Federal Agency for
Cartography and Geodesy

EPN real-time analysis status report

Wolfgang Söhne, Georg Weber

Federal Agency for Cartography and Geodesy

RT network – status observations

- **New: TOR2 (GPS+GLO)**
- **Coming next: SRJV (GPS+GLO)**
- **New stations (global scale): ADH1, LYR1, OSL1, WUH2 (GPS+GLO)**
- **Upgraded (GPS+GLO): OUS2, ULAB**
- **Upgraded (GPS+GLO+GAL): WTZZ**

Federal Agency for Cartography and Geodesy

RT network – status products

- **Eight regular contributions to IGS-RT PP (BKG/TUP, CNES, DLR, ESOC, GFZ, GMV, NRCan, Wuhan)**
- **Some ACs with more contributions, e.g. GPS+GLO, e.g. other satellite reference point**

Federal Agency for Cartography and Geodesy

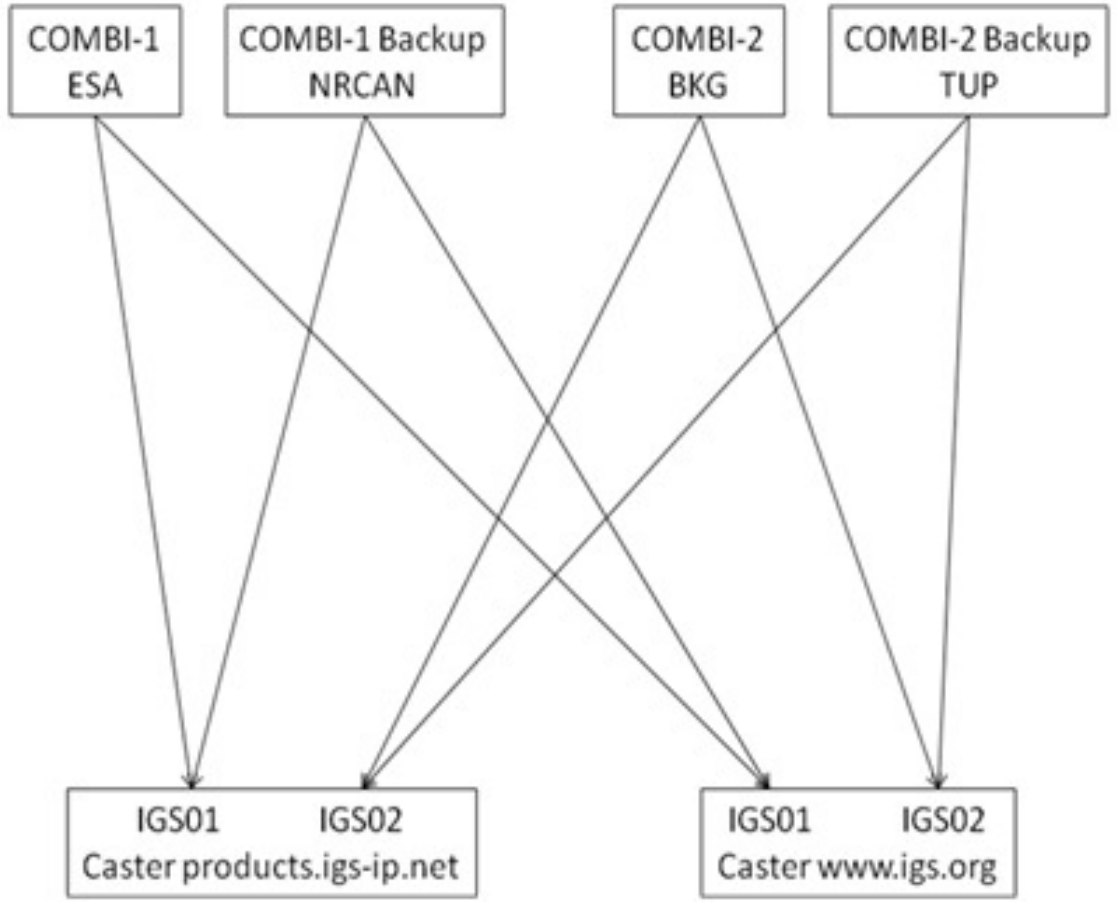
RT network – status products

- **RT Combination:**
  - **Different solutions exist**
  - **Kalman Filter and Single-Epoch**
  - **New backup scheme installed: two identical jobs at two different locations**
  - **Proof of new backup: PPP monitoring by BKG switching between corrections streams (48 per day) -> no significant performance degradation**

Federal Agency for Cartography and Geodesy

RT network – status products

- Combi
  - Sev
  - Kalr
  - New
    jobs
  - Proc
    swit
    day)



lentical

g by BKG
ms (48 per
egradation
y

RT network – status products

- **Combination:**
  - **Several solutions exist**
  - **Kalman Filter and Single-Epoch**
  - **New backup scheme installed: two identical jobs at two different locations**
  - **Proof of new backup: PPP monitoring by BKG switching between corrections streams (48 per day) -> no significant performance degradation**

Federal Agency for Cartography and Geodesy

RT network – status products

- **Problems:**
  - **Mountpoint naming (5 char)**
    - **35 products streams with ‘CLK??’ plus some with ‘IG???’ on IGS caster ‘products-ip’**
    - **‘identifier’ used for the details**
  - **File (*.sp3, *.clk) naming (3 char prefix)**
    - **Used for comparison and archiving**

Federal Agency for Cartography and Geodesy

EPN RT – ETRS89 corrections

- **EUREF symposium 2011, resolution no. 5:**

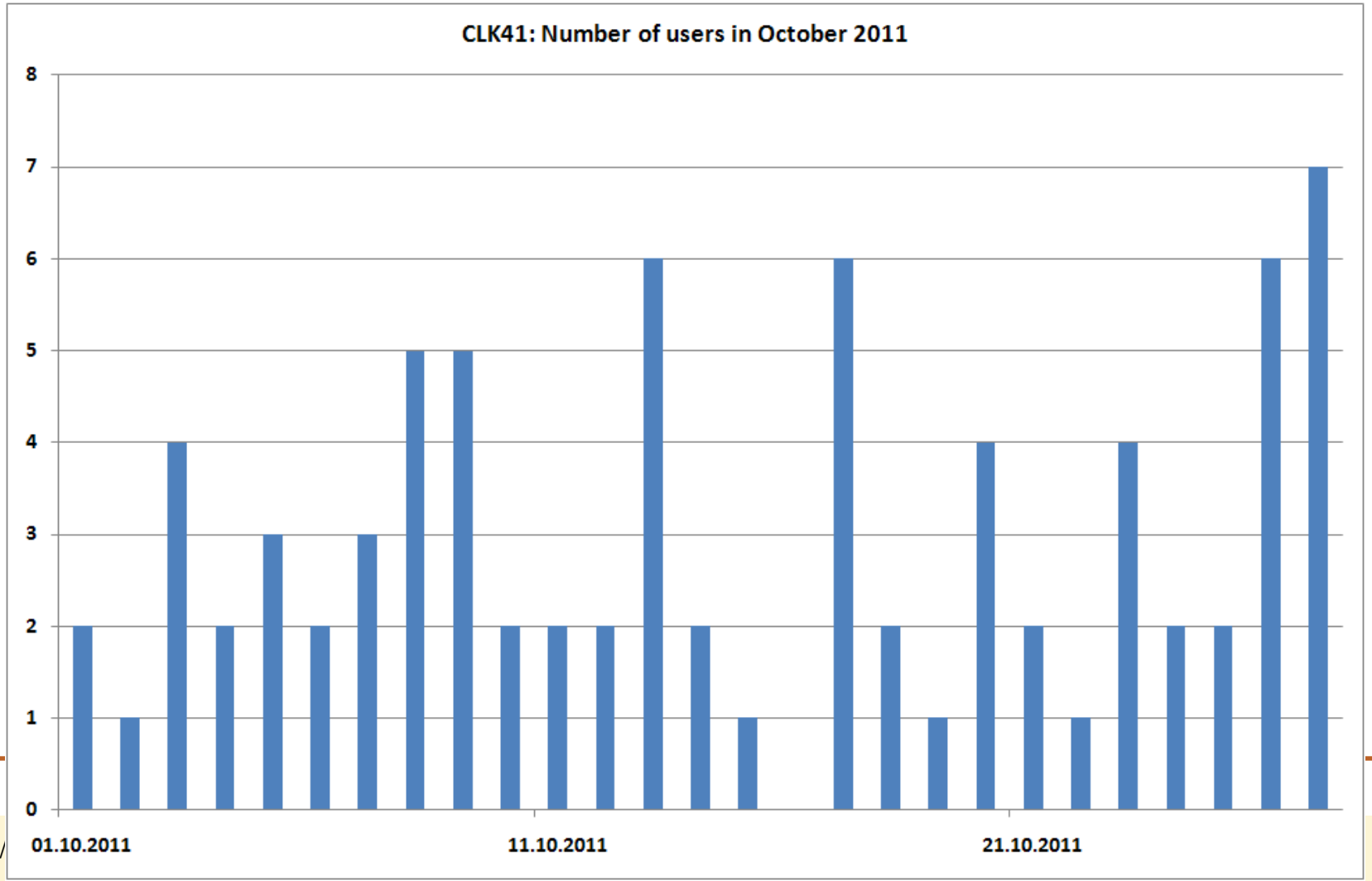
  (…) "*recognising* the recent availability of corrections in the RTCM standard for orbits, clocks and biases, that enable the testing of real-time precise point positioning (PPP) in the ETRS89

  ***invites* the EUREF community to trial these new corrections and provide feedback to the TWG on their performance."**

Federal Agency for Cartography and Geodesy

EPN RT – ETRS89 corrections

- CLK41 on EUREF caster ‘euref-ip’
- Derived from BKG’s GPS+GLO solution CLK11



EPN RT – ETRS89 corrections Questions

- **Availability of real-time corrections only or, in addition, availability of files (sp3, clk)?**
- **Which (open source) tools are able to handle the real-time (open standard) corrections? – BNC, RTKNAVI, ???**
- **Files can be used in various software packages for PPP but**
- **Which software is able to write the corrections to file?**
- **Wouldn't it be more precise to transform the IGS08-related files rather than the stream?**

Federal Agency for Cartography and Geodesy

EPN RT – ETRS89 corrections

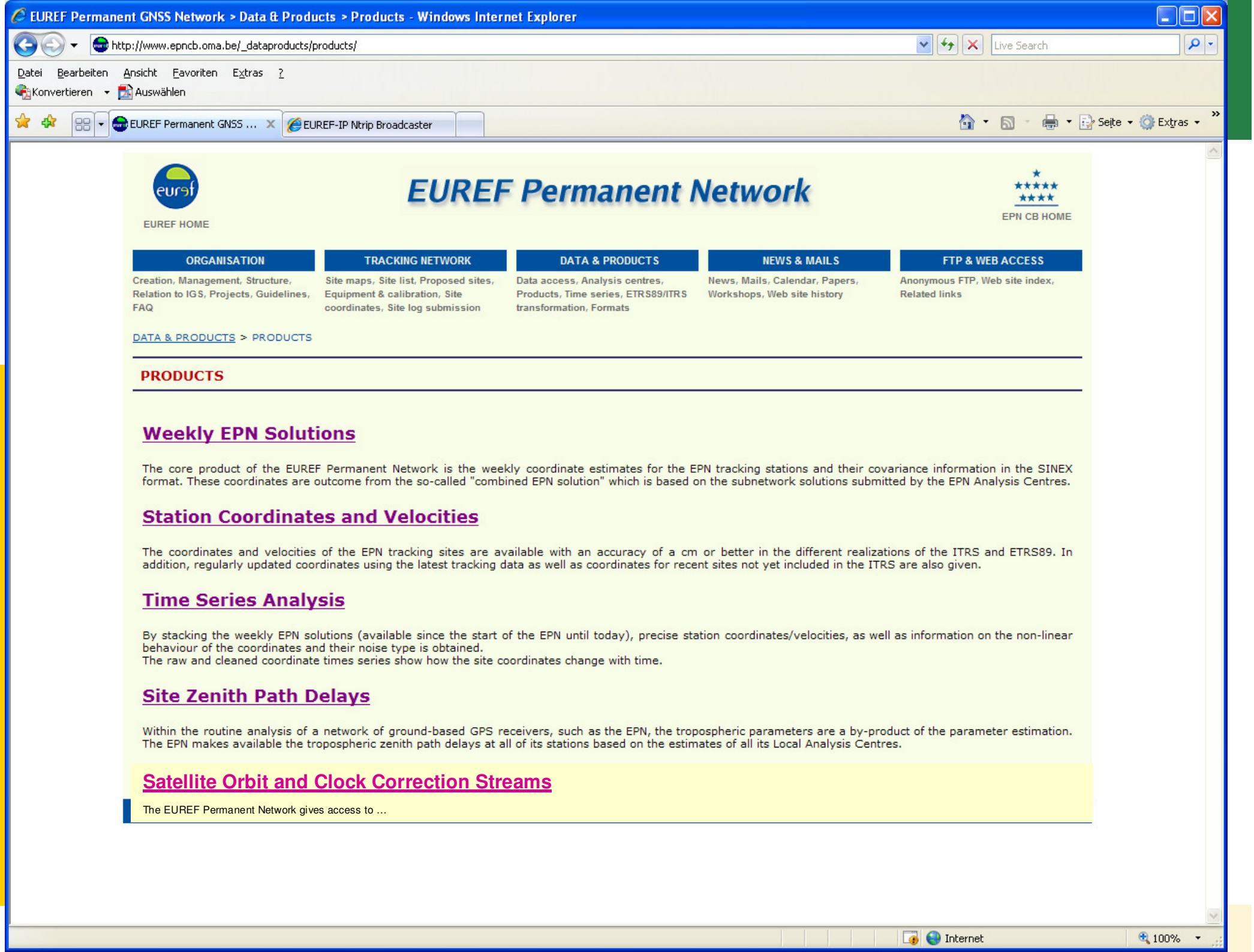
- **Accuracy of the implemented transformation**
- **ETRS89:**
  - **Data stream CLK41 on www.euref-ip.net**
  - **Error (offset): ~ 6-7 mm, only in Height**
- **GDA94:**
  - **Data stream CLK43 on products.igs-ip.net**
  - **Error (offset): ~ 6 cm, only in Height**
  - **Reason: huge scale factor**
  - **Reference: Huisman et al., IUGG2011 (poster), JoG (in review)**

Federal Agency for Cartography and Geodesy

EPN RT – ETRS89 corrections access

- **'DATA & PRODUCTS' → 'PRODUCTS': Introduce new (5th) section about 'Satellite Orbit and Clock Correction Streams'**
- **Create new page: http://www.epncb.oma.be/_dataproducts/products/realtimecorrections Description of 'What', 'How', 'Where', 'Tools' and 'Performance'**

Federal Agency for Cartography and Geodesy


EUREF Permanent GNSS Network > Data & Products > Products - Windows Internet Explorer
http://www.epncb.oma.be/_dataproducts/products/
Live Search
Datei Bearbeiten Ansicht Favoriten Extras ?
Konvertieren Auswählen
EUREF Permanent GNSS ...
EUREF-IP Ntrip Broadcaster
Seite Extras
EUREF HOME
EUREF Permanent Network
EPN CB HOME
ORGANISATION
Creation, Management, Structure, Relation to IGS, Projects, Guidelines, FAQ
TRACKING NETWORK
Site maps, Site list, Proposed sites, Equipment & calibration, Site coordinates, Site log submission
DATA & PRODUCTS
Data access, Analysis centres, Products, Time series, ETRS89/ITRS transformation, Formats
NEWS & MAILS
News, Mails, Calendar, Papers, Workshops, Web site history
FTP & WEB ACCESS
Anonymous FTP, Web site index, Related links
DATA & PRODUCTS > PRODUCTS
PRODUCTS
Weekly EPN Solutions
The core product of the EUREF Permanent Network is the weekly coordinate estimates for the EPN tracking stations and their covariance information in the SINEX format. These coordinates are outcome from the so-called "combined EPN solution" which is based on the subnetwork solutions submitted by the EPN Analysis Centres.
Station Coordinates and Velocities
The coordinates and velocities of the EPN tracking sites are available with an accuracy of a cm or better in the different realizations of the ITRS and ETRS89. In addition, regularly updated coordinates using the latest tracking data as well as coordinates for recent sites not yet included in the ITRS are also given.
Time Series Analysis
By stacking the weekly EPN solutions (available since the start of the EPN until today), precise station coordinates/velocities, as well as information on the non-linear behaviour of the coordinates and their noise type is obtained.
The raw and cleaned coordinate times series show how the site coordinates change with time.
Site Zenith Path Delays
Within the routine analysis of a network of ground-based GPS receivers, such as the EPN, the tropospheric parameters are a by-product of the parameter estimation. The EPN makes available the tropospheric zenith path delays at all of its stations based on the estimates of all its Local Analysis Centres.
Satellite Orbit and Clock Correction Streams
The EUREF Permanent Network gives access to ...
Internet
100%

EPN RT – ETRS89 corrections access

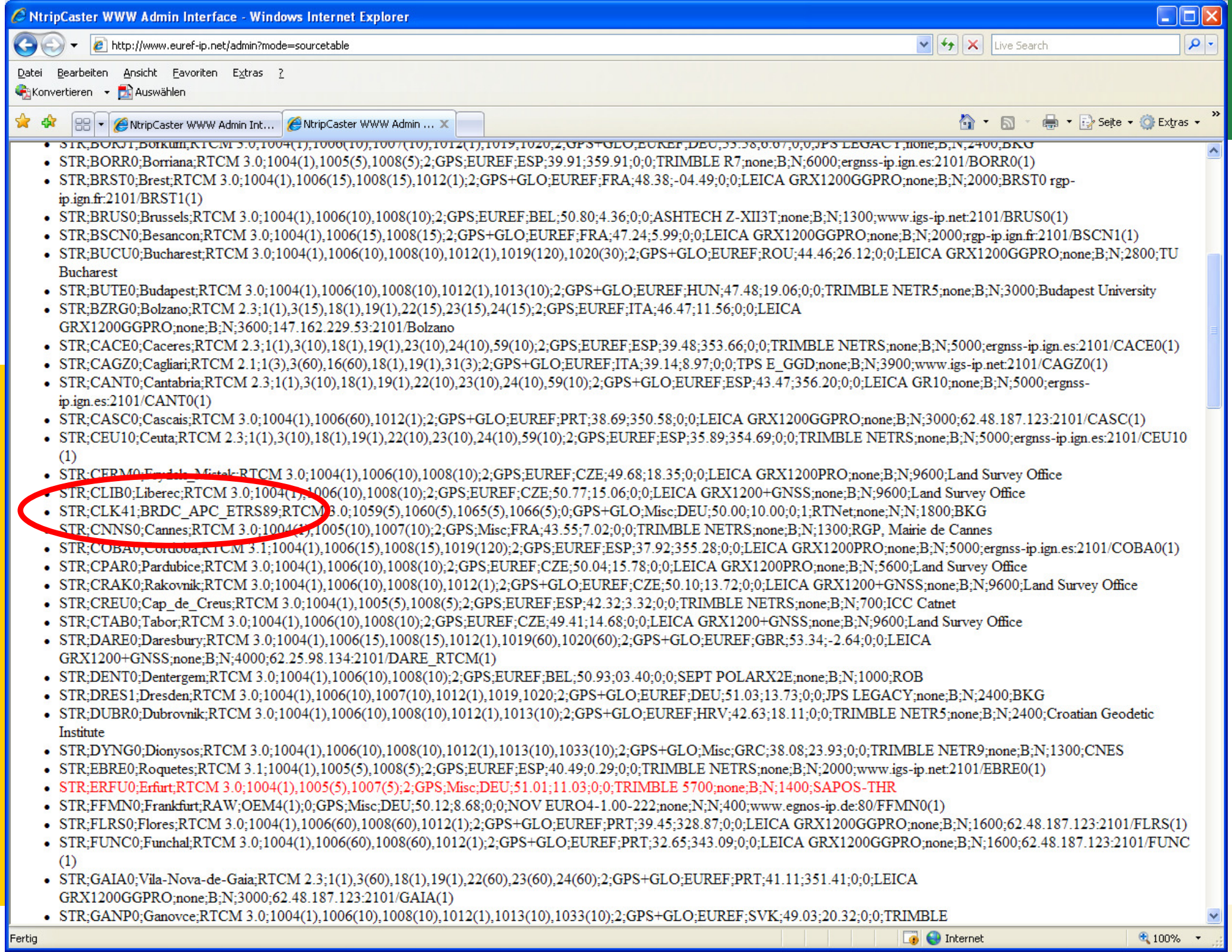
- **'DATA & PRODUCTS' → 'PRODUCTS': Introduce new (5th) section about 'Satellite Orbit and Clock Correction Streams'**
- **Create new page: http://www.epncb.oma.be/_dataproducts/products/realtimecorrections Description of 'What', 'How', 'Where', 'Tools' and 'Performance'**

Federal Agency for Cartography and Geodesy

EPN RT – ETRS89 corrections access

- **Establish new caster for EUREF products: http://products.euref-ip.net**
- **Move existing product stream(s) and establish new ones:**
  EUR01: GPS-only orbit/clock corrections derived from the combination of the six European ACs
  EUR02: GPS+GLO orbit/clock corrections derived from the combination of the European Acs BKG/TUP and DLR
  EUR03: GPS+GLO+GAL orbit/clock corrections

Federal Agency for Cartography and Geodesy


NtripCaster WWW Admin Interface - Windows Internet Explorer
http://www.euref-ip.net/admin?mode=sourcetable
Live Search
Datei Bearbeiten Ansicht Favoriten Extras ?
Konvertieren Auswählen
NtripCaster WWW Admin Int...
NtripCaster WWW Admin ...
Seite Extras
STR;BORR0;Borriana;RTCM 3.0;1004(1),1005(5),1008(5);2;GPS;EUREF;ESP;39.91;359.91;0;0;TRIMBLE R7;none;B;N;6000;ergnss-ip.ign.es:2101/BORR0(1)
STR;BRST0;Brest;RTCM 3.0;1004(1),1006(15),1008(15),1012(1);2;GPS+GLO;EUREF;FRA;48.38;-04.49;0;0;LEICA GRX1200GGPRO;none;B;N;2000;BRST0 rgp-ip.ign.fr:2101/BRST1(1)
STR;BRUS0;Brussels;RTCM 3.0;1004(1),1006(10),1008(10);2;GPS;EUREF;BEL;50.80;4.36;0;0;ASHTECH Z-XII3T;none;B;N;1300;www.igs-ip.net:2101/BRUS0(1)
STR;BSCN0;Besancon;RTCM 3.0;1004(1),1006(15),1008(15);2;GPS+GLO;EUREF;FRA;47.24;5.99;0;0;LEICA GRX1200GGPRO;none;B;N;2000;rgp-ip.ign.fr:2101/BSCN1(1)
STR;BUCU0;Bucharest;RTCM 3.0;1004(1),1006(10),1008(10),1012(1),1019(120),1020(30);2;GPS+GLO;EUREF;ROU;44.46;26.12;0;0;LEICA GRX1200GGPRO;none;B;N;2800;TU Bucharest
STR;BUTE0;Budapest;RTCM 3.0;1004(1),1006(10),1008(10),1012(1),1013(10);2;GPS+GLO;EUREF;HUN;47.48;19.06;0;0;TRIMBLE NETR5;none;B;N;3000;Budapest University
STR;BZRG0;Bolzano;RTCM 2.3;1(1),3(15),18(1),19(1),22(15),23(15),24(15);2;GPS;EUREF;ITA;46.47;11.56;0;0;LEICA GRX1200GGPRO;none;B;N;3600;147.162.229.53:2101/Bolzano
STR;CACE0;Caceres;RTCM 2.3;1(1),3(10),18(1),19(1),23(10),24(10),59(10);2;GPS;EUREF;ESP;39.48;353.66;0;0;TRIMBLE NETRS;none;B;N;5000;ergnss-ip.ign.es:2101/CACE0(1)
STR;CAGZ0;Cagliari;RTCM 2.1;1(3),3(60),16(60),18(1),19(1),31(3);2;GPS+GLO;EUREF;ITA;39.14;8.97;0;0;TPS E_GGD;none;B;N;3900;www.igs-ip.net:2101/CAGZ0(1)
STR;CANT0;Cantabria;RTCM 2.3;1(1),3(10),18(1),19(1),22(10),23(10),24(10),59(10);2;GPS+GLO;EUREF;ESP;43.47;356.20;0;0;LEICA GR10;none;B;N;5000;ergnss-ip.ign.es:2101/CANT0(1)
STR;CASC0;Cascais;RTCM 3.0;1004(1),1006(60),1012(1);2;GPS+GLO;EUREF;PRT;38.69;350.58;0;0;LEICA GRX1200GGPRO;none;B;N;3000;62.48.187.123:2101/CASC(1)
STR;CEU10;Ceuta;RTCM 2.3;1(1),3(10),18(1),19(1),22(10),23(10),24(10),59(10);2;GPS;EUREF;ESP;35.89;354.69;0;0;TRIMBLE NETRS;none;B;N;5000;ergnss-ip.ign.es:2101/CEU10(1)
STR;CLIB0;Liberec;RTCM 3.0;1004(1),1006(10),1008(10);2;GPS;EUREF;CZE;50.77;15.06;0;0;LEICA GRX1200+GNSS;none;B;N;9600;Land Survey Office
STR;CLK41;BRDC_APC_ETRS89;RTCM 3.0;1059(5),1060(5),1065(5),1066(5);0;GPS+GLO;Misc;DEU;50.00;10.00;0;1;RTNet;none;N;N;1800;BKG
STR;CNNS0;Cannes;RTCM 3.0;1004(1),1005(10),1007(10);2;GPS;Misc;FRA;43.55;7.02;0;0;TRIMBLE NETRS;none;B;N;1300;RGP, Mairie de Cannes
STR;CPAR0;Pardubice;RTCM 3.0;1004(1),1006(10),1008(10);2;GPS;EUREF;CZE;50.04;15.78;0;0;LEICA GRX1200PRO;none;B;N;5600;Land Survey Office
STR;CRAK0;Rakovnik;RTCM 3.0;1004(1),1006(10),1008(10),1012(1);2;GPS+GLO;EUREF;CZE;50.10;13.72;0;0;LEICA GRX1200+GNSS;none;B;N;9600;Land Survey Office
STR;CREU0;Cap_de_Creus;RTCM 3.0;1004(1),1005(5),1008(5);2;GPS;EUREF;ESP;42.32;3.32;0;0;TRIMBLE NETRS;none;B;N;700;ICC Catnet
STR;CTAB0;Tabor;RTCM 3.0;1004(1),1006(10),1008(10);2;GPS;EUREF;CZE;49.41;14.68;0;0;LEICA GRX1200+GNSS;none;B;N;9600;Land Survey Office
STR;DARE0;Daresbury;RTCM 3.0;1004(1),1006(15),1008(15),1012(1),1019(60),1020(60);2;GPS+GLO;EUREF;GBR;53.34;-2.64;0;0;LEICA GRX1200+GNSS;none;B;N;4000;62.25.98.134:2101/DARE_RTCM(1)
STR;DENT0;Dentergem;RTCM 3.0;1004(1),1006(10),1008(10);2;GPS;EUREF;BEL;50.93;03.40;0;0;SEPT POLARX2E;none;B;N;1000;ROB
STR;DRES1;Dresden;RTCM 3.0;1004(1),1006(10),1007(10),1012(1),1019,1020;2;GPS+GLO;EUREF;DEU;51.03;13.73;0;0;JPS LEGACY;none;B;N;2400;BKG
STR;DUBR0;Dubrovnik;RTCM 3.0;1004(1),1006(10),1008(10),1012(1),1013(10);2;GPS+GLO;EUREF;HRV;42.63;18.11;0;0;TRIMBLE NETR5;none;B;N;2400;Croatian Geodetic Institute
STR;DYNG0;Dionysos;RTCM 3.0;1004(1),1006(10),1008(10),1012(1),1013(10),1033(10);2;GPS+GLO;Misc;GRC;38.08;23.93;0;0;TRIMBLE NETR9;none;B;N;1300;CNES
STR;EBRE0;Roquetes;RTCM 3.1;1004(1),1005(5),1008(5);2;GPS;EUREF;ESP;40.49;0.29;0;0;TRIMBLE NETRS;none;B;N;2000;www.igs-ip.net:2101/EBRE0(1)
STR;ERFU0;Erfurt;RTCM 3.0;1004(1),1005(5),1007(5);2;GPS;Misc;DEU;51.01;11.03;0;0;TRIMBLE 5700;none;B;N;1400;SAPOS-THR
STR;FFMN0;Frankfurt;RAW;OEM4(1);0;GPS;Misc;DEU;50.12;8.68;0;0;NOV EURO4-1.00-222;none;N;N;400;www.egnos-ip.de:80/FFMN0(1)
STR;FLRS0;Flores;RTCM 3.0;1004(1),1006(60),1008(60),1012(1);2;GPS+GLO;EUREF;PRT;39.45;328.87;0;0;LEICA GRX1200GGPRO;none;B;N;1600;62.48.187.123:2101/FLRS(1)
STR;FUNC0;Funchal;RTCM 3.0;1004(1),1006(60),1008(60),1012(1);2;GPS+GLO;EUREF;PRT;32.65;343.09;0;0;LEICA GRX1200GGPRO;none;B;N;1600;62.48.187.123:2101/FUNC(1)
STR;GAIA0;Vila-Nova-de-Gaia;RTCM 2.3;1(1),3(60),18(1),19(1),22(60),23(60),24(60);2;GPS+GLO;EUREF;PRT;41.11;351.41;0;0;LEICA GRX1200GGPRO;none;B;N;3000;62.48.187.123:2101/GAIA(1)
STR;GANP0;Ganovce;RTCM 3.0;1004(1),1006(10),1008(10),1012(1),1013(10),1033(10);2;GPS+GLO;EUREF;SVK;49.03;20.32;0;0;TRIMBLE
Fertig
Internet
100%

EPN RT – ETRS89 corrections access

- **Establish new caster for EUREF products: http://products.euref-ip.net**
- **Move existing product stream(s) and establish new ones:**
  EUR01: GPS-only orbit/clock corrections derived from the combination of the six European ACs
  EUR02: GPS+GLO orbit/clock corrections derived from the combination of the European Acs BKG/TUP and DLR
  EUR03: GPS+GLO+GAL orbit/clock corrections

Federal Agency for Cartography and Geodesy