



Royal Observatory
of Belgium

EPN CB News

C. Bruyninx

New EPN Stations

4-CHAR ID	LOCATION	FUNCTION	CALIB	FROM
CAKO	Cakovec, Croatia	GLO	Type	16/06/2013
DUB2	Dubrovnik, Croatia	GLO	Type	16/06/2013
PEN2	Penc, Hungary	GLO GAL	Individual	16/06/2013
PORE	Porec, Croatia	GLO	Type	16/06/2013
POZE	Pozega, Croatia	GLO	Type	16/06/2013
ZADA	Zadar, Croatia	GLO	Type	16/06/2013



Updates

Necessary because of Bernese V5.2 release

- Station Metadata:
 - New EUREF52.STA file, in addition to EUREF.STA file (V5.0)
 - Additional tests (wrt SN – see later)
- Ocean Loading Corrections
 - Update of FES2004.BLQ (header included, needed for V52, neglected in V50)
 - New file FES2004_CMC.BLQ for non-Bernese users (Rosa)

EPN CB Time Series

PRODUCTS & SERVICES > POSITION TIME SERIES > **GRAS_10002M006 (Caussols, France)**

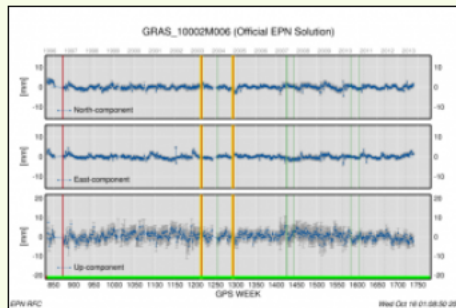
EPN station position time series:

(select a station)

Other residual position time series: [ITRF2008](#)

MULTI-YEAR EPN SOLUTION

Official, solutions included up to May 12, 2013 (GPS wk 1740)



Residual position time series of the cumulative EPN solution (tied to IGS08) with as input:

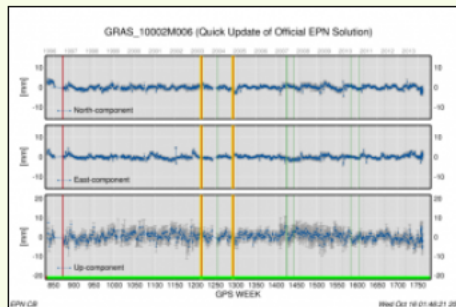
1. the reprocessed weekly EPN solutions up to GPS week 1408 (corrected to be in accordance with the [epn_08.atx](#) antenna calibration model)
2. the weekly (routine) EPN solutions from GPS week 1409 till 1631 (corrected to be in accordance with the [epn_08.atx](#) antenna calibration model)
3. the weekly (routine) EPN solutions from GPS week 1632 till 1740

The North, East, Up-components are the position residuals with respect to the estimated station positions and velocities. During the estimation, position outliers have been eliminated and discontinuities have been introduced.

[Display outliers](#) eliminated from combination: 1303-1303

[Display estimated position shifts](#)

Extended, solutions included up to October 14, 2013 (GPS wk 1762 dow 1)



Residual position time series of the cumulative EPN solution with as input:

1. the reprocessed weekly EPN solutions up to GPS week 1408 (corrected to be in accordance with the [epn_08.atx](#) antenna calibration model)
2. the weekly (routine) EPN solutions from GPS week 1409 till 1631 (corrected to be in accordance with the [epn_08.atx](#) antenna calibration model)
3. the weekly (routine) EPN solutions, from GPS week 1632 till 1680
4. the weekly (routine) EPN solutions, from GPS week 1681 till 1757
5. the daily (routine) EPN solutions, from GPS week 1758 dow 0 till GPS week 1762 dow 1

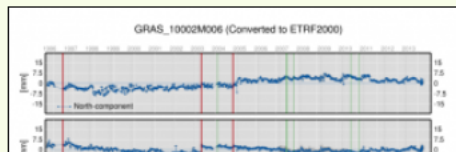
The North, East, Up-components are the position residuals of each weekly (or daily) solution with respect to the estimated station positions and velocities.

Parts 1), 2) and 3) correspond to the latest official EPN solution and have been corrected for outliers and discontinuities.

Last 'official solution' + new weekly + rapid daily solutions

WEEKLY EPN SOLUTIONS

Extracted positions in ITRS/ETRS89



Positions extracted from the following [EPN SINEX solutions](#):

1. the reprocessed weekly EPN solutions up to GPS week 1408
2. the weekly (routine) EPN solutions from GPS week 1409 till 1631
3. the weekly (routine) EPN solutions, from GPS week 1632 till 1757
4. the daily (routine) EPN solutions, from GPS week 1758 dow 0 till GPS week 1762 dow 1

Rapid daily solutions

- Daily download of rapid daily combined EPN solutions from BKG in order to update the station time series at the EPN CB.
- Since GPS week 1759/0 all the daily solutions cause inversion error in catref.
Negative variances for eg station YEBE
- Contact with BKG and new ACC
 - Problem caused by IGE switching to Bernese 5.2 → regularization of the a priori constraint matrix set to 'NO'
 - Solved by asking IGE to submit new rapid daily solutions with option set to 'YES' and recompute rapid daily solutions

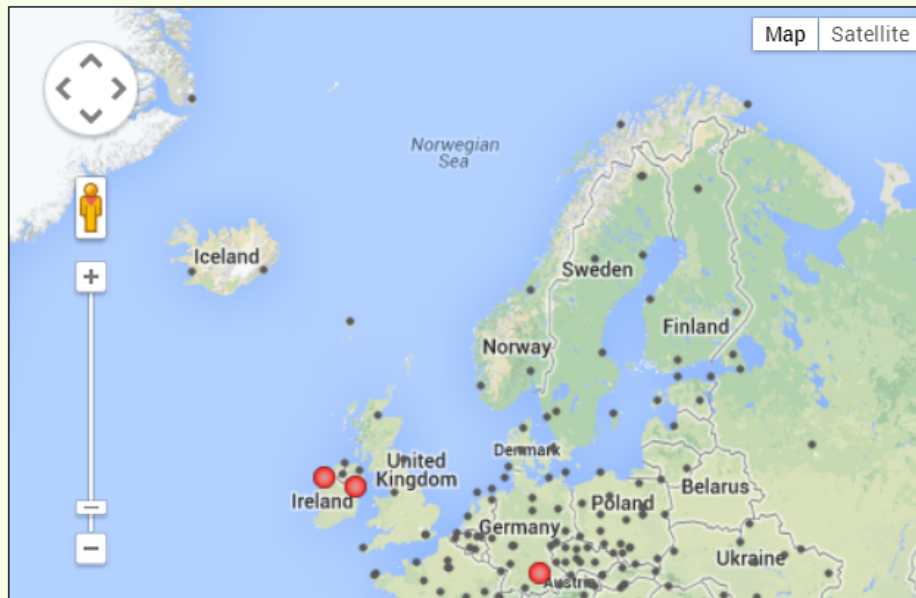
Proposed EPN Stations

NETWORK & DATA > PROPOSED STATIONS

All stations proposed to the EPN should follow the [procedure for becoming an EPN station](#) and [guidelines for EPN stations and operational centres](#).

Marker Name	Proposed at	City	Country	DQ (%)		Availability (%)					Latency			Documentation				Meta-data		Relevance to EPN	Data		Interested analysis centres
				0°	15°	Daily BKG	OLG	BKG	OLG	RT	Hourly(%) BKG	OLG	RT (s)	CL	SL	SP	NC	Daily	RT		AC	DQ	
CSTB	2010-06-09	CastleBar	Ireland	87	97	100	96	99	99	—	96	89	—	✓	✓	✓	✗	✓	—	R	T	✓	IGE, ROB, WUT
DYNG	2012-04-02	DIONYSOS	Greece	87	98	100	100	100	100	—	93	71	0.5	✓	✓	✓	—	✓	✓	R, E, C	T	✓	ASI, BEK, BKG, IGN, RGA
KNJA	2012-03-14	Knjazevac	Serbia	84	96	89	36	0	97	—	0	97	—	✗	✓	✓	—	✓	—	—	T	✓	RGA
NPAZ	2011-05-04	Novi Pazar	Serbia	85	97	89	36	0	96	—	0	96	—	✓	✓	✓	✓	✓	—	R	T	✓	OLG, RGA, SGO, SUT, WUT
OBE4	2012-11-14	Oberpfaffenhofen	Germany	97	99	100	0	100	100	—	99	95	1.7	✓	✓	✓	—	✓	✗	R, E	I	✓	BKG, ROB
PLND	2011-05-04	Plandiste	Serbia	81	92	89	36	0	97	—	0	96	—	✓	✓	✓	✓	✓	—	R	T	✗	BKG, OLG, RGA, SGO, SUT
SABA	2011-05-04	Sabac	Serbia	93	97	89	36	0	97	—	0	97	—	✓	✓	✓	✓	✓	—	R	T	✗	OLG, RGA, SGO, SUT
SELV	2012-03-05	Selvagem Grande Island	Portugal	—	—	0	0	0	0	—	0	0	—	✓	✓	✓	—	✓	—	R	T	✓	BEK
TLLG	2010-06-09	Dublin	Ireland	88	97	100	96	100	99	—	96	90	—	✓	✓	✓	✗	✓	—	R	T	✓	IGE, ROB, WUT

Move with the mouse over the red cross for more information.



Data Quality (based on [TEQC](#))

0°: % of dual frequency GPS data above 0° of elevation
(at least 90%, between 80% and 89%, less than 80%)

15°: % of dual frequency GPS data above 15° of elevation
(at least 90%, between 80% and 89%, less than 80%)

Availability (adopted data flow for the station data)

Daily: data available (%) during the last 28 days
(at least 90%, between 80% and 89%, less than 80%)

Hourly: data available (%) during the last 28 days
(at least 90%, between 80% and 89%, less than 80%)

RT: data available (%) during the last 7 days
(at least 90%, between 80% and 89%, less than 80%)

Latency

Hourly: % of data with latency below 10 minutes during the last 7 days
(at least 90%, between 80% and 89%, less than 80%)

RT: data latency (%) during the last 7 days
(below 3 s, between 3 s and 4.9 s, more than 5 s)

Documentation

CL: commitment letter available at EPN CB

SL: correctly formatted station log available at EPN CB

SP: station pictures (and short comments) available at EPN CB

NC: national EPN coordinates available at EPN CB

Proposed EPN Stations

LANTMÄTERIET
Dnr 508-2013/3443 1 (5)

PROPOSAL OF NEW EPN STATIONS IN SWEDEN

September 20, 2013

EPN Central Bureau
Dr. Carine Bruyninx
Avenue Circulaire, 3
B-1180 Brussels
Belgium

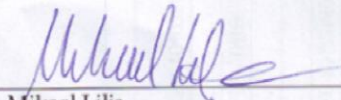
Lantmäteriet would like to propose 20 new GNSS stations for inclusion into EPN.

Today, Lantmäteriet operates seven EPN stations (KIR0, MAR6, ONSA, SPT0, SKE0, VIL0, VIS0). The proposed stations are co-located with the original fundamental SWEPOS stations which have been in operation since 1993. Seven of the proposed stations are also co-located with the existing Swedish EPN stations.

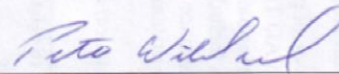
The new twin monuments – that are now proposed for inclusion in EPN – were installed in order to continue the original time series as long as possible without altering the equipment more than necessary.

The stations have been installed following EPN guidelines and once accepted in the EPN, Lantmäteriet commits to continuously maintain and operate these stations following the EPN guidelines for a period of at least 5 years.

Please, see the following pages for more information on the proposed sites.

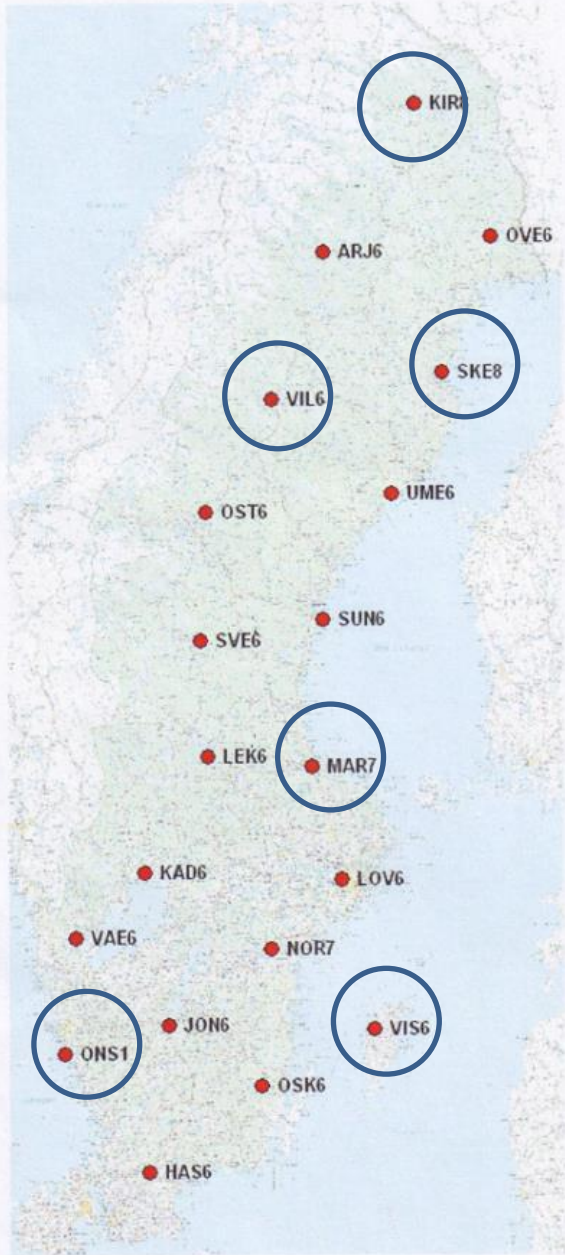


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Map of proposed EPN stations



Individual calibrations
GPS, GLONASS, Galileo

Mobile absolute gravity:
ARJ6, KIR8, MAR7, ONS1, OST6, SKE8, VIS6

All connected to national leveling network
Historical data available since summer of 2011

From start:
RTCM 3 / RINEX 2.11
RTCM-MSM / RINEX 3.02 for MGEX stations
(ONS1, KIR8, MAR7)

Planned for all:
RTCM-MSM / RINEX 3.02

Station upgrades

GPS → GPS+GLO(+GAL)

2013-09-11T14:00Z :

REDU	2	ASHTech UZ-12	GPS
REDU	3	SEPT POLARX4	GPS+GLO

2013-09-24T17:00Z :

LINZ	7	TRIMBLE NETRS	GPS
LINZ	8	TRIMBLE NETR9	GPS+GLO+GAL

2013-09-13T10:00Z :

PADO	7	TRIMBLE NETRS	GPS
PADO	8	LEICA GR10	GPS+GLO+GAL

2013-10-01T00:00Z :

VLNS	3	ASHTech Z-XII3	GPS
VLNS	4	LEICA GRX1200+GNSS	GPS+GLO

GPS+GLO → GPS+GLO+GAL

2013-06-04T08:00Z :

PUYV	8	TRIMBLE NETR5	GPS+GLO
PUYV	9	LEICA GR25	GPS+GLO+GAL+SBAS

2013-06-05T10:00Z :

AUTN	5	TRIMBLE NETR5	GPS+GLO
AUTN	6	LEICA GR25	GPS+GLO+GAL+SBAS

2013-07-17T10:00Z :

CAEN	5	TRIMBLE NETR5	GPS+GLO
CAEN	6	LEICA GR25	GPS+GLO+GAL+SBAS

2013-07-18T12:00Z :

CREI	11	TRIMBLE NETR5	GPS+GLO
CREI	12	LEICA GR25	GPS+GLO+GAL+SBAS

2013-07-18T10:00Z :

LIL2	8	TRIMBLE NETR8	GPS+GLO
LIL2	9	LEICA GR25	GPS+GLO+GAL+SBAS

2013-07-16T11:00Z :

NICO	14	LEICA GRX1200GGPRO	GPS+GLO
NICO	15	LEICA	
GRX1200+GNSS		GPS+GLO+GAL+SBAS	

2013-08-29T17:05Z :

TERS	8	TPS ODYSSEY_E	GPS+GLO
TERS	9	SEPT POLARX4	GPS+GLO+GAL

2013-08-14T10:05Z :

VILL	9	SEPT	
POLARX4		GPS+GLO+GAL+BDS+QZSS+SBAS	
VILL	10	SEPT POLARX4	GPS+GLO

2013-09-10T08:00Z :

ENTZ	5	TRIMBLE NETR5	GPS+GLO
ENTZ	6	LEICA GR25	GPS+GLO+GAL+SBAS

2013-10-01T00:00Z :

VLNS	3	ASHTech Z-XII3	GPS
VLNS	4	LEICA GRX1200+GNSS	GPS+GLO

Duplicate Antenna SN

Station	Antenna/Radome		Serial number	Part used of SN	Indiv. Calib.
SUN6	LEIAR25.R3	LEIT	08490012	90012	YES
VALE	LEIAR25.R3	LEIT	10190012	90012	YES

VALE station log:

```

4.2 Antenna Type      : LEIAR25.R3      LEIT
    Serial Number     : 10190012
    Antenna Reference Point : BPA
    Marker->ARP Up Ecc. (m) : 3.0390
    Marker->ARP North Ecc(m) : 0.0000
    Marker->ARP East Ecc(m) : 0.0000
    Alignment from True N   : 0 deg
    Antenna Radome Type     : LEIT
    Radome Serial Number    :
    Antenna Cable Type      : (vendor & type number)
    Antenna Cable Length    : 30 m
    Date Installed          : 2010-09-16T00:00Z
    Date Removed            : CCYY-MM-DDThh:mmZ
    Additional Information   : (multiple lines)
  
```

Duplicate Antenna SN

Station	Antenna/Radome		Serial number	Part used of SN	Indiv. Calib.
SUN6	LEIAR25.R3	LEIT	08490012	90012	YES
VALE	LEIAR25.R3	LEIT	10190012	90012	YES

Individual calibration file (ANTEX format):

LEIAR25.R3 LEIT90012

ROBOT Geo++ GmbH

5.0

0.0 90.0 5.0

4

EPNC

INDIVIDUAL ANTENNA CALIBRATION

Miguel Angel Cano Villaverde

STATION: VALE

Date Installed : 2010-09-16T00:00Z

Date Removed : CCYY-MM-DDThh:mmZ

FULL SN: 10190012

(C) Geo++ GmbH

Antenna Calibration Date: 2010-08-11 22:01:15

G01

1.96 0.08 163.37

NOAZI	0.00	0.27	1.02	2.10	3.27	4.27	4.84	4.81	4.16	3.03	1.64	0.26	-0.90	-1.73	-2.18	-2.18
0.0	0.00	0.20	0.92	2.02	3.28	4.38	5.05	5.09	4.47	3.33	1.91	0.49	-0.73	-1.63	-2.17	-2.17
5.0	0.00	0.20	0.91	2.02	3.26	4.36	5.02	5.05	4.43	3.28	1.85	0.42	-0.81	-1.72	-2.27	-2.27
10.0	0.00	0.20	0.91	2.01	3.24	4.33	4.98	5.01	4.39	3.23	1.79	0.35	-0.88	-1.79	-2.35	-2.35
15.0	0.00	0.20	0.91	2.00	3.22	4.30	4.95	4.97	4.34	3.18	1.74	0.30	-0.94	-1.84	-2.38	-2.38
20.0	0.00	0.20	0.91	1.99	3.20	4.27	4.91	4.93	4.29	3.13	1.69	0.25	-0.98	-1.87	-2.39	-2.39
25.0	0.00	0.20	0.91	1.98	3.18	4.24	4.87	4.88	4.25	3.09	1.65	0.21	-1.01	-1.89	-2.37	-2.37
30.0	0.00	0.20	0.91	1.97	3.17	4.21	4.83	4.83	4.20	3.04	1.61	0.17	-1.03	-1.88	-2.33	-2.33
35.0	0.00	0.20	0.91	1.97	3.15	4.18	4.79	4.79	4.15	3.00	1.57	0.15	-1.04	-1.87	-2.29	-2.29

START OF ANTENNA

TYPE / SERIAL NO

METH / BY / # / DATE

DAZI

ZEN1 / ZEN2 / DZEN

OF FREQUENCIES

SINEX CODE

COMMENT

COMMENT

COMMENT

COMMENT

COMMENT

COMMENT

COMMENT

COMMENT

START OF FREQUENCY

NORTH / EAST / UP

Duplicate Antenna SN

ANTEX V1.4 format description:

	(only allowed at the specified position)	
END OF HEADER	Last record in the header section.	60X
START OF ANTENNA	Record indicating the start of an antenna section.	60X
TYPE / SERIAL NO	Receiver antenna:	
	- Antenna type: strict IGS	A20,
	rcvr_ant.tab antenna and radome code	
	- Serial number (blank: all representatives of the specified antenna type)	A20,
	- blank	A10,
	- blank	A10
	Satellite antenna:	
	- Antenna type: strict IGS	
	rcvr_ant.tab satellite antenna code	
	Example: 'BLOCK IIA'	
	- Satellite code "sNN" (blank: all representatives of the specified antenna type)	
	For the selection of single satellites	
	the satellite system flag ('G','R',	
	'E','C','J','S') together with the PRN	

Solution?

Adapt ANTEX file with individual calibrations
and
use Full SN (A20) instead of 5-char.

→ EPN CB can create individual calibration file with A20 SN for test purposes

Handling of new (A20) SN needs to be checked for the different analysis software used in EPN

BEFORE changing official EPN file with individual calibrations

But, in any case, problem needs to be solved!

Within Bernese

				2	0.0002	-0.0005	0.1581	
LEIAR25.R3	LEIT	70015	70015	1	0.0009	0.0008	0.1604	2
				2	0.0016	0.0016	0.1584	
LEIAR25.R3	LEIT	70026	70026	1	0.0001	0.0006	0.1596	2
				2	0.0001	0.0000	0.1571	
LEIAR25.R3	LEIT	90012	90012	1	0.0020	0.0001	0.1634	2
				2	0.0006	-0.0024	0.1588	
LEIAR25.R3	LEIT	0 99999		1	0.0002	0.0001	0.1617	2
				2	0.0002	-0.0006	0.1588	
LEIAR25.R3	NONE	30025	30025	1	0.0002	0.0001	0.1599	2
				2	0.0002	-0.0004	0.1585	

Limitation to 6-digit SN?

ANTENNA/RADOME	TYPE	NUMBER	SYS	FRQ	TYP	D(0)	D(Z)	D(A)	M(Z)	SINEX	METHOD	DATE	REMARK						
*****	*****	*	***	***	***	***	***	***	***	*****	*****	*****	*****						
LEIAR25.R3	LEIT	90012	G	2	1	0	5	5	90	EPNC	ROBOT	11-AUG-10							
		R		2	1	0	5	5	90	EPNC	ROBOT	11-AUG-10							
	NORTH	MM	EAST	MM	UP	MM	FACTOR												
	*****	**	*****	**	*****	**	*****												
G01 0	1.96		0.08		163.37		0.100E+01												
G02 0	0.64		-2.36		158.83		0.100E+01												
R01 0	1.96		0.08		163.37		0.100E+01												
R02 0	0.64		-2.36		158.83		0.100E+01												
G01 0	A\Z	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85
90																			
G01 0	0	0.00	0.20	0.92	2.02	3.28	4.38	5.05	5.09	4.47	3.33	1.91	0.49	-0.73	-1.63	-2.17	-2.28	-1.77	-0.37
21																			
G01 0	5	0.00	0.20	0.91	2.02	3.26	4.36	5.02	5.05	4.43	3.28	1.85	0.42	-0.81	-1.72	-2.27	-2.40	-1.92	-0.54
03																			
G01 0	10	0.00	0.20	0.91	2.01	3.24	4.33	4.98	5.01	4.39	3.23	1.79	0.35	-0.88	-1.79	-2.35	-2.47	-2.01	-0.66
86																			
G01 0	15	0.00	0.20	0.91	2.00	3.22	4.30	4.95	4.97	4.34	3.18	1.74	0.30	-0.94	-1.84	-2.38	-2.50	-2.03	-0.72
73																			
G01 0	20	0.00	0.20	0.91	1.99	3.20	4.27	4.91	4.93	4.29	3.13	1.69	0.25	-0.98	-1.87	-2.39	-2.47	-2.00	-0.70

IGS infrastructure Committee

Station naming: *The station name goes from 4 characters to 9 characters (4 char name + 2 char for receiver and antenna + 3 char for country) the new names have been accepted in the RINEX WG, the GB and made public in the publication of the 3.02 standard.*

*The **new names are not in use** and I have polled different stakeholders with no positive feedback on their use in.*

...keep things as they are and if station naming becomes an issue we can use the solution available from Rx3.02....

New Rx3 File naming: *no one uses them in MGEX and their use is not a priority (the old daily, hourly and 15 min filenames are still in use for Rx3.02 files), there is currently no support to implement the new filenames in the Rx3 files since station operators and processing centers are in general not ready to assume the change at this time.*