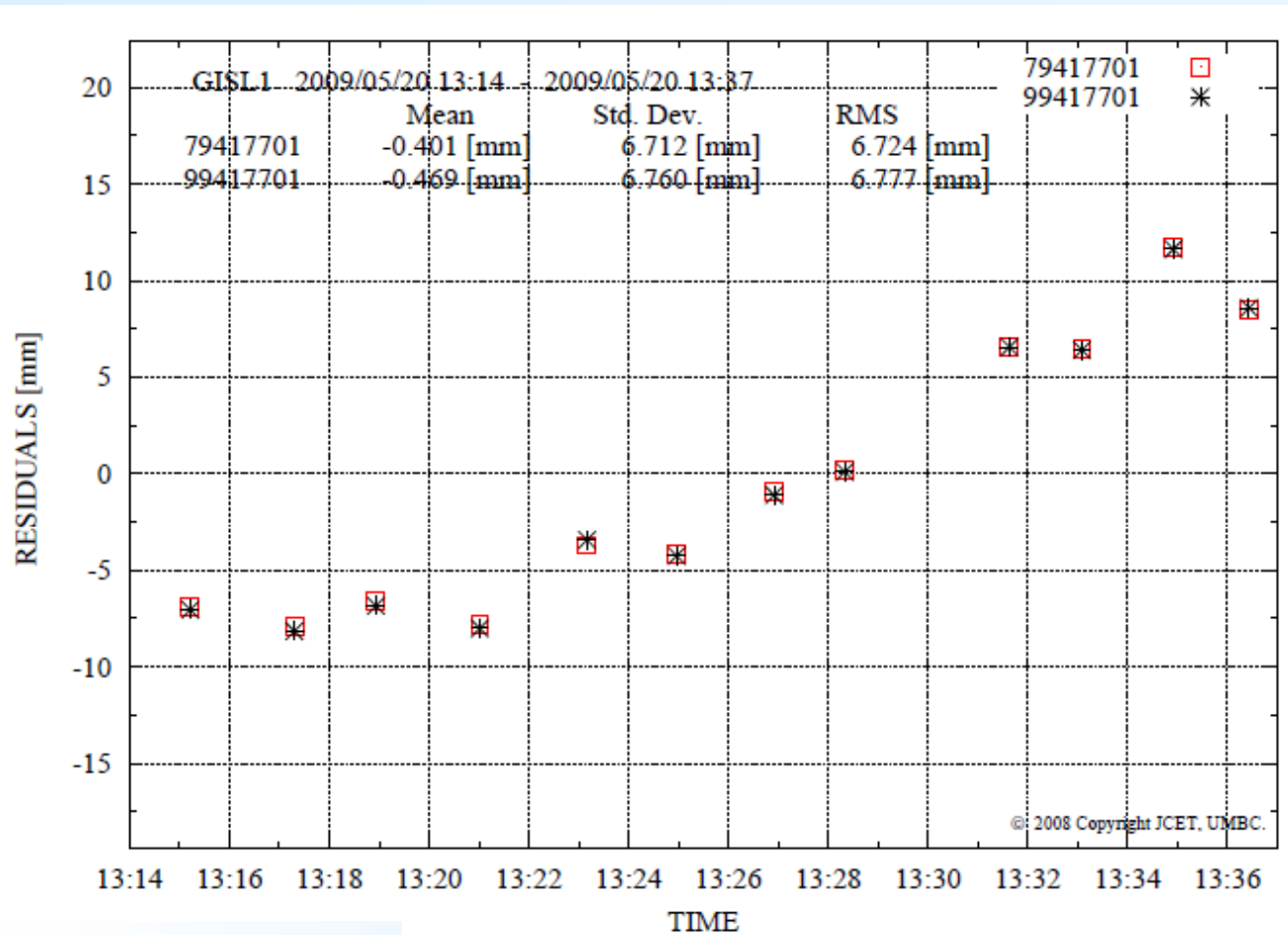
MERIT FROM CRD

760390109140348818040000994177 1	0	0 54848767888	325320 96073001 27	0	0	0 235383	0 127 522 <u>10</u> 011100030
760390109140349991040000994177 1	0	0 52642947630	325320 96083001 27	0	0	0 235383	0 127 1442 <u>10</u> 011100030

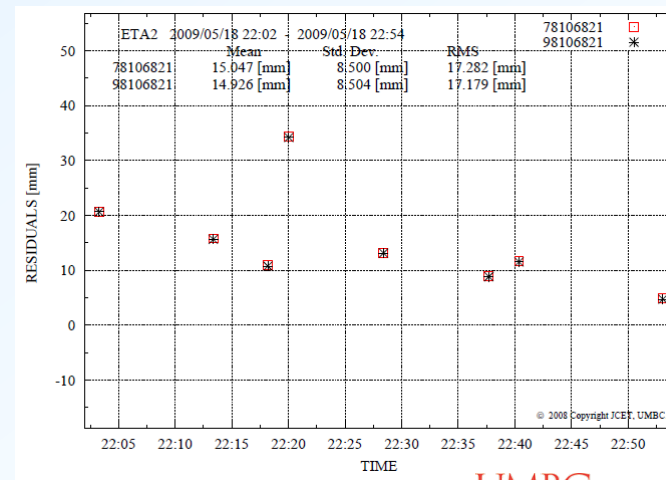
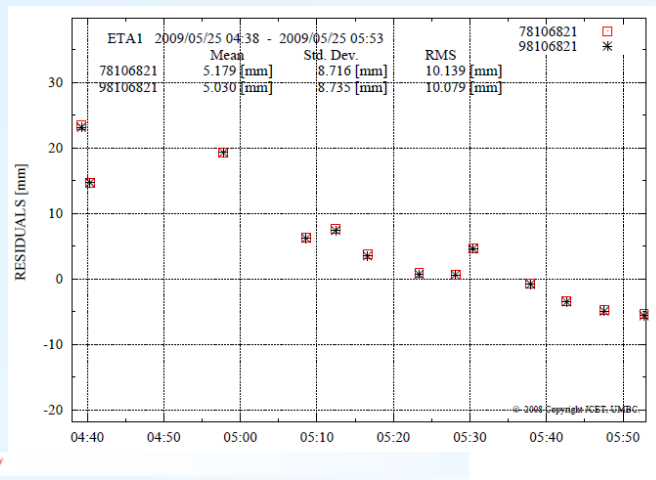
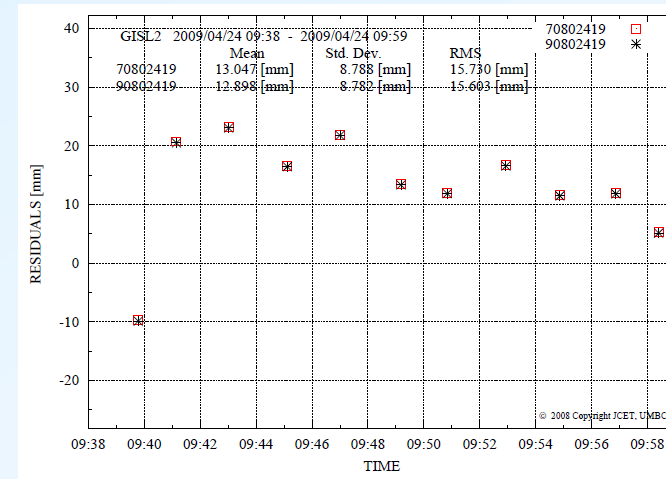
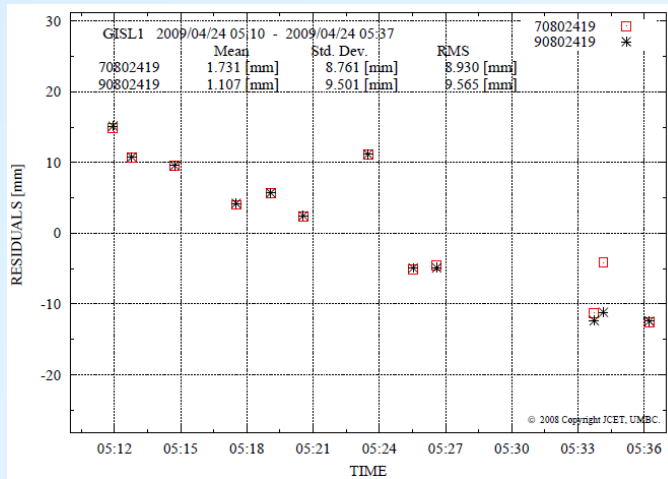
MERIT FROM QL

76039010914034881804000079417701	05484876788800000405320096073001027	002353830000000012700522 <u>3</u> 011108110
76039010914034881804000079417701	05484876788800000405320096073001027	002353830000000012700522 <u>3</u> 011108110

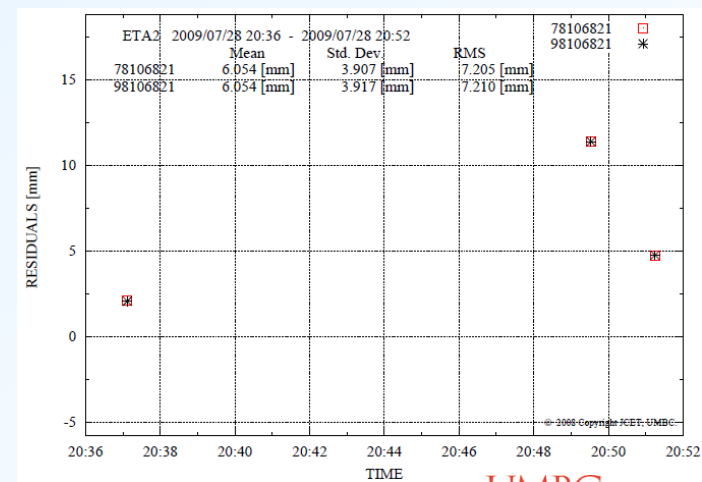
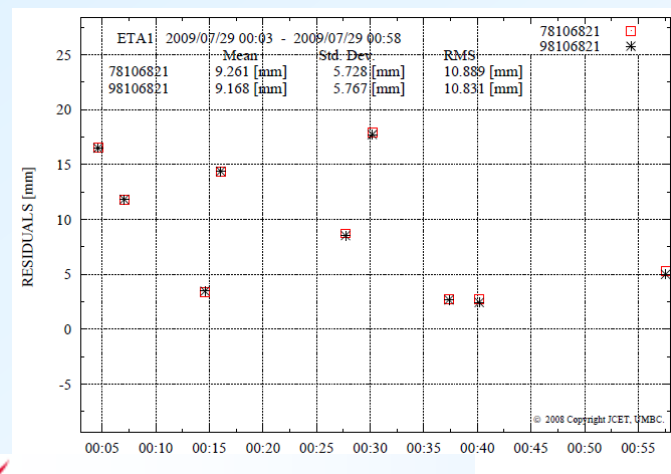
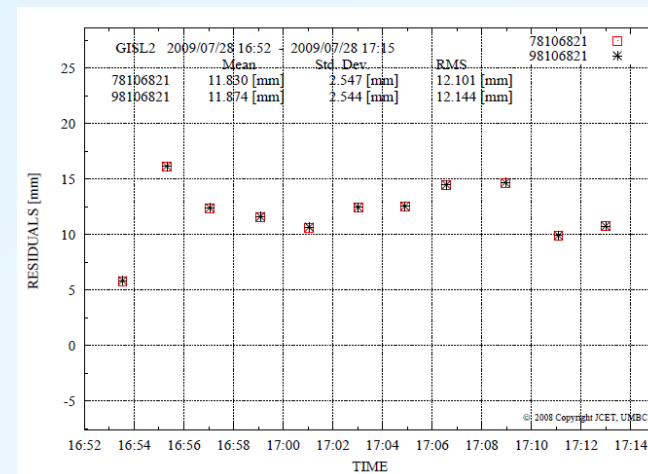
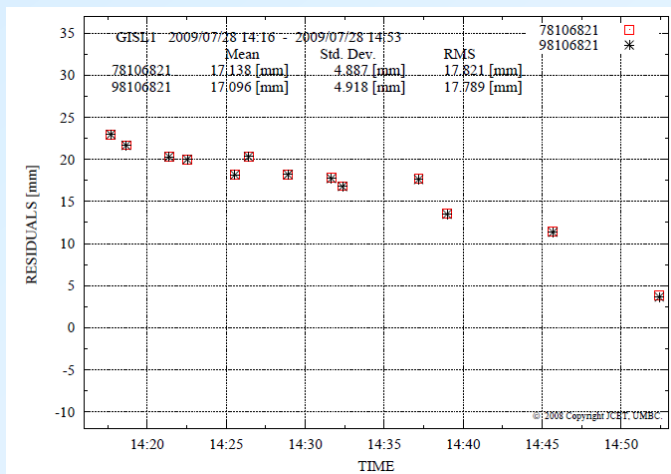
Problem with Epoch Time Scale Record 7941 Matera



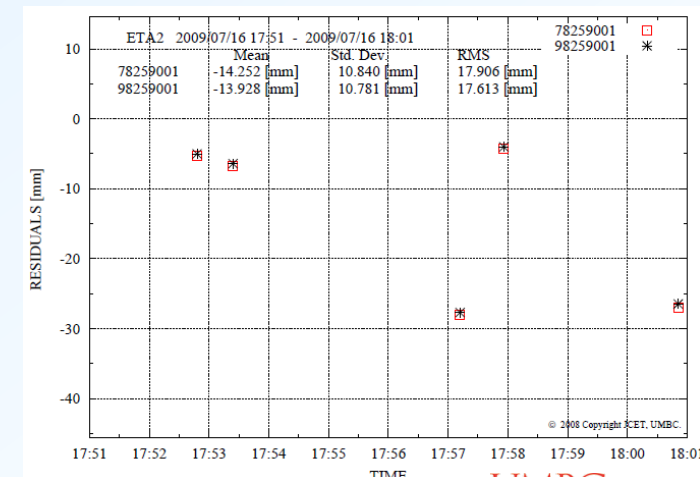
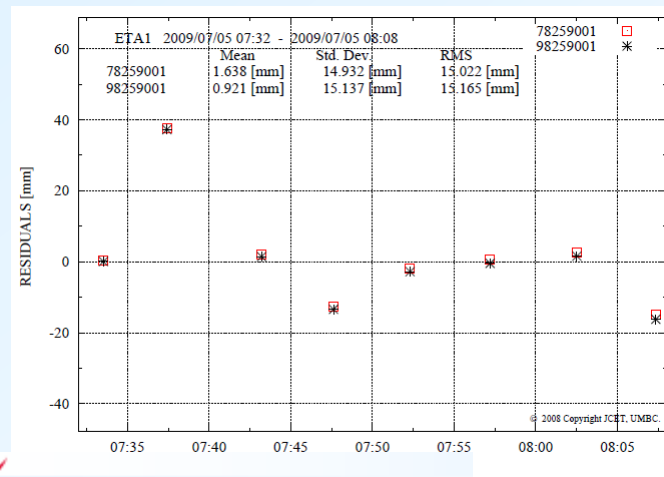
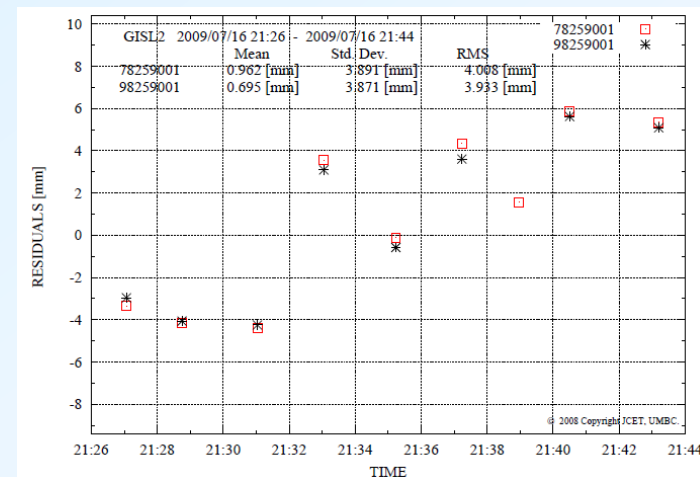
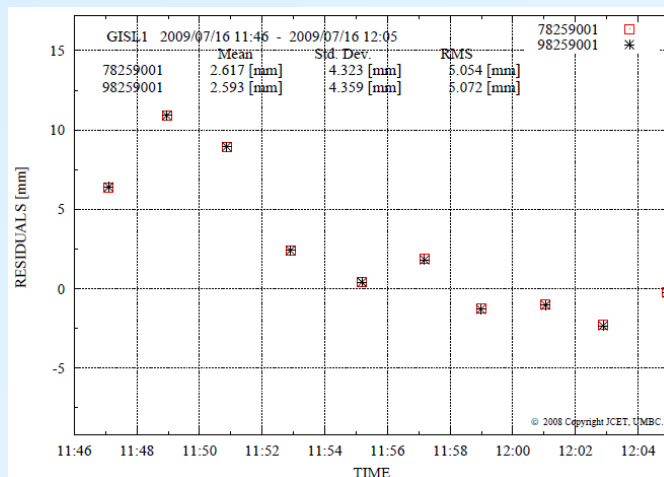
Residual Comparisons 7080



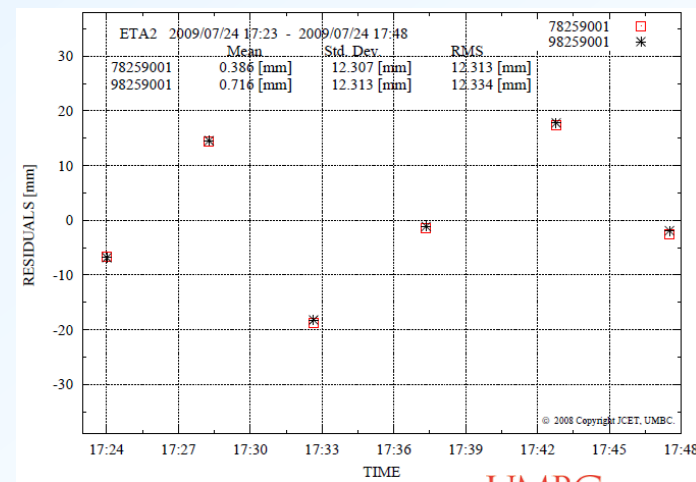
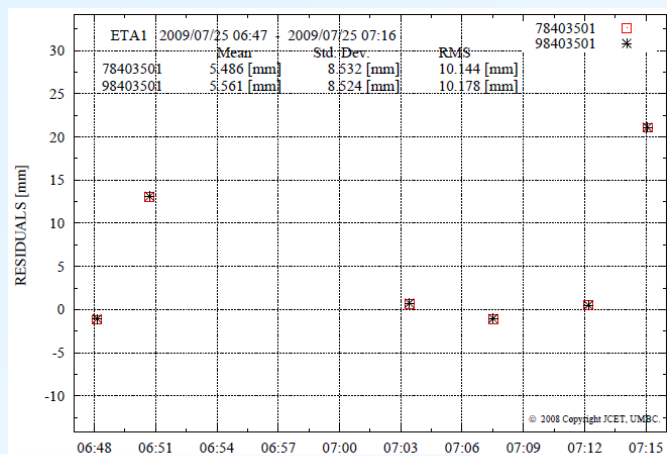
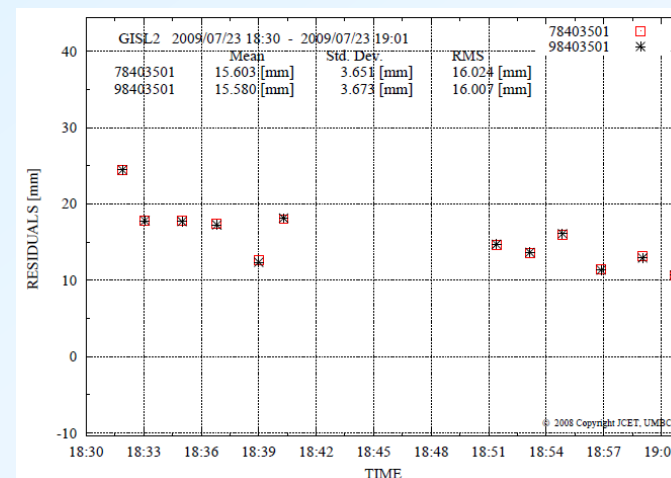
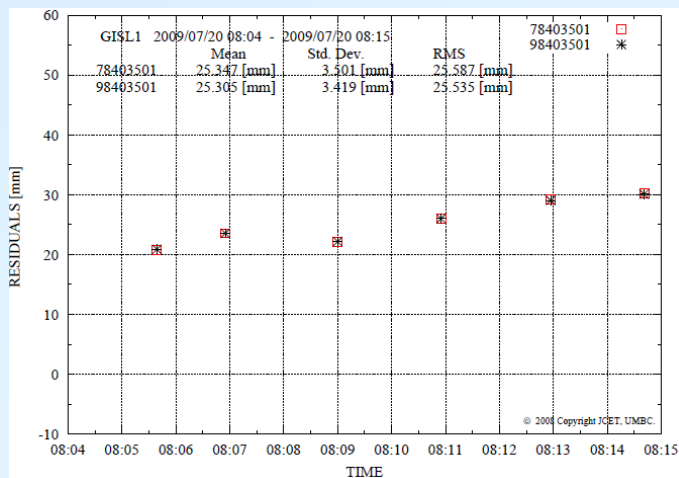
Residual Comparisons 7810



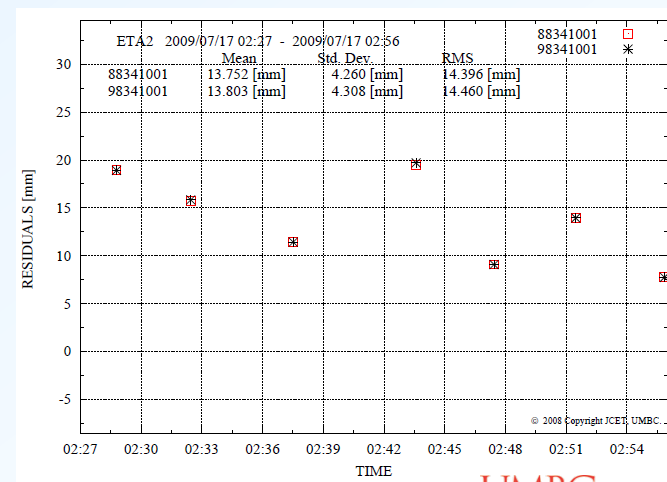
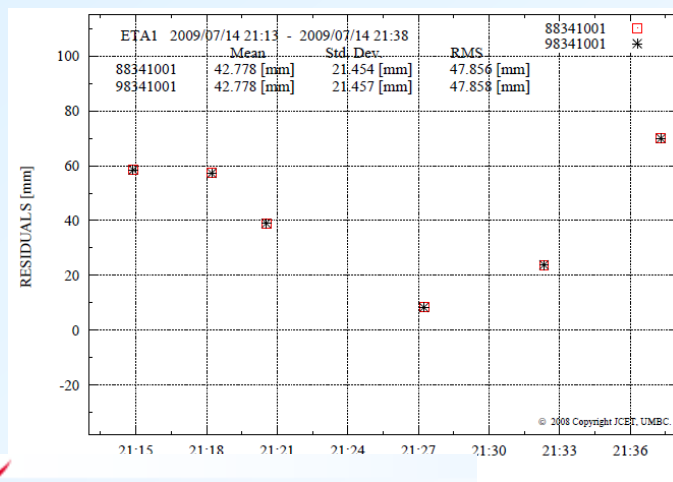
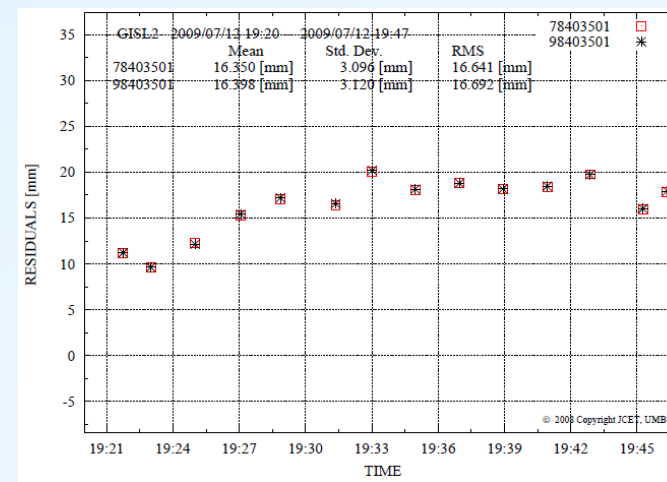
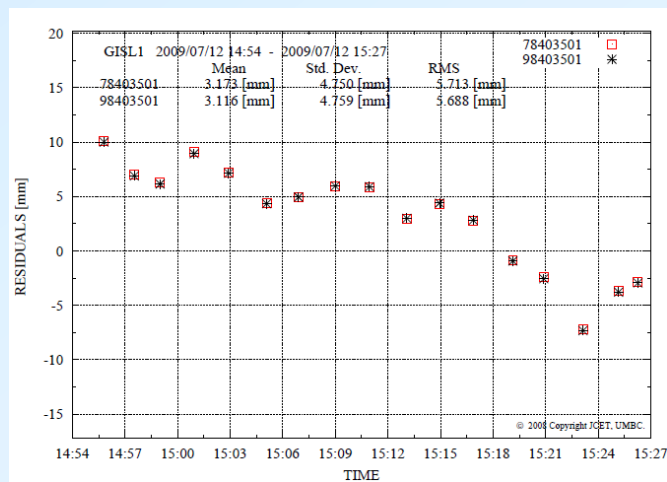
Residual Comparisons 7825



Residual Comparisons 7840



Residual Comparisons 8834



Summary

- We have successfully used NP data in the new CRD format in GEODYN
- No major issues with the format, nearly identical results
- We had identified at the time that more tests are needed:
 - Use current test files to evaluate the effect of the higher precision available
- We have now examined data from stations: 7080, 7810, 7825, 7840, 7941 and 8834
- Differences seen are consistent with additional precision (lower RMS generally)
 - Stations do not follow CRD rules
 - OC have not caught these errors

Validating the new CRD data format

Magdalena Kuzmicz-Cieslak
JCET/Univ. of Maryland Baltimore County

Erricos C. Pavlis
JCET/Univ. of Maryland Baltimore County, and
NASA Goddard Space Flight Center

epavlis@UMBC.edu

- Tested data submitted by MLRS in CRD and ILRS NP format for the past few months
- We convert the CRD data back to a quasi-ILRS FR format, which is directly readable by our analysis s/w (GEODYN)
 - All quantities were converted using the CRD precision
 - Met data are used without interpolation

```

h1 CRD 0 2007 9 5 13
h2 MDOL      7080 24 19 4
h3 LAGEOS1   7603901 1155      8820 0 0|
h4 1 2007 5 11 23 53 33 2007 5 11 0 2 14 0 0 0 0 1 0 2
c0 0 532.000 std mll mcp mt1
c1 0 mll Nd-Yag 1064.00 10.00 -1.00 200.0 -1.00 1
c2 0 mcp mcp 532.000 -1.00 3800.0 0.0 unknown -1.0 3.00 -1.0 35.0 none
c3 0 mt1 TAC TAC MLRS_CMOS_TMRB_TD811 na 467300000.0
60 std 5 2
40 86013.4523810 0 std 47 46 -1.000 -831.7 0.0 59.4 0.118 -0.837 203.4 3 3
20 86023.457 803.09 296.26 32. > MET RECORD for next 2 data
11 86023.456666973740 0.045600077128 std 2 120 22 92.5 1.503 -0.308 -47.9 1.83
11 86090.485491141153 0.044884749423 std 2 120 89 109.7 1.519 -0.342 17.3 7.42
20 86338.192 803.09 296.06 32. > MET RECORD for 1 data
11 86338.192059406327 0.042824226301 std 2 120 99 85.0 1.588 -0.002 -60.8 8.25
20 71.549 803.09 296.26 33. > MET RECORD for next 2 data
11 71.549406949766 0.042137743997 std 2 120 47 84.2 1.551 -0.110 -73.2 3.92
11 131.175048712525 0.041934327881 std 2 120 2 46.1 0.354 -2.750 -29.3 0.17
50 std 94.1 1.616 0.060 22.9 0
h8
h9

```

MERIT from CRD file:

760390107131	860234566670	70802419	0	00456000771280000	092	53200	80312962032	0	0	0
760390107131	860904854911	70802419	0	00448847494230000	109	53200	80312962032	0	0	0
760390107131	863381920594	70802419	0	00428242263010000	085	53200	80312960032	0	0	0
760390107132	000715494070	70802419	0	00421377439970000	084	53200	80312962033	0	0	0
760390107132	001311750487	70802419	0	00419343278810000	046	53200	80312962033	0	0	0



ILRS NP to ILRS FR-X



FR from ILRS QL NP file below:

76039010815123363562398470802419	05166975787700000795320080092929042	-000092700000000477001124011165210
76039010815123429390708870802419	05093552953200000915320080092929042	-000092700000000477001224011165210
76039010815123628676498670802419	04899772996800001035320080092929042	-000092700000000477000624011165210
76039010815123649985661270802419	04881811221900000825320080092929042	-000092700000000477001224011165210
76039010815123848570794970802419	04742912087700000755320080092929042	-000092700000000477002524011165210

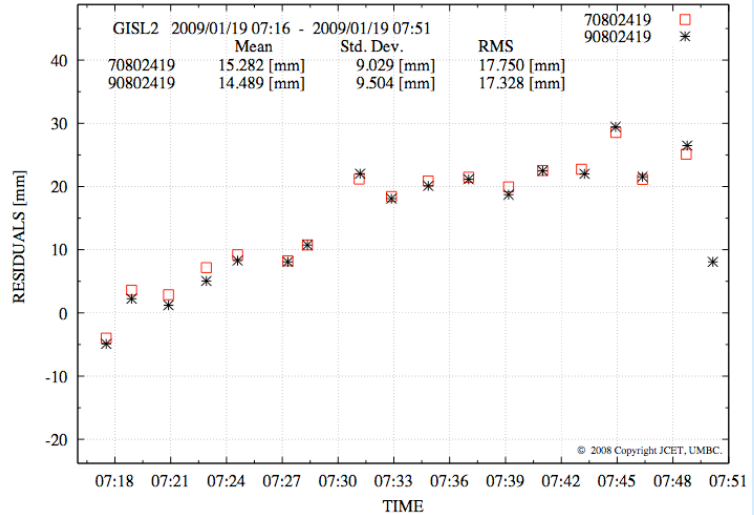
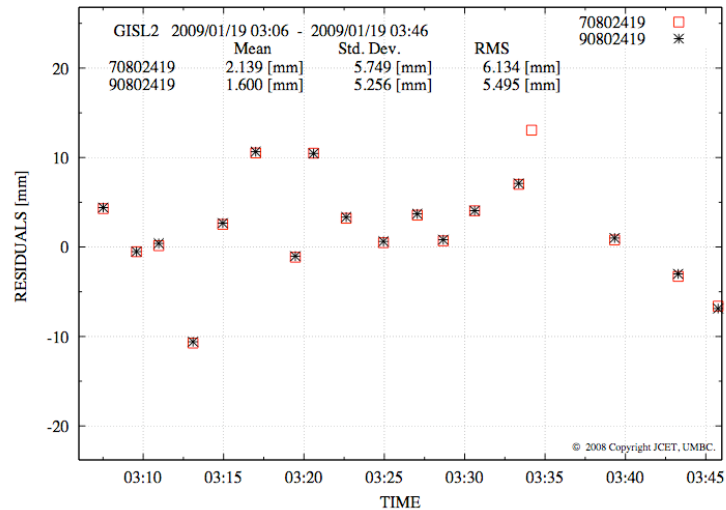
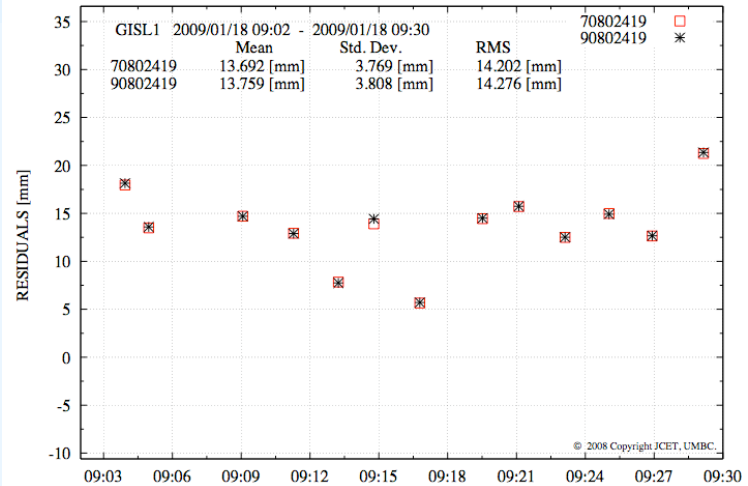
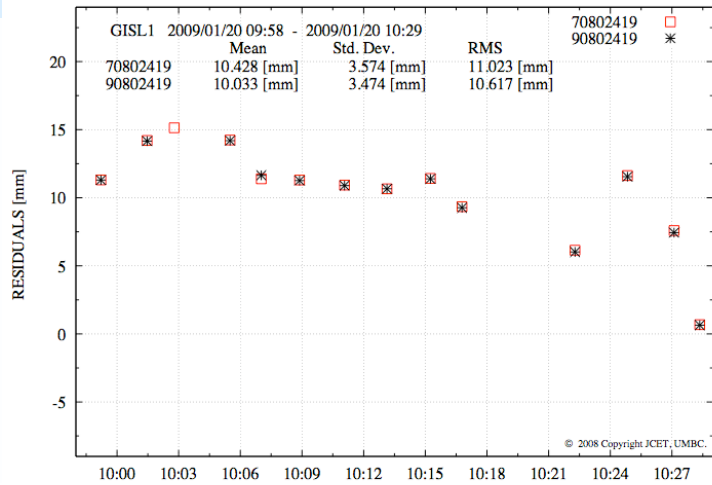
MERIT from CRDX

760390108151023363562398359369000000802419000000000000000516697578770000008000532000080088292950420000000000000000-0000926800000000467001124011165230
760390108151023429390708769046000000802419000000000000000509355295320000008000532000080088292950420000000000000000-0000926800000000467001224011165230
7603901081510236286764986288940000008024190000000000000004899772996700000008000532000080088292950420000000000000000-0000926800000000467000624011165230
7603901081510236499856611704640000008024190000000000000004881811221800000008000532000080088292950420000000000000000-0000926800000000467001224011165230
7603901081510238485707949091080000008024190000000000000004742912087700000008000532000080088292950420000000000000000-0000926800000000467002524011165230

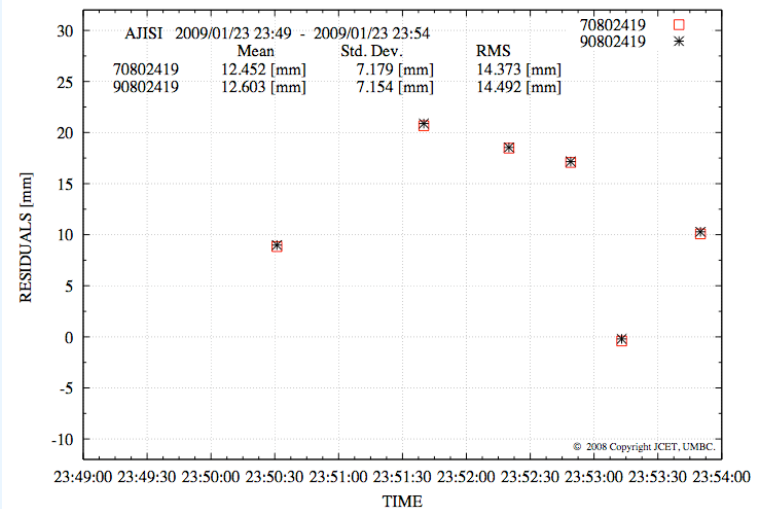
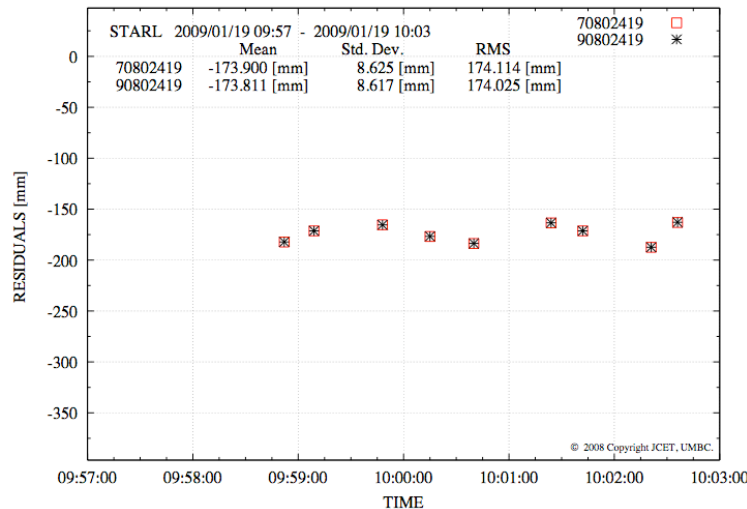
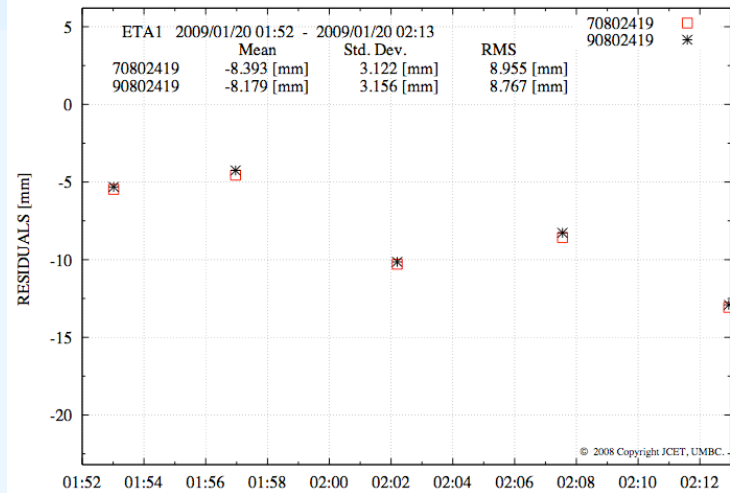
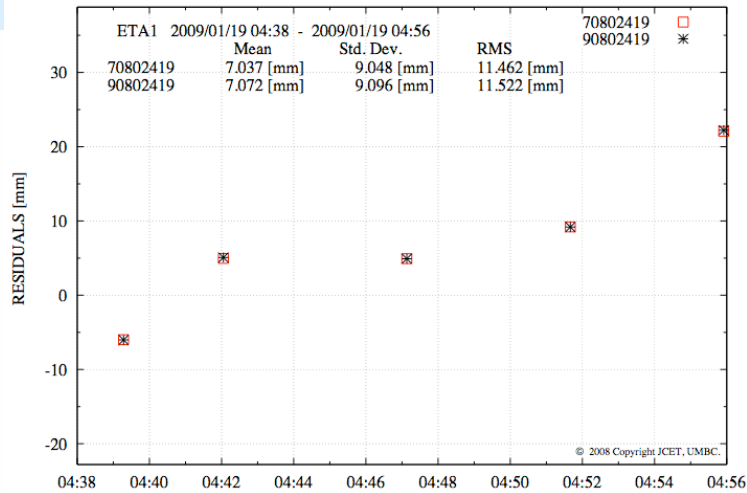
FR-X from CRD NP file above:



LAGEOS 1 & 2 Examples



E-1, Starlette, & Ajisai Examples



- We successfully tested the new CRD format data from MLRS in GEODYN
- We tested only LAGEOS 1 & 2, ETALON 1 & 2, Starlette & Ajisai data only
- No major issues with the format, nearly identical results, $|\Delta v_R| \leq 0.5 \text{ mm}$
- Questions to the WG:
 - Adopt rules of use, e.g. should met data be interpolated linearly or not?
 - Should other data types in CRD be examined? (FR, QL, engineering data)
- Procedure runs automatically once a week (Tuesday) for available sites

EDC OC Activities - CRD

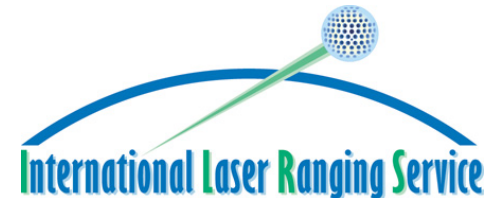
International Technical Laser Workshop on SLR
Tracking of GNSS Constellations

ILRS Data Formats and Procedures Working Group
Meeting, Metsovo, Greece, September 15, 2009



CRD Status at EDC

- As proposed at the previous DF&P WG meeting in Vienna, April 2009, a Web page for checking of CRD files was installed (multi-pass files?)
- 24 users/stations have an account for this new service
- 14 stations send CRD data files to EDC, which are rigorously checked
- CRD files with errors are extracted, and stations were informed about the errors



CRD data delivery to EDC OC

Station	NPT	FR	CRD	Comments
Lviv (1831)	X			
Simeiz (1873)	X	X		
Chagchun (7237)	X	X		
Koganei (7308)		X		fr-crd of JASON-2 only
Concepcion (7405)	X	X		
Zimmerwald (7810)	X	X		approved
Borowiec (7811)	X			
Shanghai (7821)	X	X		
Mount Stromlo (7825)	X	X	X	file names?
Grasse/FTLRS (7829)		X		fr-crd of JASON-2 only
Herstmonceux (7840)	X	X		
Grasse (7845)		X		fr-crd of JASON-2 only
Matera (7941)	X	X		
Wetzell (8834)	X	X		
Riga (1884)				announced to send soon
Katzively (1893)				announced to send soon
San Fernando (7824)				announced to send soon
Potsdam (7841)				announced to send soon

