

*Mult-disciplinary EUREF Products*

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# Status of the EUREF Combination Solutions

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EUREF Analysis workshop

Sept. 9.-10.1999, IGN-Marne la Vallee, France

# Content

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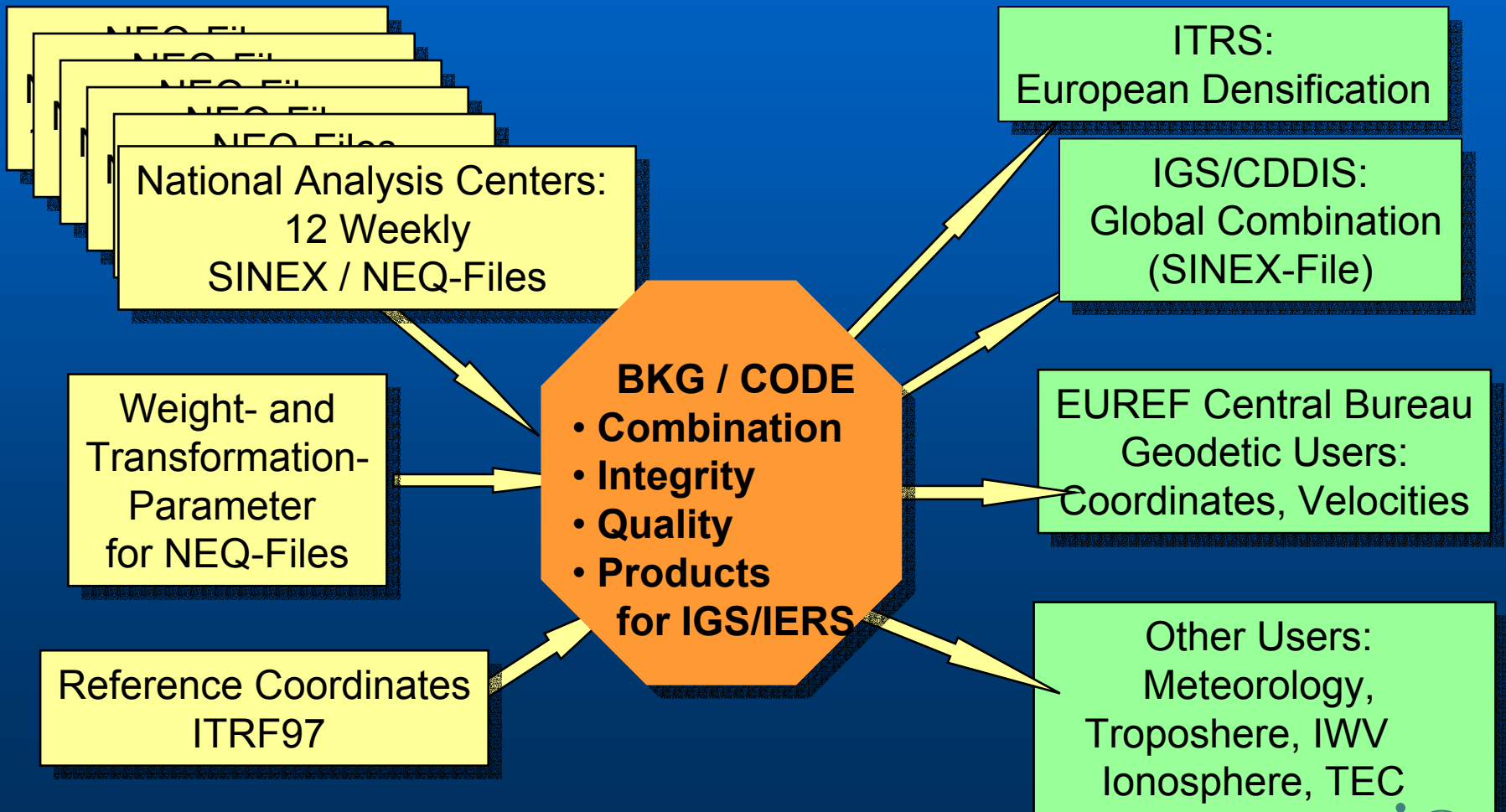
- Introduction
- Strategy
- Quality checks
- ITRF 97 / Fixing
- Problems
- Changes / Outlook

# Introduction / History

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- October 1998: discussion of CODE/AIUB and BKG about sharing of tasks
- First informative talks to EUREF TWG and president
- January 1999 training of BKG staff in Berne UNIX scripts
- Approval of switch at EUREF-meeting in Prague, June 3 to 5, 1999
- Parallel processing from GPS week 1000 till 1020.
- Since GPS week 1020 processing at BKG
- Close contact to AIUB maintained

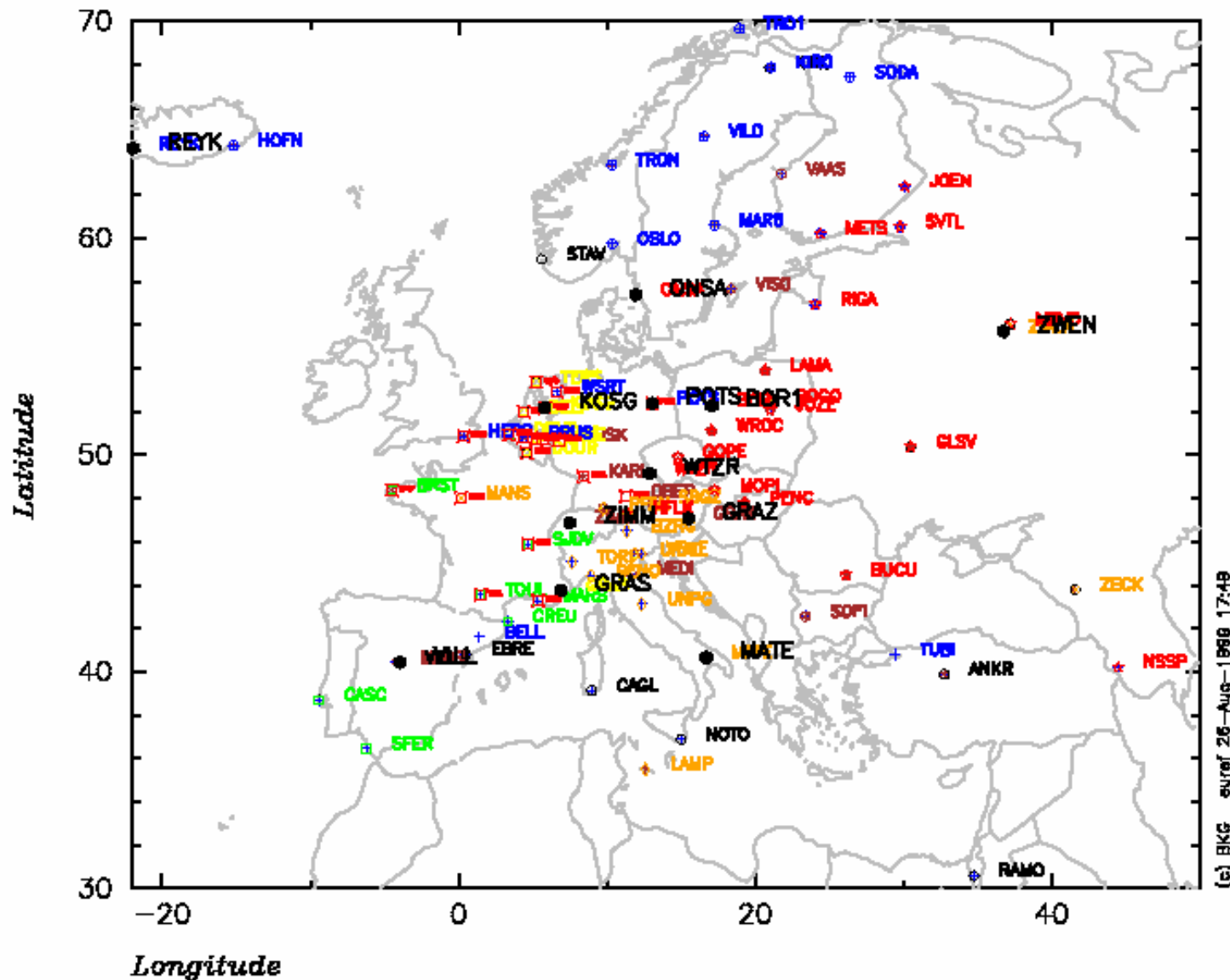
# European Combination Solution



# Weekly Combination Procedure

- Combination of 12 loosely constrained sub-networks
- Equal weights for all solutions by covariance rescaling
- **EUN**: Combination with Helmert condition  
(3 translations) for quality assessment  
=> **EUR-Summary** (rms)
- **EUS**: Combination with ITRF97 fixing of 14 sites  
=> **EUR-SINEX** solution
- **EUW**: Combination of last 7 weeks for quality checks
- Iterative procedure
- Products available at ROB and BKG (AIUB no more)
- Results distributed to CDDIS, EUREF-Mail

# EUREF Network, August 1999



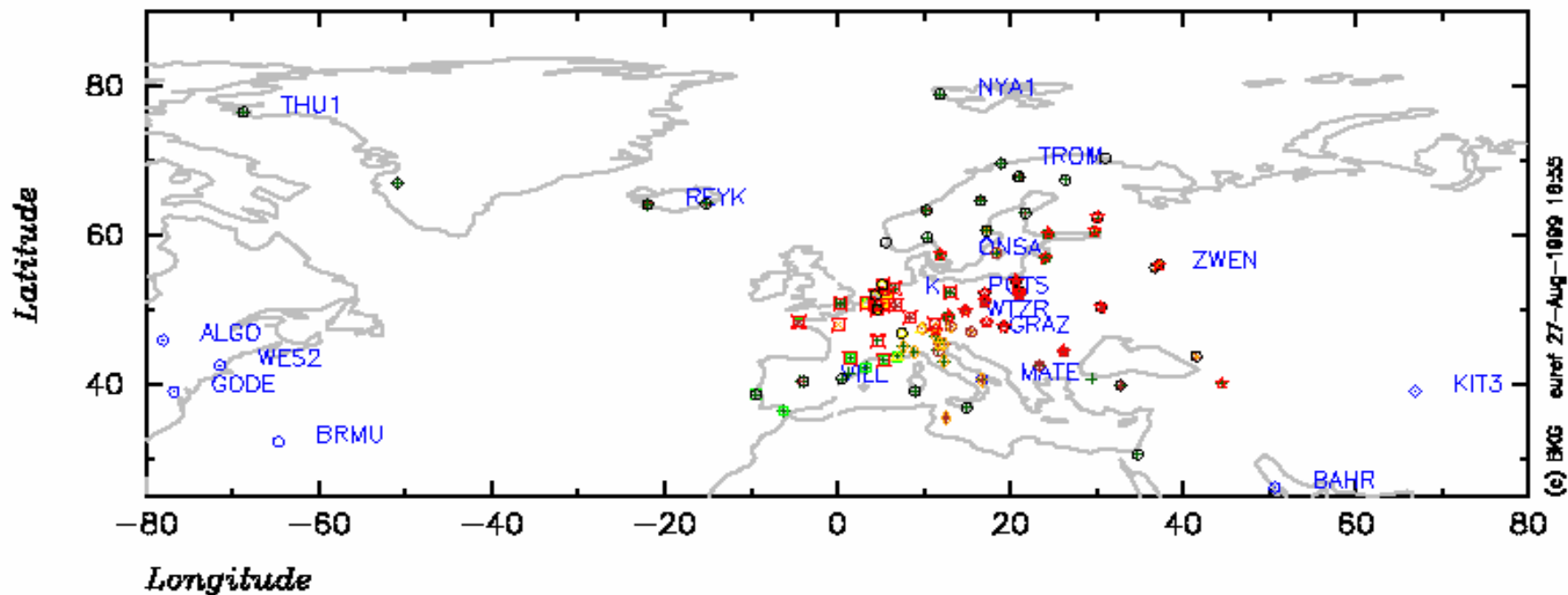
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# Status of Network

- GPS week 1022, No. of sites: 77
- Total in 7 week comparison: 83
- ITRF97 datum sites fixed 14 (12-1+3)
- RMS of combination: .8 / 1. / 3.5 mm
- Sites evaluated by two Analysis Centers 21
- Sites evaluated by three Analysis Centers 50
- Sites evaluated by four Analysis Centers 4
- No. of eliminations due to large rms: 1-3
- No. of eliminations due to site problems .5  
(antenna changes, data-gap, ... )

# IGS Core Stations in ITRF97

IGS Core Stations for fixing in EUROPE



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# Fit to Datum Sites in ITRF97

FILE 1: ITRF97 EPOCH 1997.0 GENERATED FROM ITRF97\_GPS.SNX

FILE 2: EUREF COMBINATION GPSWEEK 1021, EUROPE

RESIDUALS IN LOCAL SYSTEM (NORTH, EAST, UP)

NUM	NAME	FLG	RESIDUALS IN MILLIMETERS			
101	GRAS 10002M006	I N	-1.3	-.8	-10.2	
103	REYK 10202M001	I M	.3	-1.3	23.1	M
105	TRO1 10302M006	I M	4.3	4.5	14.2	M
107	NYA1 10317M003	I N	-1.7	3.6	-8.7	
111	ONSA 10402M004	I N	1.5	.9	16.5	
121	GRAZ 11001M002	I N	-.1	1.0	-3.7	
128	BOR1 12205M002	I N	-.2	-2.9	-3.4	
135	ZWEN 12330M001	I N	3.0	2.4	-.4	
144	MATE 12734M008	I N	3.2	-.9	-1.1	
153	VILL 13406M001	I N	-3.0	-1.4	-.6	
157	KOSG 13504M003	I N	-.6	-.7	7.2	
159	ZIMM 14001M004	I M	-2.4	-3.4	16.9	M
160	POTS 14106M003	I N	-.1	1.6	6.2	
161	WTZR 14201M010	I N	-1.8	.7	-2.1	
431	THU1 43001M001	I N	-1.3	-.6	.4	
	RMS / COMPONENT		1.9	1.8	7.2	

NUMBER OF PARAMETERS:7 NUMBER OF COORDINATES:36 RMS OF TRANSFORMATION:4.7 MM

# Effect of fixing on Network small:

- 1 OLD SET OF FIXSTATIONS, 12 INCL ZIMM
- 2 NEW SET OF FIXSTATIONS, 14 INCL REYK, THU1, TRO1
- 3 NEW SET OF FIXSTATIONS, 12 NO REYK, TRO1

	North			East			Up		
F F F WTZR	.0	.0	.0	.0	.0	.0	.0	.0	.0
.0									
F MM ZIMM	-1.3	.8	.5	-2.5	1.3	1.2	13.5	-7.0	-6.5
MMM ANKR	.1	.0	-.1	-.6	.5	.0	.0	-.3	.2
MMM VENE	-.1	.1	.0	-.6	.4	.2	.2	.9	-.6
-.3									
M F F THU1	-.7	.4	.4		.4	-.2	-.2		-1.8
.9 .9									
M FM TRO1	-.9	2.2	-1.2	-2.5	3.9	-1.3		-3.7	8.5
4.8									
M F F NYA1	1.4	7	7	1.9	2.1	2.1		1.9	2.1

# Differences between AC's

EUN							
BZRG	N	1.9	2.2	-1.4	...	-.1	
	E	1.7	-2.4	-.3	...	-.2	
	U	8.1	-1.0	-2.3	...	11.2	
CAGL	N	1.2	-1.3	.0		1.1	
	E	2.6	3.6	-.3		-.9	
	U	4.3	3.5	-1.4		-4.7	
VENE	N	.4	.2	-.5	...	.3	.4
	E	2.9	-4.9	-1.4	...	.3	.3
	U	11.2	-1.8	-15.9	...	9.6	-5.0
WTZR	N	.5	.3	-.4	...	.6	-.2
	E	.7	.8	.1	...	.9	-.5
	U	4.5	5.7	1.1	...	-1.3	5.0
ANKR	N	.7	.1	-.2		-.9	
	E	1.4	1.7	-1.0		.2	
	U	2.5	2.6	2.5		.6	

Loosely  
constrained  
solution  
EUN1021

# Differences between AC's

## EUS10227

BZRG	N	2.5	3.5	-8	...	.5
	E	5.6	-7.8	-1.4		-.1
	U	9.0	-3.6	-11.1		5.0

CAGL	N	1.6	1.4	.2		-1.8
	E	1.9	-1.1	-2.0		1.4
	U	9.0	5.0	-7.7		-8.9

VENE	N	2.7	2.3	.5	...	-3.7	1.7
	E	6.3	-10.5	-2.7	...	-.4	.0
	U	16.9	-3.7	-24.1	...	12.8	-10.1

CASC	N	5.7	1.8		-3.3	-7.1
	E	10.6	-1.2		.7	-14.9
	U	18.8	-10.3		-5.4	-23.9

MARS	N	1.8	1.7			-.4	-1.8
	E	3.0	-3.6			-2.0	1.1
	U	16.2	-11.8			19.4	-3.0

Fixed  
solution  
EUS1021

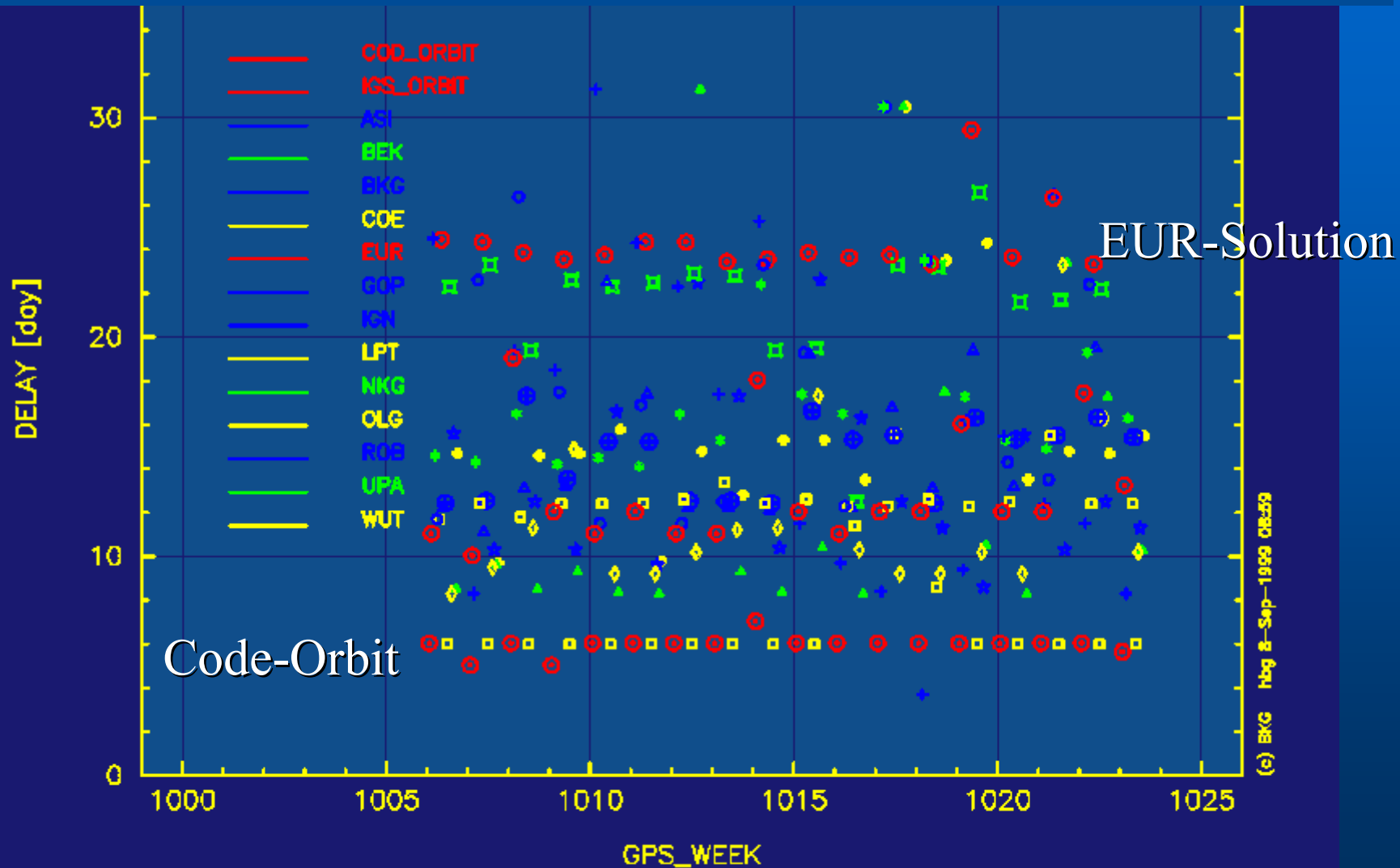
# Problems

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- Site specific problems: e.g. VENE , Nordic Sites, HERS
- AC specific problems:
  - offsets of AC solution ?
  - processing strategy of AC  
( Orbits used, a-priory sigma, elev. cutoff)
  - fixing sites included (1,2, ...)
- Quality control: Helmert transformation not always ok
- Processing times, time delay in SNX delivery

# Delivery of Products:

Arrival time at BKG after end of GPS week



# Changes / Outlook

- Basically no changes in strategy at present
- Improvement in quality control
- Feedback to AC's
- Improvement in delivery, 4->3 weeks- if necessary ?

## *Future issues*

- Subdivision of EUREF-Maximum number of sites?
- Inclusion of other permanent networks  
(tide gauges, meteorology...)
- New products, new software, relation to GNAAC's