

Since 1998

Multi-Satellite Daily Bias Report: How to Read and Handle it

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URL: <http://www.science.hit-u.ac.jp/otsubo/slr/bias>

Multi-satellite bias analysis - Windows Internet Explorer

<http://www.science.hit-u.ac.jp/otsubo/slr/bias/>

Multi-satellite bias analysis

Multi-Satellite Bias Analysis Report for Worldwide Satellite Laser Ranging Stations

Latest Analysis Report: >> [from 28 Sep 2008 to 11 Oct 2008](#)

Stations with high productivity

	# pass/# NP	Site Name(ID)		# pass/# NP	Site Name(ID)
Lageos1	43/565	Yarragadee (7090)	Lageos2	44/700	Yarragadee (7090)
	36/359	Mt Stromlo (7825)		30/461	Mt Stromlo (7825)
	26/299	Matera (7941)		22/286	San Juan (7406)
Etalon1	8/79	Zimmerwald (7810)	Etalon2	10/74	Yarragadee (7090)
	7/59	Yarragadee (7090)		10/51	San Juan (7406)
	5/79	Graz (7839)		7/52	Graz (7839)
	5/33	San Juan (7406)			
	5/12	Changchun (7237)			
Starlette	53/712	Yarragadee (7090)	Stella	32/345	Yarragadee (7090)
	44/473	Mt Stromlo (7825)		23/186	Mt Stromlo (7825)
	38/410	San Juan (7406)		22/129	Changchun (7237)
Ajisai	72/1383	Yarragadee (7090)			
	50/1018	Washington (7105)			
	47/770	Mt Stromlo (7825)			

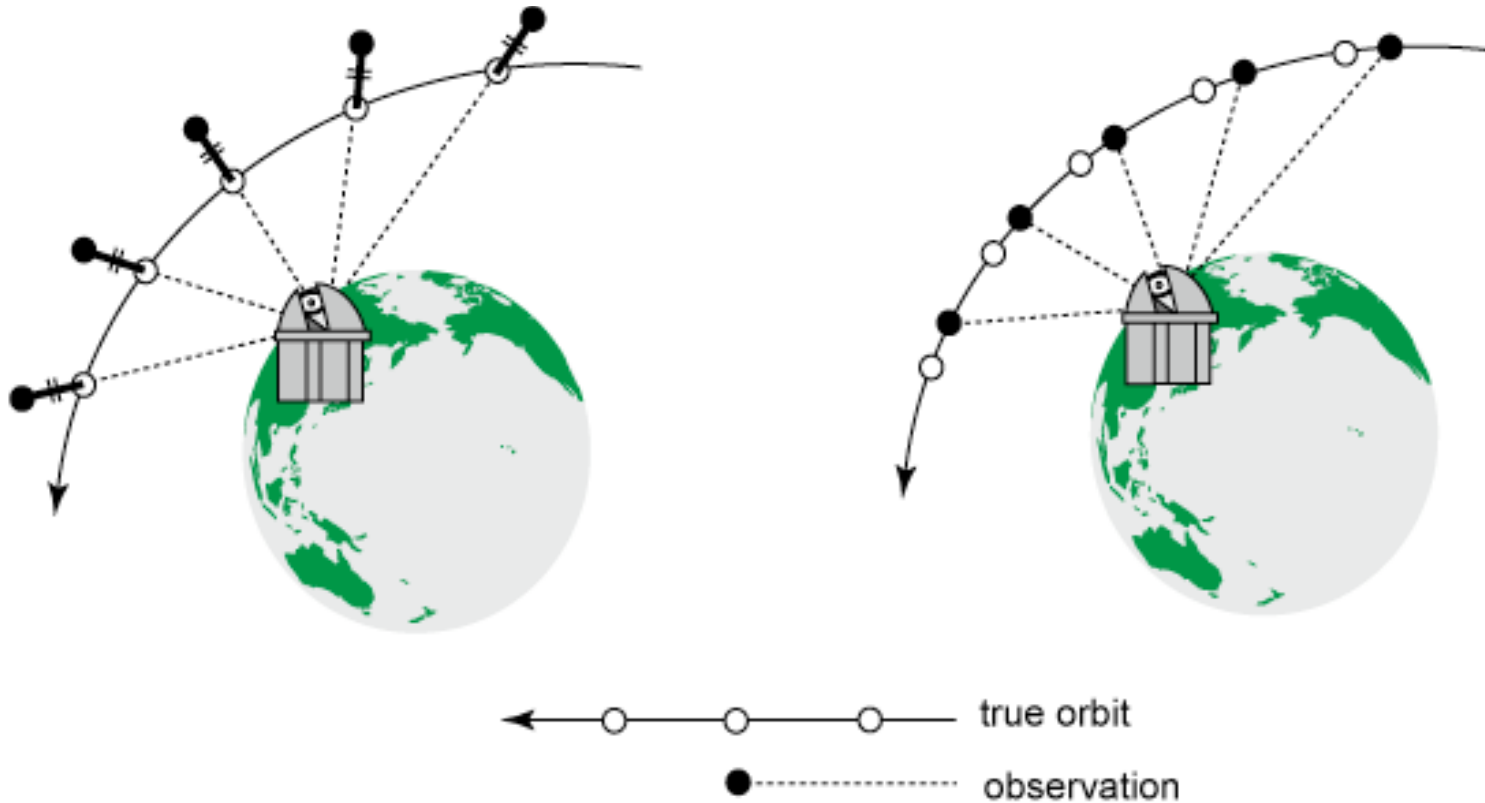
more satellites (GNSS and LEO)
included in the daily reports!!

Click

Archive: (each covers 14 days from the date) Year [2007](#) [2006](#) [2005](#)

[28 Sep 2008](#) [31 Aug 2008](#) [31 Jul 2008](#) [30 Jun 2008](#) [31 May 2008](#) [30 Apr 2008](#) [31 Mar 2008](#) [29 Feb 2008](#) [31 Jan 2008](#)
[27 Sep 2008](#) [30 Aug 2008](#) [30 Jul 2008](#) [29 Jun 2008](#) [30 May 2008](#) [29 Apr 2008](#) [30 Mar 2008](#) [28 Feb 2008](#) [30 Jan 2008](#)
[26 Sep 2008](#) [29 Aug 2008](#) [29 Jul 2008](#) [28 Jun 2008](#) [29 May 2008](#) [28 Apr 2008](#) [29 Mar 2008](#) [27 Feb 2008](#) [29 Jan 2008](#)
[25 Sep 2008](#) [28 Aug 2008](#) [29 Jul 2008](#) [28 Jun 2008](#) [29 May 2008](#) [28 Apr 2008](#) [29 Mar 2008](#) [26 Feb 2008](#) [28 Jan 2008](#)

Range bias & time bias



7811 = BOROWIEC

#	sat	site	date	time	dur	rb mm	error	tb us	error	prec	bad	tot
JAS2	7811		2008/09/13	00:35	1	6	(7)	---	(--.-)	2	0	4
LAG1	7811		2008/09/13	02:17	15	-1	(11)	-24.6	(13.1)	16	0	9

See the past proceedings papers on the analysis itself.

16 satellites being analysed

STARLETTE
STELLA

AJISAI

LAGEOS
(2 Sats)

ETALON
(2 Sats)

ENVISAT

JASON-1

GLONASS
(3 Sats)

ERS-2

JASON-2

GPS
(2 Sats)

Why Multi-Satellite?

Low and High Satellites

- **(LAGEOS -1, -2 +) Ajisai, Starlette, Stella, JASON-1, -2, ERS-2, ENVISAT, ETALON-1, -2, GPS & GLONASS**

(some of them sometimes dropped from the report because of a lack of observations, a bad fit of orbit, etc.)

- Make problems easily identified.

LAGEOS observations NOT required.

Time span of the problematic passes clearly seen.

Frequency bias detectable.

LEO-only or HEO-only problems detectable.

- Are not precisely determined compared to LAGEOS, but still useful for QC.

Do not judge from just one pass.

Daily Schedule for QC Analysis

- Automated Daily Procedure
 - Midnight, JST: Data download from CDDIS, EDC and USNO. File format arrangement, etc.
 - 6.30 am JST: Orbit determination (and orbit generation for tomorrow's analysis).
 - 9 to 10 am JST (=0 to 1h UT): Pass-by-pass residual analysis.
 - Upload the report card.
 - Update the webpage.
 - Checked by humans (not everyday).



When we find large biases...

Human Check :

- Is the bias large enough? Is it surely 'their' problem?
- Is the problem continuous, not a one-pass event?
- Has the problem already been solved?
- Who is a contact point of the station?

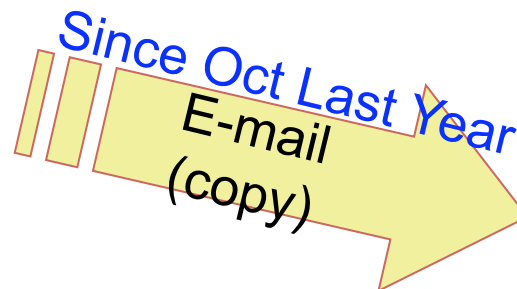
Then,



Hitotsubashi Univ



*Hello ABC station,
It seems your laser observations ...
(Glad if you give me a reply!)*



SLR Station



ILRS Task Force
[1]

Obvious biases reported to stations: 2008

[Sep, 2008] 1 or 2 or 3 RB ← laser multipulse

[Sep, 2008] < 2 m RB ← calibration (human) error.

[Jul, 2008] 1.2 km RB ← calibration error. System testing.

[Jul, 2008] 200 ms TB ← ??.

[Jun-Jul, 2008] 132 m RB ← ??.

[Jun, 2008] -20 ms TB ← hardware & software problem.

[Jun, 2008] 10 ms TB ← software (?)

[Apr, 2008] Non-existing station ID ← human error.

[Feb, 2008] Atm pressure error ← wire problem.

[Feb, 2008] 0.5 to 1.7 km RB (Freq bias?) ← ??

[Jan-Feb, 2008] 1 day TB (Wrong Day) ← ??

[Jan, 2008] 3 m RB ← laser multipulse.

[Jan, 2008] 18.6 ms TB ← event timer.

[Jan, 2008] < 2 m TB (LEO Only) ← ??

Great
improvement in
10 years.

Quick
feedback
→ Shortening
error periods.

DIY for sub-cm accuracy

QC at Station
(NP generation stage)

Pass-by-pass QC
from ACs/AACs

Long-term sub-cm QC
through Collaboration

Worry about cm or sub-cm systematic error?

– ACs do not know what your error source would be.

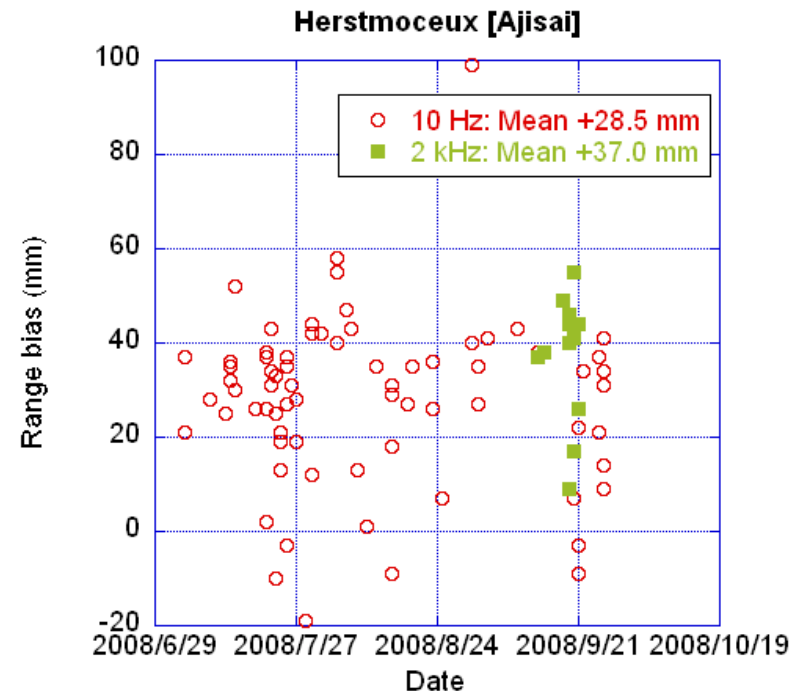
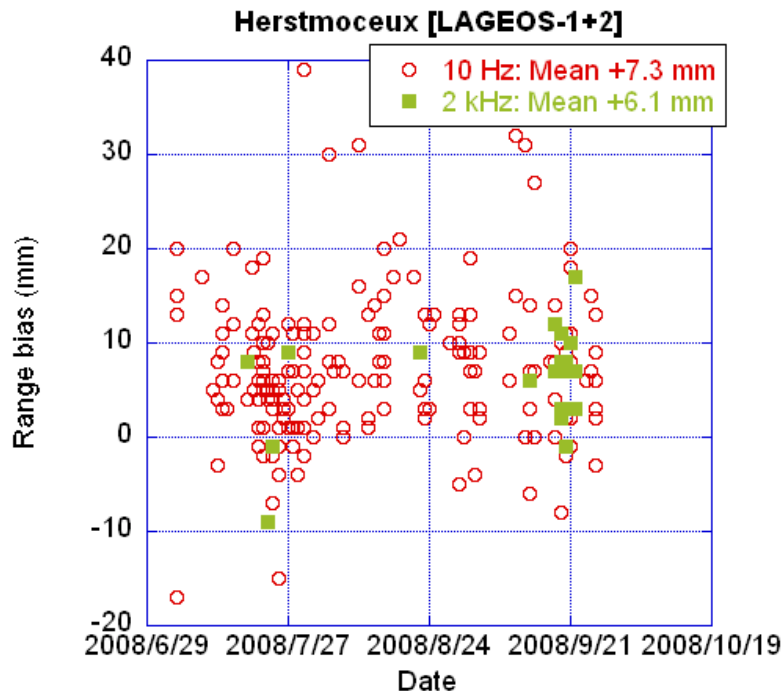
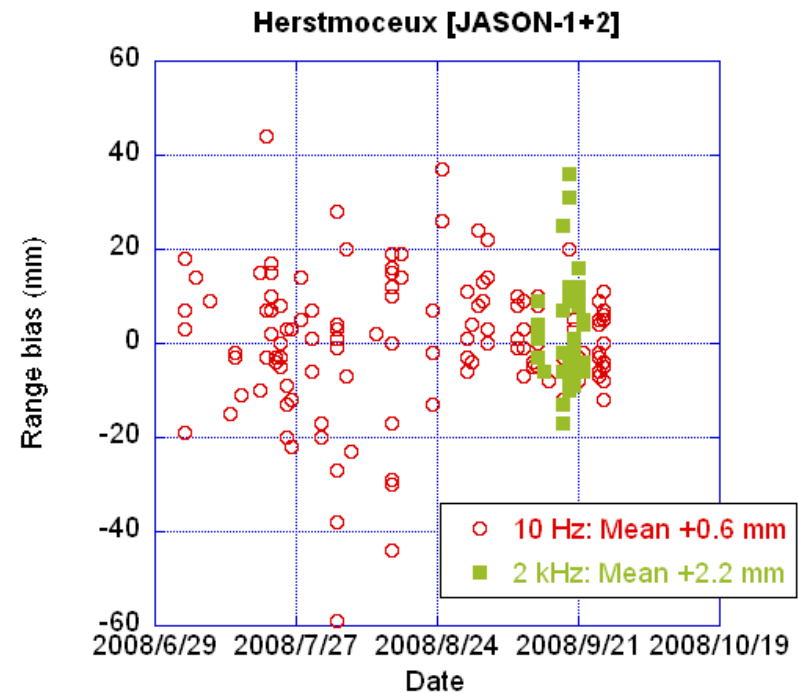
Observer, Time since System Activation, Room Temperature,
Signal Intensity, Optical Configuration, and much more!!

DIY: An Example

10-Hz vs 2-kHz at Herstmonceux

- SCI = 6: 10(+) Hz
- SCI = 7: 2 kHz

→ Extract “Range bias” from daily reports (easy spreadsheet job)



Summary & Future works

Almost 10 Years' Continuous Run! CRL→NICT→HIT-U

- Powerful tool for detecting various type of problems.
- Many thanks to regular/occasional worldwide users!

Communications between stations and ACs

- Some E-mail address on ILRS Webpages was obsolete.
- Face-to-face workshop is important (thanks Stanislaw!).

Future works

- Better TRF (SLRF2008? Our own updates?)
- Shorter delay (24 hrs to a few hrs?).

Want to delete data? Yes, you can, with CRD.

- Some cases (wrong day, wrong station ID, etc) are NOT correctable/recoverable with the current framework.
- CRD: Set “Data Quality Alert Indicator” = “2”.

Leap Second on 1 Jan 2009 !!

Last time: 1 Jan 2006

Stations

- Perfect job last time!
- 1 or 2 second time bias (even 1-day, 1-year time bias) seen in the past.
- Check the procedure after you go back home.

(ACs)

- Check the software. Handling of UT1-UTC is tricky.