eurst **EPN Network Coordination**

C. Bruyninx, G. Carpentier, F. Roosbeek, EPN Central Bureau, Royal Observatory of Belgium

Introduction

The EUREF Permanent Network (EPN) is a science driven network of permanent GPS stations whose weekly computed positions are used by EUREF (subcommission of the IAG) to realize the ETRS89 (European Terrestrial Reference System).

More than 150 EPN stations, distributed over 32 countries, provide in near real-time high quality GPS data archived at local and regional data centres. Sixteen EPN analysis centres routinely analyse the data from this network and deliver to the GPS community precise coordinates for all stations involved in the network.

Since the EPN network is the European densification of the International GPS Service (IGS), a complete harmonisation of standards between the global and European network is put forward.

The EPN Central Bureau (CB) is responsible for the day-to-day general management of the EUREF Permanent Network consistent with the directives, policies and priorities set up by the EUREF Technical Working Group. This poster gives an overview of the activities of the EPN CB, such as :

- Coordination of the introduction of new sites into the network, and determination of station status
- Stimulate the EPN community to deliver highest quality, reliable GPS data by continuously performing quality controls on all data
- Stimulate the EPN community to deliver near real-time and real-time observations by continuously monitoring the EPN data flow
- Maintain and continuously update the EPN CB web site with all information about sites, centres, networks, data flow, data quality, data holdings, product generation, product available
- Perform a long-term coordination role to ensure that EUREF participants contribute to the service in a consistent and continuous manner and adhere to EUREF standards

EPN CB web site : http://www.epncb.oma.be/

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<u>Guidelines for EPN stations (latest updates)</u>

For new stations :

- A *letter stating the long-term commitment* (at least 5 years) has to be sent to the EPN CB.
- A *minimal distance of 300 km* to already existing EPN stations is required. Exceptions to this rule are possible for EPN stations submitting hourly data or contributing to EPN Special Projects (EUREF-IP Project, European Combined Geodetic Network Project, Time Series Project).

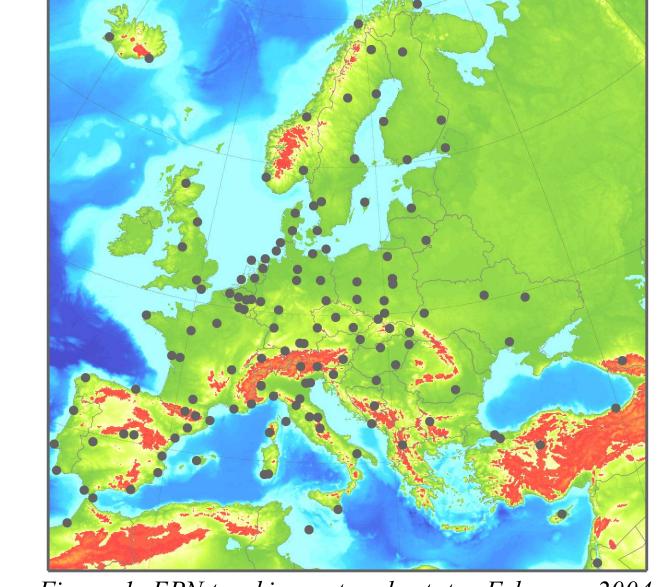
Monitoring of meta-data

The EPN CB makes available a calendar that an overview of the *errors in the* headers of RINEX observation files with respect to the information in the site log sheets. Calendars are available from January 1998 on. This information is extremely usefull for the reprocessing of old data.

Monitoring of the hourly data flow

61 % of the EPN stations deliver hourly data. In order to stimulate these stations to deliver data with a minimal latency, we monitor the hourly data flow in permanence by checking the availability of the hourly data in the different EPN data centres.





For existing stations :

- Stations not part of combined EPN solution for more than 3 months are labelled as inactive. Inactive stations can recover the operational status when they fulfil the EPN requirements again.
- Hourly tracking stations can optionally *stop supplementary daily data transfer* should be done after approval of data centre.

Site log submission and testing

EPN site logs may be tested using an automatic email system (epncbslt@oma.be) which will parse the log and reply to the sender giving him the result of the test.

EPN site logs may be submitted also to an automatic email system (epncbsls@oma.be) which will parse the log, reply to the sender and install it in the EPN CB data base if the format is compliant.

Each site log updates are automatically followed by an update of the EPN SINEX template and all associated files.

_egend:		
No data	available	

vo data avallad No error

Small error (RINEX header error with negligible impact on data analysis : rec. firmware vers., rec. serial nbr Major error (RINEX header error with impact on data analysis : marker name, marker number, rec. name,

ant, name and N.E.U eccentricity.)

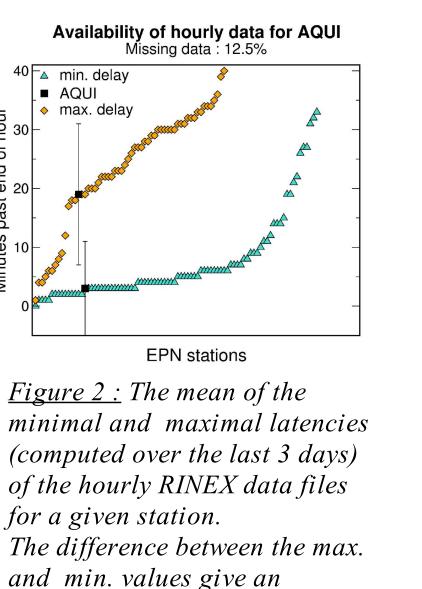
TLSE_10003M009 inconsistencies for 2002 (previous year)

January 2003								February 2003							
Wk nr	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Wknr	Sun	Mon	Tue	Wed	Thu	Fri	Sat
1199				01 - 001	02 - 002	03 - 003	04 - 004	1203							01 - 032
1200	05 - 005	06 - 006	07 - 007	08 - 008	09 - 009	10 - 010	11 - 011	1204	02 - 033	03 - 034	04 - 035	05 - 036	06 - 037	07 - 038	08 - 039
1201	12 - 012	13 - 013	14 - 014	15 - 015	16 - 016	17 - 017	18 - 018	1205	09 - 040	10 - 041	11 - 042	12 - 043	13 - 044	14 - 045	15 - 046
1202	19 - 019	20 - 020	21 - 021	22 - 022	23 - 023	24 - 024	25 - 025	1206	16 - 047	17 - 048	18 - 049	19 - 050	20 - 051	21 - 052	22 · 053
1203	26 - 026	27 - 027	28 - 028	29 - 029	30 - 030	31 - 031		1207	23 - 054	24 - 055	25 - 056	26 - 057	27 - 058	28 - 059	

March 2003									April 2003						
Wk nr	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Wknr	Sun	Mon	Tue	Wed	Thu	Fri	Sat
1207				_			01 - 060	1212			01 - 091	02 - 092	03 - 093	04 - 094	05 - 095
1208	02 - 061	03 - 062	04 - 063	05 - 064	06 - 065	07 - 066	08 - 067	1213	06 - 096	07 - 097	08 - 098	09 - 099	10 - 100	11 - 101	12 - 102
1209	09 - 068	10 - 069	11 - 070	12 - 071	13 - 072	14 - 073	15 - 074	1214	13 - 103	14 - 104	15 - 105	16 - 106	17 - 107	18 - 108	19 - 109
1210	16 - 075	17 - 076	18 - 077	19 - 078	20 - 079	21 - 080	22 - 081	1215	20 - 110	21 - 111	22 - 112	23 - 113	24 - 114	25 - 115	26 - 116
1211	23 - 082	24 - 083	25 - 084	26 - 085	27 - 086	28 - 087	29 - 088	1216	27 - 117	28 - 118	29 - 119	30 - 120			
1212	30 - 089	31 - 090	_												

<u>Table 1:</u> Calendar that gives an overview of the inconsistencies between the *RINEX header and site log file.*





indication on how much time it

takes for the hourly data of that

station to get distributed among

its EPN data centres.

ectronic Mail 10-Feb-2004 10:15:04 UTC Me

Author: EPN CB/Bruyninx (Subject: EPN hourly data latency - January 2004

(for sliding window analysis) and should be deliverd as quickly as possible

Hourly RINEX data files delivered after onsidered as missing. After this delay, only INEX files can be submitted

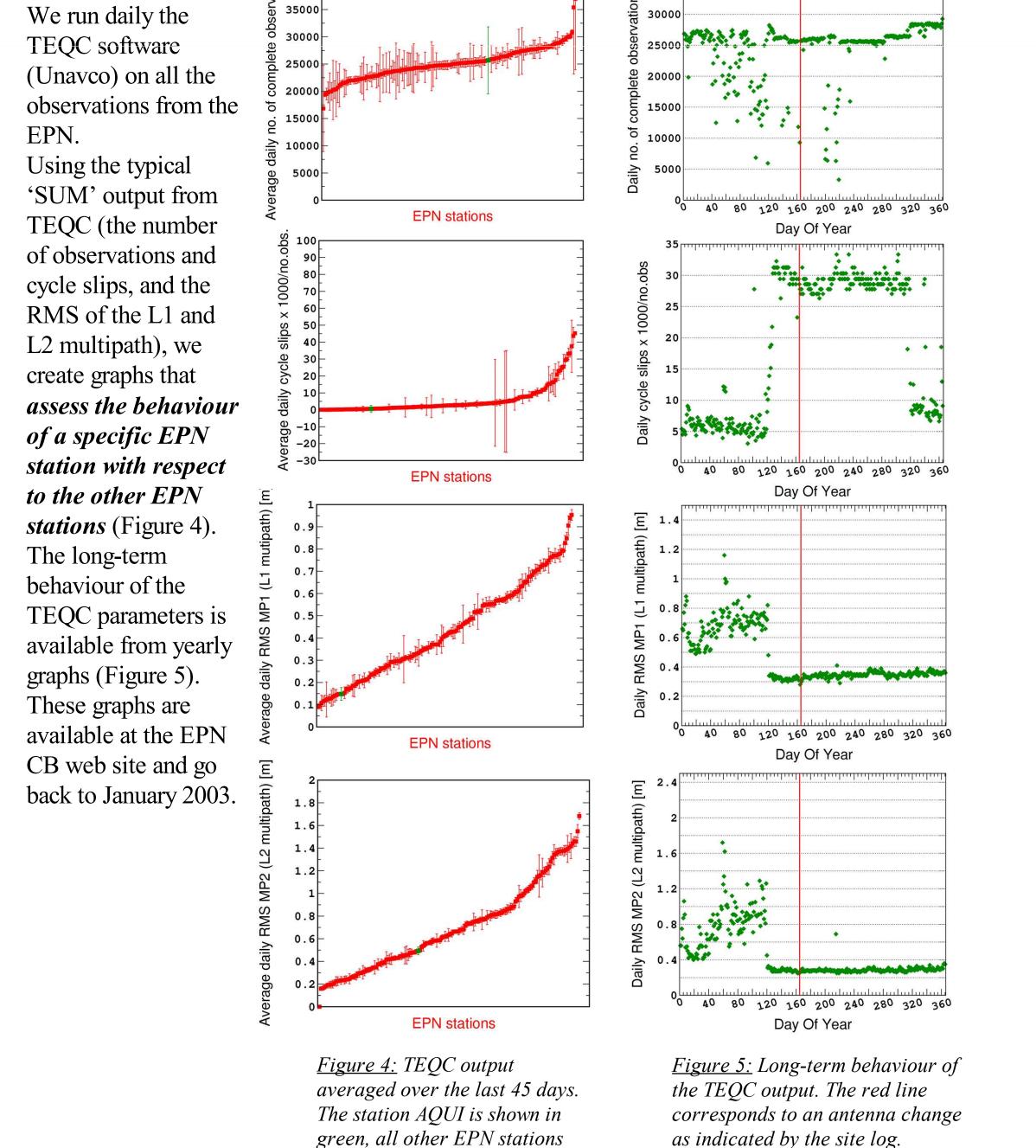
January 2004 (DOY 001/2004 --> 031/2004)

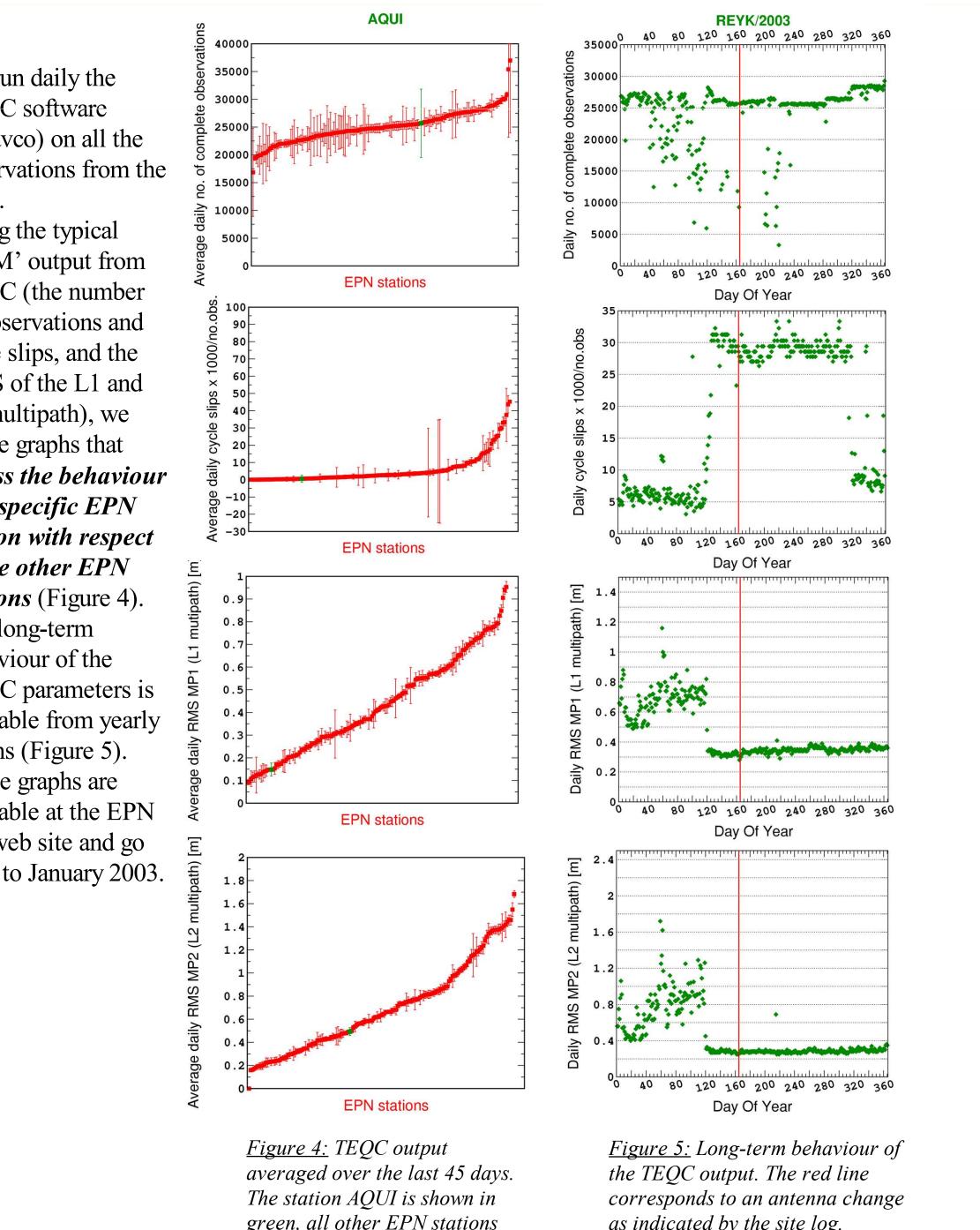
I	10	0m-04m 0	5m-09m .	10m-59m 0	01h-24h 0	10-0301	03d-mis
ACOR	I	1	1	1	1	1	100%
AJAC	I		1	I	I	1	100%
ALAC	Т	1	1	1		1	100%
ALME	Т	1	1	1		1	100%
ANKR	Т	1	1	1		1	100%
AQUI	Т	77%	13%	18	6 %	1	2%
BELL	Т	1	1	1		1	100%
BOGI	Т	1	68%	3%	12%	1	17%
BOGO	Т	76%	1%	0%	14%	1	10%
BOR1	Т	98%	18	18	1	1	
BORK	Т	10%	86%	3%	1%	1	0%
BRST	Ι	1	1	34%	62%	I	4 %
BRUS	1	97%	0%	1%	1%	1	

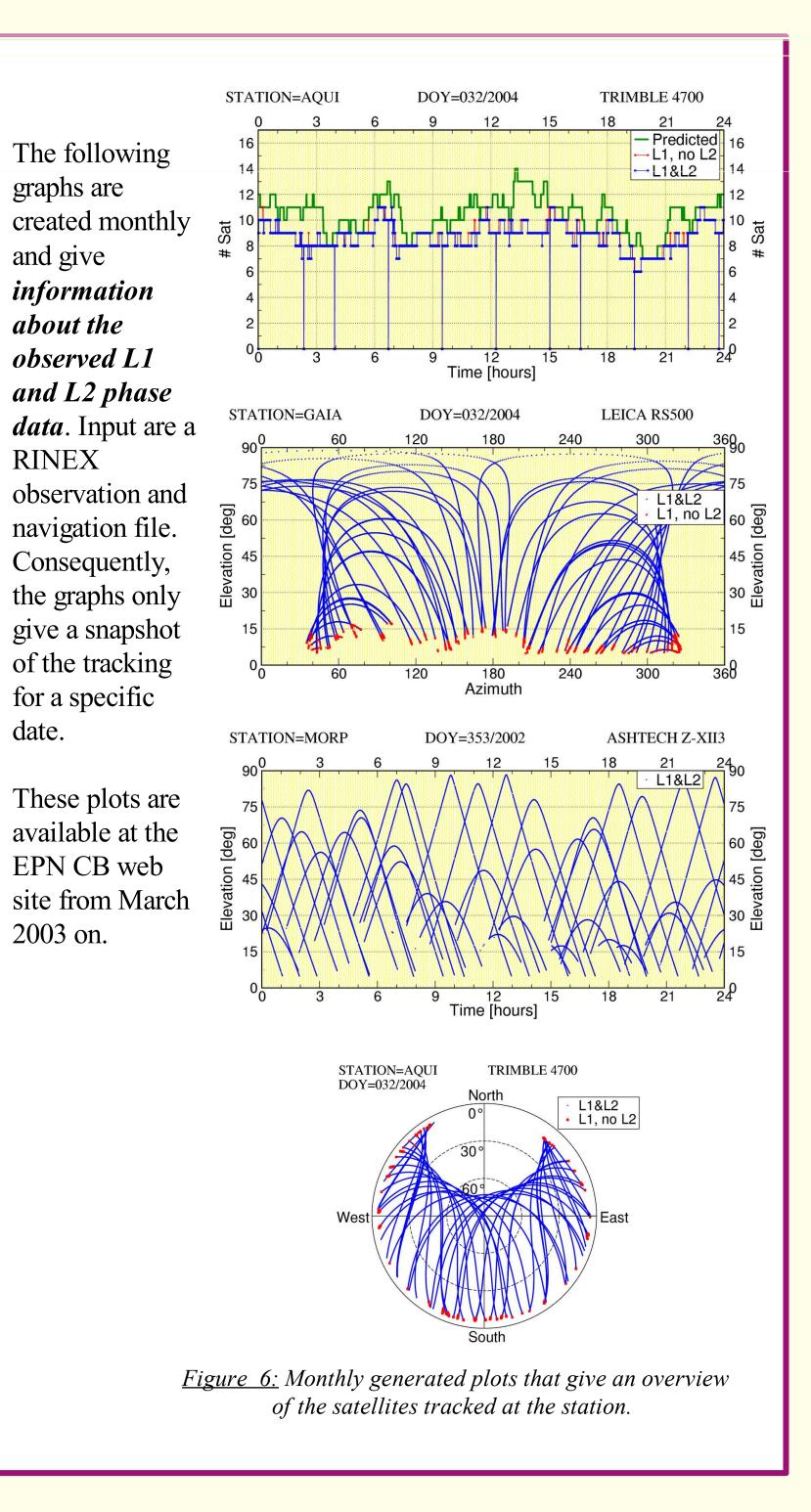
Table 2: Monthly issued EUREF mail with an overview of the latencies of the hourly EPN data



The EPN CB monitors the long-term tracking performance of a station based on the *daily* percentage of the number of complete observations (both L1 and L2 are observed) with respect to the number of predicted observations. Input are the daily RINEX observation file and the RINEX navigation message (necessary to compute the predicted observations)







In Figure 3, the percentage, given in brown, is computed for a fixed elevation cut off angle of 15°. It should in principle only change when there is a change in the receiver/antenna equipment or environment.

The percentage, given in red, is computed with the elevation cut off entered in the receiver at that time. In principle, when this cut off decreases, the percentage will also decrease (more low elevation satellites will be lost). When the cut off increases, the percentage will grow (less satellites will be lost).

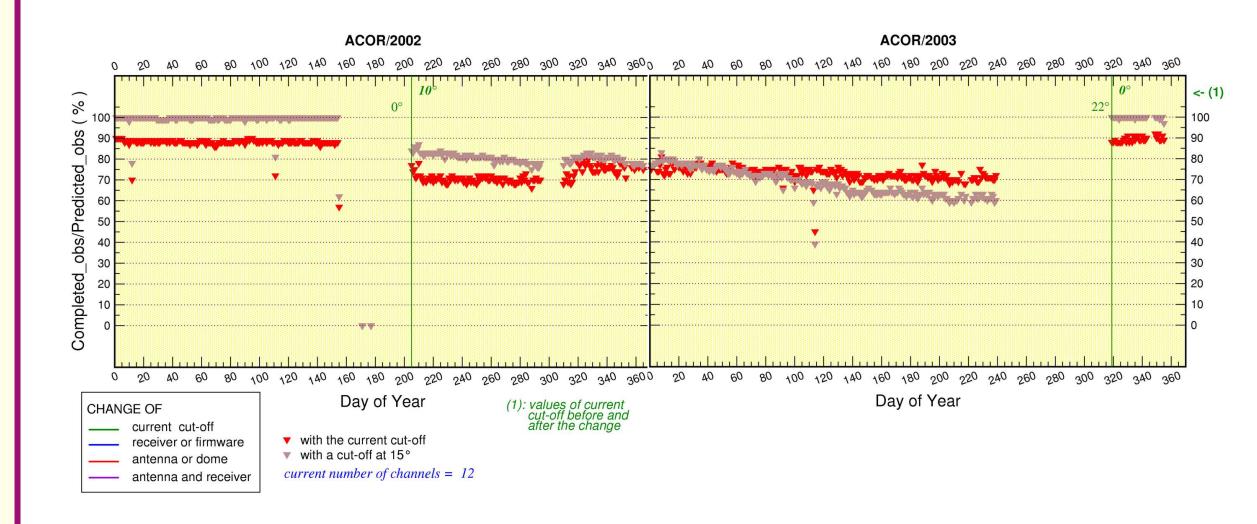
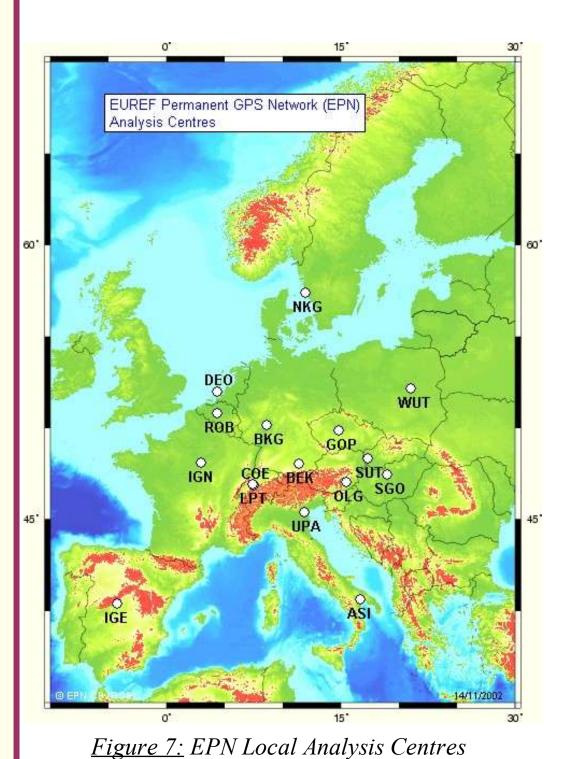


Figure 3 : Mid 2002, the number of observations tracked at ACOR started to slowly decrease. The station manager finally identified the problem as coming from a continuous remote controller (with a strange behavior) of a crane in the port. Telecommunication authorities stopped this controller with as result that the station started to track properly again.

These plots are available for each EPN station at the EPN CB web site. They are updated daily, when new RINEX observation data become available. The earliest plots go back to January 2001.

Distributed Data Analysis

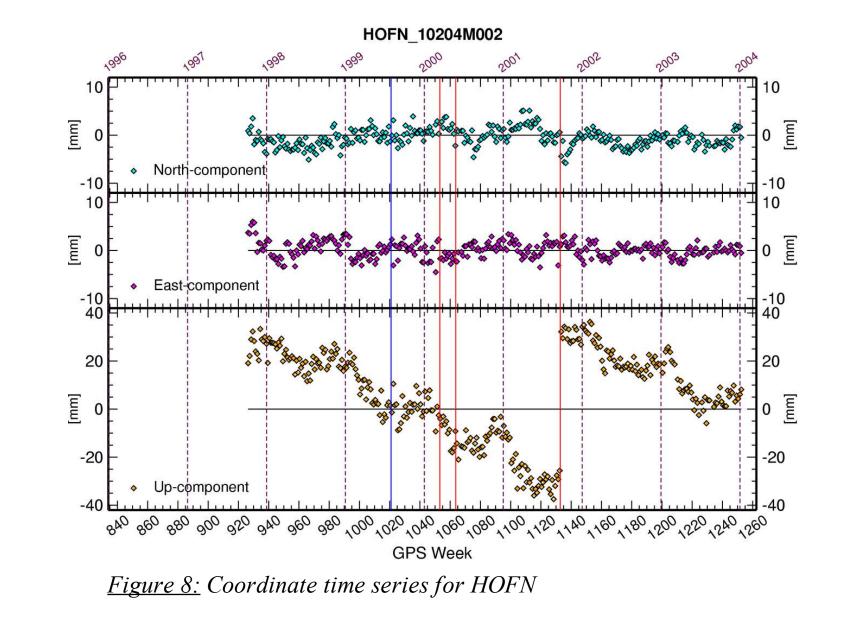


The EPN uses the principle of distributed processing : subnetworks are separately processed by different EUREF Local Analysis Centres (LACs). A new EPN station can only be integrated in the network when at least 3 LACs have agreed to process the data of that station routinely. The EPN CB monitors the metadata in the weekly LAC SINEX *solutions* and contacts the LACs and the Analysis Coordinator (who combines the individual solutions) when errors are found. A resubmission of the LAC solution is requested in this case.

<u>Time series</u>

Each week, when a new EUREF combined solution becomes available, the EPN CB computes a *cumulative solution with the goal to monitor the* coordinates of the EPN stations. Equipment changes at the station are indicated on the graphs by vertical lines (blue for a receiver/firmware change, red for an antenna/radome change).

are in red.



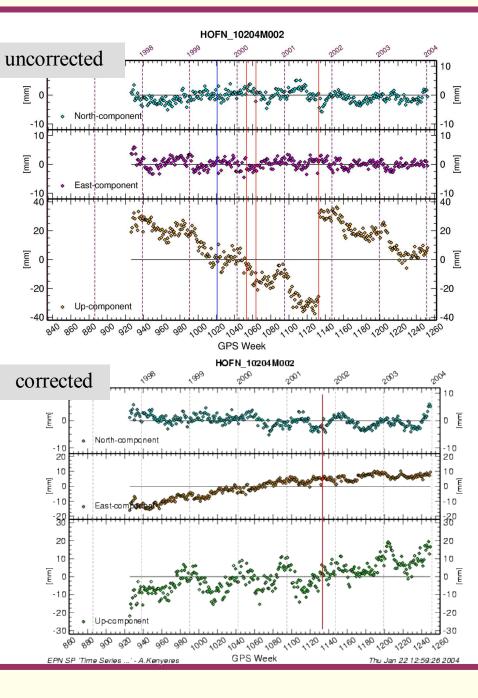
Improved time series

An EPN Special Project, chaired by A. Kenyeres, has to task to : • identify periods where the coordinate estimates or a station are unreliable (outliers)

• estimate the coordinate jumps caused by equipment changes.

Using this information, improved time series are created and are made available at the EPN CB web site together with the outlier and discontinuity information.

_	Estimated coordinate jumps [mm]:												
	GPS week	North	North RMS	East	East RMS	Up	Up RMS						
	1133	-4.5	0.6	1.8	0.5	66.3	2.5						
	A. Kenyeres												



Acknowledgements

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