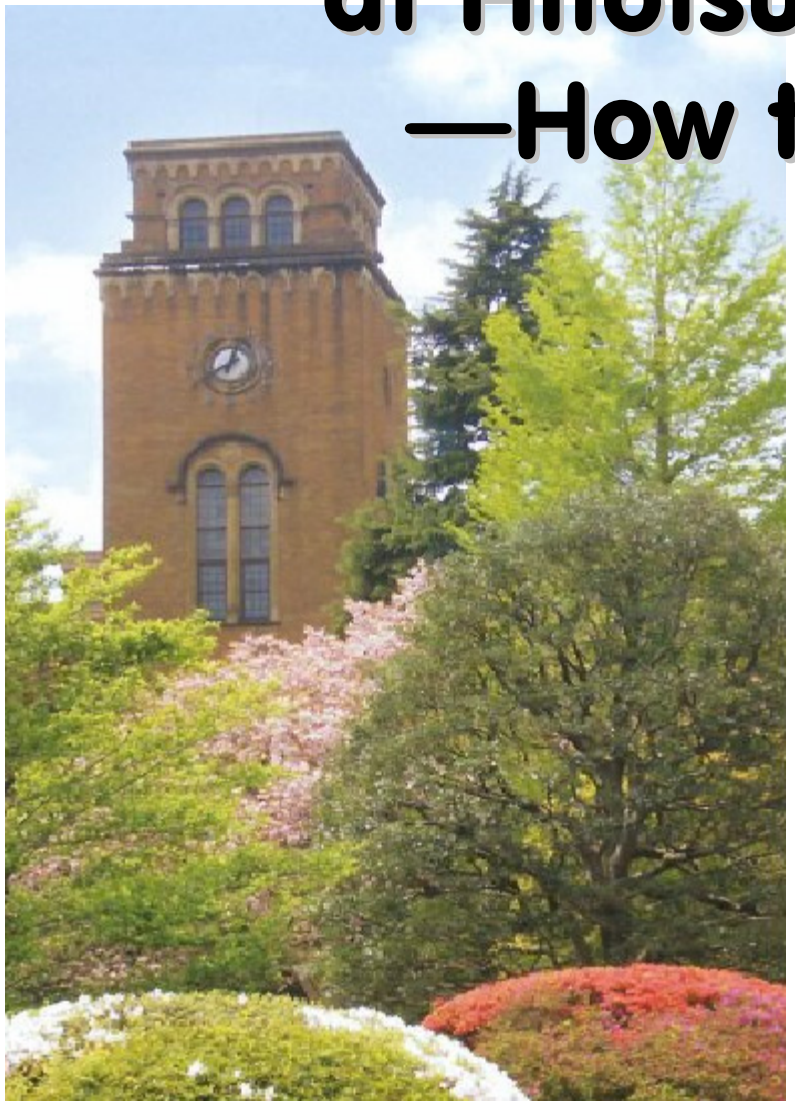
Multi-Satellite Quality Check at Hitotsubashi University —How to read/use it—



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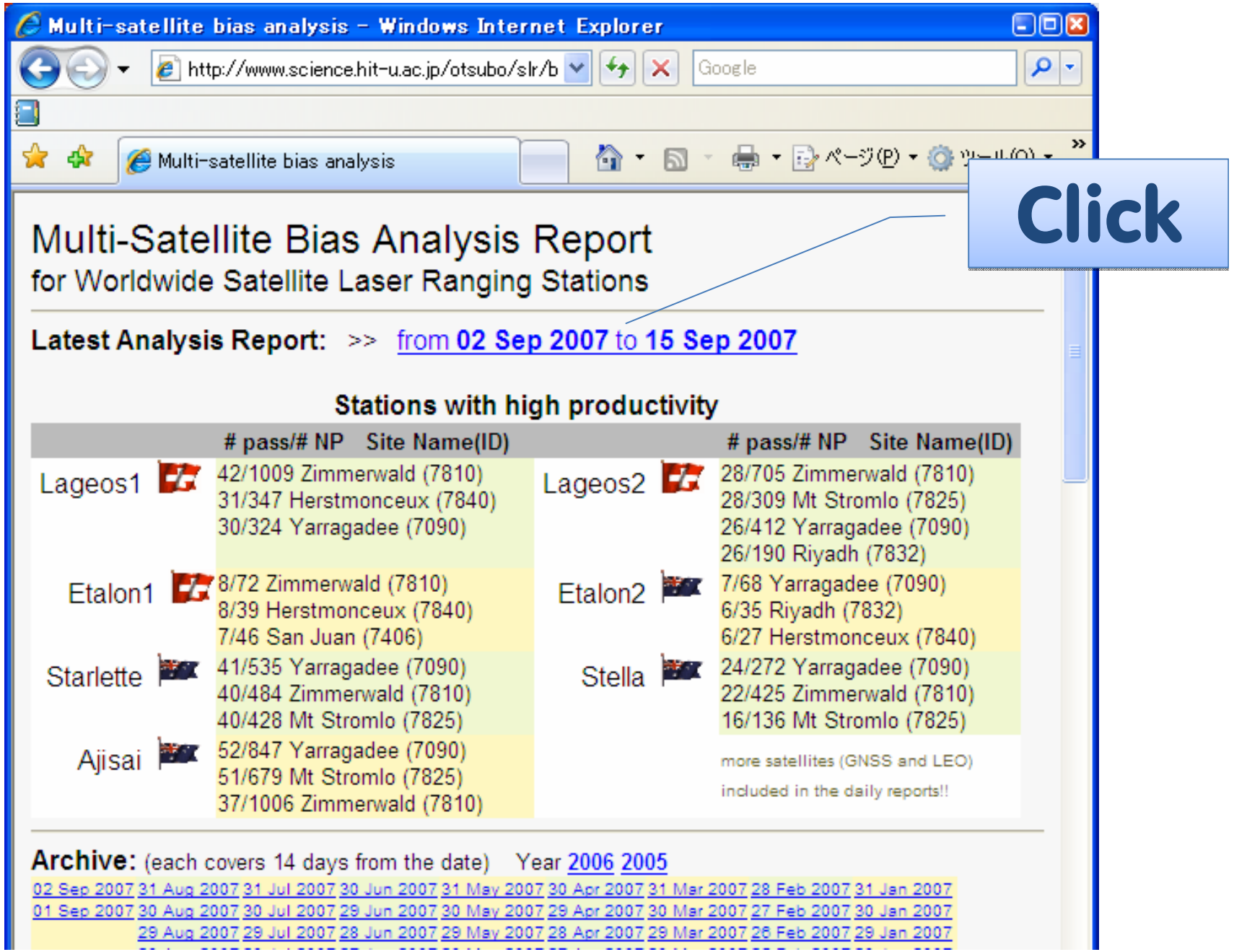
HITOTSUBASHI UNIVERSITY

Daily QC Analysis Continues for ILRS!

- Friday, 30 March 2007: Left NICT.
- Monday, 2 April 2007: Moved to Graduate School/Faculty of Social Studies, Hitotsubashi University.
- Thursday, 5 April 2007: Sent an SLRMail message on this move.
- Monday, 9 April 2007: Rebuilt the QC webpage, and sent an SLRMail with a new URL.
- Tuesday, 10 April 2007: Closed the NICT QC webpage.

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



```
#
#  7090 = YARRAGADEE
# sat site       date  time dur    rb mm   error        tb us    error    prec bad total  rms   pres  temp hum  sdelay shft  rms cfg r wlen
 LAG2 7090 2007/09/09 13:45  10      -2 (     3 )       0.7 (   11.4 )     2   0 /   7    8  990.0 284.3  77   15845   -1    4 0 1 0  532
 ETA1 7090 2007/09/09 14:13 132       3 (     6 )      20.7 (   10.9 )     4   0 /   7   23  989.3 284.7  73   24369    0    6 0 1 0  532
 ENVI 7090 2007/09/09 14:38   5       5 (     4 )      -2.0 (    0.9 )     2   0 /  23    8  990.1 284.0  74   15845    0    4 0 1 0  532
 AJI1 7090 2007/09/09 14:44   1       7 (     3 )  -------.- ( ----.- )     1   0 /   5   12  990.0 284.0  74   15845    0    4 0 1 0  532
 LAG1 7090 2007/09/09 15:27  43       4 (     3 )       2.4 (    1.5 )     2   0 /  23    9  989.1 284.9  70   15846    1    4 0 1 0  532
 STRL 7090 2007/09/09 17:38  10       2 (     3 )       1.8 (    0.6 )     1   0 /  21    8  988.6 283.0  75   15845   -1    4 0 1 0  532
 STEL 7090 2007/09/09 18:54   8      -2 (     3 )       0.0 (    0.5 )     1   0 /  18    9  988.3 281.1  82   15845    1    4 0 1 0  532
 LAG1 7090 2007/09/09 19:05  34      15 (     3 )      -2.5 (    2.0 )     1   0 /  14    8  988.3 281.0  83   15845    1    4 0 1 0  532
 STRL 7090 2007/09/09 19:29   8       1 (     3 )      -5.8 (    1.1 )     1   0 /  18    8  988.3 280.9  84   15845    1    4 0 1 0  532
 GP35 7090 2007/09/09 19:44  31      29 (    49 )     117.4 (  204.0 )     1   0 /   8   12  988.2 281.3  84   24368   -2    7 0 1 0  532
 ETA2 7090 2007/09/09 20:18 103      -4 (     6 )     -12.0 (   21.7 )     4   0 /  14   25  988.0 281.1  82   24368   -0    7 0 1 0  532
```

Inside our 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.

PCs: Property of NICT

Why "Multi-Satellite" ?

Low and High Satellites

- (**LAGEOS -1, -2** +) **Ajisai, Starlette, Stella, JASON, 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.)

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

  Do not judge from just one pass.

- Makes 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.

How to READ the reports: Suggestions

- **Are the observed passes there? :** Network problem?
- **(bad / total) :** Bad = number of outliers, should be 0.
- **(rb (error) and tb (error)) :** Range bias with its 1-σ error and time bias with its 1-σ error.
  - When "------.-" appears, the pass was too short. Try to earn longer pass duration (cf. "######.#" = overflow).
  - Do not be bothered if the 1-σ error is also large, ex. tb (error) = "-273.3 (304.4)".
- **(tail of each line…) :** Check them carefully!
  - XXX-m range bias when the calibration changes by XXX-m.
  - Temperature reading "frozen" for a week.

COOK our reports by yourselves!

QC at Station
(NP generation stage)

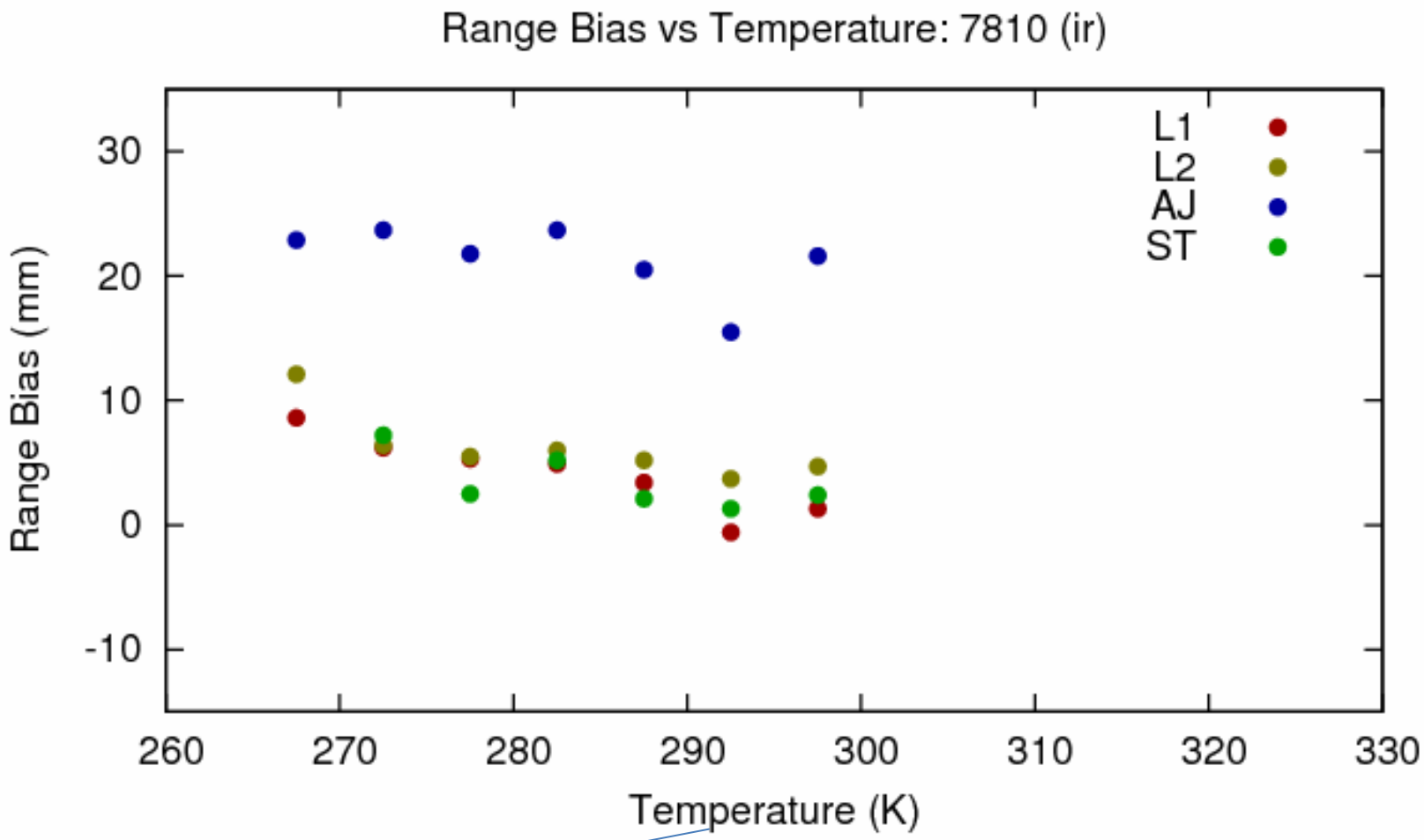
Pass-by-pass QC
from ACs/AACs

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, etc??

COOK yourselves: Example



This is the temperature of outdoor air, but what if this were the room temperature?

To Do at Hitotsubashi Univ

- New TRF
  - SLRTRF2005? Additional new/improved stations?
  - Cause a jump when changed.
  - Will be announced via SLRMail.
- More satellites
  - GLONASS-102, GIOVE, etc.
- More? Any ideas?