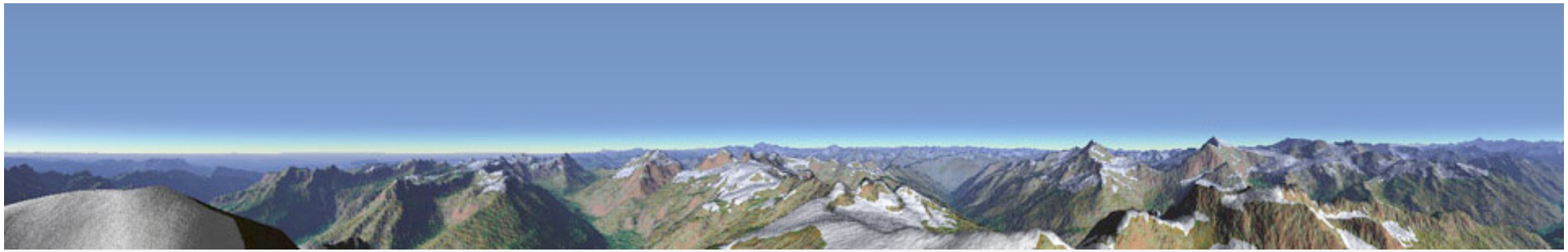

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Bundesamt für Landestopografie
Office fédéral de topographie
Ufficio federale di topografia
Uffizi federal da topografia

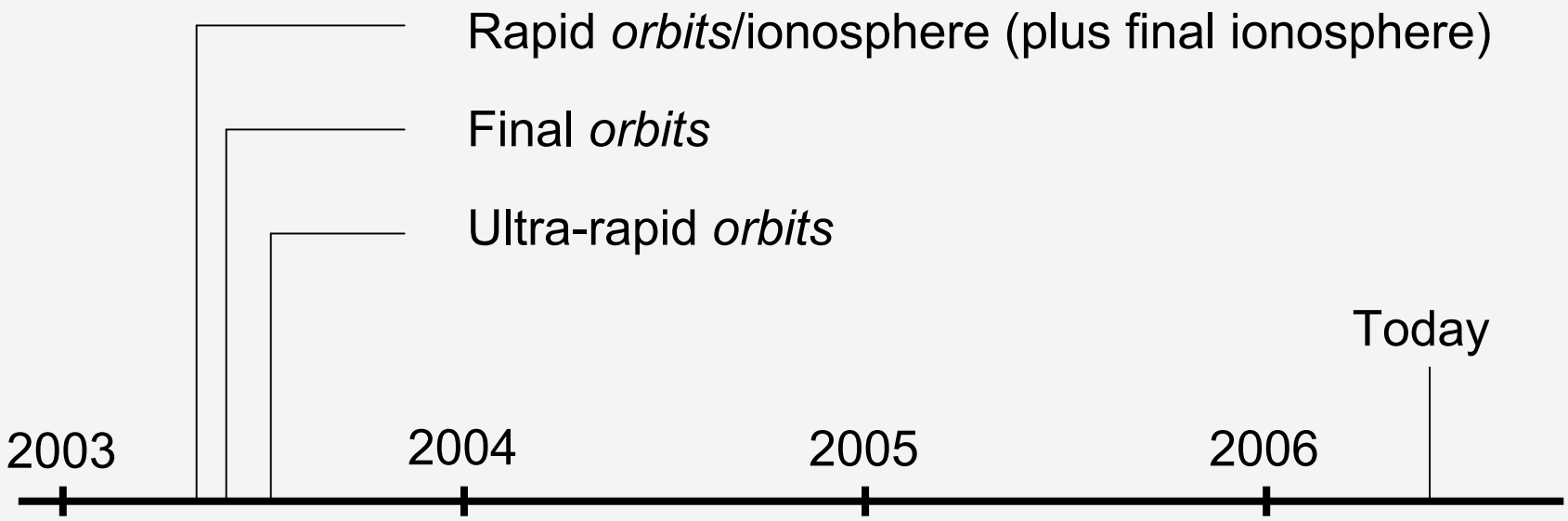
GNSS Analysis at CODE

S. Schaer[1], U. Hugentobler[2], R. Dach[2], M. Meindl[2], H. Bock[2], C. Urschl[2], A. Gäde[2], M. Ploner[2], L. Ostini[2], P. Fridez[2] , G. Beutler[2]

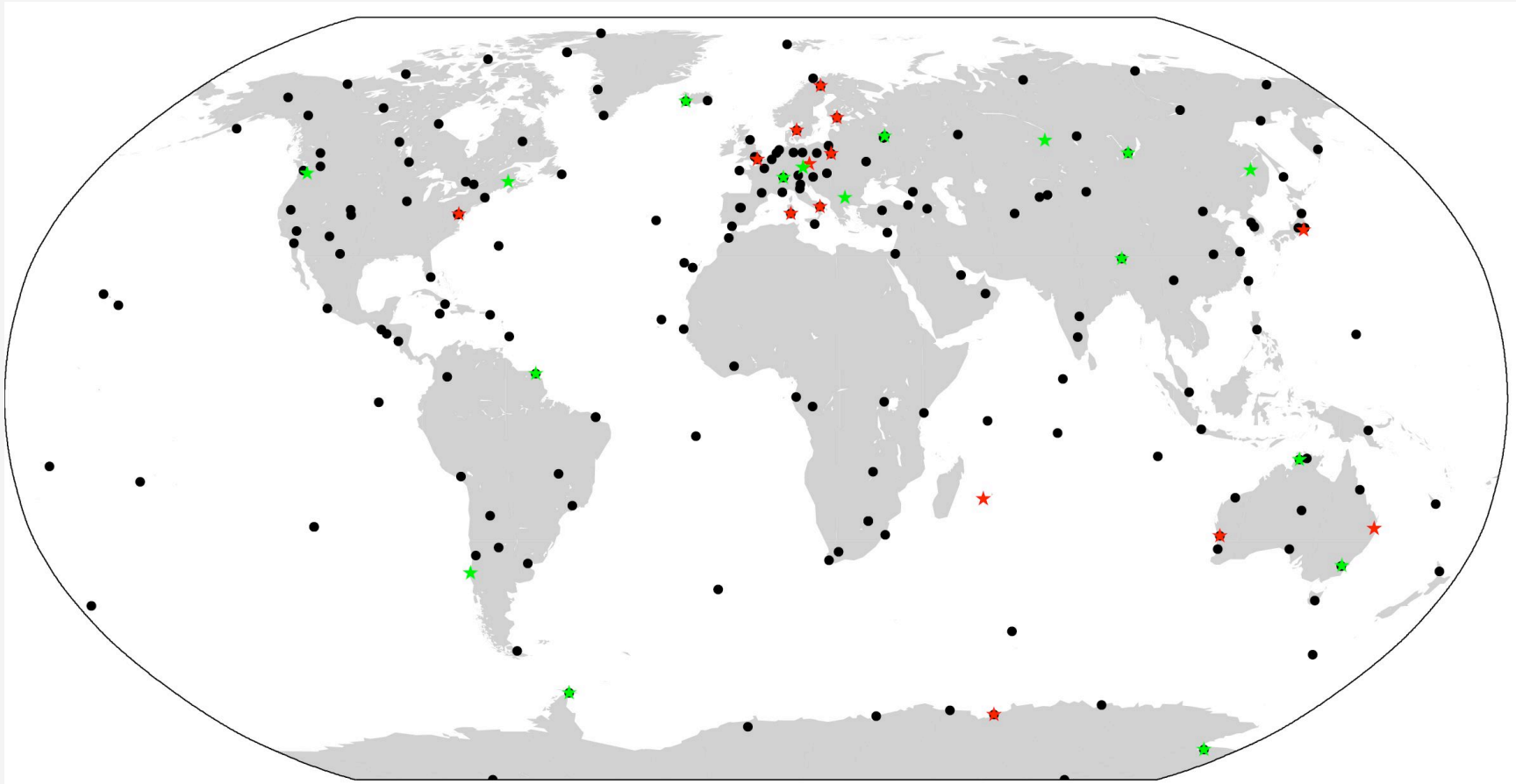
[1]swisstopo/AIUB
[2]AIUB

CODE's GNSS Orbit Product Lines

Combination on the observation level: GPS and GLONASS orbits are generated simultaneously in a rigorous GNSS analysis, ensuring best possible consistency between GPS and GLONASS orbits.

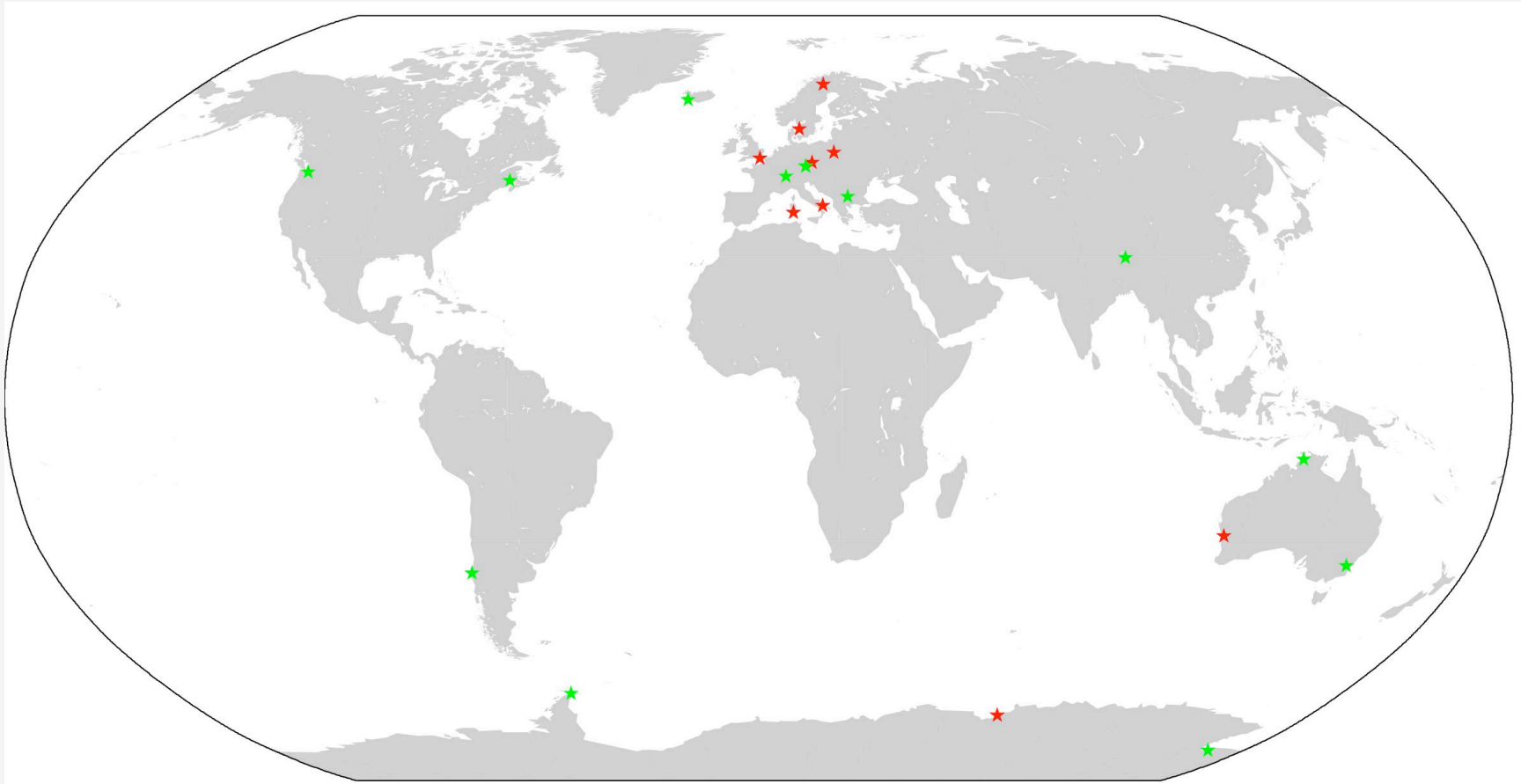


IGS/IGLOS Tracking Network as Considered in CODE´s Final GNSS Analysis



Legend: GPS-only – GPS/GLONASS – **AIV**-GPS/GLONASS

IGLOS Tracking Network as Considered in CODE´s Ultra-Rapid GNSS Analysis



Legend: GPS/GLONASS – **AIV**-GPS/GLONASS

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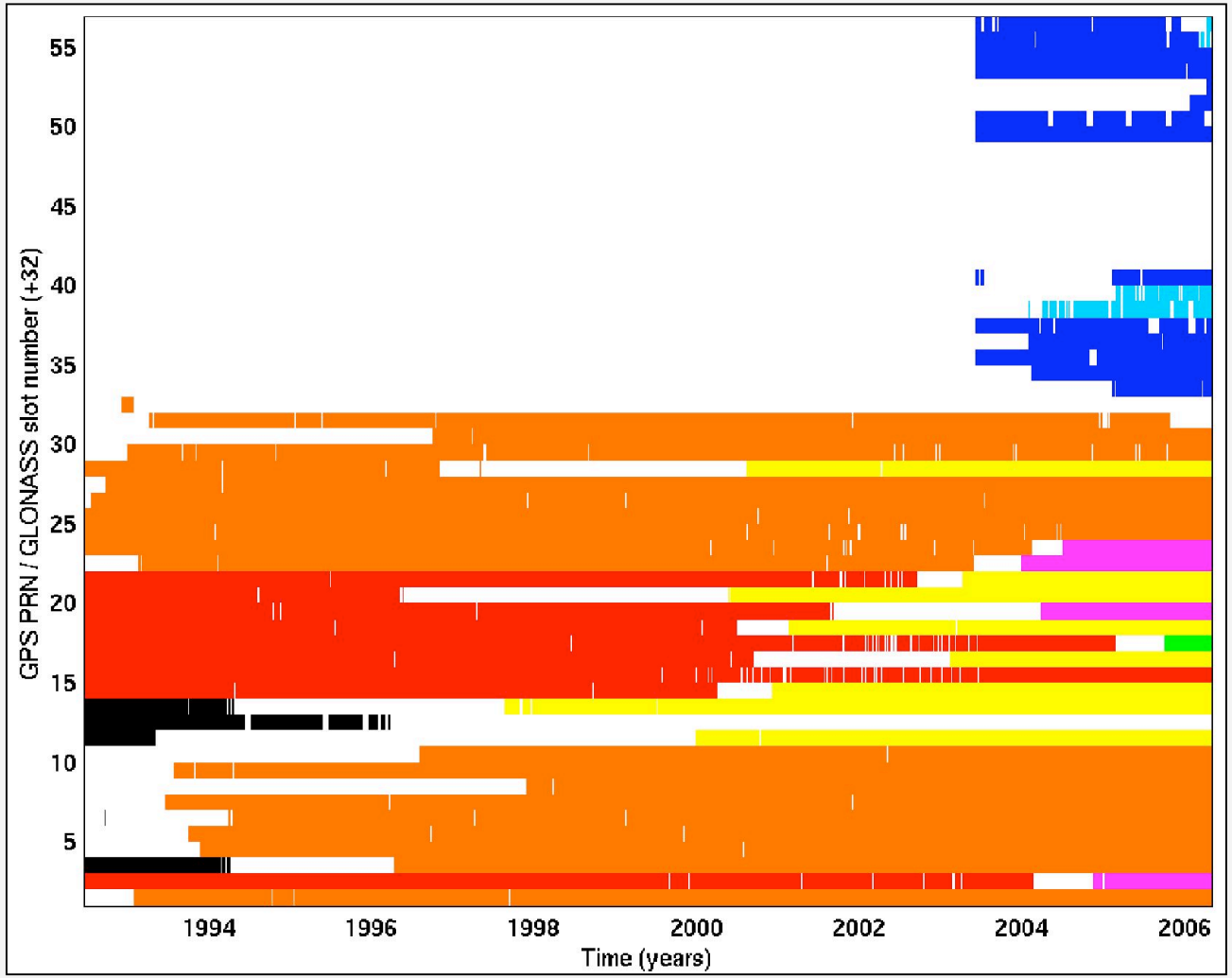
Evolution of GPS/GLONASS Satellite Constellation (1)



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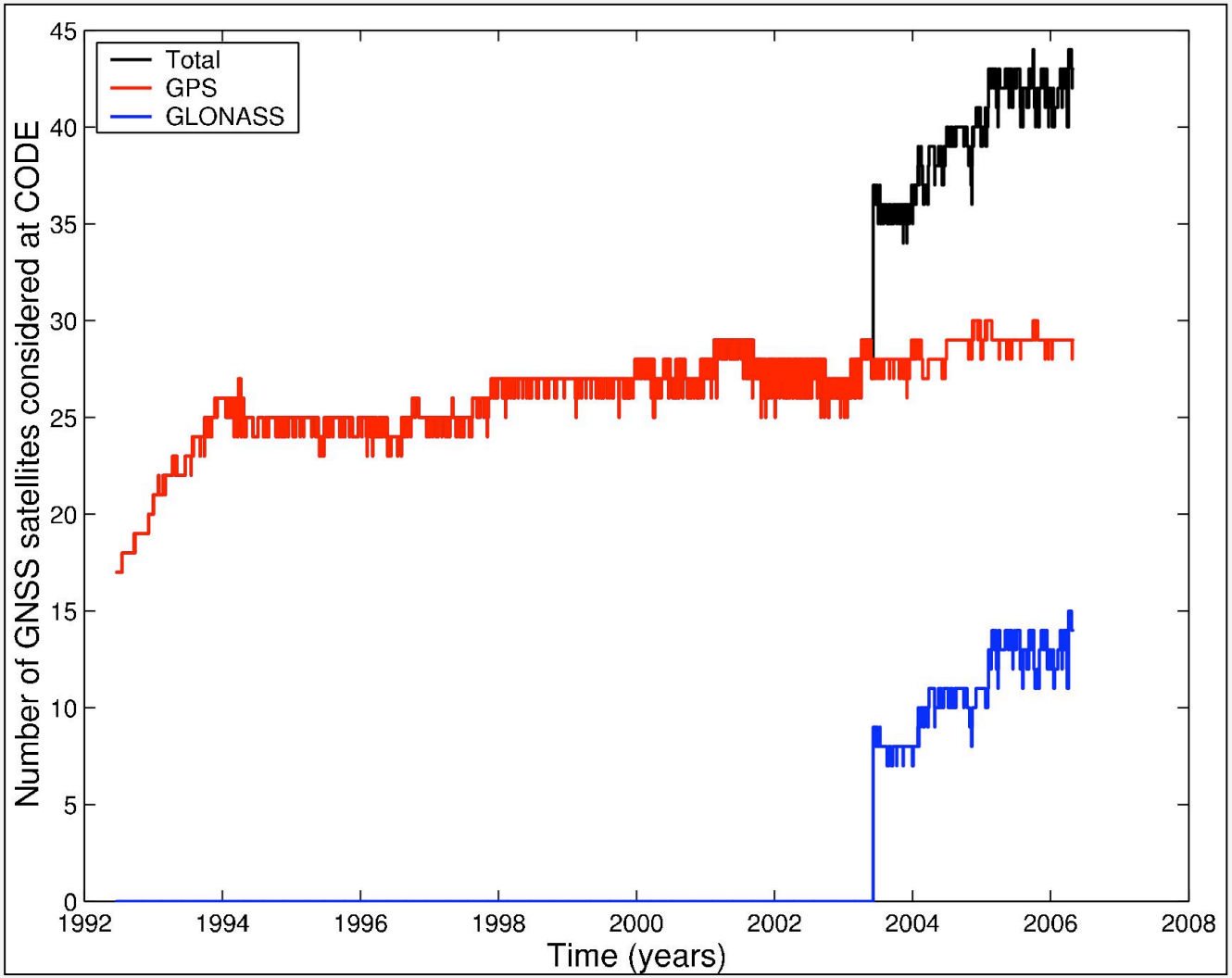
Evolution of GPS/GLONASS Satellite Constellation (2)



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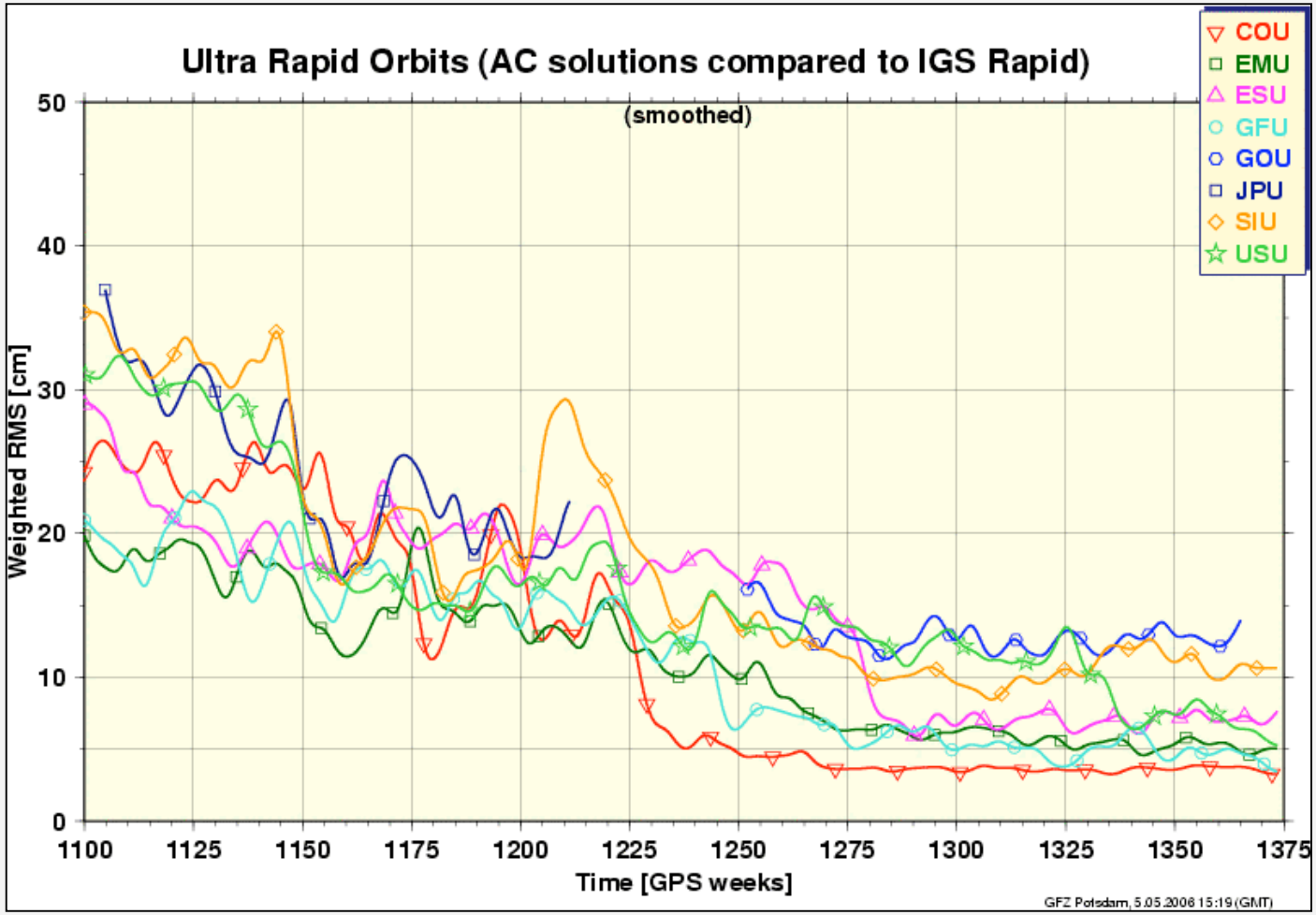
IGS AC Ultra-Rapid (GPS) Orbit Consistency



Courtesy: G. Gendt, GFZ, Potsdam, Germany

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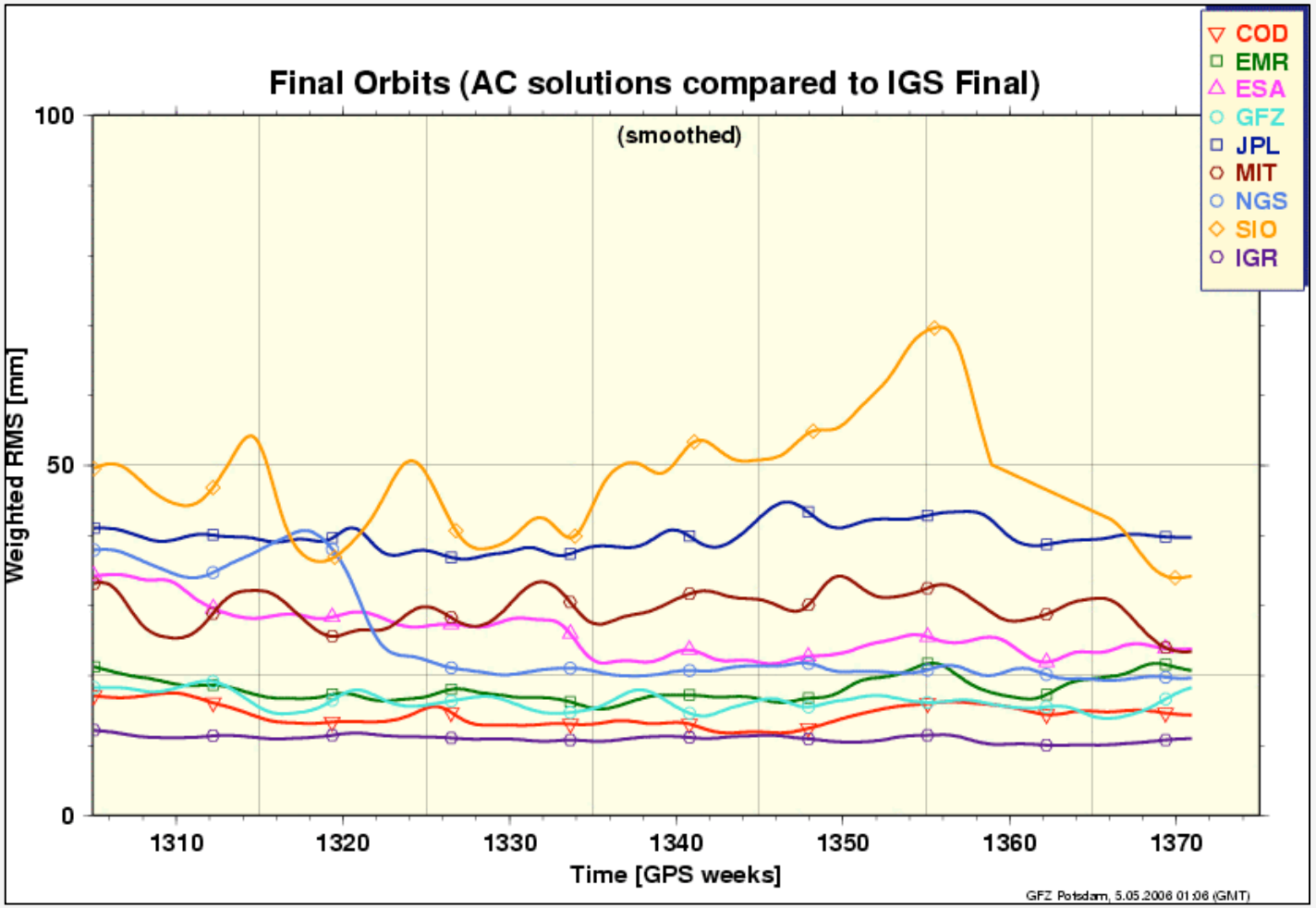
Listing of Most Recent Eclipses by the Moon

G05	8:34	06-04-27 13:51:26	06-04-27 14:00:00	95.7
G06	30:54	06-04-27 16:06:42	06-04-27 16:37:37	46.1
G08	12:15	06-04-27 19:45:03	06-04-27 19:57:18	5.0
G09	22:06	06-04-27 22:13:54	06-04-27 22:36:00	26.7
G15	28:49	06-04-27 18:10:42	06-04-27 18:39:31	9.4
G17	27:18	06-04-27 20:26:44	06-04-27 20:54:02	35.0
G18	26:02	06-04-27 18:08:56	06-04-27 18:34:57	18.2
G21	38:33	06-04-27 14:56:14	06-04-27 15:34:47	16.8
G22	20:53	06-04-27 19:39:07	06-04-27 20:00:00	14.4
G25	6:27	06-04-27 16:00:50	06-04-27 16:07:16	0.8
G27	22:02	06-04-27 19:07:05	06-04-27 19:29:07	38.5
G30	22:33	06-04-27 14:38:21	06-04-27 15:00:55	31.6
R01	18:55	06-04-27 17:38:35	06-04-27 17:57:30	100.0
R02	31:06	06-04-27 19:28:55	06-04-27 20:00:00	98.5
R03	36:40	06-04-27 21:28:28	06-04-27 22:05:08	73.5
R04	17:35	06-04-27 23:18:24	06-04-27 23:35:58	5.4
R08	34:22	06-04-27 15:52:01	06-04-27 16:26:23	50.8
R20	36:17	06-04-27 20:32:27	06-04-27 21:08:44	91.5
R24	17:03	06-04-27 17:39:09	06-04-27 17:56:12	100.0

IGS AC Final (GPS) Orbit Consistency



Courtesy: G. Gendt, GFZ, Potsdam, Germany

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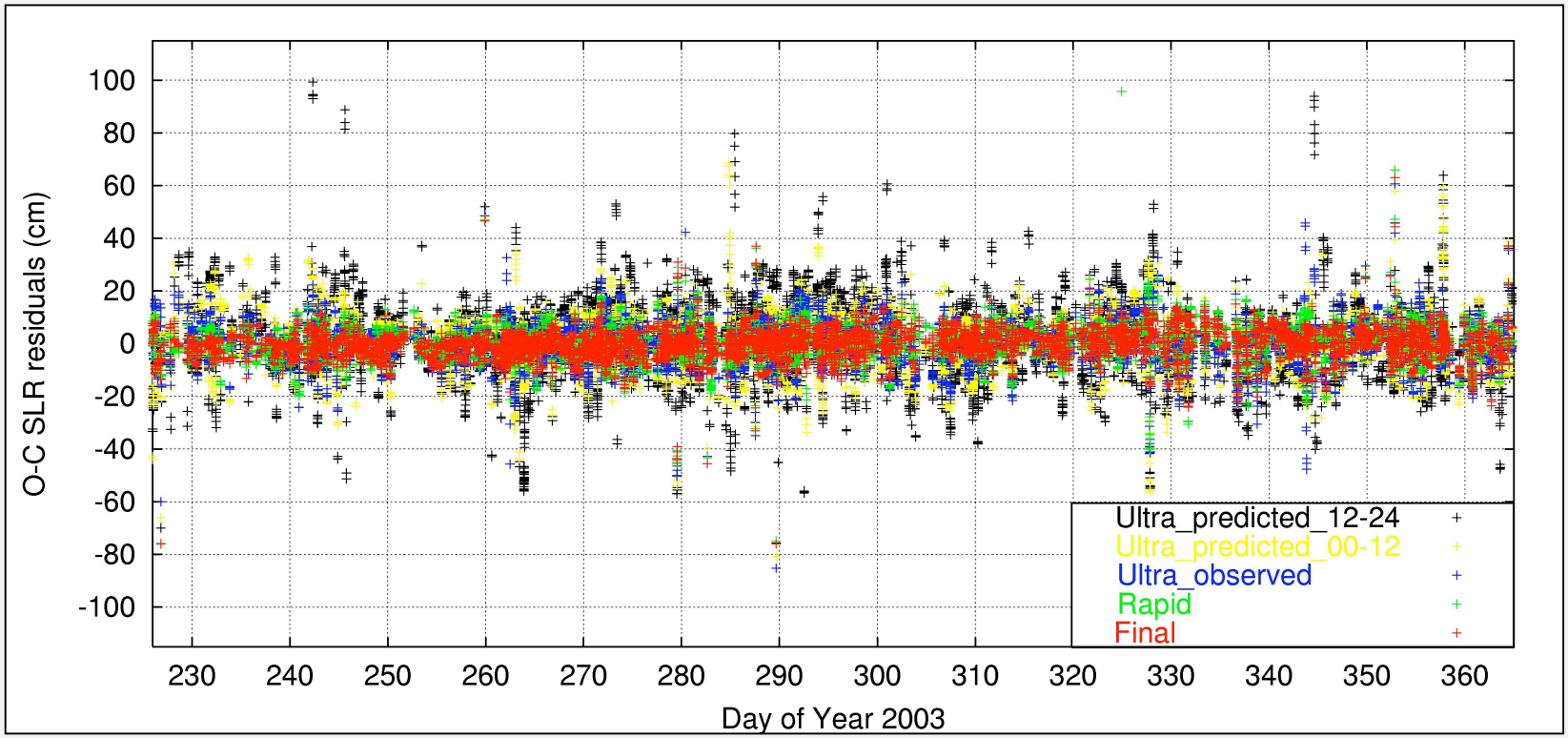
CODE GLONASS Orbit Validation Using SLR Data



Standard deviation: 13 – 9 – 7 – 6 - 5 cm

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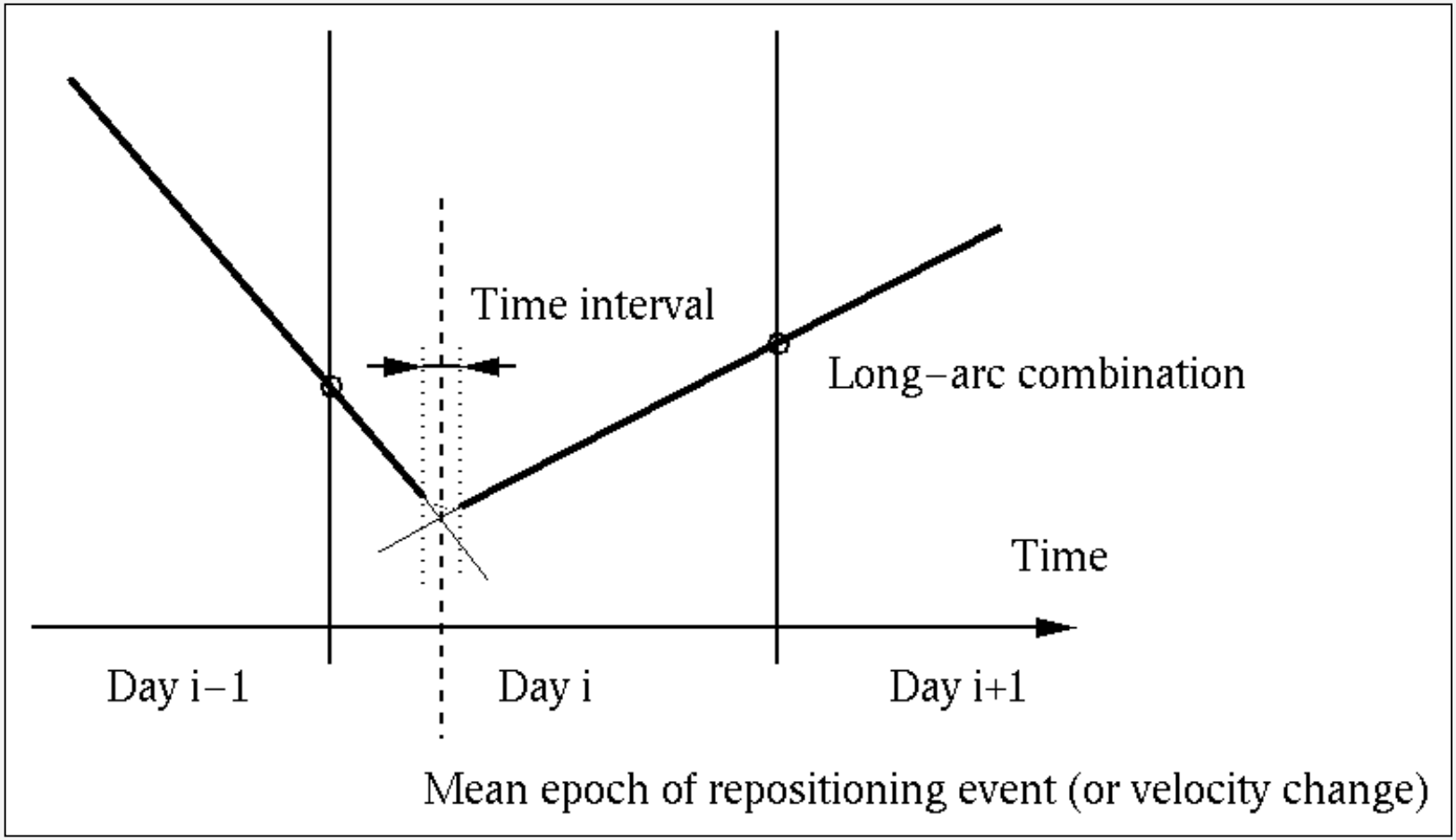
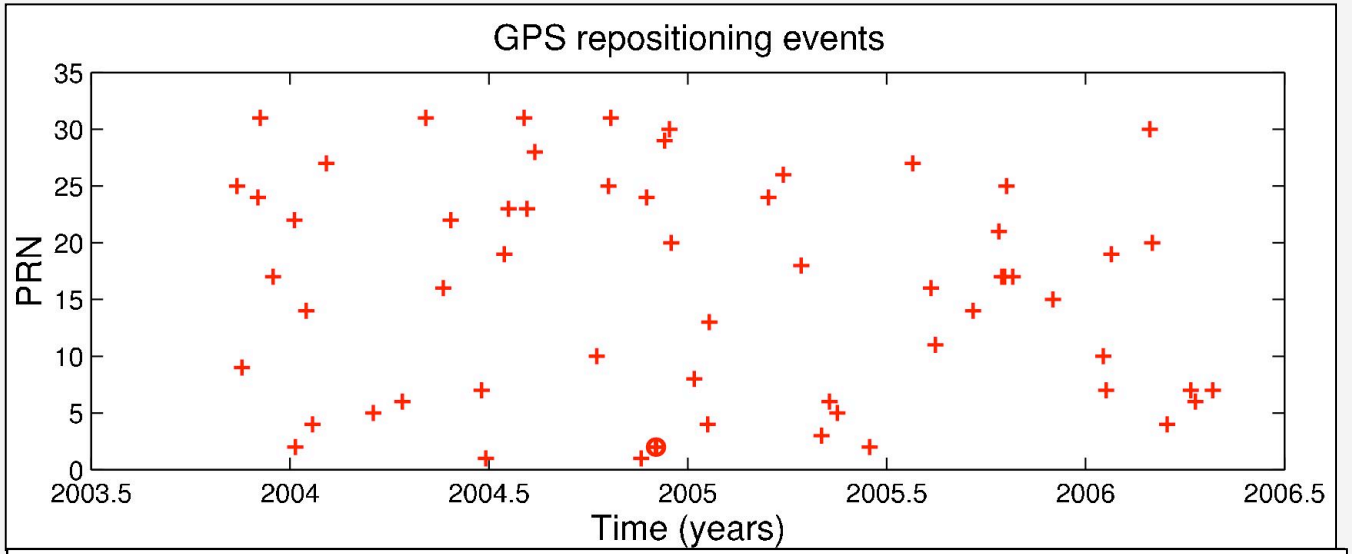
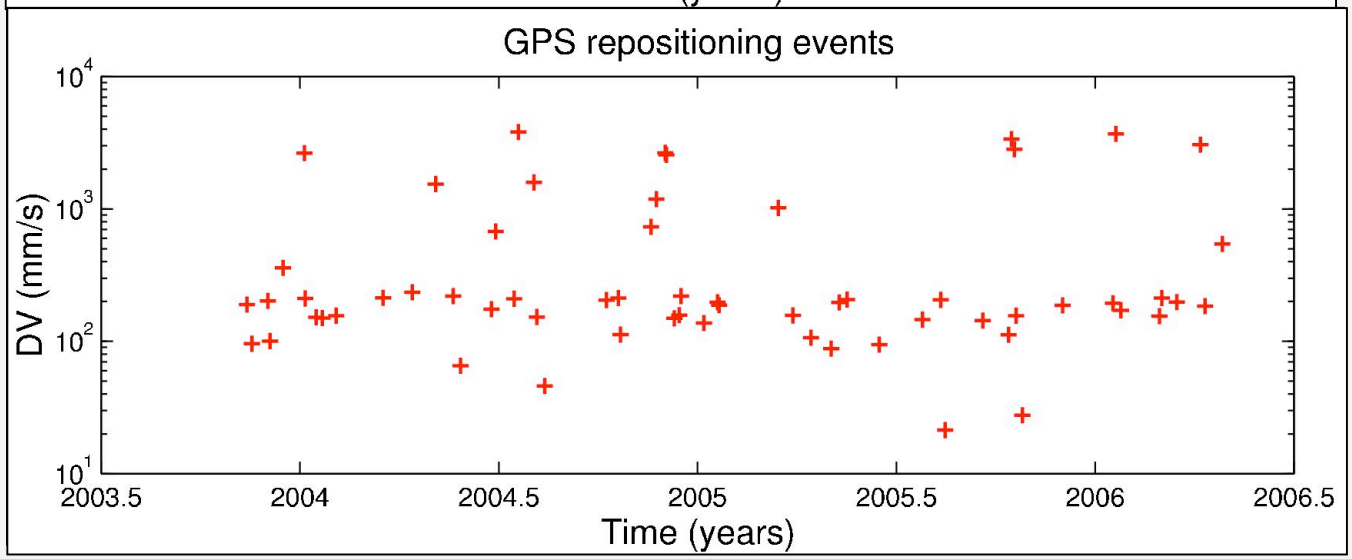
Precise Orbit Determination for GPS Satellites Being Repositioned



Characteristics of GPS Repositionings





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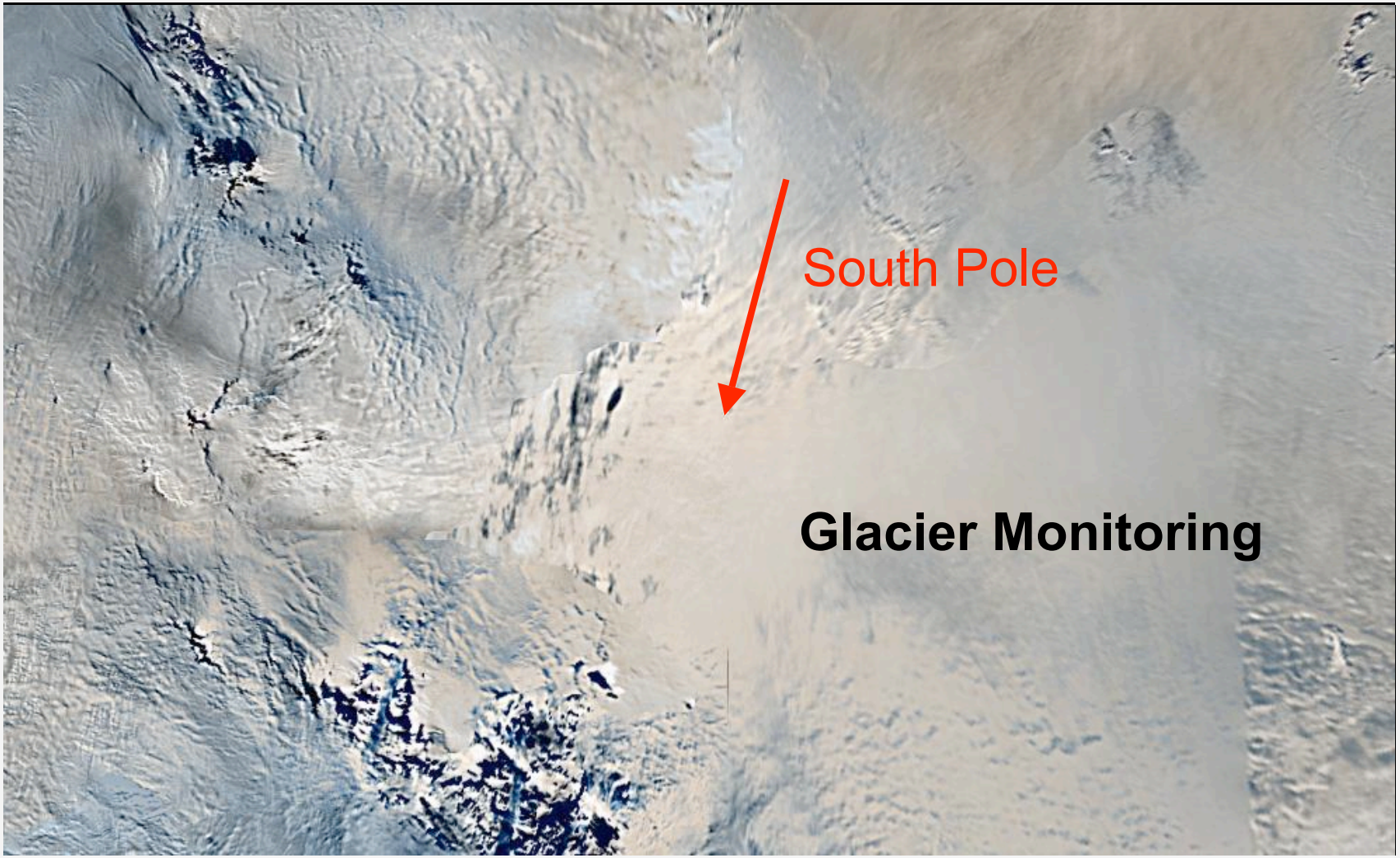
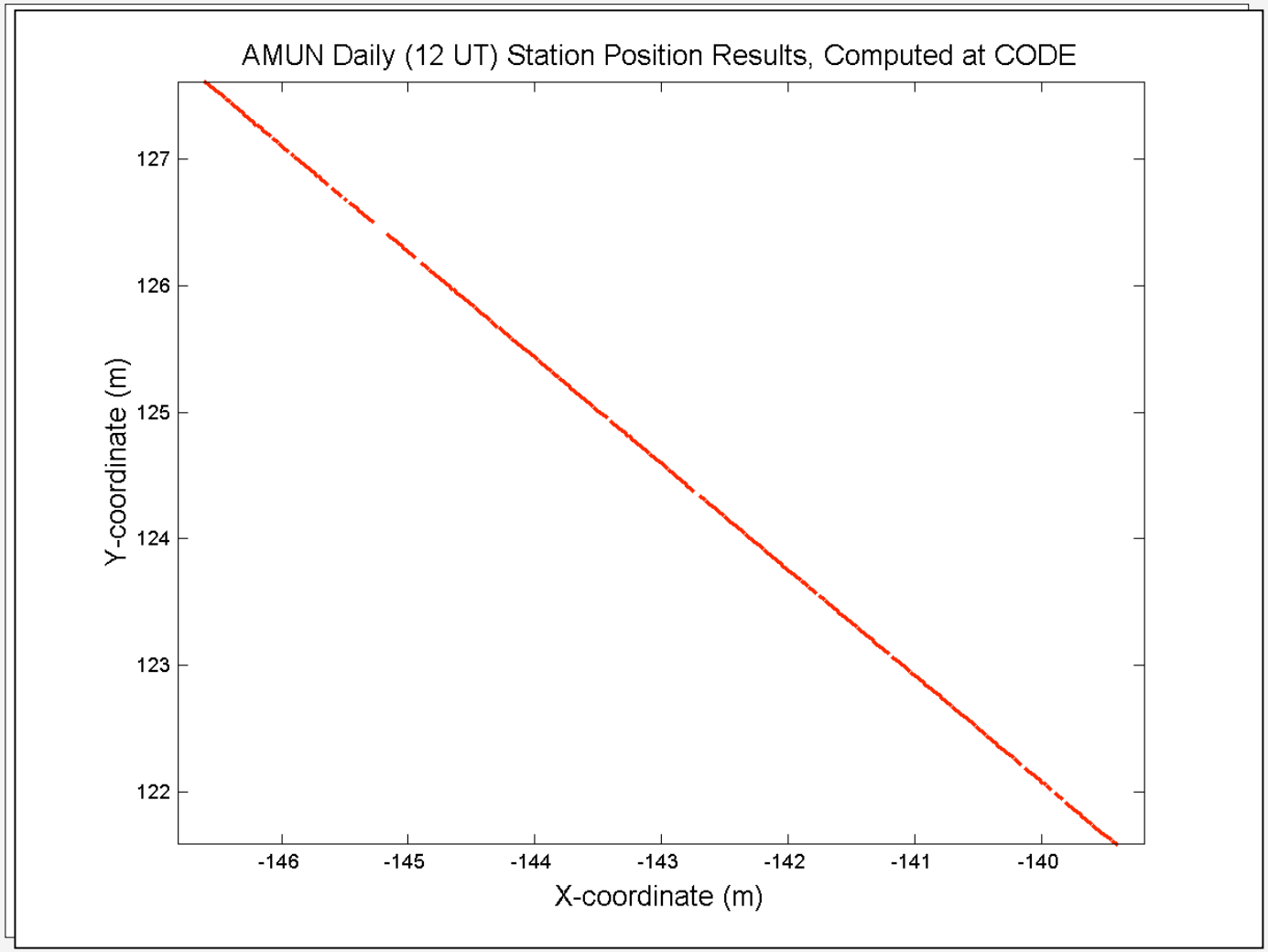
“Fast Moving” Amundsen-Scott (AMUN/AMU2) Station in the Antarctica (1)



“Fast Moving” Amundsen-Scott (AMUN/AMU2) Station in the Antarctica (2): Linear Motion



“Fast Moving” Amundsen-Scott (AMUN/AMU2) Station in the Antarctica (3): Horizontal Components

σ_X = 1.8 mm

V = 27.3 mm/d

↓

V = 27.8 mm/d

σ_Y = 1.8 mm

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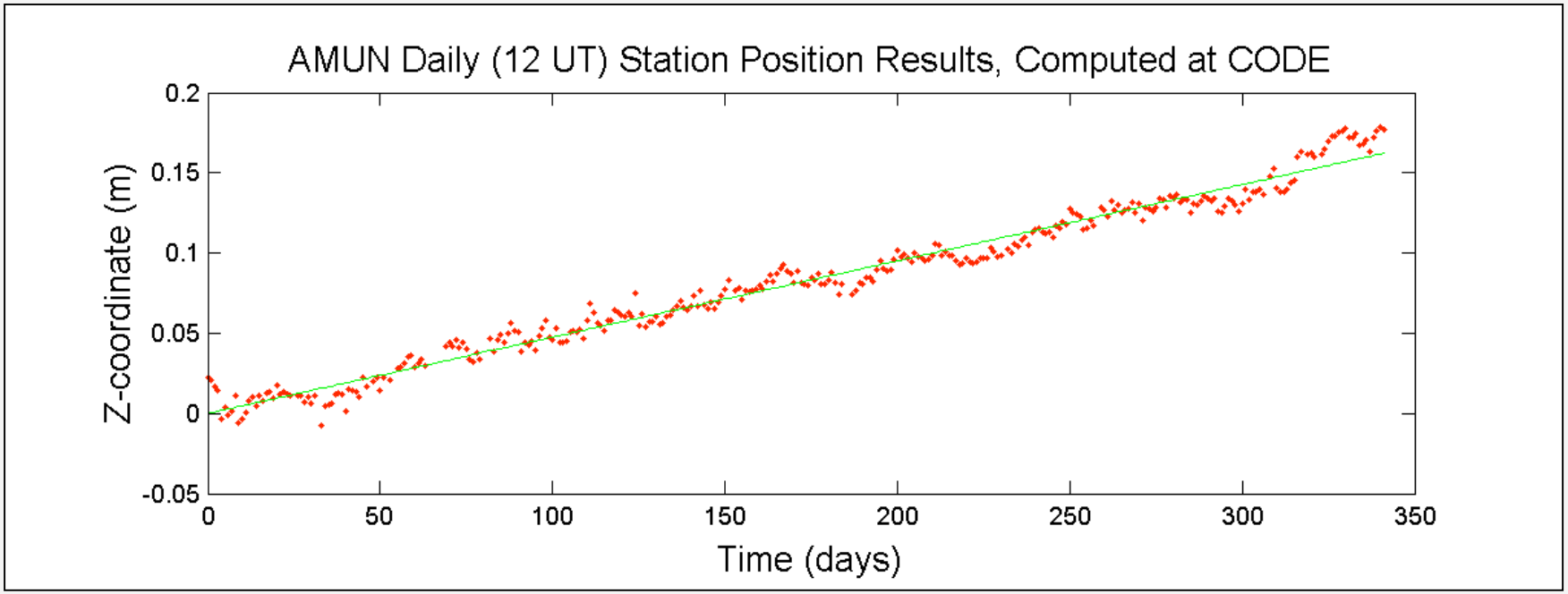
“Fast Moving” Amundsen-Scott (AMUN/AMU2) Station in the Antarctica (4): Vertical Component



σ_Z = 7.5 mm

V_Z = +0.174 m/y

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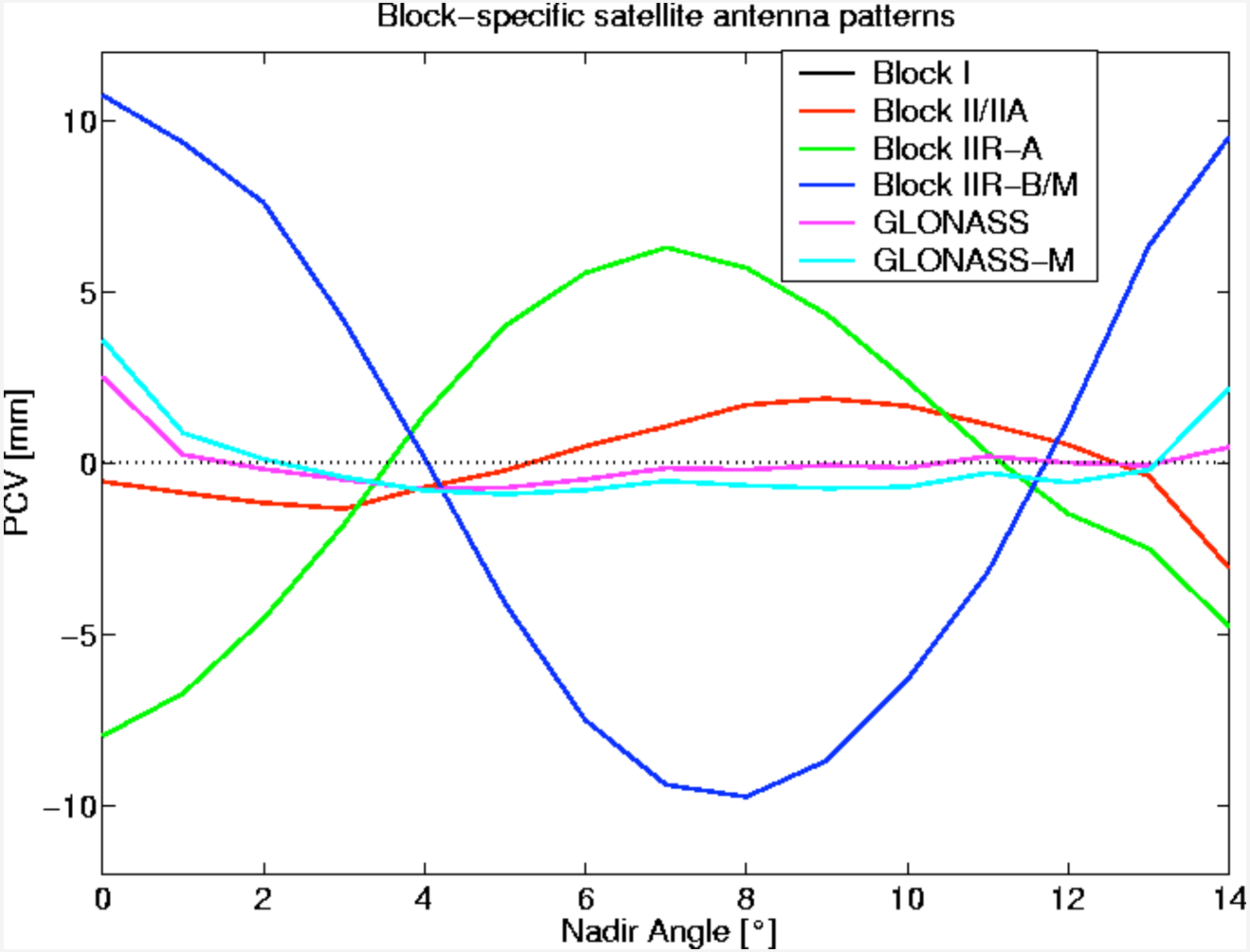
Absolute PCV Patterns for Both the GPS and the GLONASS Satellite Constellation, Computed at CODE



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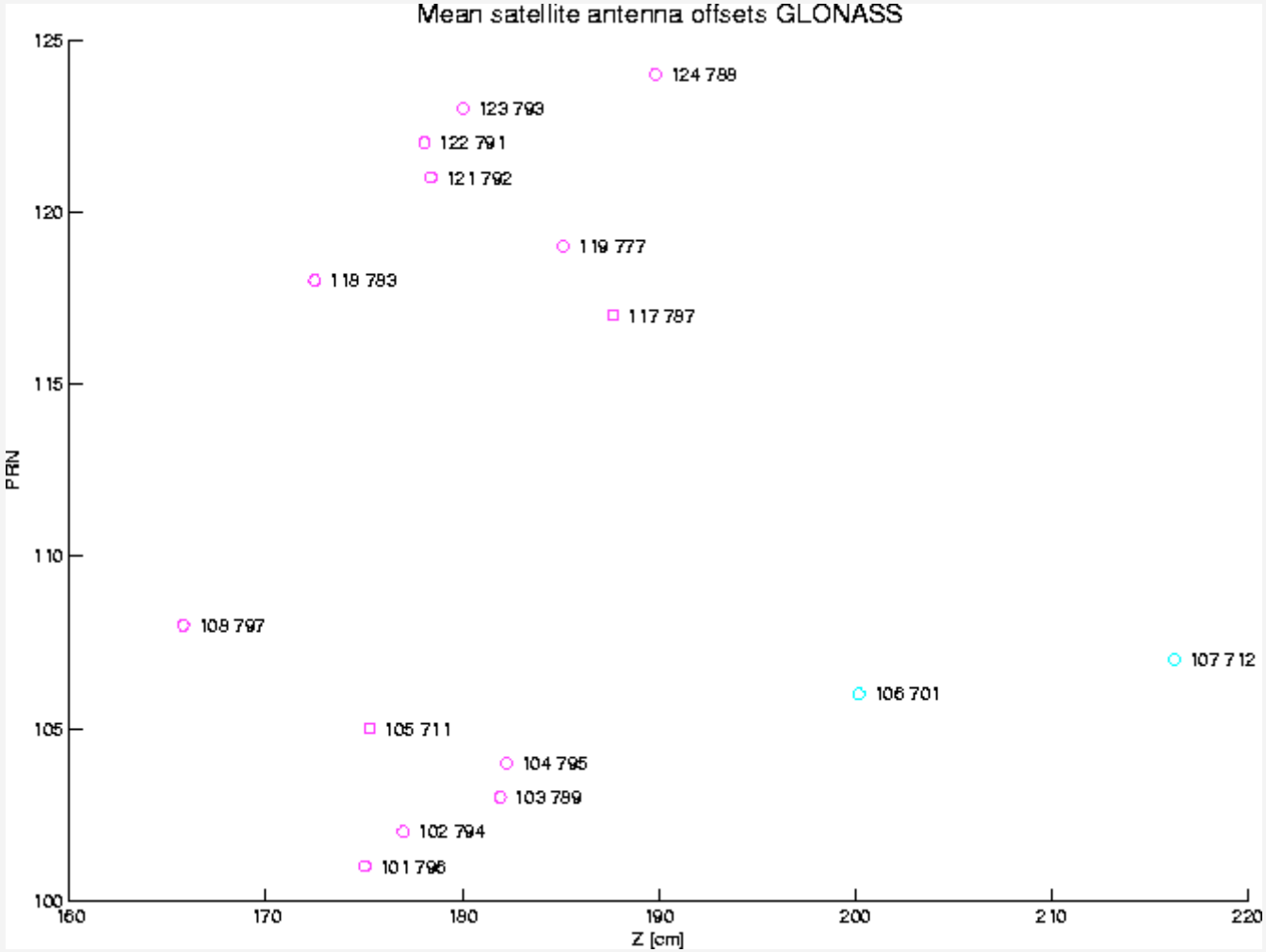
Mean (Z) Satellite Antenna Offsets for the GLONASS Constellation, Computed at CODE



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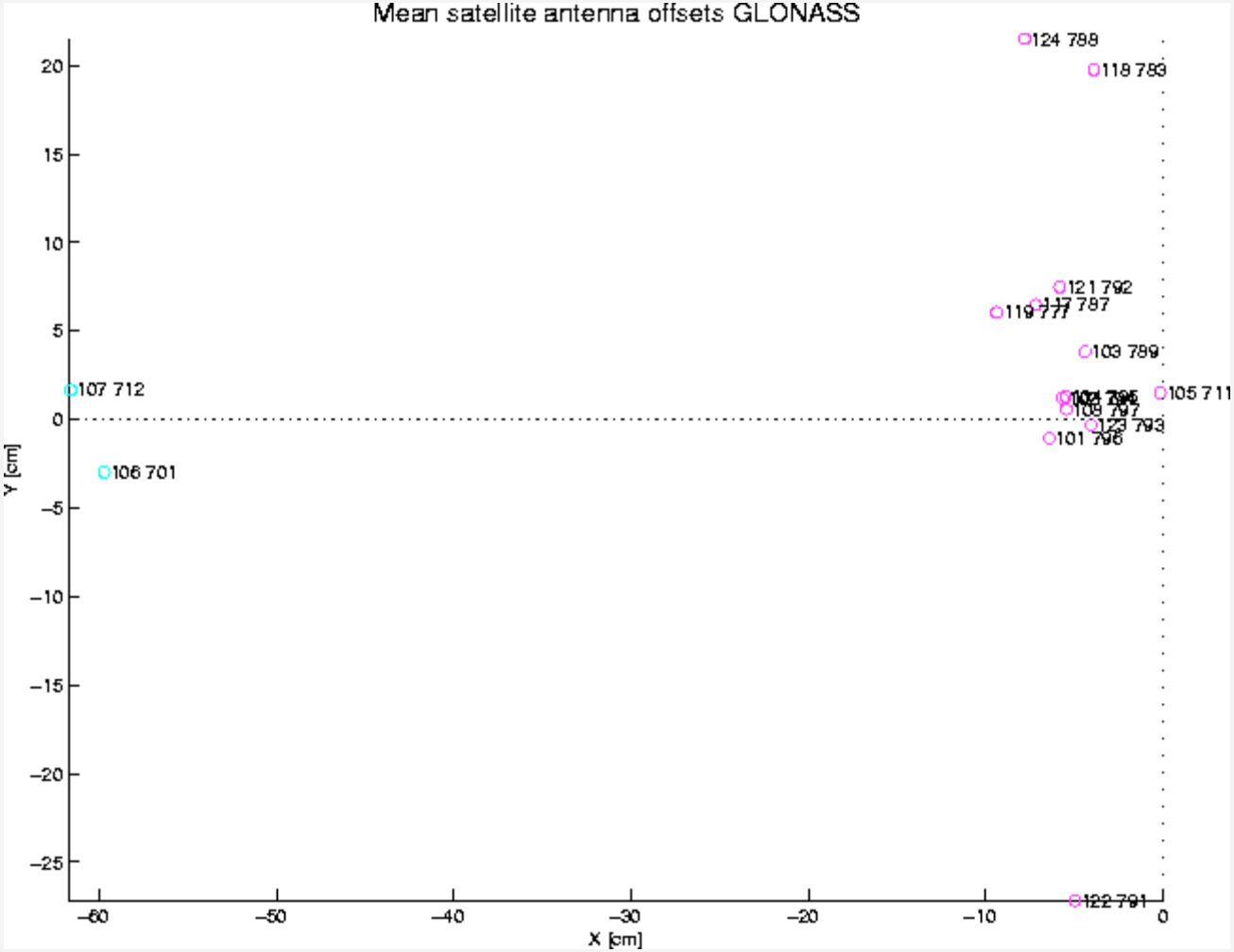
Mean X and Y Satellite Antenna Offsets for the GLONASS Constellation, Computed at CODE



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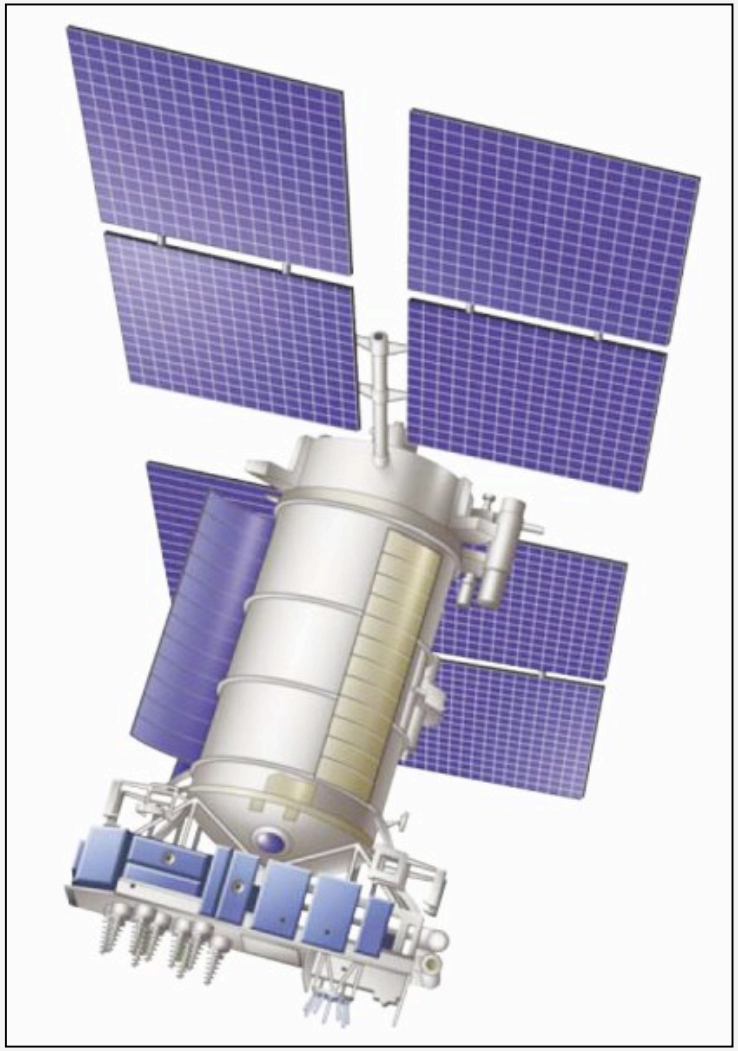
Sketch of a GLONASS-M Spacecraft



Summary

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  - troposphere estimates (even for SP), and ionosphere products (IONEX).
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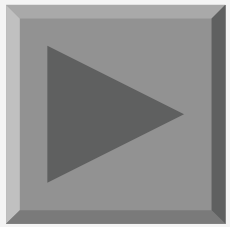
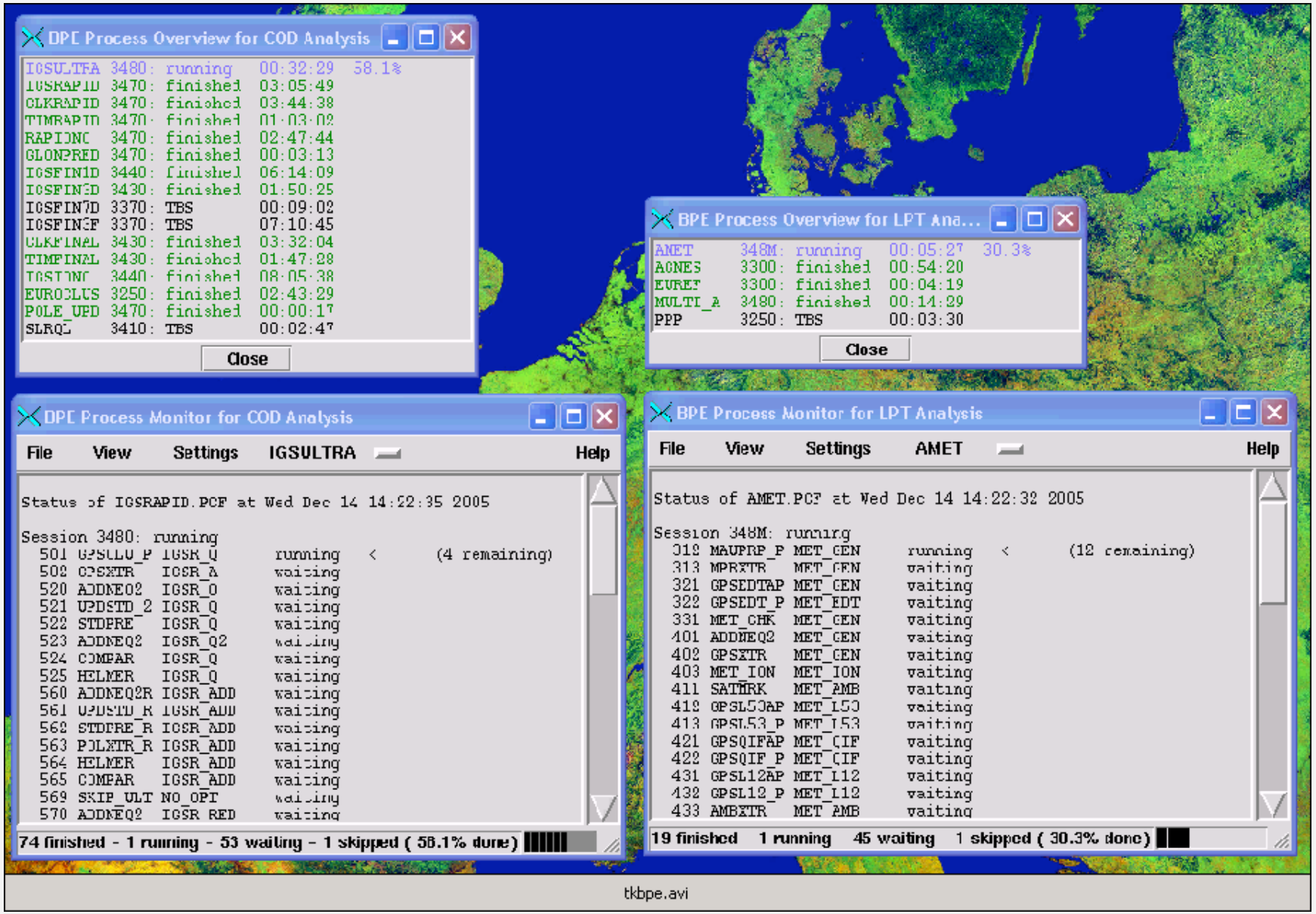
- CODE is ready to switch to an absolute (IGS05) PCV model.
- Increased collaboration between swisstopo and AIUB.

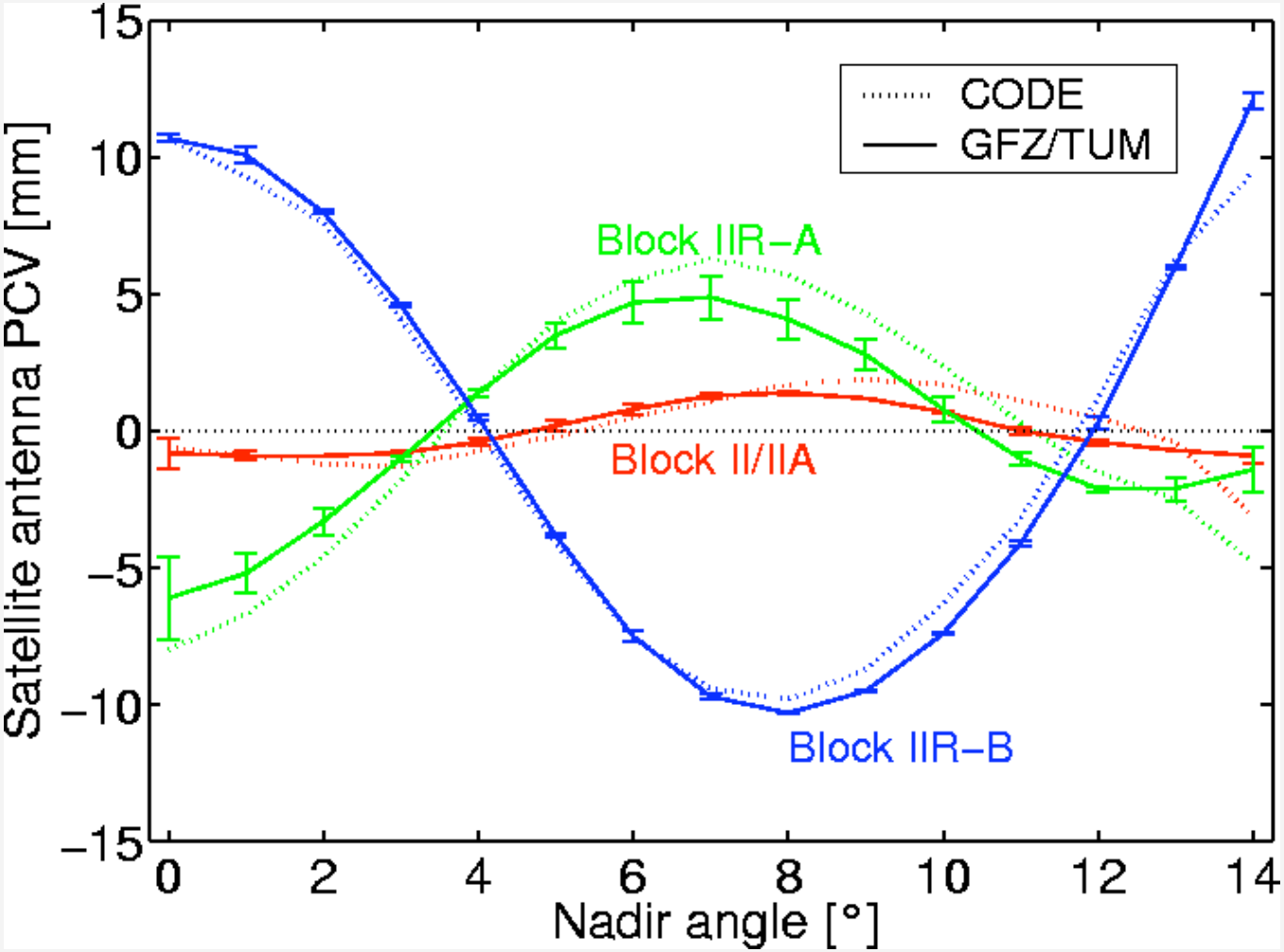
CODE (COD) and swisstopo (LPT) Operational BPE Processing Monitor

Illustration for the use of shared (PERL) scripts on the basis of “tkbpe” (► gain of synergies!):

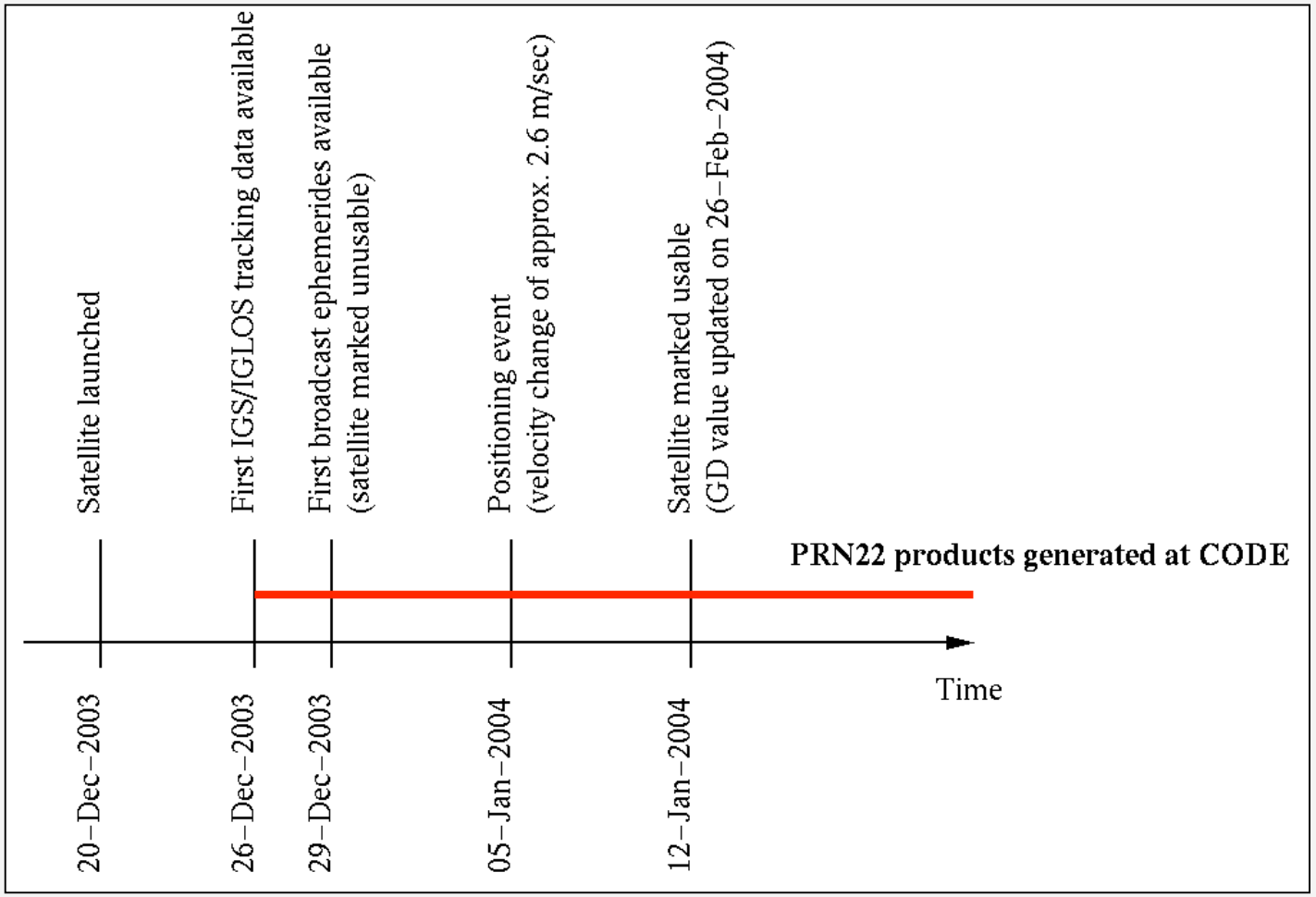



BPE Process Overview for COD Analysis
IGSULTRA 3480: running 00:32:29 58.1%
IGSRAPID 3470: finished 03:05:49
GLKRAPID 3470: finished 03:44:38
TIMRAPID 3470: finished 01:03:02
RAPIDNC 3470: finished 02:47:44
GLONPRED 3470: finished 00:03:13
IGSFIN1D 3440: finished 06:14:09
IGSFIN3D 3430: finished 01:50:25
IGSFIN7D 3370: TBS 00:09:02
IGSFIN3F 3370: TBS 07:10:45
GLKFINAL 3430: finished 03:32:04
TIMFINAL 3430: finished 01:47:28
EUROCLUS 3250: finished 02:43:29
POLE_UPD 3470: finished 00:00:17
SLRQL 3410: TBS 00:02:47
Close
BPE Process Overview for LPT Ana...
AMET 348M: running 00:05:27 30.3%
AGNES 3300: finished 00:54:20
EURET 3300: finished 00:04:19
MULTI_A 3480: finished 00:14:29
PPP 3250: TBS 00:03:30
Close
BPE Process Monitor for COD Analysis
File View Settings IGSULTRA Help
Status of IGSRAPID.PCF at Wed Dec 14 14:22:35 2005
Session 3480: running
501 GPSULO_P IGSR_Q running < (4 remaining)
502 GPSXTR IGSR_A waiting
520 ADDNEQ2 IGSR_Q waiting
521 UPDSTD_2 IGSR_Q waiting
522 STDPRE IGSR_Q waiting
523 ADDNEQ2 IGSR_Q2 waiting
524 COMPAR IGSR_Q waiting
525 HELMER IGSR_Q waiting
560 ADDNEQ2R IGSR_ADD waiting
561 UPDSTD_R IGSR_ADD waiting
562 STDPRE_R IGSR_ADD waiting
563 POLXTR_R IGSR_ADD waiting
564 HELMER IGSR_ADD waiting
565 COMPAR IGSR_ADD waiting
569 SKIP_ULT NO_OPT waiting
570 ADDNEQ2 IGSR_RED waiting
74 finished - 1 running - 53 waiting - 1 skipped (58.1% done)
BPE Process Monitor for LPT Analysis
File View Settings AMET Help
Status of AMET.PCF at Wed Dec 14 14:22:32 2005
Session 348M: running
318 MAUPRP_P MET_GEN running < (12 remaining)
313 MPRXTR MET_GEN waiting
321 GPSEDTAP MET_GEN waiting
322 GPSEDT_P MET_EDT waiting
331 MET_CHK MET_GEN waiting
401 ADDNEQ2 MET_GEN waiting
402 GPSXTR MET_GEN waiting
403 MET_ION MET_ION waiting
411 SATMRK MET_AMB waiting
419 GPSL53AP MET_L53 waiting
413 GPSL53_P MET_L53 waiting
421 GPSQIFAP MET_QIF waiting
422 GPSQIF_P MET_QIF waiting
431 GPSL12AP MET_L12 waiting
432 GPSL12_P MET_L12 waiting
433 AMBXTR MET_AMB waiting
19 finished 1 running 45 waiting 1 skipped (30.3% done)
tkbpe.avi

Comparison of CODE GPS Absolute PCV Patterns With Combined GFZ/TUM Results



Chronology of a GPS Block-IIR Satellite Launch (PRN22)



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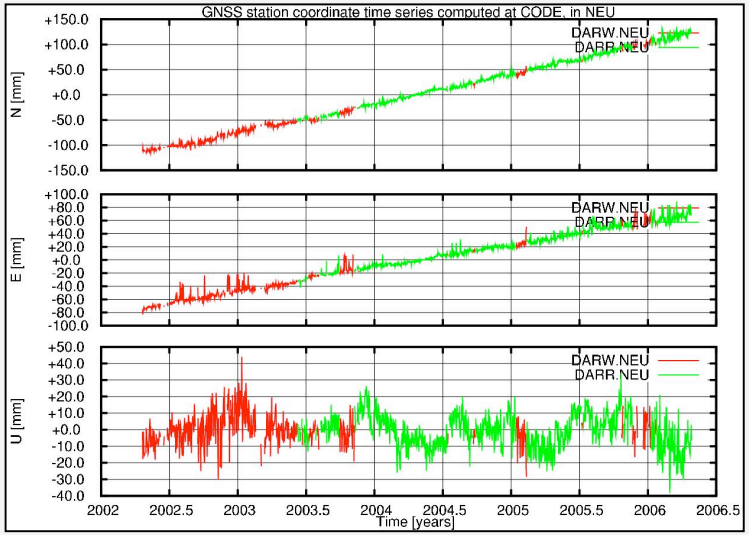
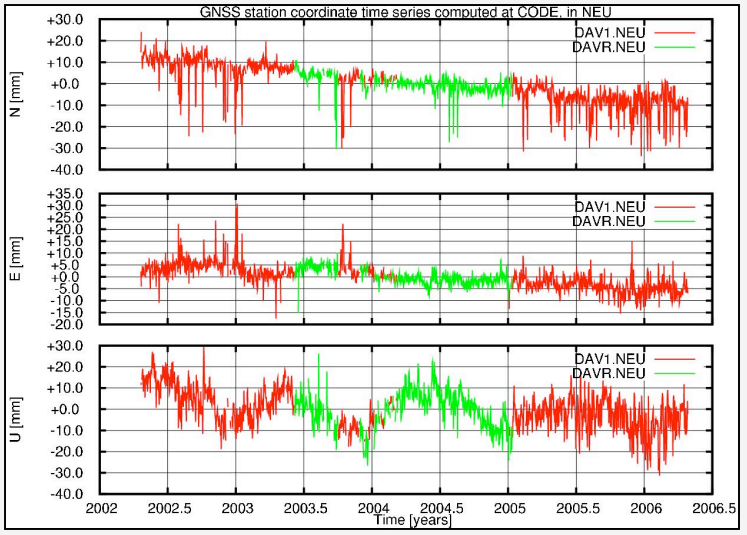
Antenna-Sharing GPS-only and GPS/GLONASS IGS Receivers: GNSS Station Coordinate Time Series as Computed at CODE

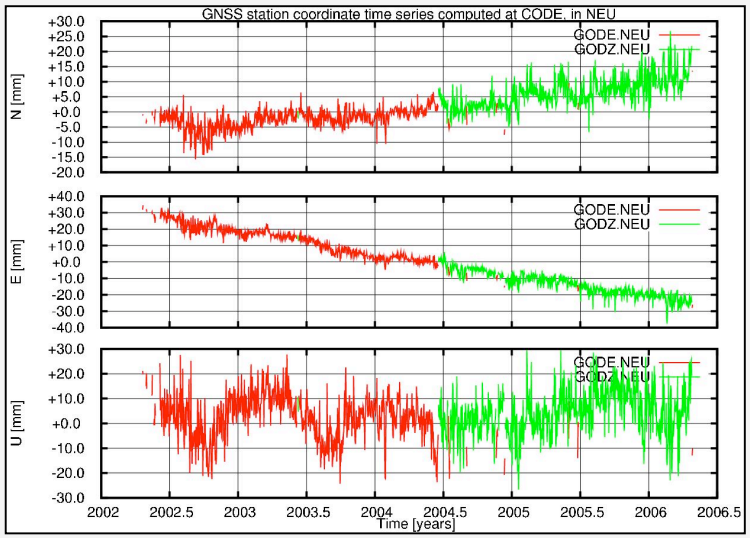
DARW/DARR



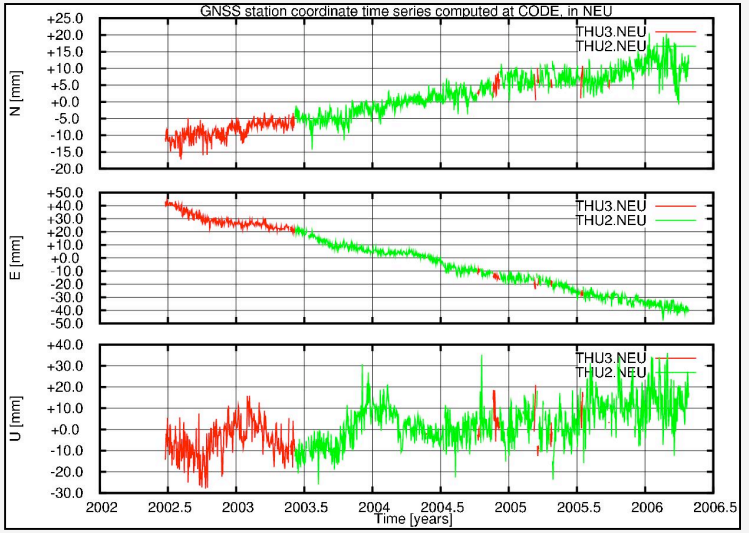
DAV1/DAVR



GODE/GODZ



THU3/THU2



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