

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

EUREF LAC Analysis at swisstopo/CODE Using the Bernese Software Version 5.0

S. Schaer, D. Ineichen, E. Brockmann

Outline

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- Increased collaboration between swisstopo and AIUB

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- LAC Analysis at swisstopo
 - Transition from Bernese Software V4.2 to V5.0
 - Overview of the new EUREF BPE processing scheme

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 - EUREF daily/weekly results
 - AGNES multi-year combination using ADDNEQ1/2 (→ CHTRF)

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- Listing of most important V5.0 model changes

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- Summary, general comment on V5.0 (→ bugfix patches)

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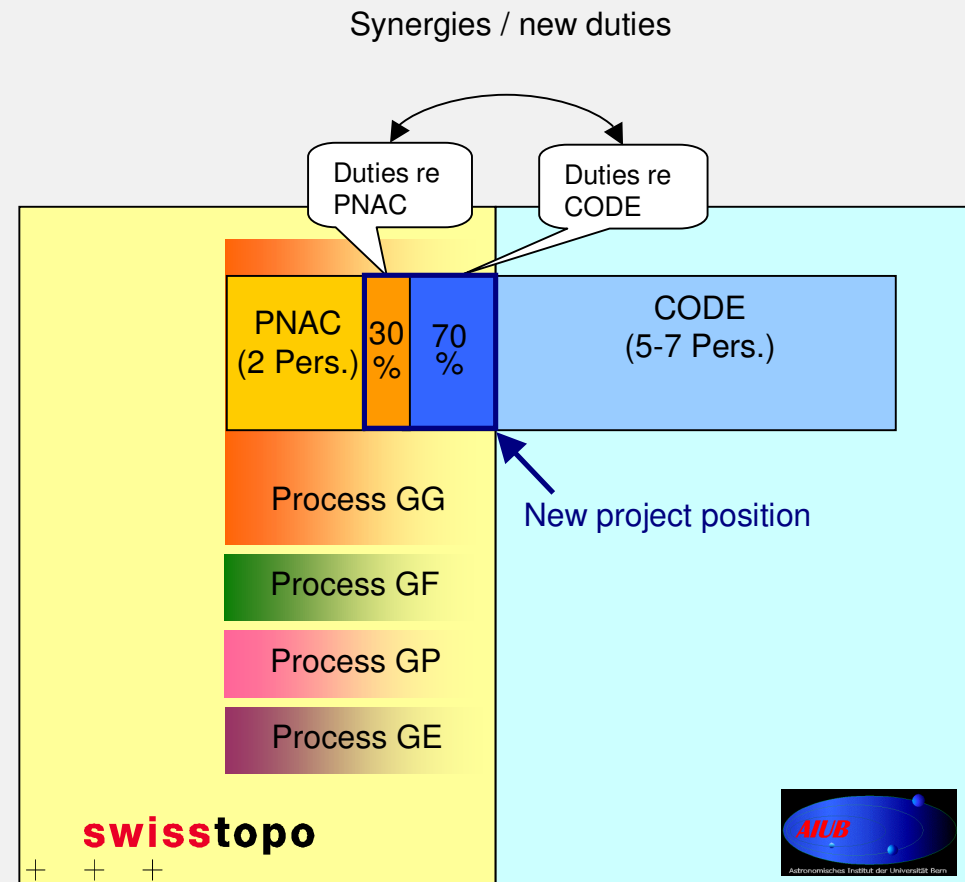
- Increased collaboration between swisstopo and AIUB
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- Listing of most important V5.0 model changes
- Summary, general comment on V5.0 (→ bugfix patches)
- Outlook regarding upcoming and future model changes

Increased Collaboration Between swisstopo and AIUB (1)

- 1 position (S. Schaer)
created at swisstopo,
occupied since
September 1, 2004

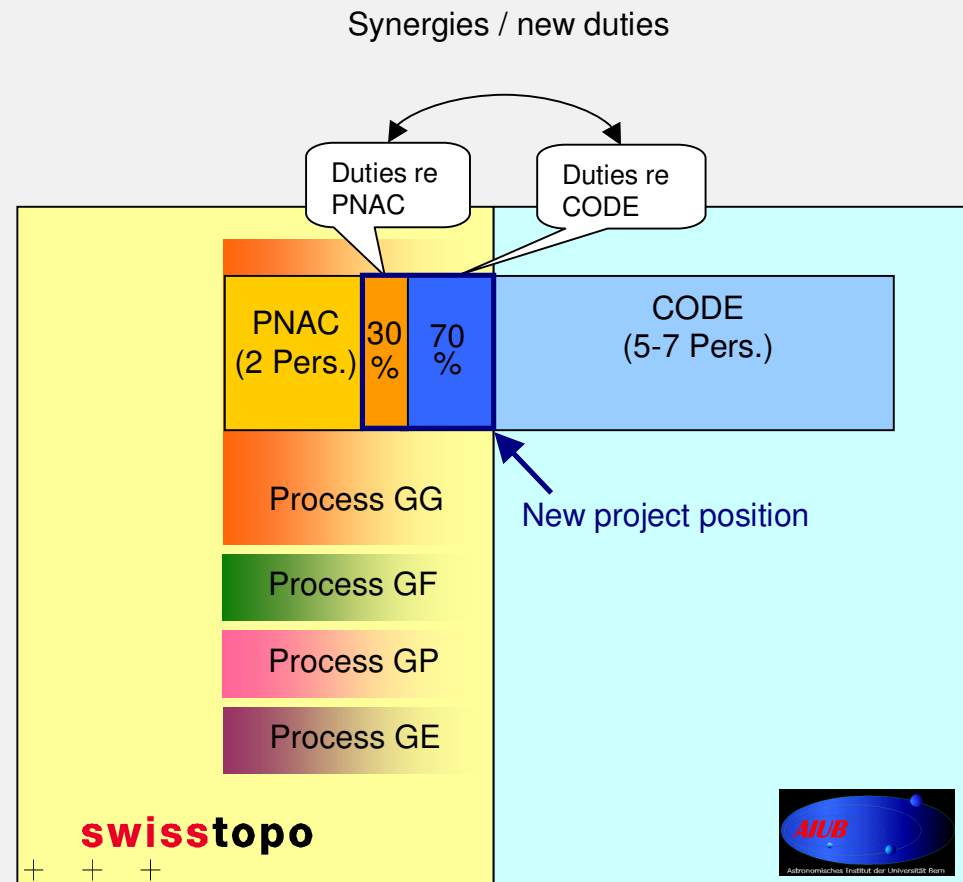
Increased Collaboration Between swisstopo and AIUB (1)

- 1 position (S. Schaer) created at swisstopo, occupied since September 1, 2004



Increased Collaboration Between swisstopo and AIUB (1)

- 1 position (S. Schaer) created at swisstopo, occupied since September 1, 2004
- For swisstopo, a „new“ form of participation at CODE and AIUB, respectively



Increased Collaboration Between swisstopo and AIUB (2)

- ... thus gaining **synergies**,
- increasing the transfer of know-how, and
- considerably reducing duplicate work related to routine GNSS data analysis.

Increased Collaboration Between swisstopo and AIUB (2)

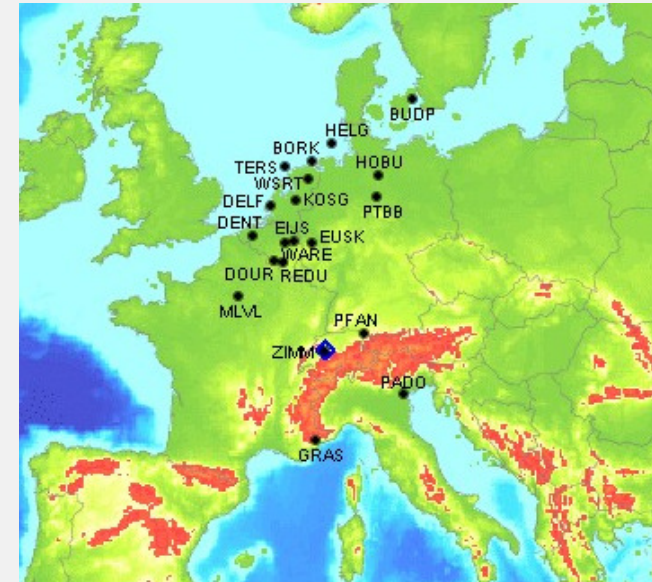
- ... thus gaining **synergies**,
- increasing the transfer of know-how, and
- considerably reducing duplicate work related to routine GNSS data analysis.
- Also, requests with respect to the Bernese Software in terms of *national* GNSS surveying (and related applications) can be better accounted for.

Increased Collaboration Between swisstopo and AIUB (2)

- ... thus gaining **synergies**,
- increasing the transfer of know-how, and
- considerably reducing duplicate work related to routine GNSS data analysis.
- Also, requests with respect to the Bernese Software in terms of *national* GNSS surveying (and related applications) can be better accounted for.
- Technical detail: shared PERL scripts and modules (→ examples), two-way computer alerting, ...

LAC Analysis at swisstopo: Transition From Bernese Software V4.2 to V5.0

- EUREF subnetwork considered at swisstopo consists of nominally 24 stations (currently active: 23, included in SINEX files: 21).
- Data processing switched to V5.0 starting with GPS week 1317 (April 3, 2005).
- Six weeks were analyzed in parallel with both versions for validation purposes (weeks 1309-1314 / DOYs 037-078, 2005).
- Selected processing options should be conform with the EPN recommendations.
- Test solutions computed: with tropospheric gradient parameters, low-elevation data.



BPE V5.0: EUREF.PCF Derived From RNX2SNX.PCF – Modifications Made (1)

```
PID SCRIPT OPT_DIR CAMPAIGN CPU P WAIT FOR....
3** ***** ***** ***** ***** 1 3** 3** 3** 3** 3** 3** 3**
#
# Copy required files and create a priori CRD file
# -----
001 EUR_COP EUR_GEN EXPRESS 1
002 COOVEL EUR_GEN EXPRESS 1 001
#
# Prepare pole, orbit, and clock information
# -----
101 POLUPO EUR_GEN EXPRESS 1 001
111 PRETAB EUR_GEN EXPRESS 1 101
112 ORBGEN EUR_GEN FAST 1 111
#
# Convert and synchronize observation data
# -----
201 RNKGRA EUR_GEN FAST 1 001
211 RKBVYAP EUR_GEN EXPRESS 1 201
212 RKBVQ_P EUR_GEN FAST 1 211
213 RNK_DEL EUR_GEN EXPRESS 1 212
221 COOSPPAP EUR_GEN EXPRESS 1 002 112 213
222 COOSPP_P EUR_GEN FAST 1 221
223 COOSXN EUR_GEN EXPRESS 1 222
#
# Form baselines, preprocess and screen phase data, save cluster NQZ files
# -----
301 SNGZIF EUR_GEN FAST 1 223
311 MAUPPAP EUR_GEN EXPRESS 1 301
312 MAUPP_P EUR_GEN FAST 1 311
313 MPKXTH EUR_GEN EXPRESS 1 312
321 GPSKXTH EUR_GEN EXPRESS 1 313
322 GPSKXTH_P EUR_GEN FAST 1 321
331 GPSXTH EUR_GEN EXPRESS 1 322
#
# Compute ambiguity-fixed network solution, resolve phase ambiguities
# -----
401 ADDNEQ2 EUR_GEN FAST 1 331
402 GPSXTH EUR_GEN EXPRESS 1 401
411 SATMRK EUR_AMB EXPRESS 1 402
412 GPSL13AP EUR_L13 EXPRESS 1 411
413 GPSL1_P EUR_L13 FAST 1 412
421 GPSQIFAP EUR_QIF EXPRESS 1 413
422 GPSQIF_P EUR_QIF FAST 1 421
431 GPSL12AP EUR_L12 EXPRESS 1 422
432 GPSL1_P EUR_L12 FAST 1 431
433 ANKXTH EUR_AMB EXPRESS 1 432
#
# Compute ambiguity-fixed network solution, create final NQZ/RNX/TRD files
# -----
501 GPSRST EUR_FIN FAST 1 433
511 ADDNEQ2 EUR_FIN FAST 1 501
512 GPSXTH EUR_FIN EXPRESS 1 511
514 HELMR1 EUR_FIN EXPRESS 1 512
521 ADDNEQ2 EUR_RED FAST 1 514
522 GPSXTH EUR_RED EXPRESS 1 521
531 ADDNEQ2 EUR_GRD FAST 1 514
532 GPSXTH EUR_GRD EXPRESS 1 531
533 ADDNEQ2 EUR_GRD FAST 1 532
541 GPSRST EUR_LED FAST 1 533
542 ADDNEQ2 EUR_LED FAST 1 514 541
543 GPSXTH EUR_LED EXPRESS 1 542
544 ADDNEQ2 EUR_LE2 FAST 1 543
#
# Do weekly processing sequence at end of week (EOW)
# -----
# PID number 601 used in starting script.
601 BPE_EOW EUR_EOW WAIT 1 522 533 544
602 STA2ITA EUR_EOW EXPRESS 1 601
603 ITA2ITA EUR_EOW EXPRESS 1 601
611 ADDNEQ2 EUR_EOW FAST 1 602 603
612 GPSXTH EUR_EOW EXPRESS 1 611
614 HELMR1_7 EUR_EOW EXPRESS 1 612
621 ADDNEQ2 EUR_SNX FAST 1 614
622 GPSXTH EUR_SNX EXPRESS 1 621
623 SMC_RBP EUR_SNX EXPRESS 1 622
631 TROGENAP EUR_TRD EXPRESS 1 623
632 TROGEN_P EUR_TRD FAST 1 631
633 GPSXTH EUR_TRD EXPRESS 1 632
641 CRDCW_7 EUR_CRD EXPRESS 1 633
#
# Compute daily and weekly repeatabilities using ADDNEQ2
# -----
# - daily
651 ADDQ2MP EUR_RPO FAST 1 641
# - weekly
652 ADDQ2MP EUR_RW FAST 1 641
# - daily with gradients
653 ADDQ2MP EUR_RDG FAST 1 641
#
# Create summary file, save results, and delete files
# -----
901 EUR_SUM EUR_GEN EXPRESS 1 651 652 653
902 EUR_SAV EUR_GEN EXPRESS 1 901
903 EUR_DEL EUR_GEN EXPRESS 1 902
904 BPE_CW EUR_GEN EXPRESS 1 903
#
# Distribute results
# -----
905 EUR_DIS EUR_GEN EXPRESS 1 904
#
# End of BPE
# -----
999 BPE_BYE EUR_GEN EXPRESS 1 905
#
#
```


BPE V5.0: EUREF.PCF Derived From RNX2SNX.PCF – Modifications Made (1)

```
PID SCRIPT OPT_DIR CAMPAIGN CPU P WAIT FOR....
3** ***** ***** ***** ***** 1 3** 3** 3** 3** 3** 3** 3**
#
# Copy required files and create a priori CRD file
# -----
001 EUR_COP EUR_GEN EXPRESS 1
002 COOVEL EUR_GEN EXPRESS 1 001
#
# Prepare pole, orbit, and clock information
# -----
101 POLUPO EUR_GEN EXPRESS 1 001
111 PRETAB EUR_GEN EXPRESS 1 101
112 ORBGEN EUR_GEN FAST 1 111
#
# Convert and synchronize observation data
# -----
201 RNKGRN EUR_GEN FAST 1 001
211 RKBVYAP EUR_GEN EXPRESS 1 201
212 RKBVQ_P EUR_GEN FAST 1 211
213 RNK_DEL EUR_GEN EXPRESS 1 212
221 COOSPPAP EUR_GEN EXPRESS 1 002 112 213
222 COOSPP_P EUR_GEN FAST 1 221
223 COOSXN EUR_GEN EXPRESS 1 222
#
# Form baselines, preprocess and screen phase data, save cluster NQZ files
# -----
301 SINZIF EUR_GEN FAST 1 223
311 MAUPPAP EUR_GEN EXPRESS 1 301
312 MAUPP_P EUR_GEN FAST 1 311
313 MPKTRN EUR_GEN EXPRESS 1 312
321 GPSKTRAP EUR_GEN EXPRESS 1 313
322 GPSKRT_P EUR_GEN FAST 1 321
331 GPSCKW EUR_GEN EXPRESS 1 322
#
# Compute ambiguity-fixed network solution, resolve phase ambiguities
# -----
401 AIDNEQ2 EUR_GEN FAST 1 331
402 GPSKTRN EUR_GEN EXPRESS 1 401
411 SATMRK EUR_AMB EXPRESS 1 402
412 GPSL13AP EUR_L13 EXPRESS 1 411
413 GPSL13_P EUR_L13 FAST 1 412
421 GPSQIFAP EUR_QIF EXPRESS 1 413
422 GPSQIF_P EUR_QIF FAST 1 421
431 GPSL12AP EUR_L12 EXPRESS 1 422
432 GPSL12_P EUR_L12 FAST 1 431
433 ANKXTR EUR_AMB EXPRESS 1 432
#
# Compute ambiguity-fixed network solution, create final NQZ/SNX/TRD files
# -----
501 GPSKRT EUR_FIN FAST 1 433
511 AIDNEQ2 EUR_FIN FAST 1 501
512 GPSKTRN EUR_FIN EXPRESS 1 511
514 HELMRN EUR_FIN EXPRESS 1 512
521 AIDNEQ2 EUR_RED FAST 1 514
522 GPSKTRN EUR_RED EXPRESS 1 521
531 AIDNEQ2 EUR_GRD FAST 1 514
532 GPSKTRN EUR_GRD EXPRESS 1 531
533 AIDNEQ2 EUR_G22 FAST 1 532
541 GPSKRT EUR_LED FAST 1 433
542 AIDNEQ2 EUR_LED FAST 1 514 541
543 GPSKTRN EUR_LED EXPRESS 1 542
544 AIDNEQ2 EUR_L22 FAST 1 543
#
# Do weekly processing sequence at end of week (EOW)
# -----
# PID number 601 used in starting script.
601 BPE_EOW EUR_EOW WAIT 1 522 533 544
602 STAZITA EUR_EOW EXPRESS 1 601
603 STAZITA EUR_EOW EXPRESS 1 601
611 AIDNEQ2 EUR_EOW FAST 1 602 603
612 GPSKTRN EUR_EOW EXPRESS 1 611
614 HELMRN_7 EUR_EOW EXPRESS 1 612
621 AIDNEQ2 EUR_SNX FAST 1 614
622 GPSKTRN EUR_SNX EXPRESS 1 621
623 SMC_RBP EUR_SNX EXPRESS 1 622
631 TROGENAP EUR_TRD EXPRESS 1 623
632 TROGEN_P EUR_TRD FAST 1 631
633 GPSKTRN EUR_TRD EXPRESS 1 632
641 CRDCKW_7 EUR_CRD EXPRESS 1 633
#
# Compute daily and weekly repeatabilities using AIDNEQ2
# -----
# - daily
651 AIDNQ2MP EUR_RPO FAST 1 641
# - weekly
652 AIDNQ2MP EUR_RW FAST 1 641
# - daily with gradients
653 AIDNQ2MP EUR_RDG FAST 1 641
#
# Create summary file, save results, and delete files
# -----
901 EUR_SUM EUR_GEN EXPRESS 1 651 652 653
902 EUR_SAV EUR_GEN EXPRESS 1 901
903 EUR_DEL EUR_GEN EXPRESS 1 902
904 BPE_CW EUR_GEN EXPRESS 1 903
#
# Distribute results
# -----
905 EUR_DIS EUR_GEN EXPRESS 1 904
#
# End of BPE
# -----
999 BPE_BYE EUR_GEN EXPRESS 1 905
#
#
```

Weekly analysis sequence

BPE V5.0: EUREF.PCF Derived From RNX2SNX.PCF – Modifications Made (1)

```
PID SCRIPT OPT_DIR CAMPAIGN CPU P WAIT FOR....
3** ***** ***** ***** ***** 1 3** 3** 3** 3** 3** 3** 3** 3**
#
# Copy required files and create a priori CRD file
# -----
001 EUR_COP EUR_GEN EXPRESS 1
002 COOVEL EUR_GEN EXPRESS 1 001
#
# Prepare pole, orbit, and clock information
# -----
101 POLUPO EUR_GEN EXPRESS 1 001
111 PRETAB EUR_GEN EXPRESS 1 101
112 ORBGEN EUR_GEN FAST 1 111
#
# Convert and synchronize observation data
# -----
201 RNKGRA EUR_GEN FAST 1 001
211 RXSVYAP EUR_GEN EXPRESS 1 201
212 RXSVV_P EUR_GEN FAST 1 211
213 RNK_DEL EUR_GEN EXPRESS 1 212
221 COOSPPAP EUR_GEN EXPRESS 1 002 112 213
222 COOSPP_P EUR_GEN FAST 1 221
223 COCCTR EUR_GEN EXPRESS 1 222
#
# Form baselines, preprocess and screen phase data, save cluster NQZ files
# -----
301 SINZIF EUR_GEN FAST 1 223
311 MAUPPAP EUR_GEN EXPRESS 1 301
312 MAUPP_P EUR_GEN FAST 1 311
313 MPKTRN EUR_GEN EXPRESS 1 312
321 GPSKTRAP EUR_GEN EXPRESS 1 313
322 GPSKTR_P EUR_GEN FAST 1 321
331 GPSCKW EUR_GEN EXPRESS 1 322
#
# Compute ambiguity-fixed network solution, resolve phase ambiguities
# -----
401 ADDNEQ2 EUR_GEN FAST 1 331
402 GPSKTRN EUR_GEN EXPRESS 1 401
411 SATMRK EUR_AMB EXPRESS 1 402
412 GPSL13AP EUR_L13 EXPRESS 1 411
413 GPSL13_P EUR_L13 FAST 1 412
421 GPSQIFAP EUR_QIF EXPRESS 1 413
422 GPSQIF_P EUR_QIF FAST 1 421
431 GPSL12AP EUR_L12 EXPRESS 1 422
432 GPSL12_P EUR_L12 FAST 1 431
433 ANKTRN EUR_AMB EXPRESS 1 432
#
# Compute ambiguity-fixed network solution, create final NQZ/RNX/TRD files
# -----
501 GPSKTR EUR_FIN FAST 1 433
511 ADDNEQ2 EUR_FIN FAST 1 501
512 GPSKTRN EUR_FIN EXPRESS 1 511
514 HELMRN EUR_FIN EXPRESS 1 512
521 ADDNEQ2 EUR_RED FAST 1 514
522 GPSKTRN EUR_RED EXPRESS 1 521
531 ADDNEQ2 EUR_GRD FAST 1 514
532 GPSKTRN EUR_GRD EXPRESS 1 531
533 ADDNEQ2 EUR_GRD FAST 1 532
541 GPSKTRN EUR_LED FAST 1 533
542 ADDNEQ2 EUR_LED FAST 1 514 541
543 GPSKTRN EUR_LED EXPRESS 1 542
544 ADDNEQ2 EUR_LED FAST 1 543
#
# Do weekly processing sequence at end of week (EOW)
# -----
# PID number 601 used in starting script.
601 BPE_EOW EUR_EOW WAIT 1 522 533 544
602 STA2STA EUR_EOW EXPRESS 1 601
603 STA2STA EUR_EOW EXPRESS 1 601
611 ADDNEQ2 EUR_EOW FAST 1 602 603
612 GPSKTRN EUR_EOW EXPRESS 1 611
614 HELMRN_7 EUR_EOW EXPRESS 1 612
621 ADDNEQ2 EUR_SNX FAST 1 614
622 GPSKTRN EUR_SNX EXPRESS 1 621
623 SMC_RBP EUR_SNX EXPRESS 1 622
631 TROGENAP EUR_TRD EXPRESS 1 623
632 TROGEN_P EUR_TRD FAST 1 631
633 GPSKTRN EUR_TRD EXPRESS 1 632
641 CRDCW_7 EUR_CRD EXPRESS 1 633
#
# Compute daily and weekly repeatabilities using ADDNEQ2
# -----
# - daily
651 ADDNEQ2P EUR_RPO FAST 1 641
# - weekly
652 ADDNEQ2P EUR_RW FAST 1 641
# - daily with gradients
653 ADDNEQ2P EUR_RDG FAST 1 641
#
# Create summary file, save results, and delete files
# -----
901 EUR_SUM EUR_GEN EXPRESS 1 651 652 653
902 EUR_SAV EUR_GEN EXPRESS 1 901
903 EUR_DEL EUR_GEN EXPRESS 1 902
904 BPE_CW EUR_GEN EXPRESS 1 903
#
# Distribute results
# -----
905 EUR_DIS EUR_GEN EXPRESS 1 904
#
# End of BPE
# -----
999 BPE_BYE EUR_GEN EXPRESS 1 905
#
#
```

Weekly analysis sequence

„Repeatability“ checks using ADDNEQ2

BPE V5.0: EUREF.PCF Derived From RNXX2SNX.PCF – Modifications Made (1)

```
PID SCRIPT OPT_DIR CAMPAIGN CPU P WAIT FOR....
3** ***** g***** g***** g***** 1 3** 3** 3** 3** 3** 3** 3** 3**
#
# Copy required files and create a priori CRD file
# -----
001 EUR_COP EUR_GEN EXPRESS 1
002 COOVEL EUR_GEN EXPRESS 1 001
#
# Prepare pole, orbit, and clock information
# -----
101 POLUPO EUR_GEN EXPRESS 1 001
111 PRETAB EUR_GEN EXPRESS 1 101
112 ORBGEN EUR_GEN FAST 1 111
#
# Convert and synchronize observation data
# -----
201 RNKGRA EUR_GEN FAST 1 001
211 RKBVAP EUR_GEN EXPRESS 1 201
212 RKBV3_P EUR_GEN FAST 1 211
213 RNK_2M EUR_GEN EXPRESS 1 212
221 COOSPPAP EUR_GEN EXPRESS 1 002 112 213
222 COOSPP_P EUR_GEN FAST 1 221
223 COOCTR EUR_GEN EXPRESS 1 222
#
# Form baselines, preprocess and screen phase data, save cluster NQ2 files
# -----
301 SNG2IF EUR_GEN FAST 1 223
311 MAUPPAP EUR_GEN EXPRESS 1 301
312 MAUPP3_P EUR_GEN FAST 1 311
321 MPKTRN EUR_GEN EXPRESS 1 312
322 GPSKTRP_P EUR_GEN FAST 1 321
331 GPSCHW EUR_GEN EXPRESS 1 322
#
# Compute ambiguity-fixed network solution, resolve phase ambiguities
# -----
401 ADDNEQ2 EUR_GEN FAST 1 331
402 GPSKTRN EUR_GEN EXPRESS 1 401
411 SATMRK EUR_AMB EXPRESS 1 402
412 GPSL33AP EUR_L33 EXPRESS 1 411
413 GPSL33_P EUR_L33 FAST 1 412
421 GPSQIFAP EUR_QIF EXPRESS 1 413
422 GPSQIF_P EUR_QIF FAST 1 421
431 GPSL12AP EUR_L12 EXPRESS 1 422
432 GPSL12_P EUR_L12 FAST 1 431
433 ANKTRN EUR_AMB EXPRESS 1 432
#
# Compute ambiguity-fixed network solution, create final NQ2/NNX/TRO files
# -----
501 GPSRST EUR_FIN FAST 1 433
511 ADDNEQ2 EUR_FIN FAST 1 501
512 GPSKTRN EUR_FIN EXPRESS 1 511
514 HELMRN EUR_FIN EXPRESS 1 512
521 ADDNEQ2 EUR_RED FAST 1 514
522 GPSKTRN EUR_RED EXPRESS 1 521
531 ADDNEQ2 EUR_GRD FAST 1 514
532 GPSKTRN EUR_GRD EXPRESS 1 531
533 ADDNEQ2 EUR_G22 FAST 1 532
541 GPSRST EUR_LED FAST 1 433
542 ADDNEQ2 EUR_LED FAST 1 514 541
543 GPSKTRN EUR_LED EXPRESS 1 542
544 ADDNEQ2 EUR_L22 FAST 1 543
#
# Do weekly processing sequence at end of week (EOW)
# -----
# PID number 601 used in starting script.
601 BPE_EOW EUR_EOW WAIT 1 522 533 544
602 STAZITA EUR_EOW EXPRESS 1 601
603 STAZITA EUR_EOW EXPRESS 1 601
611 ADDNEQ2 EUR_EOW FAST 1 602 603
612 GPSKTRN EUR_EOW EXPRESS 1 611
614 HELMRN_7 EUR_EOW EXPRESS 1 612
621 ADDNEQ2 EUR_SNK FAST 1 614
622 GPSKTRN EUR_SNK EXPRESS 1 621
623 SNG_R2P EUR_SNK EXPRESS 1 622
631 TROGENAP EUR_TRO EXPRESS 1 623
632 TROGEN_P EUR_TRO FAST 1 631
633 GPSKTRN EUR_TRO EXPRESS 1 632
641 CRDCW_7 EUR_CRD EXPRESS 1 633
#
# Compute daily and weekly repeatabilities using ADDNEQ2
# -----
# - daily
651 ADDQZMP EUR_RPO FAST 1 641
# - weekly
652 ADDQZMP EUR_RW FAST 1 641
# - daily with gradients
653 ADDQZMP EUR_RDG FAST 1 641
#
# Create summary file, save results, and delete files
# -----
901 EUR_SUM EUR_GEN EXPRESS 1 651 652 653
902 EUR_SAV EUR_GEN EXPRESS 1 901
903 EUR_DEL EUR_GEN EXPRESS 1 902
904 BPE_CW EUR_GEN EXPRESS 1 903
#
# Distribute results
# -----
905 EUR_DIS EUR_GEN EXPRESS 1 904
#
# End of BPE
# -----
999 BPE_BYE EUR_GEN EXPRESS 1 905
#
#
```

Extended ambiguity resolution sequence
(→ baselines shorter than 100 or 10 km)

Weekly analysis sequence

„Repeatability“ checks using ADDNEQ2

BPE V5.0: EUREF.PCF Derived From RNX2SNX.PCF – Modifications Made (2)

```
PID SCRIPT OPT_DIR CAMPAIGN CPU P WAIT FOR....
3** ***** 3***** 3***** 1 3** 3** 3** 3** 3** 3** 3**

# Copy required files and create a priori CRD file
# -----
001 EUR_COP EUR_GEN EXPRESS 1
002 COUVEL EUR_GEN EXPRESS 1 001
# -----

# Prepare plan, utility, and clock information
# -----
101 POLUPD EUR_GEN EXPRESS 1 001
111 PRETAB EUR_GEN EXPRESS 1 101
112 ORIGIN EUR_GEN FAST 1 111
# -----

# Convert and synchronize observation data
# -----
201 RNKGRA EUR_GEN FAST 1 001
211 RKBVAP EUR_GEN EXPRESS 1 201
212 RKBVQ_P EUR_GEN FAST 1 211
213 RNK_DEL EUR_GEN EXPRESS 1 212
221 COBSPPAP EUR_GEN EXPRESS 1 002 112 213
222 COBSPP_P EUR_GEN FAST 1 221
223 COBSXN EUR_GEN EXPRESS 1 222
# -----

# Form baselines, preprocess and screen phase data, save cluster NBO files
# -----
301 SNGDIF EUR_GEN FAST 1 223
311 MAUPPAP EUR_GEN EXPRESS 1 301
312 MAUPP_P EUR_GEN FAST 1 311
321 MPKTRN EUR_GEN EXPRESS 1 312
322 GPRCTAP EUR_GEN EXPRESS 1 313
323 GPRCT_P EUR_GEN FAST 1 321
331 GPRCWN EUR_GEN EXPRESS 1 322
# -----

# Compute ambiguity-fixed network solution, resolve phase ambiguities
# -----
401 ADDNEQ2 EUR_GEN FAST 1 331
402 GPSXTR EUR_GEN EXPRESS 1 401
411 SATMRK EUR_AMB EXPRESS 1 402
412 GPSL33AP EUR_L33 EXPRESS 1 411
413 GPSL3_P EUR_L33 FAST 1 412
421 GPSQIFAP EUR_QIF EXPRESS 1 413
422 GPSQIF_P EUR_QIF FAST 1 421
431 GPSL12AP EUR_L12 EXPRESS 1 422
432 GPSL1_P EUR_L12 FAST 1 431
433 ANKXTR EUR_AMB EXPRESS 1 432
# -----

# Compute ambiguity-fixed network solution, create final NBO/RNX/TRX files
# -----
501 GPSRST EUR_FIN FAST 1 433
511 ADDNEQ2 EUR_FIN FAST 1 501
512 GPSXTR EUR_FIN EXPRESS 1 511
514 HELMRN EUR_FIN EXPRESS 1 512
521 ADDNEQ2 EUR_RED FAST 1 514
522 GPSXTR EUR_RED EXPRESS 1 521
531 ADDNEQ2 EUR_GRD FAST 1 514
532 GPSXTR EUR_GRD EXPRESS 1 531
533 ADDNEQ2 EUR_GRD FAST 1 532
541 GPSRST EUR_LED FAST 1 533
542 ADDNEQ2 EUR_LED FAST 1 514 541
543 GPSXTR EUR_LED EXPRESS 1 542
544 ADDNEQ2 EUR_LE2 FAST 1 543
# -----

# Do weekly processing sequence at end of week (EOW)
# -----
# PID number 601 used in starting script.
601 BPE_EOW EUR_EOW WAIT 1 522 533 544
602 STAJSTA EUR_EOW EXPRESS 1 601
603 STAJSTA EUR_EOW EXPRESS 1 601
611 ADDNEQ2 EUR_EOW FAST 1 602 603
612 GPSXTR EUR_EOW EXPRESS 1 611
614 HELMRN_7 EUR_EOW EXPRESS 1 612
621 ADDNEQ2 EUR_SNX FAST 1 614
622 GPSXTR EUR_SNX EXPRESS 1 621
623 SMC_RBP EUR_SNX EXPRESS 1 622
631 TROGAP EUR_TR0 EXPRESS 1 623
632 TROGAP_P EUR_TR0 FAST 1 631
633 GPSXTR EUR_TR0 EXPRESS 1 632
641 CRDCW_7 EUR_CRD EXPRESS 1 633
# -----

# Compute daily and weekly repeatabilities using ADDNEQ2
# -----
# - daily
651 ADDQ2MP EUR_RPO FAST 1 641
# - weekly
652 ADDQ2MP EUR_RW FAST 1 641
# - daily with gradients
653 ADDQ2MP EUR_RDG FAST 1 641
# -----

# Create summary file, save results, and delete files
# -----
901 EUR_SUM EUR_GEN EXPRESS 1 651 652 653
902 EUR_SAV EUR_GEN EXPRESS 1 901
903 EUR_DEL EUR_GEN EXPRESS 1 902
904 BPE_CW EUR_GEN EXPRESS 1 903
# -----

# Distribute results
# -----
905 EUR_DIS EUR_GEN EXPRESS 1 904
# -----

# End of BPE
# -----
999 BPE_BYE EUR_GEN EXPRESS 1 905
#
#
```

Call of preparing PERL scripts:

BPE V5.0: EUREF.PCF Derived From RNX2SNX.PCF – Modifications Made (2)

```
PID SCRIPT OPT_DIR CAMPAIGN CPU P WAIT FOR....
3** ***** ***** ***** 1 3** 3** 3** 3** 3** 3**
# Copy required files and create a priori CRD file
# -----
001 EUR_COP EUR_GEN EXPRESS 1
002 COOVEL EUR_GEN EXPRESS 1 001
# -----
# Prepare prior, utility and clock information
# -----
101 POLUPD EUR_GEN EXPRESS 1 001
111 PRETAB EUR_GEN EXPRESS 1 101
112 ORBGEN EUR_GEN FAST 1 111
# -----
# Convert and synchronize observation data
# -----
201 RINXGA EUR_GEN FAST 1 001
211 RINXVAP EUR_GEN EXPRESS 1 201
212 RINXVAP_P EUR_GEN FAST 1 211
```

Call of preparing PERL scripts:

```
# Prepare reference files
# -----
system("$ENV{X}/AUTO/get_gendata.pl");
system("$ENV{X}/AUTO/copyRef.pl ${dirCrd}.. $crdInf REF$yyssss");

# Prepare orbit/ERP info
# -----
system("$ENV{X}/AUTO/get_orbdata.pl -t igs -d $ddd -y $yyyy");
system("$ENV{X}/AUTO/put_orbdata.pl -t igs -c $dirPre -o $b -s $yyssss");

# Prepare daily RINEX data
# -----
system("$ENV{X}/AUTO/get_obsdata.com -d=$ddd");
system("$ENV{X}/AUTO/put_data.pl $yy $ssss %EUR $dirRxo");
```

```
901 EUR_SM EUR_GEN EXPRESS 1 651 652 653
902 EUR_SAV EUR_GEN EXPRESS 1 901
903 EUR_DEL EUR_GEN EXPRESS 1 902
904 EUR_CW EUR_GEN EXPRESS 1 903
# -----
# Distribute results
# -----
905 EUR_DIS EUR_GEN EXPRESS 1 904
# -----
# End of BPE
# -----
999 BPE_BYE EUR_GEN EXPRESS 1 905
# -----
#
```

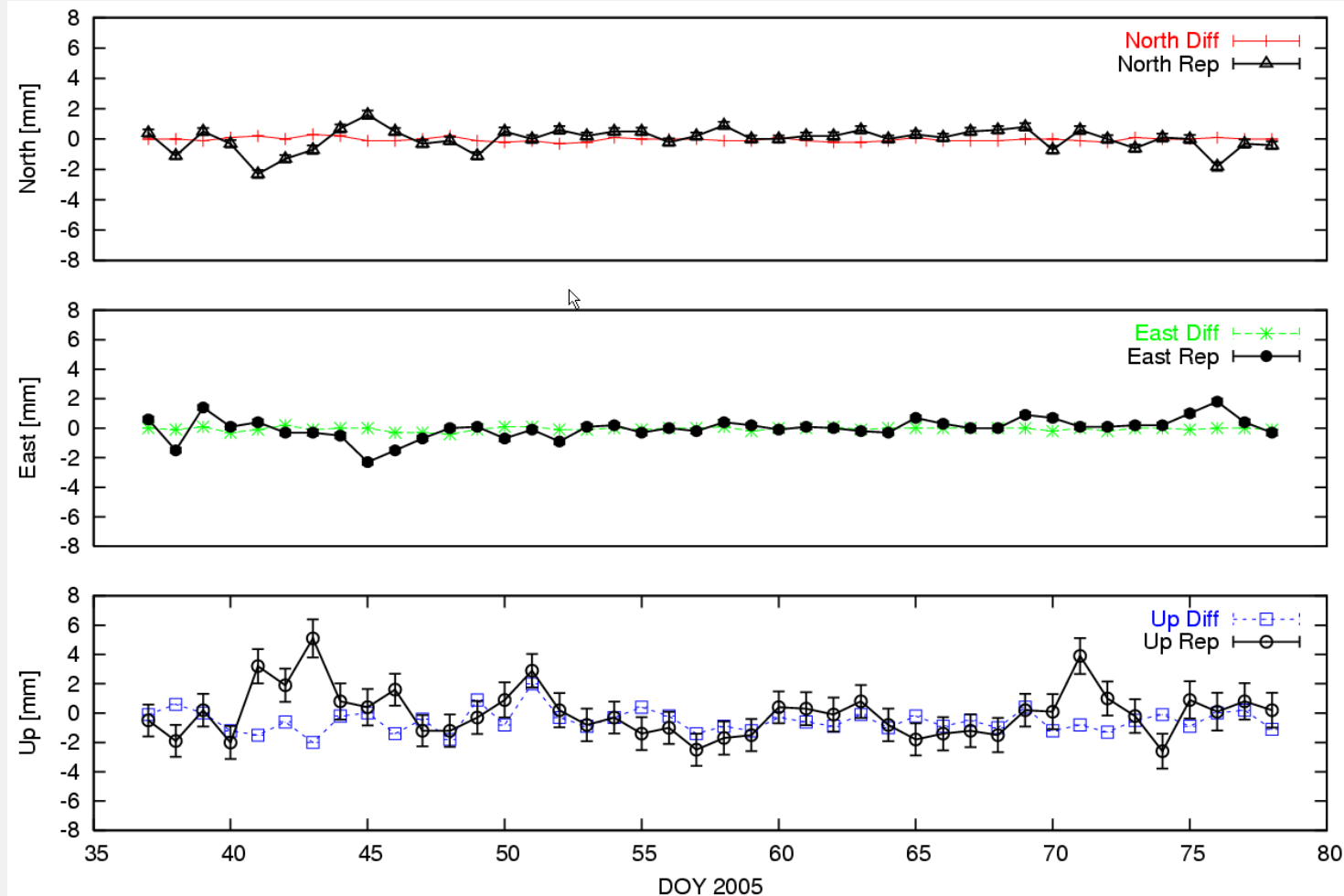
Identical PERL Function for Station Selection, Used at swisstopo and at CODE Side

ANDE	%OBS_INT	%AGN	%MET		%agnes
ARDE	%OBS_INT	%AGN	%MET		%agnes
BOR1	%OBS_EXT		%MET	%FIX	%euref/%igs
BORK	%OBS_EXT	%EUR			%euref
BOUR	%OBS_INT	%AGN	%MET		%agnes
BRST	%OBS_EXT	%AGN	%MET	%FIX	%euref/%igs
BRTZ	%OBS_EXT	%AGN	%MET		%rpg
BRUS	%OBS_EXT		%MET	%FIX	%euref/%igs
BSCN	%OBS_EXT	%AGN	%MET		%rpg
BUDP	%OBS_EXT	%EUR			%euref
BZRG	%OBS_EXT	%AGN	%MET	%FIX	%euref/%igs
CAGL	%OBS_EXT		%MET	%FIX	%euref/%igs
CHAT	%OBS_EXT	%AGN		%FIX	%rpg
DAVO	%OBS_INT	%AGN	%MET		%agnes
DELF	%OBS_EXT	%EUR		%FIX	%euref
DENT	%OBS_EXT	%EUR		%FIX	%euref
DOUR	%OBS_EXT	%AGN	%EUR	%FIX	%euref
EGLT	%OBS_EXT	%AGN	%MET		%rpg
EIJS	%OBS_EXT	%EUR		%FIX	%euref
EPFL	%OBS_INT	%AGN	%MET		%agnes
ETHZ	%OBS_INT	%AGN	%MET		%agnes
EUSK	%OBS_EXT	%EUR		%FIX	%euref
EXWI	%OBS_EXT	%AGN			%other
FALE	%OBS_INT	%AGN	%MET		%agnes
FCLZ	%OBS_EXT	%AGN		%FIX	%rpg
FHBB	%OBS_INT	%AGN	%MET		%agnes
FLDK	%OBS_EXT	%AGN	%MET		%bev
FREI	%OBS_EXT	%AGN	%MET		%sapos
FRIC	%OBS_INT	%AGN	%MET		%agnes
GENE	%OBS_INT	%AGN	%MET		%agnes

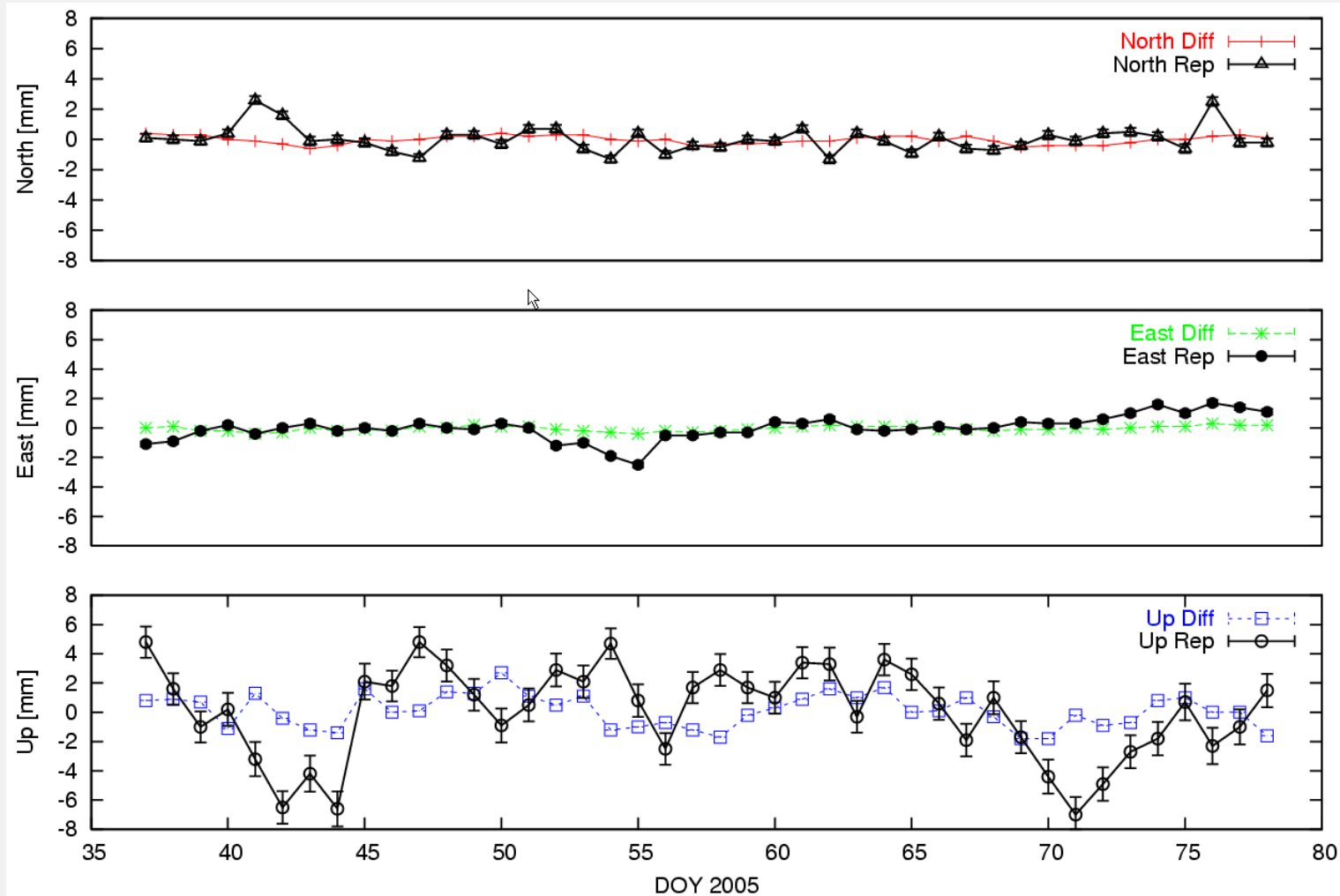
Identical PERL Function for Station Selection, Used at swisstopo and at CODE Side

AJAC	%GPS	%OBS						%EUR		%001	%igs/%euref	
ALBH	%GPS	%OBS		%RAP (4)	%FIN	%ION	%CLK			%002	%igs	
ALGO	%GPS	%OBS	%NAV	%RAP (4)	%FIN	%ION	%CLK	%TIM	%HRD	%002	%igs	
ALIC	%GPS	%OBS		%RAP (4)	%FIN	%ION	%CLK		_HRD	%003	%igs	
ALME	%GPS	%OBS						%EUR		%001	%euref	
ALRT	%GPS	%OBS		%RAP (1)	%FIN	%ION	%CLK			%002	%igs	
AMC2	%GPS	%OBS	%NAV	%RAP (4)	%FIN	%ION	%CLK	%TIM	%HPF	%HRD	%002	%igs/%timlab
AMUN	%GPS	%OBS		%RAP (0)	%FIN	%ION	%CLK			%003	%other/%vel	
ANKR	%GPS	%OBS		%RAP (4)	%FIN	%ION	%CLK	%EUR		%001	%igs/%euref	
AOML	%GPS	%OBS		%RAP (2)	%FIN	%ION	%CLK			%002	%igs	
AREQ	%GPS	%OBS		%RAP (2)	%FIN	%ION	%CLK		%HRD	%002	%igs	
ARTU	%GPS	%OBS		%RAP (2)	%FIN	%ION	%CLK		%HPF	%HRD	%001	%igs
ASC1	%GPS	%OBS		%RAP (1)	%FIN	%ION	%CLK		%HPF	%002	%igs	
ASPA	%GPS	%OBS		%RAP (1)	%FIN	%ION	%CLK			%003	%igs	
AUCK	%GPS	%OBS		%RAP (1)	%FIN	%ION	%CLK			%003	%igs	
AUTO	%GPS		%NAV								%merged	
BAHR	%GPS	%OBS		%RAP (1)	%FIN	%ION	%CLK	%EUR	%HPF	%001	%igs	
BAKO	%GPS	%OBS		%RAP (4)	%FIN	%ION	%CLK			%003	%igs	
BAN2	%GPS	%OBS							%HRD		%hpf	
BILI	%GPS	%OBS		%RAP (3)	%FIN	%ION	%CLK			%002	%igs	
BJFS	%GPS	%OBS		%RAP (4)	%FIN	%ION	%CLK			%003	%igs	
BOGI	%MIX	%OBS									%igs/%iglos/%euref/%unused	
BOGO	%GPS	%OBS						%EUR		%001	%euref	
BOGT	%GPS	%OBS		%RAP (2)	%FIN	%ION	%CLK		%HPF	%HRD	%002	%igs
BOR1	%GPS	%OBS		%RAP (4)	%FIN	%ION	%CLK	%EUR		%001	%igs/%euref/%timlab	
BRAZ	%GPS	%OBS		%RAP (2)	%FIN	%ION	%CLK			%002	%igs	
BRDC	%GPS		%NAV								%merged	
BREW	%GPS	%OBS							%HRD		%hpf	
BRMU	%GPS	%OBS		%RAP (2)	%FIN	%ION	%CLK			%002	%igs	
BRST	%GPS	%OBS		%RAP (4)	%FIN	%ION	%CLK	%EUR		%001	%igs/%euref	

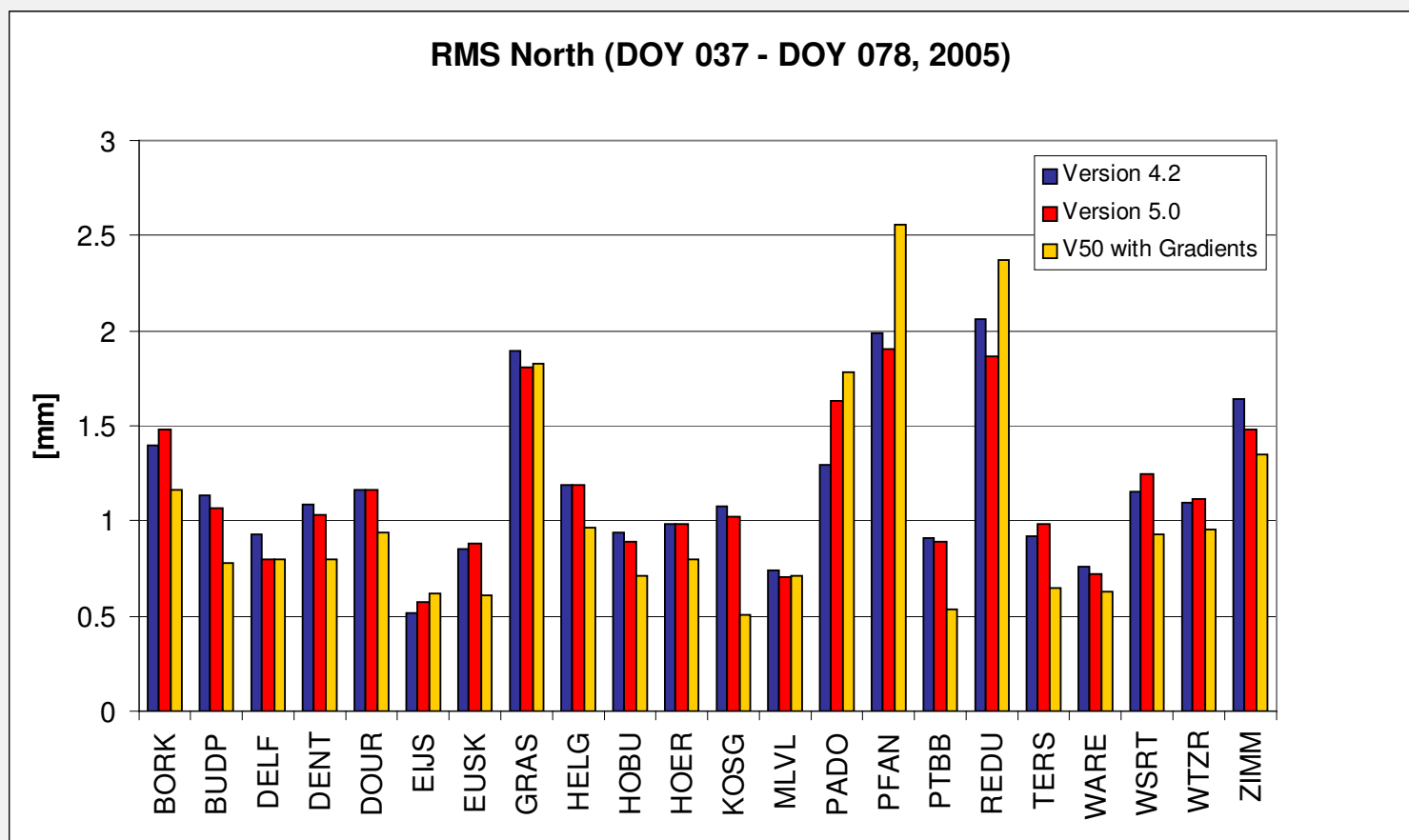
V4.2/V5.0 Daily Differences and Repeatability: Station EUSK (Euskirchen, D)



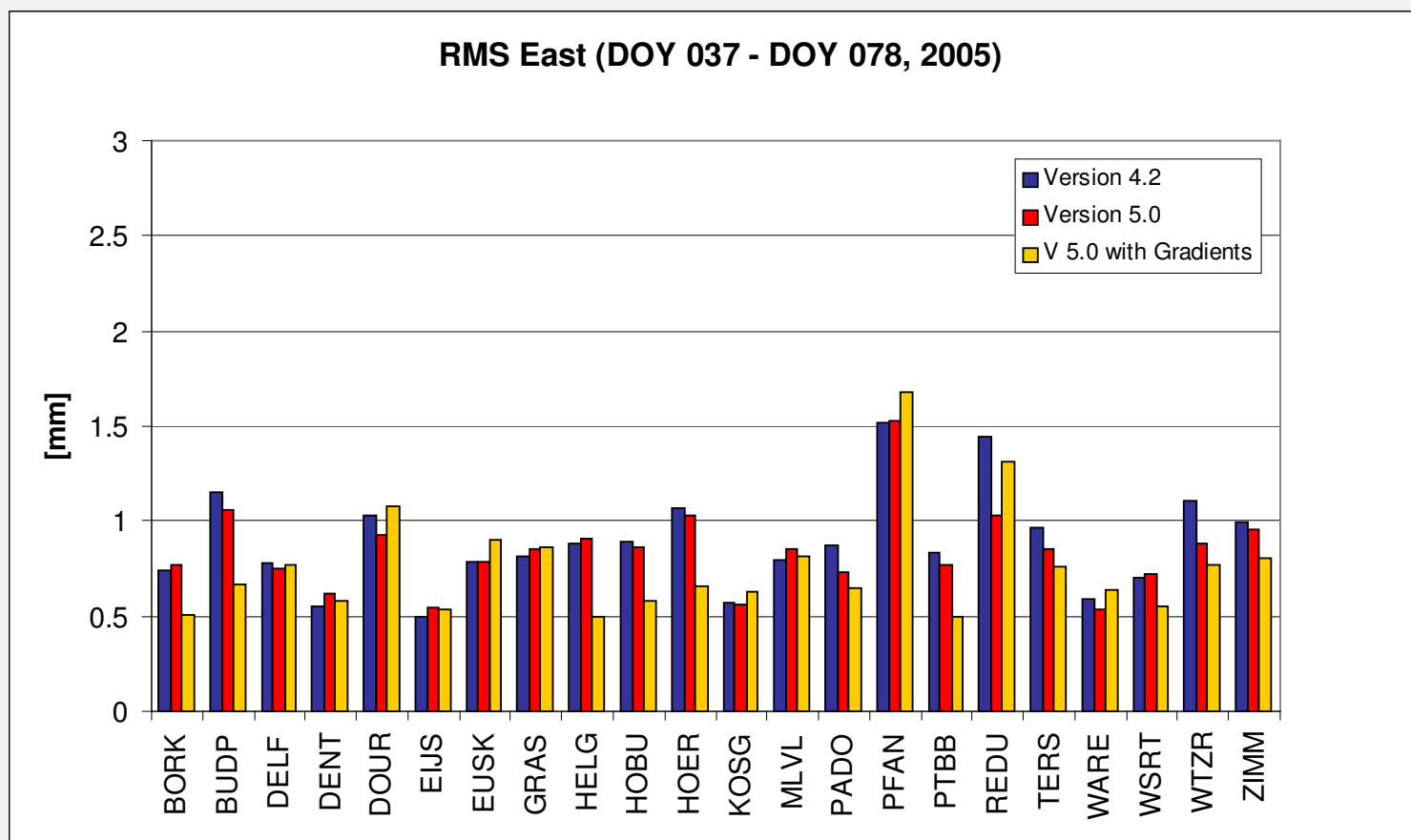
V4.2/V5.0 Daily Differences and Repeatability: Station TERS (Terschelling, NL)



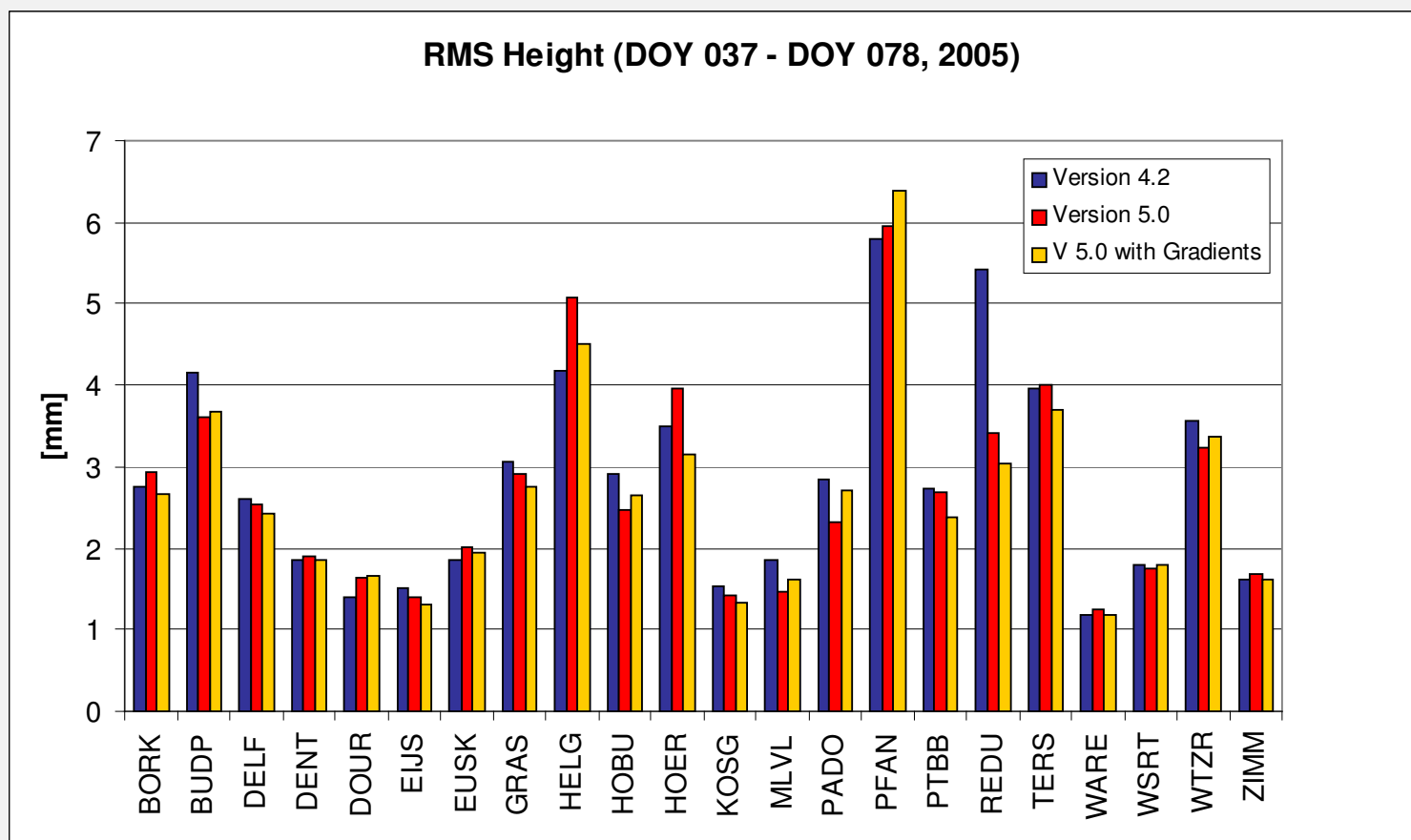
Daily Coordinate Repeatability (North)



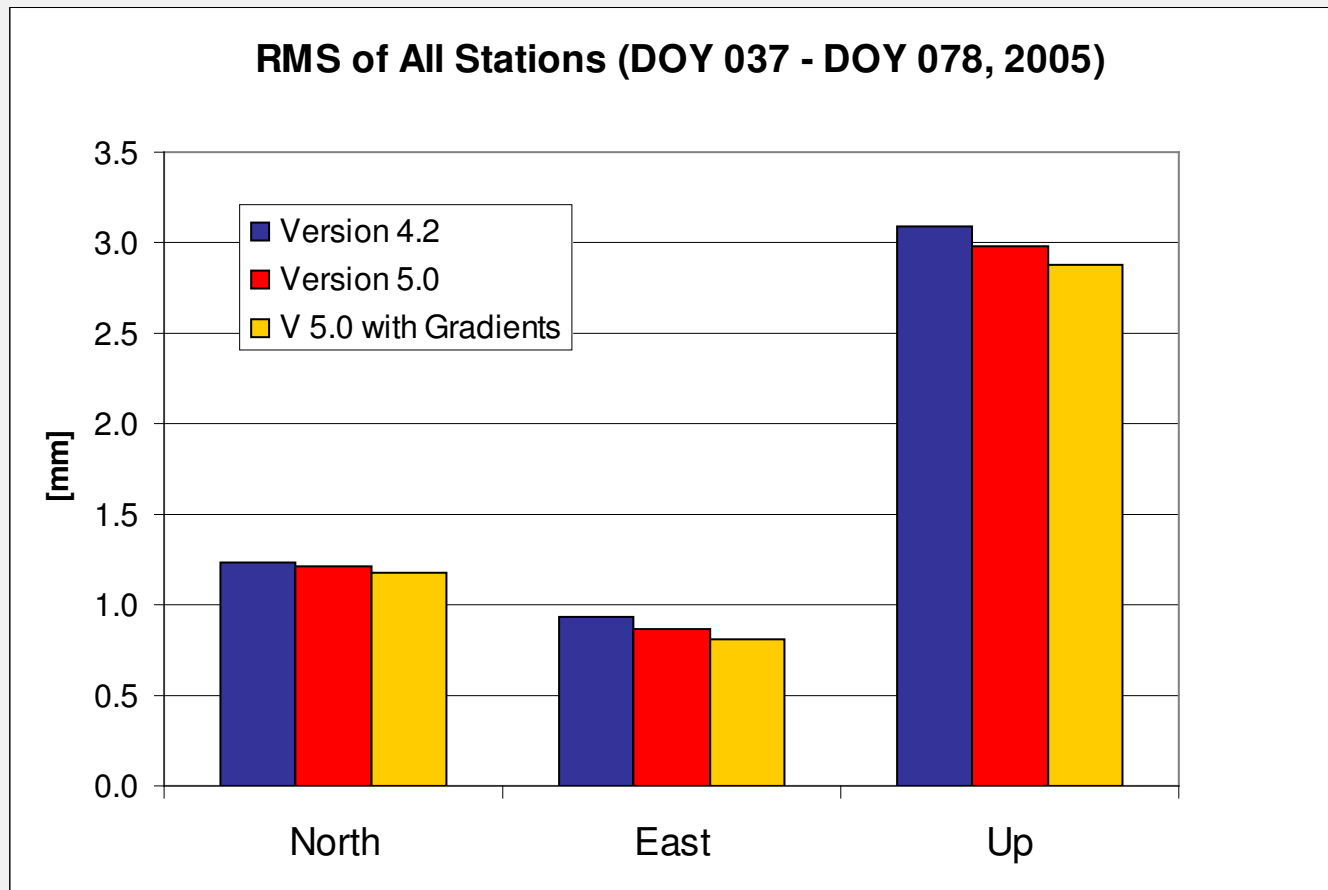
Daily Coordinate Repeatability (East)



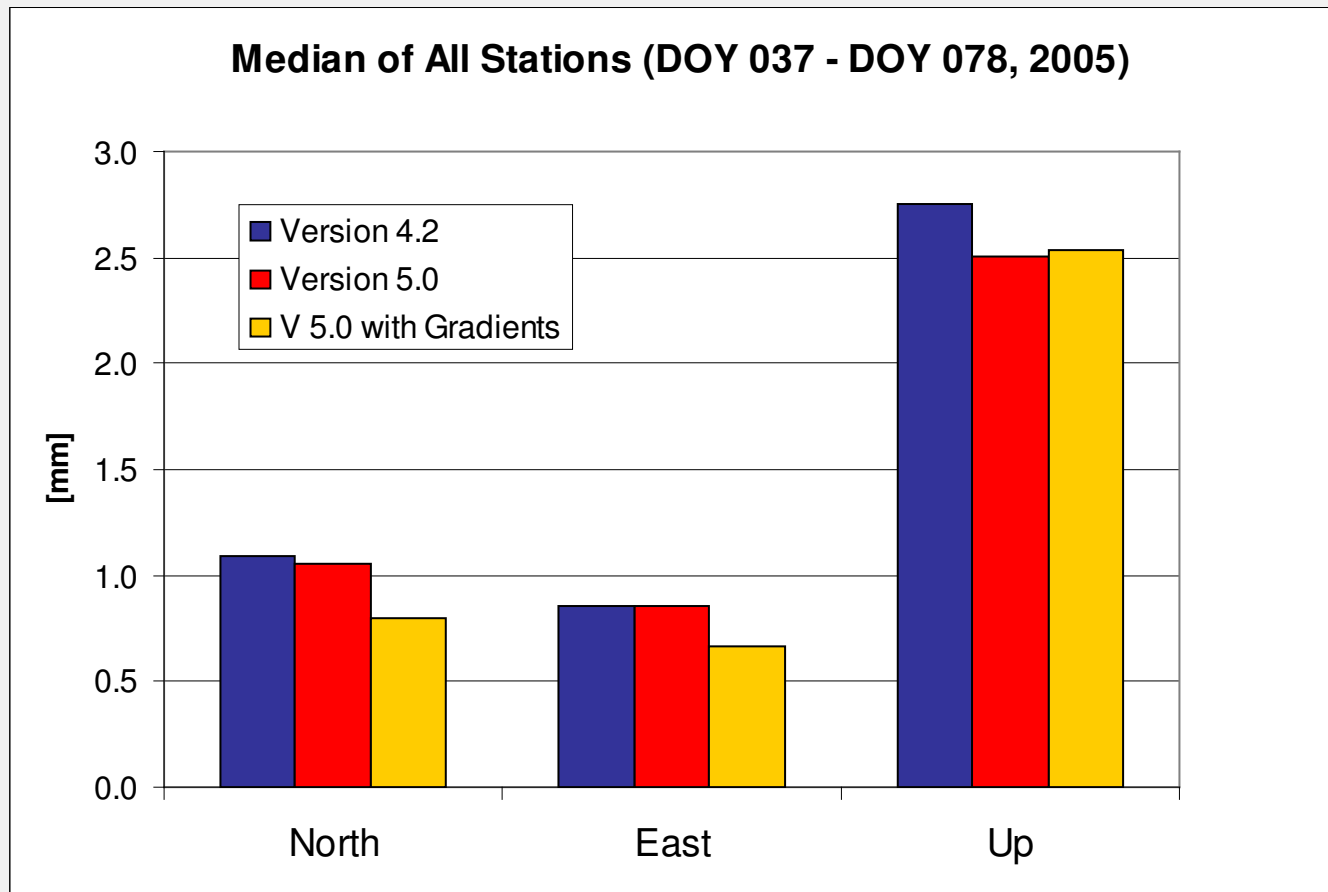
Daily Coordinate Repeatability (Height)



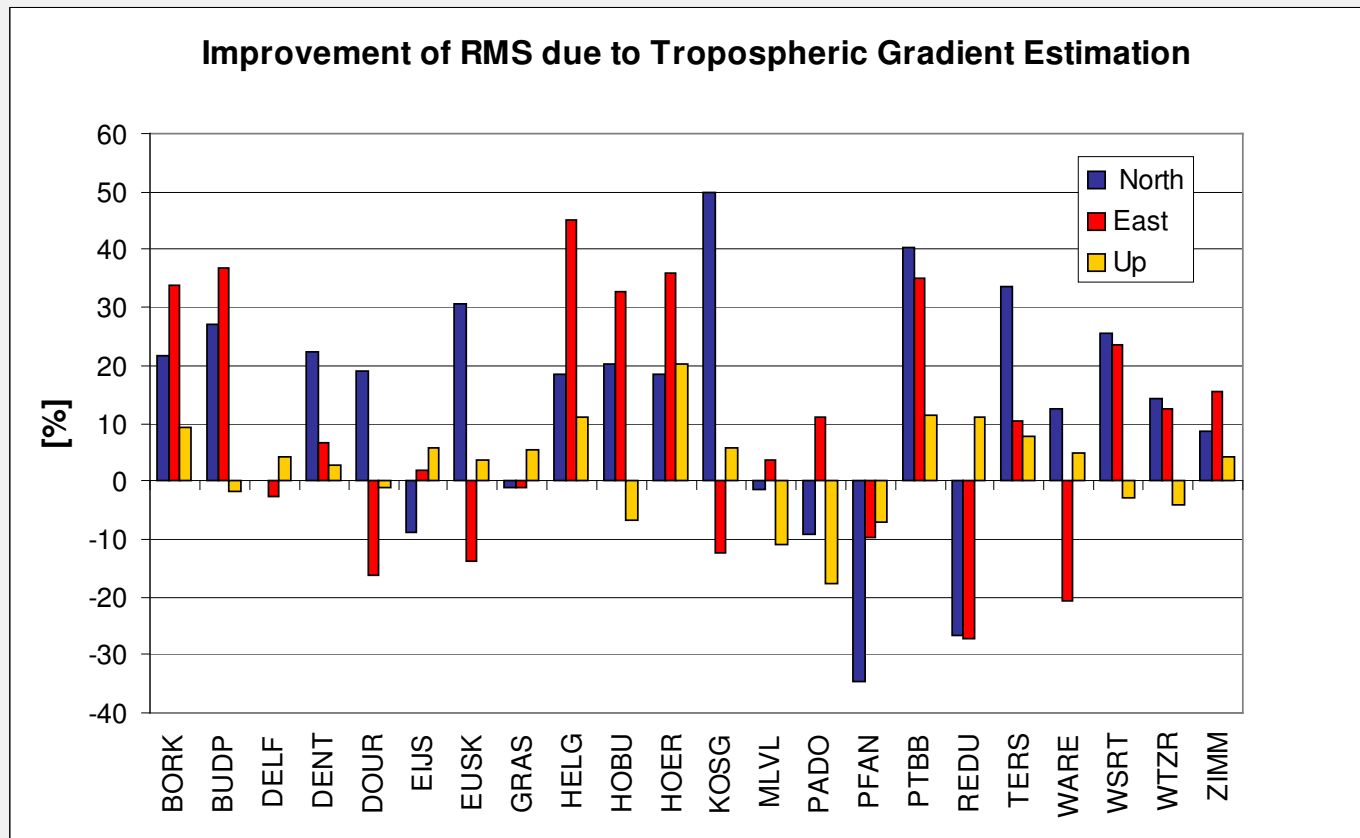
Daily Coordinate Repeatability (RMS)



Daily Coordinate Repeatability (Median)



Improvement of RMS due to Tropospheric Gradient Parameter Estimation



Comparison of Estimated Coordinates: Helmert Transformation V4.2 (dry) vs. V5.0 (dry/wet)

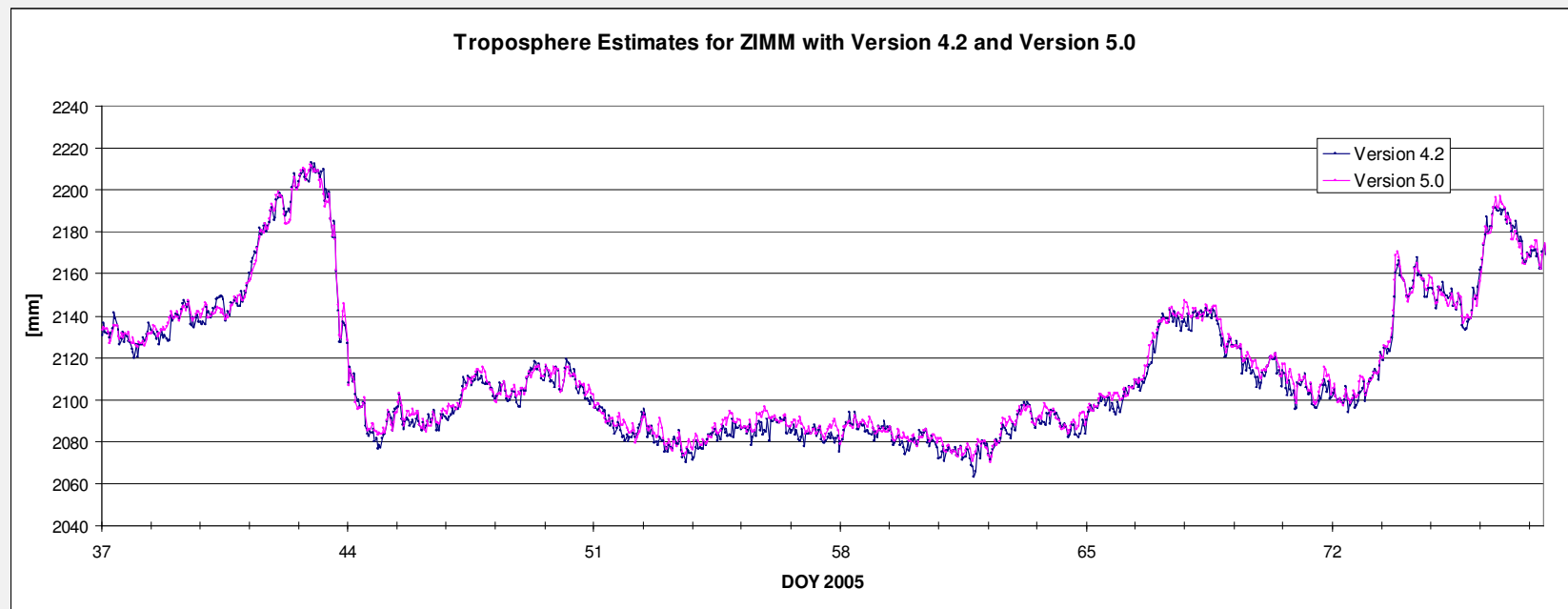
	RMS North	RMS East	RMS Height
6 Parameter	0.7 mm	0.2 mm	0.6 mm
7 Parameter	0.1 mm	0.2 mm	0.6 mm

Comparison of Estimated Coordinates: Helmert Transformation V4.2 (dry) vs. V5.0 (dry/wet)

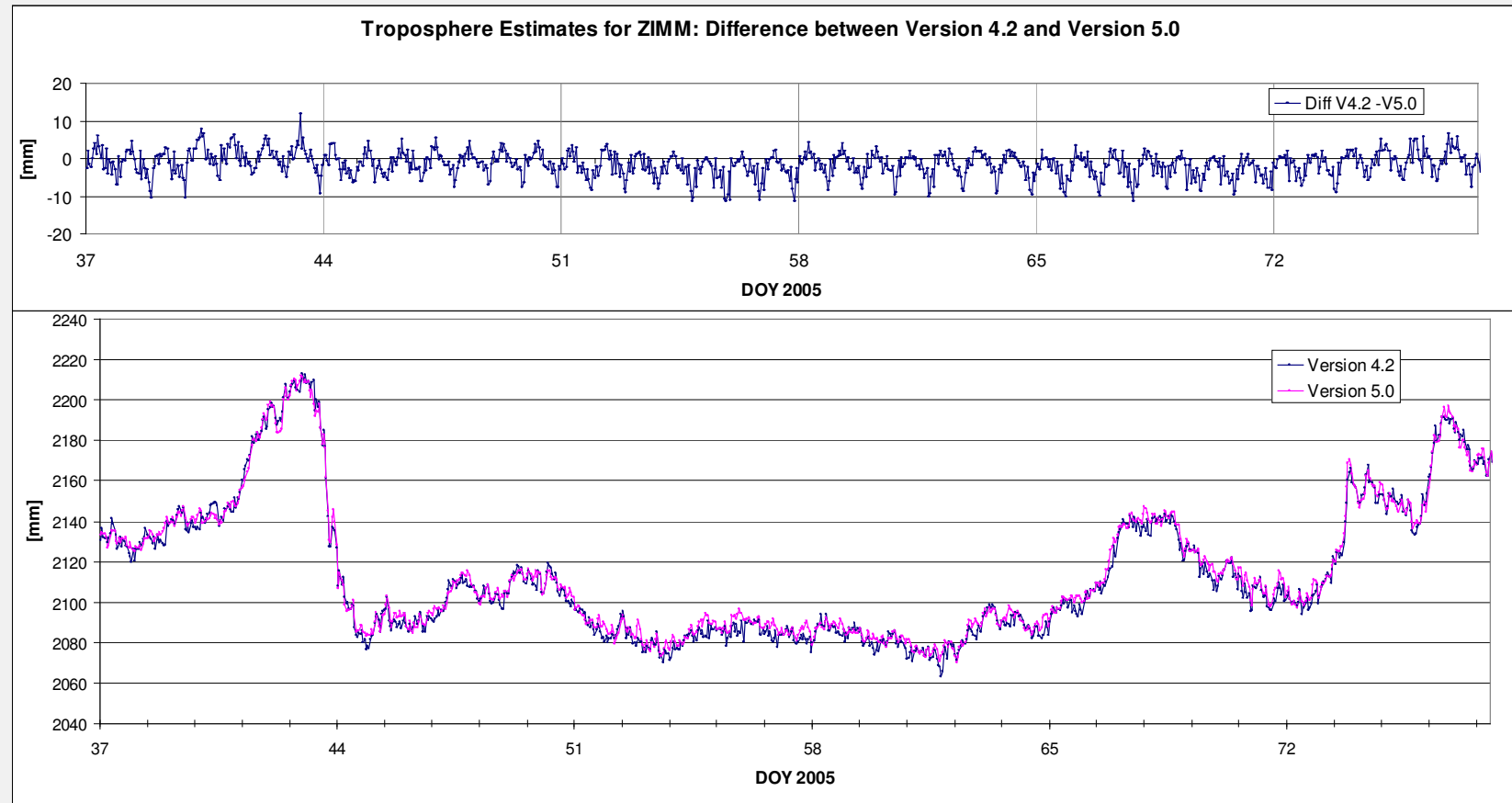
	RMS North	RMS East	RMS Height
6 Parameter	0.7 mm	0.2 mm	0.6 mm
7 Parameter	0.1 mm	0.2 mm	0.6 mm

→ Significant scale parameter of $+1.7 \pm 0.2$ ppb

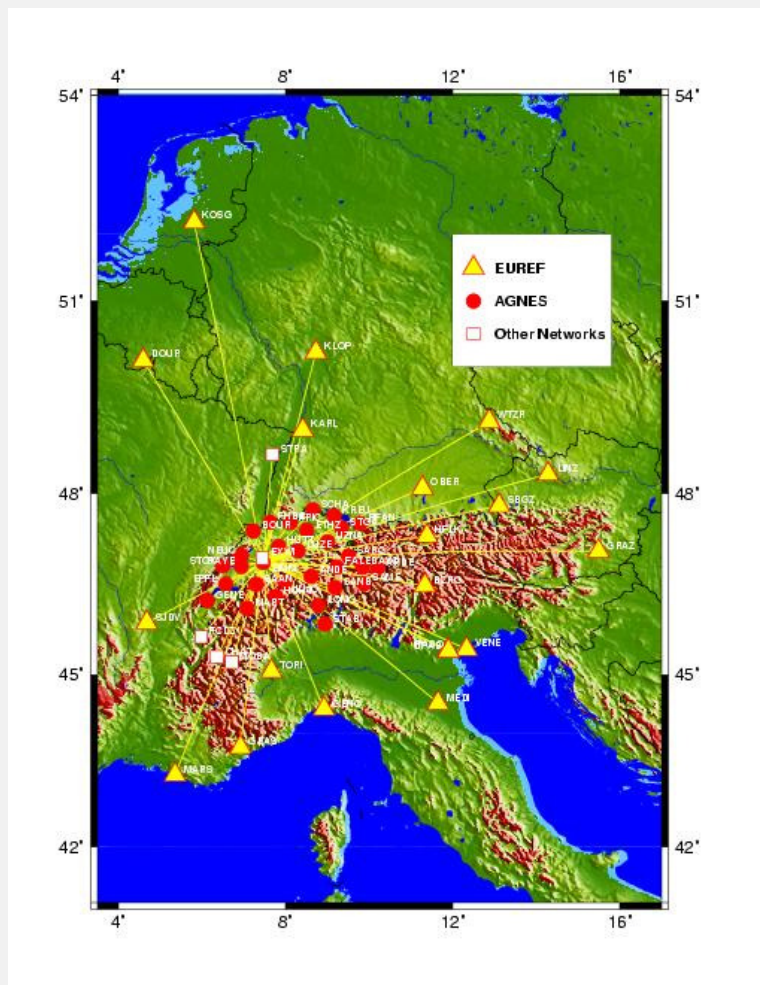
Troposphere Estimation V4.2/V5.0 (Station ZIMM)



Troposphere Estimation V4.2/V5.0 (Station ZIMM)

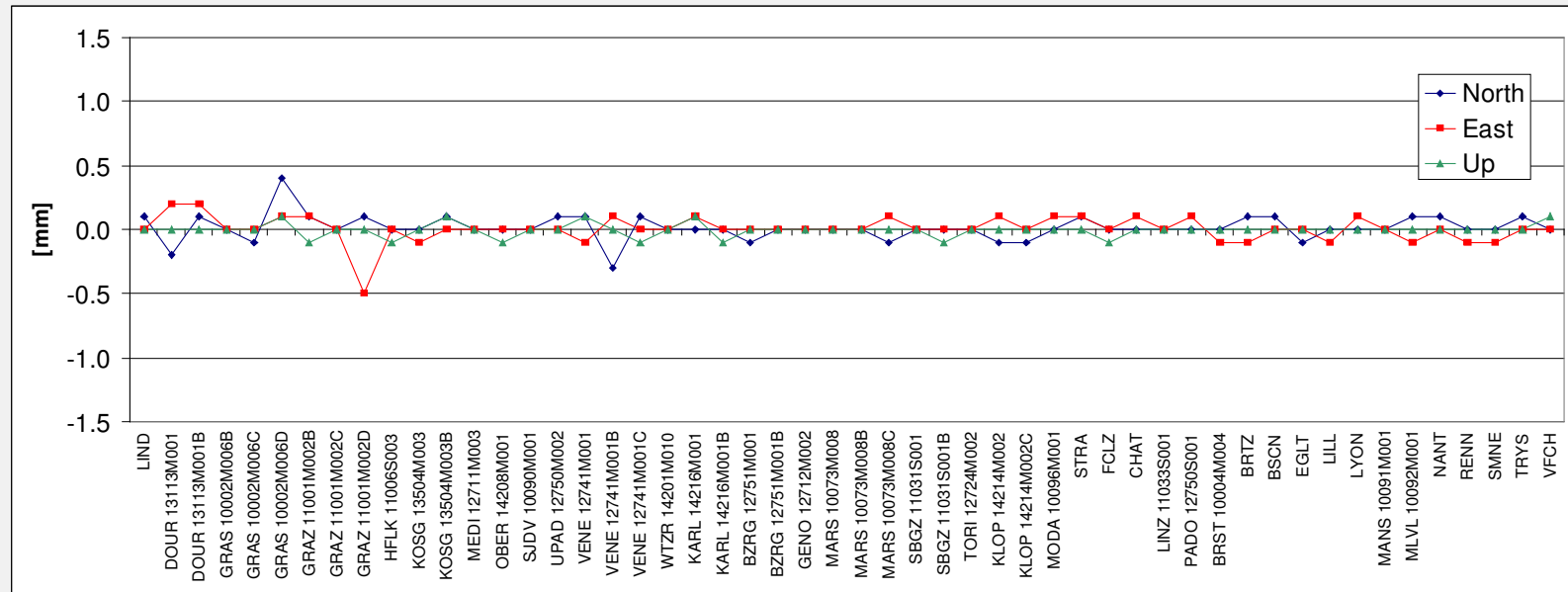


AGNES 7-Year Combination of 350 Weekly ADDNEQ1 (V4.2) Solutions: Station Network



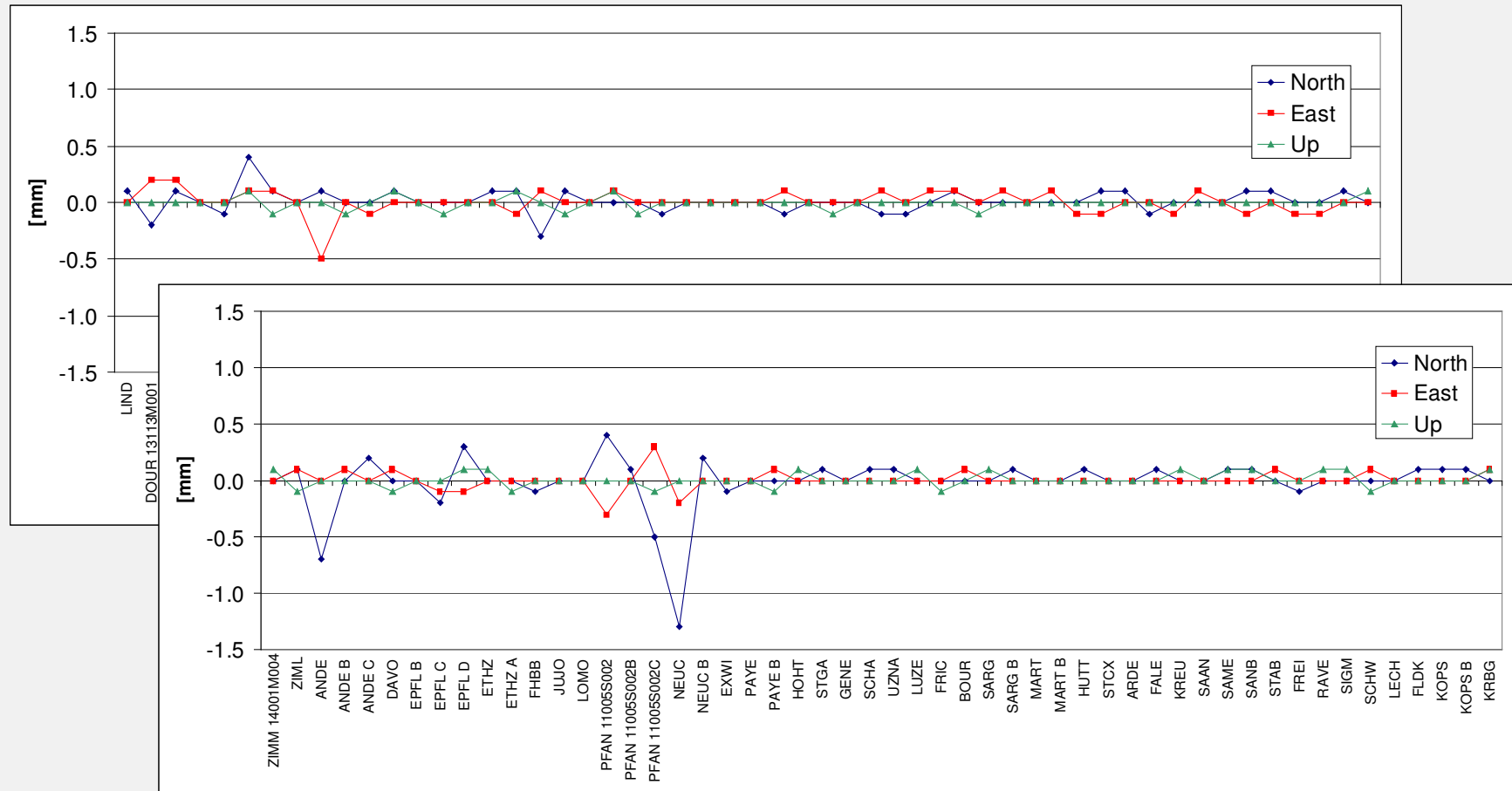
“AGNES+” network consists of
nominally 79 stations (currently
active: 75, AGNES: 29)

AGNES 7-Year Combination of 350 Weekly ADDNEQ1 (V4.2) Solutions: Coordinate Differences: ADDNEQ1 vs. ADDNEQ2 (V5.0)



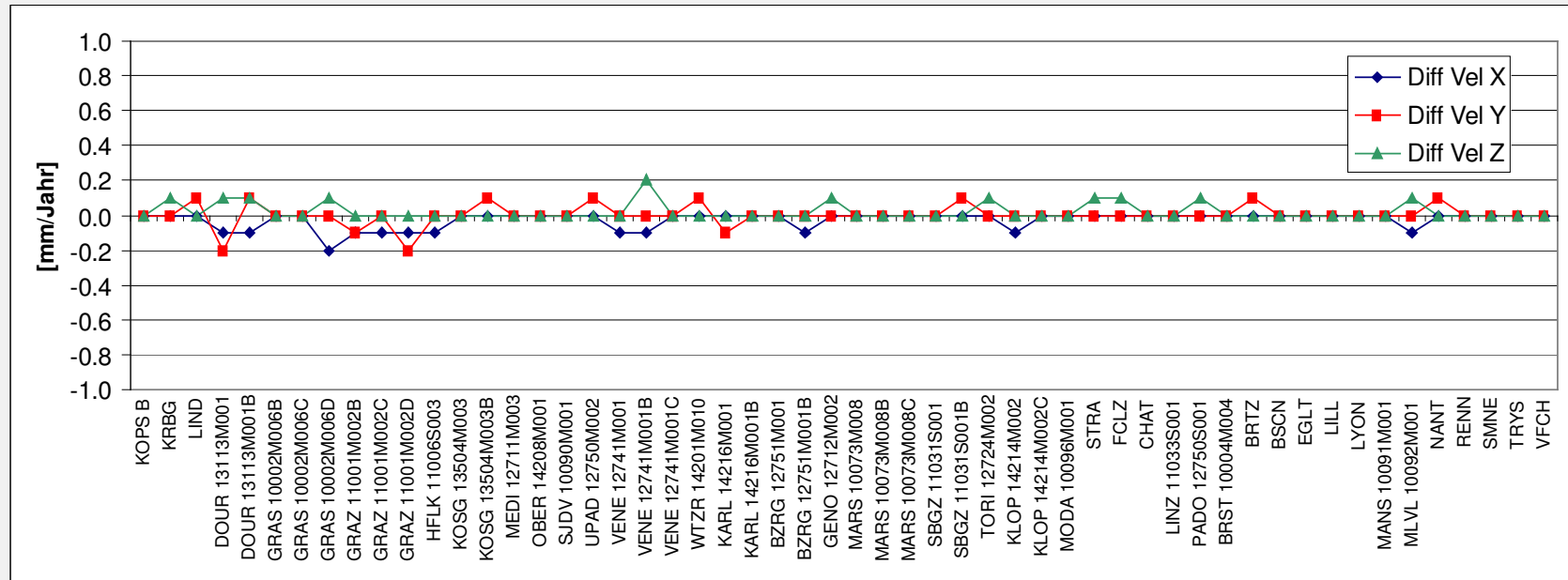
AGNES 7-Year Combination of 350 Weekly ADDNEQ1 (V4.2)

Solutions: Coordinate Differences: ADDNEQ1 vs. ADDNEQ2 (V5.0)



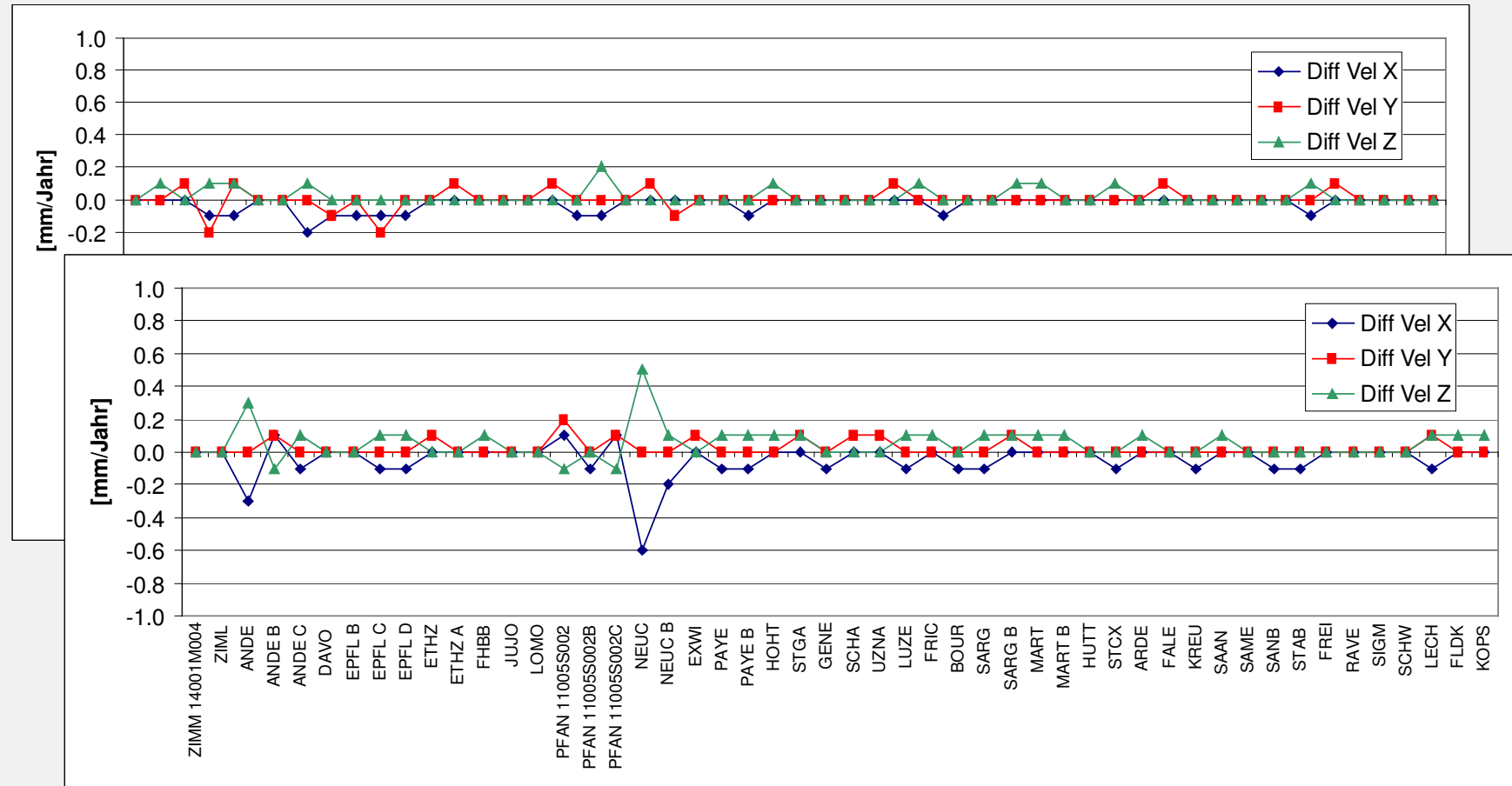
Differences mainly caused by improved relative velocity constraining in V5.0 combination.

AGNES 7-Year Combination of 350 Weekly ADDNEQ1 (V4.2) Solutions: Velocity Differences: ADDNEQ1 vs. ADDNEQ2 (V5.0)



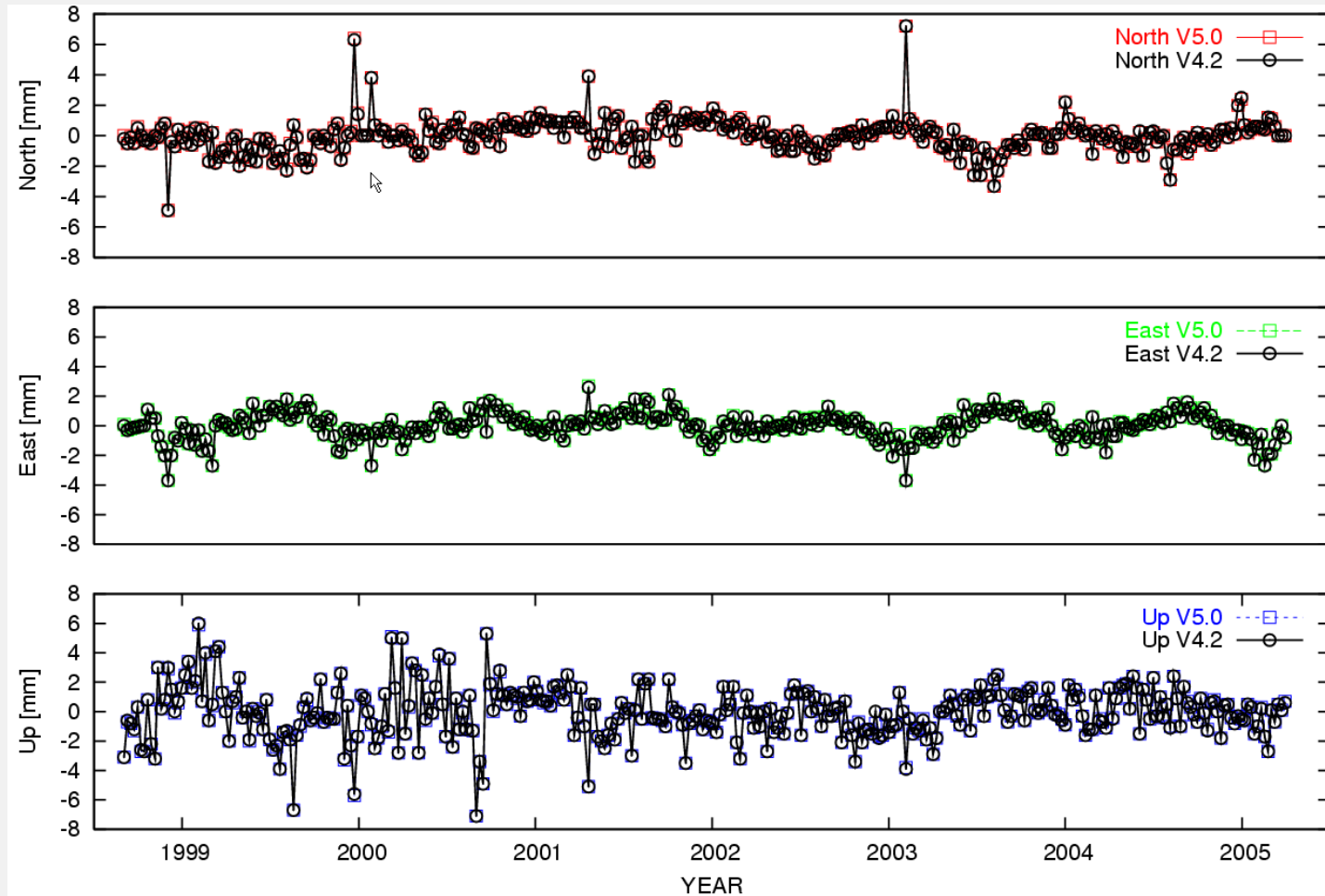
AGNES 7-Year Combination of 350 Weekly ADDNEQ1 (V4.2)

Solutions: Velocity Differences: ADDNEQ1 vs. ADDNEQ2 (V5.0)

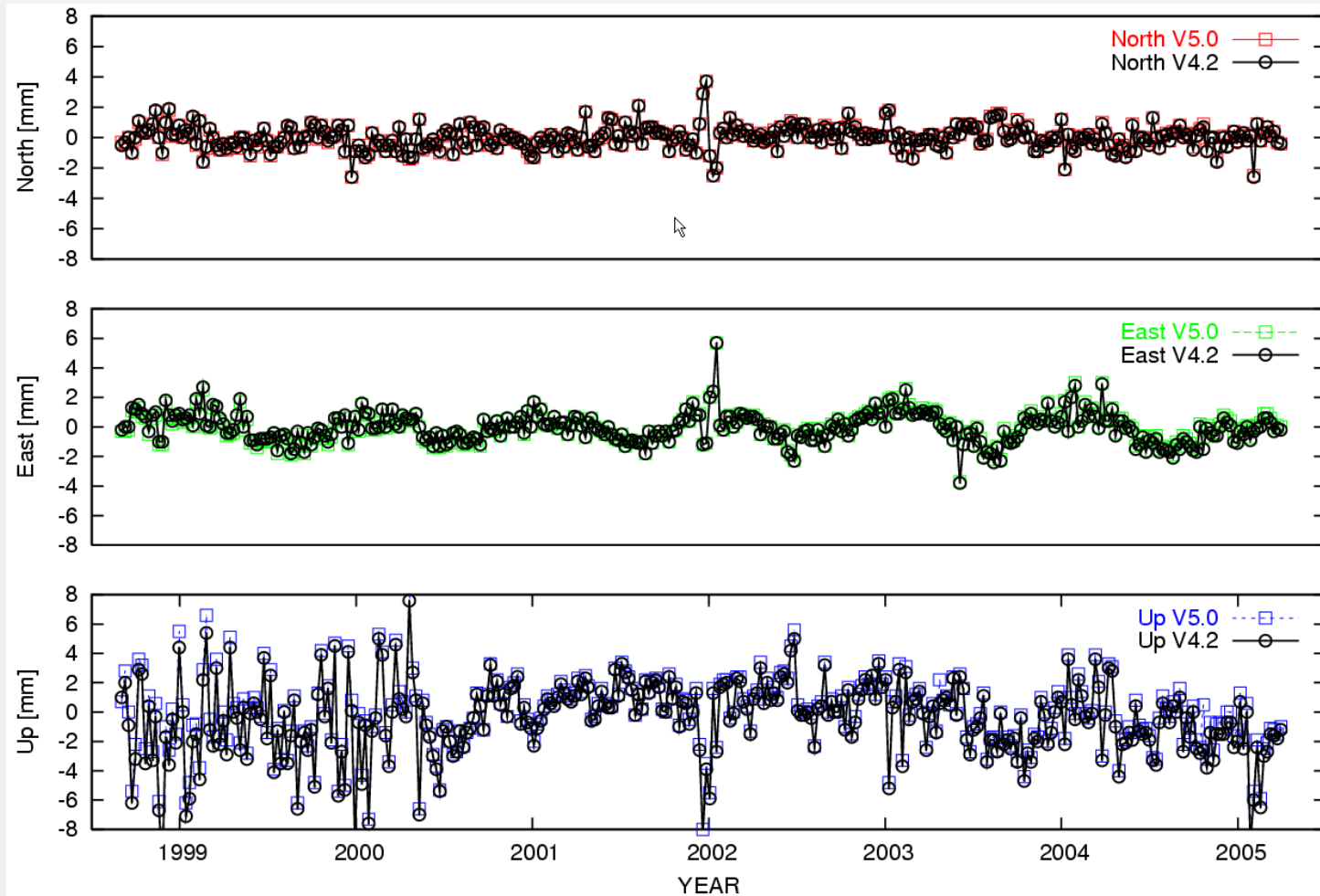


Differences mainly caused by improved relative velocity constraining in V5.0 combination.

AGNES 7-Year Combination of 350 Weekly ADDNEQ1 (V4.2) Solutions: Residuals for ETHZ (CH), ADDNEQ1 vs. ADDNEQ2 (V5.0)



AGNES 7-Year Combination of 350 Weekly ADDNEQ1 (V4.2) Solutions: Residuals for WTZR (D), ADDNEQ1 vs. ADDNEQ2 (V5.0)



Listing of Most Important V5.0 Model (or Processing) Changes

- IERS 2000 conventions:
 - Earth tides: TIDE96 replaced by TIDE2000 (provided by ROB)
 - Step-2 correction (bug reported in BSW Mail 190, June 15, 2004)
 - Nutation: IAU2000 (old: IAU80)
 - Subdaily pole model: IERS2000 (old: RAY96)
- Ocean loading correction model: GOT00.2 (→ GOT002_EUR.BLQ)
- Tropospheric modeling using *piece-wise linear* functions
- Mapping using dry-Niell in conjunction with wet-Niell MF possible
- Estimation of tropospheric gradient parameters fully supported in ADDNEQ2 (→ deletion of corresponding parameters on NEQ level)
- Consideration of P1-C1 bias values possible (→ CODE.DCB)
- PCV-Information: PHAS_IGS.REL (→ RECEIVER.)
- GNSS data import (using RXOBV3):
 - Consideration of radome codes possible (optionally 16 or 20 char.)
 - Various new useful options in regard to automatic data import
 - Selection of GPS **or** GPS/GLONASS (→ GPSEST)

Summary, General Comment on V5.0 (→ Bugfix Patches)

- Differences between V4.2 and V5.0 analysis results are on a negligible level (or may be explained by existing model differences), provided that similar processing/program options are used
- This is definitely a very demanding task in view of the (steadily increasing) complexity of the analysis software.
- To keep the software up-to-date with respect to the V5.0 buglist (made available at www.bernese.unibe.ch) is a *must* for *all* EUREF LACs employing the Bernese Software, particularly in terms of
 - ADDNEQ2 (velocity estimation, COV file export, etc.)
 - specific BPE PERL scripts (involving a removal of problem files)
- Provision of accumulative bugfix patches is planned
- Status concerning V5.0 software documentation (→ draft version in pdf form available, including tutorial, see www.bernese.unibe.ch)

Outlook Regarding Upcoming and Future Model Changes

- Consideration of „absolute“ GNSS receiver and satellite antenna offset and pattern models (→ ANTEX V1.3 data conversion at AIUB)
 - Inclusion of low-elevation data (down to 3 degrees)
 - Refinement, or standardization of SINEX data generation step at LACs (→ two-step ADDNEQ2 procedure)
 - Estimation of tropospheric horizontal gradient parameters
 - Inclusion of GLONASS tracking data (today: 29 GPS plus 14 GLONASS satellites active, 3 permanently marked unusable)
 - Consideration of meteo-data-based tropospheric mapping factors
 - Correction for atmospheric loading effect
- × „Reprocessing“ capability becomes more and more important (→ consistent time series for station coordinates)

BPE Process Monitoring for swisstopo (LPT) and CODE Routine Analysis

The screenshot displays three windows from the BPE Process Monitoring software:

- BPE Process Monitor for COD Analysis:** Shows the status of IGSRAPID.PCF at Fri May 27 16:38:44 2005. Session 1470 is finished. The bottom status bar indicates: 0 finished - 0 running - 0 waiting - 0 skipped.
- BPE Process Monitor for LPT Analysis:** Shows the status of EUREF.PCF at Fri May 27 17:13:15 2005. It lists sessions 0930 through 1010. Session 0990 is running, while others are finished or waiting. The bottom status bar indicates: 52 finished - 1 running - 6 waiting - 5 skipped (89.1% done).
- BPE Process Overview for COD Analysis:** A table showing the completion status and times for various COD analysis sessions.
- BPE Process Overview for LPT Analysis:** A table showing the completion status and times for various LPT analysis sessions.

Process	Session	Status	Time
IGSULTRA	1470	finished	01:13:27
TIMRAPID	1460	finished	00:41:17
IGSFIND	1430	finished	05:28:45
IGSFIN3F	1410	TBS	03:56:26
IGSIONO	1430	finished	06:01:08
SLRQL	1410	finished	00:02:54
IGSRAPID	1460	finished	02:50:21
RAPIONO	1460	finished	02:13:19
IGSFIND3D	1420	finished	01:55:34
CLKFINAL	1420	finished	04:33:06
EUROCLUS	1240	finished	03:30:10
CLKRAPID	1460	finished	03:41:24
GLONPRED	1460	finished	00:04:06
IGSFIND7D	1410	TBS	00:07:36
TIMFINAL	1420	finished	01:44:28
POLE_UPD	1460	finished	00:00:29

Process	Session	Status	Time	Progress
AMET	May	00:00:11		
AGNES	1270	finished	00:25:25	
EUREF	0990	running	00:05:44	89.1%

Redesign of EUREF Weekly SINEX Combination Scheme at BKG

- BKG and AIUB/swisstopo are currently in the process of reviewing and redesigning the EUREF SINEX combination scheme
- 2-day visit of Heinz Habrich at AIUB (18-19 April 2005)
- Start to treat „Bernese“ and „non-Bernese“ (specifically ASI and DEO) SINEX contributions in the same manner
- Non-trivial task (→ „dynamic“ weighting strategy)
- 1.5-year combination test run carried out at AIUB (on the basis of EUROCOMB.PCF V5.0/V5.1)

BPE V5.0: EUREF.PCF Derived From RNX2SNX.PCF – Weekly Analysis Sequence

```
PID SCRIPT OPT_DIR CAMPAIGN CPU P WAIT FOR...
3** ***** g***** g***** g***** 1 3** 3** 3** 3** 3** 3** 3** 3**
#
# Copy required files and create a priori CRD file
# -----
001 EUR_COP EUR_GEN EXPRESS 1
002 COOVEL EUR_GEN EXPRESS 1 001
#
# Prepare pole, orbit, and clock information
# -----
101 POLJPO EUR_GEN EXPRESS 1 001
111 PRETAB EUR_GEN EXPRESS 1 101
112 ORBGEN EUR_GEN FAST 1 111
#
# Convert and synchronise observation data
# -----
201 RNXGRA EUR_GEN FAST 1 001
211 RNXBVAP EUR_GEN EXPRESS 1 201
212 RNXBVA_P EUR_GEN FAST 1 211
213 RNXCML EUR_GEN EXPRESS 1 212
221 COOSPPAP EUR_GEN EXPRESS 1 002 112 213
222 COOSPP_P EUR_GEN FAST 1 221
223 COOCTR EUR_GEN EXPRESS 1 222
#
# Form baselines, preprocess and screen phase data, save cluster NEQ files
# -----
301 SNGDIP EUR_GEN FAST 1 223
311 HAUPPPAP EUR_GEN EXPRESS 1 301
312 HAUPPP_P EUR_GEN FAST 1 311
313 MPKXTH EUR_GEN EXPRESS 1 312
321 GPSTRTAP EUR_GEN EXPRESS 1 313
322 GPSTRT_P EUR_GEN FAST 1 321
331 GPSTCW EUR_GEN EXPRESS 1 322
#
# Compute ambiguity-float network solution, resolve phase ambiguities
# -----
401 ADENRQ2 EUR_GEN FAST 1 331
402 GPSTXTH EUR_GEN EXPRESS 1 401
411 SATMNR EUR_AMB EXPRESS 1 402
412 GPSEL3AP EUR_L33 EXPRESS 1 411
413 GPSEL3_P EUR_L33 FAST 1 412
421 GPQOIFAP EUR_QIF EXPRESS 1 413
422 GPQOIF_P EUR_QIF FAST 1 421
431 GPSEL12AP EUR_L12 EXPRESS 1 422
432 GPSEL12_P EUR_L12 FAST 1 431
433 AMKXTH EUR_AMB EXPRESS 1 432
#
# Compute ambiguity-fixed network solution, create final NEQ/SNX/TRO files
# -----
501 GPSTRT EUR_FIN FAST 1 433
511 ADENRQ2 EUR_FIN FAST 1 501
512 GPSTXTH EUR_FIN EXPRESS 1 511
514 HELMRH EUR_FIN EXPRESS 1 512
521 ADENRQ2 EUR_RED FAST 1 514
522 GPSTXTH EUR_RED EXPRESS 1 521
531 ADENRQ2 EUR_GRO FAST 1 514
532 GPSTXTH EUR_GRO EXPRESS 1 531
533 ADENRQ2 EUR_GRO FAST 1 532
541 GPSTRT EUR_LEO FAST 1 433
542 ADENRQ2 EUR_LEO FAST 1 514 541
543 GPSTXTH EUR_LEO EXPRESS 1 542
544 ADENRQ2 EUR_LE2 FAST 1 543
#
# Do weekly processing sequence at end of week (EOW)
# -----
# PID number 601 used in starting script
601 BPE_ROW EUR_ROW WAIT 1 522 533 544
602 STAJSTA EUR_ROW EXPRESS 1 601
603 STAJSTA EUR_ROW EXPRESS 1 601
611 ADENRQ2 EUR_ROW FAST 1 602 603
612 GPSTXTH EUR_ROW EXPRESS 1 611
614 HELMRH_7 EUR_ROW EXPRESS 1 612
621 ADENRQ2 EUR_SNX FAST 1 614
622 GPSTXTH EUR_SNX EXPRESS 1 621
623 SNK_REP EUR_SNX EXPRESS 1 622
631 TROGENAP EUR_TRO EXPRESS 1 623
632 TROGEN_P EUR_TRO FAST 1 631
633 GPSTXTH EUR_TRO EXPRESS 1 632
641 CRCTCW_7 EUR_CRO EXPRESS 1 633
#
# Compute daily and weekly repeatabilities using ADENRQ2
# -----
# - daily
651 ADENQ2MP EUR_RPO FAST 1 641
# - weekly
652 ADENQ2MP EUR_RW FAST 1 641
# - daily with gradients
653 ADENQ2MP EUR_RDG FAST 1 641
#
# Create summary file, save results, and delete files
# -----
901 EUR_SUM EUR_GEN EXPRESS 1 651 652 653
902 EUR_SAV EUR_GEN EXPRESS 1 901
903 EUR_DEL EUR_GEN EXPRESS 1 902
904 BPE_C10 EUR_GEN EXPRESS 1 903
#
# Distribute results
# -----
905 EUR_DIS EUR_GEN EXPRESS 1 904
#
# End of BPE
# -----
999 BPE_BYE EUR_GEN EXPRESS 1 905
#
#
```


BPE V5.0: EUREF.PCF Derived From RNX2SNX.PCF – Weekly Analysis Sequence

```
PID SCRIPT OPT_DIR CAMPAIGN CPU P WAIT FOR...
3** ***** g***** g***** 1 3** 3** 3** 3** 3** 3** 3**
#
# Copy required files and create a priori CRD file
# -----
001 EUR_COP EUR_GEN EXPRESS 1
002 COOVEL EUR_GEN EXPRESS 1 001
#
# Prepare pole, orbit, and clock information
# -----
101 POLJPO EUR_GEN EXPRESS 1 001
111 PRETAB EUR_GEN EXPRESS 1 101
112 ORBGEN EUR_GEN FAST 1 111
#
# Convert and synchronise observation data
# -----
201 RXNGRA EUR_GEN FAST 1 001
211 RXSVAP EUR_GEN EXPRESS 1 201
212 RXCBVA_P EUR_GEN FAST 1 211
213 RXCLM EUR_GEN EXPRESS 1 212
221 COOPPPAP EUR_GEN EXPRESS 1 002 112 213
222 COOPPP_P EUR_GEN FAST 1 221
223 COOPTH EUR_GEN EXPRESS 1 222
#
# Form baselines, preprocess and screen phase data, save cluster NEQ files
# -----
301 SNGDIP EUR_GEN FAST 1 223
311 HAUPPPAP EUR_GEN EXPRESS 1 301
312 HAUPPP_P EUR_GEN FAST 1 311
313 MPKXTH EUR_GEN EXPRESS 1 312
321 GPSUTAP EUR_GEN EXPRESS 1 313
322 GPSRDT_P EUR_RPT FAST 1 321
331 GPSXTR EUR_GEN EXPRESS 1 322
#
# Compute ambiguity-fixed network solution, resolve phase ambiguities
# -----
401 ACNREQ2 EUR_GEN FAST 1 331
402 GPXTH EUR_GEN EXPRESS 1 401
411 SATNRS EUR_AMB EXPRESS 1 402
412 GPSL12AP EUR_L12 EXPRESS 1 411
413 GPSL12_P EUR_L12 FAST 1 412
421 GPSQIFAP EUR_QIF EXPRESS 1 413
422 GPSQIF_P EUR_QIF FAST 1 421
431 GPSL12AP EUR_L12 EXPRESS 1 422
432 GPSL12_P EUR_L12 FAST 1 431
433 ANKXTH EUR_AMB EXPRESS 1 432
#
# Compute ambiguity-fixed network solution, create final NEQ/SNX/TRO files
# -----
501 GPSRST EUR_FIN FAST 1 433
511 ACNREQ2 EUR_FIN FAST 1 501
512 GPXTH EUR_FIN EXPRESS 1 511
514 HELMR1 EUR_FIN EXPRESS 1 512
521 ACNREQ2 EUR_RPD FAST 1 514
522 GPXTH EUR_RPD EXPRESS 1 521
531 ACNREQ2 EUR_GRO FAST 1 514
532 GPXTH EUR_GRO EXPRESS 1 531
533 ACNREQ2 EUR_GRO FAST 1 532
541 GPSRST EUR_LED FAST 1 433
542 ACNREQ2 EUR_LED FAST 1 514 541
543 GPXTH EUR_LED EXPRESS 1 542
544 ACNREQ2 EUR_LED FAST 1 543
#
# Do weekly processing sequence at end of week (EOW)
# -----
# PID number 601 used in starting script
601 BPE_EOW EUR_EOW WAIT 1 522 533 544
602 STA2STA EUR_EOW EXPRESS 1 601
603 STA2STA EUR_EOW EXPRESS 1 601
611 ACNREQ2 EUR_EOW FAST 1 602 603
612 GPXTH EUR_EOW EXPRESS 1 611
614 HELMR1_7 EUR_EOW EXPRESS 1 612
621 ACNREQ2 EUR_SNX FAST 1 614
622 GPXTH EUR_SNX EXPRESS 1 621
623 SNX_REP EUR_SNX EXPRESS 1 622
631 TROGENAP EUR_TRO EXPRESS 1 623
632 TROGEN_P EUR_TRO FAST 1 631
633 GPXTH EUR_TRO EXPRESS 1 632
641 CRDCHK_7 EUR_CRD EXPRESS 1 633
#
# Compute daily and weekly repeatabilities using ADDNEQ2
# -----
# - daily
651 ADDNQ2MP EUR_RPD FAST 1 641
# - weekly
652 ADDNQ2MP EUR_RPW FAST 1 641
# - daily with gradients
653 ADDNQ2MP EUR_RDG FAST 1 641
#
# Create summary file, save results, and delete files
# -----
901 EUR_SUM EUR_GEN EXPRESS 1 651 652 653
902 EUR_SAV EUR_GEN EXPRESS 1 901
903 EUR_DEL EUR_GEN EXPRESS 1 902
904 BPE_CLO EUR_GEN EXPRESS 1 903
#
# Distribute results
# -----
905 EUR_DIS EUR_GEN EXPRESS 1 904
#
# End of BPE
# -----
999 BPE_BYE EUR_GEN EXPRESS 1 905
#
#
```

```
#
# Do weekly processing sequence at end of week (EOW)
# -----
# PID number 601 used in starting script
601 BPE_EOW EUR_EOW WAIT 1 522 533 544
602 STA2STA EUR_EOW EXPRESS 1 601
603 STA2STA EUR_EOW EXPRESS 1 601
611 ADDNEQ2 EUR_EOW FAST 1 602 603
612 GPSXTR EUR_EOW EXPRESS 1 611
614 HELMR1_7 EUR_EOW EXPRESS 1 612
621 ADDNEQ2 EUR_SNX FAST 1 614
622 GPSXTR EUR_SNX EXPRESS 1 621
623 SNX_REP EUR_SNX EXPRESS 1 622
631 TROGENAP EUR_TRO EXPRESS 1 623
632 TROGEN_P EUR_TRO FAST 1 631
633 GPSXTR EUR_TRO EXPRESS 1 632
641 CRDCHK_7 EUR_CRD EXPRESS 1 633
#
# Compute daily and weekly repeatabilities using ADDNEQ2
# -----
# - daily
651 ADDNQ2MP EUR_RPD FAST 1 641
# - weekly
652 ADDNQ2MP EUR_RPW FAST 1 641
# - daily with gradients
653 ADDNQ2MP EUR_RDG FAST 1 641
```

BPE V5.0: EUREF.PCF Derived From RNX2SNX.PCF – Ambiguity Resolution Scheme

```
PID SCRIPT OPT_DIR CAMPAIGN CPU P WAIT FOR...
3** ***** ***** ***** 1 3** 3** 3** 3** 3** 3** 3**
#
# Copy required files and create a priori CRD file
# -----
001 EUR_COP EUR_GEN EXPRESS 1
002 COOVEL EUR_GEN EXPRESS 1 001
#
# Prepare pole, orbit, and clock information
# -----
101 POLJPO EUR_GEN EXPRESS 1 001
111 PRETAB EUR_GEN EXPRESS 1 101
112 ORGREN EUR_GEN FAST 1 111
#
# Convert and synchronize observation data
# -----
201 RONGRA EUR_GEN FAST 1 001
211 RKNVAP EUR_GEN EXPRESS 1 201
212 RKNBVL_P EUR_GEN FAST 1 211
213 RNCDEL EUR_GEN EXPRESS 1 212
221 COOSPPAP EUR_GEN EXPRESS 1 002 112 213
222 COOSPP_P EUR_GEN FAST 1 221
223 COONTH EUR_GEN EXPRESS 1 222
#
# Form baselines, preprocess and screen phase data, save cluster NQD files
# -----
301 SNGDIF EUR_GEN FAST 1 223
311 HAUPRPAP EUR_GEN EXPRESS 1 301
312 HAUPRP_P EUR_GEN FAST 1 311
313 MPKXTR EUR_GEN EXPRESS 1 312
321 GPSRTAP EUR_GEN EXPRESS 1 313
322 GPSRTD_P EUR_GEN FAST 1 321
331 GPSCTW EUR_GEN EXPRESS 1 332
#
# Compute ambiguity-float network solution, resolve phase ambiguities
# -----
401 ADDNEQ2 EUR_GEN FAST 1 331
402 GPSXTR EUR_GEN EXPRESS 1 401
411 SATMRK EUR_AMB EXPRESS 1 402
412 GPSL53AP EUR_L53 EXPRESS 1 411
413 GPSL53_P EUR_L53 FAST 1 412
421 GPSQIFAP EUR_QIF EXPRESS 1 413
422 GPSQIF_P EUR_QIF FAST 1 421
431 GPSL12AP EUR_L12 EXPRESS 1 422
432 GPSL12_P EUR_L12 FAST 1 431
433 AMBXTR EUR_AMB EXPRESS 1 432
#
# Do weekly processing sequence at end of week (EOW)
# -----
# PID number 601 used in starting script
601 RPE_ROW EUR_ROW WAIT 1 522 533 544
602 STA2STA EUR_ROW EXPRESS 1 601
603 STA2STA EUR_ROW EXPRESS 1 601
611 ADDNEQ2 EUR_ROW FAST 1 602 603
612 GPSXTR EUR_ROW EXPRESS 1 611
614 HELMHL_7 EUR_ROW EXPRESS 1 612
621 ADDNEQ2 EUR_SNK FAST 1 614
622 GPSXTR EUR_SNK EXPRESS 1 621
623 SNG_REP EUR_SNK EXPRESS 1 622
631 TROGRENAP EUR_TR0 EXPRESS 1 623
632 TROGREN_P EUR_TR0 FAST 1 631
633 GPSXTR EUR_TR0 EXPRESS 1 632
641 CROCTW_7 EUR_CRO EXPRESS 1 633
#
# Compute daily and weekly repeatabilities using ADDNEQ2
# -----
# - daily
651 ADDNG2MP EUR_RPO FAST 1 641
# - weekly
652 ADDNG2MP EUR_ROW FAST 1 641
# - daily with gradients
653 ADDNG2MP EUR_RDG FAST 1 641
#
# Create summary file, save results, and delete files
# -----
901 EUR_SUM EUR_GEN EXPRESS 1 651 652 653
902 EUR_SAV EUR_GEN EXPRESS 1 901
903 EUR_DEL EUR_GEN EXPRESS 1 902
904 RPE_CLO EUR_GEN EXPRESS 1 903
#
# Distribute results
# -----
905 EUR_DIS EUR_GEN EXPRESS 1 904
#
# End of BPE
# -----
999 RPE_BYE EUR_GEN EXPRESS 1 905
#
```

```
#
# Compute ambiguity-float network solution, resolve phase ambiguities
# -----
401 ADDNEQ2 EUR_GEN FAST 1 331
402 GPSXTR EUR_GEN EXPRESS 1 401
411 SATMRK EUR_AMB EXPRESS 1 402
412 GPSL53AP EUR_L53 EXPRESS 1 411
413 GPSL53_P EUR_L53 FAST 1 412
421 GPSQIFAP EUR_QIF EXPRESS 1 413
422 GPSQIF_P EUR_QIF FAST 1 421
431 GPSL12AP EUR_L12 EXPRESS 1 422
432 GPSL12_P EUR_L12 FAST 1 431
433 AMBXTR EUR_AMB EXPRESS 1 432
```

BPE V5.0: EUREF.PCF Derived From RNX2SNX.PCF – Preparing PERL Scripts

```
PID SCRIPT OPT_DIR CAMPAIGN CPU P WAIT FOR....
3** 8***** 8***** 8***** 8***** 1 3** 3** 3** 3** 3**

# Copy required files and create a priori CRD file
# -----
001 EUR_COP EUR_GEN EXPRESS 1
002 COOVEL EUR_GEN EXPRESS 1 001
# -----

# Prepare final, ready-to-use CRD information
# -----
101 POLIPO EUR_GEN EXPRESS 1 001
111 PRETAB EUR_GEN EXPRESS 1 101
112 ORIGIN EUR_GEN FAST 1 111
# -----
# Convert and synchronize observation data
# -----
201 RINGRA EUR_GEN FAST 1 001
211 RINGVAP EUR_GEN EXPRESS 1 201
212 RINGVAP_P EUR_GEN FAST 1 211
213 RINGVAP_P EUR_GEN EXPRESS 1 212
221 COOPPPAP EUR_GEN EXPRESS 1 002 112 213
222 COOPPP_P EUR_GEN FAST 1 221
223 COOPTR EUR_GEN EXPRESS 1 222
# -----
# Form baselines, preprocess and screen phase data, save cluster NEQ files
# -----
301 SNGDIP EUR_GEN FAST 1 223
311 HAUPHAP EUR_GEN EXPRESS 1 301
312 HAUPHAP_P EUR_GEN FAST 1 311
313 HAUPHAP_P EUR_GEN EXPRESS 1 312
321 GPRSTAP EUR_GEN EXPRESS 1 313
322 GPRST_P EUR_GEN FAST 1 321
331 GPRCTW EUR_GEN EXPRESS 1 322
# -----
# Compute ambiguity-fixed network solution, resolve phase ambiguities
# -----
401 ADENRQ2 EUR_GEN FAST 1 331
402 GPRCTH EUR_GEN EXPRESS 1 401
411 SATMRK EUR_AMB EXPRESS 1 402
412 GPSL53AP EUR_L53 EXPRESS 1 411
413 GPSL53_P EUR_L53 FAST 1 412
421 GPSQIFAP EUR_QIF EXPRESS 1 413
422 GPSQIF_P EUR_QIF FAST 1 421
431 GPSL12AP EUR_L12 EXPRESS 1 422
432 GPSL12_P EUR_L12 FAST 1 431
433 AMRQTH EUR_AMB EXPRESS 1 432
# -----
# Compute ambiguity-fixed network solution, create final NEQ/SNX/TRX files
# -----
501 GPRST EUR_FIN FAST 1 433
511 ADENRQ2 EUR_FIN FAST 1 501
512 GPRCTH EUR_FIN EXPRESS 1 511
514 HELMR1 EUR_FIN EXPRESS 1 512
521 ADENRQ2 EUR_RED FAST 1 514
522 GPRCTH EUR_RED EXPRESS 1 521
531 ADENRQ2 EUR_GSD FAST 1 514
532 GPRCTH EUR_GSD EXPRESS 1 531
533 ADENRQ2 EUR_GSD FAST 1 532
541 GPRST EUR_LED FAST 1 433
542 ADENRQ2 EUR_LED FAST 1 514 541
543 GPRCTH EUR_LED EXPRESS 1 542
544 ADENRQ2 EUR_LEZ FAST 1 543
# -----
# Do weekly processing sequence at end of week (EOW)
# -----
# PID number 601 used in starting script
601 RPE_ROW EUR_ROW WAIT 1 522 533 544
602 STAJSTA EUR_ROW EXPRESS 1 601
603 STAJSTA EUR_ROW EXPRESS 1 601
611 ADENRQ2 EUR_ROW FAST 1 602 603
612 GPRCTH EUR_ROW EXPRESS 1 611
614 HELMR1_7 EUR_ROW EXPRESS 1 612
621 ADENRQ2 EUR_SNX FAST 1 614
622 GPRCTH EUR_SNX EXPRESS 1 621
623 SNK_REP EUR_SNX EXPRESS 1 622
631 TROGSRAP EUR_TR0 EXPRESS 1 623
632 TROGSR_P EUR_TR0 FAST 1 631
633 GPRCTH EUR_TR0 EXPRESS 1 632
641 CRCTW_7 EUR_CRD EXPRESS 1 633
# -----
# Compute daily and weekly repeatabilities using ADENRQ2
# -----
# - daily
651 ADENQ2MP EUR_RPO FAST 1 641
# - weekly
652 ADENQ2MP EUR_ROW FAST 1 641
# - daily with gradients
653 ADENQ2MP EUR_RDG FAST 1 641
# -----
# Create summary file, save results, and delete files
# -----
901 EUR_SUM EUR_GEN EXPRESS 1 651 652 653
902 EUR_SAV EUR_GEN EXPRESS 1 901
903 EUR_DEL EUR_GEN EXPRESS 1 902
904 RPE_C10 EUR_GEN EXPRESS 1 903
# -----
# Distribute results
# -----
905 EUR_DIS EUR_GEN EXPRESS 1 904
# -----
# End of RPE
# -----
999 RPE_BYE EUR_GEN EXPRESS 1 905
# -----
#
```

```
PID SCRIPT OPT_DIR CAMPAIGN CPU P WAIT FOR....
3** 8***** 8***** 8***** 8***** 1 3** 3** 3** 3** 3** 3**
#
# Copy required files and create a priori CRD file
# -----
001 EUR_COP EUR_GEN EXPRESS 1
002 COOVEL EUR_GEN EXPRESS 1 001
```

BPE V5.0: EUREF.PCF Derived From RNX2SNX.PCF – Preparing PERL Scripts

```
PID SCRIPT OPT_DIR CAMPAIGN CPU P WAIT FOR....
3** 8***** 8***** 8***** 8***** 1 3** 3** 3** 3** 3** 3**

# Copy required files and create a priori CRD file
# -----
001 EUR_COP EUR_GEN EXPRESS 1
002 COOVEL EUR_GEN EXPRESS 1 001
# -----

# Prepare daily orbit and clock information
# -----
101 POLJPO EUR_GEN EXPRESS 1 001
111 PRETAN EUR_GEN EXPRESS 1 101
112 ORNGEN EUR_GEN FAST 1 111
# -----
# Convert and synchronise observation data
# -----
201 RONGRA EUR_GEN FAST 1 001
211 RKNVAP EUR_GEN EXPRESS 1 201
212 RKNVLA_P EUR_GEN FAST 1 211
213 RKNVLA EUR_GEN EXPRESS 1 212
221 COGSPAP EUR_GEN EXPRESS 1 002 112 213
222 COGSP_P EUR_GEN FAST 1 221
223 COGTH EUR_GEN EXPRESS 1 222
# -----
# Form baselines, preprocess and screen phase data, save cluster NQ files
# -----
301 SNGDIP EUR_GEN FAST 1 223
311 HAUPRAP EUR_GEN EXPRESS 1 301
312 HAUPRP_P EUR_GEN FAST 1 311
313 HPRXTH EUR_GEN EXPRESS 1 312
321 GPRCTAP EUR_GEN EXPRESS 1 313
322 GPRCT_P EUR_GEN FAST 1 321
331 GPRCTW EUR_GEN EXPRESS 1 322
```

```
PID SCRIPT OPT_DIR CAMPAIGN CPU P WAIT FOR....
3** 8***** 8***** 8***** 8***** 1 3** 3** 3** 3** 3** 3**

#
# Copy required files and create a priori CRD file
# -----
001 EUR_COP EUR_GEN EXPRESS 1
002 COOVEL EUR_GEN EXPRESS 1 001
```

```
# Prepare reference files
# -----
system("$ENV{X}/AUTO/get_gendata.pl");
system("$ENV{X}/AUTO/copyRef.pl ${dirCrd}.. $crdInf REF$yyssss");

# Prepare orbit/ERP info
# -----
system("$ENV{X}/AUTO/get_orbdata.pl -t igs -d $ddd -y $yyyy");
system("$ENV{X}/AUTO/put_orbdata.pl -t igs -c $dirPre -o $b -s $yyssss");

# Prepare daily RINEX data
# -----
system("$ENV{X}/AUTO/get_obsdata.com -d=$ddd");
system("$ENV{X}/AUTO/put_data.pl $yy $ssss %EUR $dirRxo");
```