

Real-time PPP Results From Global Orbit and Clock Corrections

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BNC is Open Source: http://igs.bkg.bund.de/ntrip/download

- BNC was designed in 2006 in co-operation with the Techn. Univ. of Prague for streaming GNSS data via Internet. Streams come in RTCM format to feed i.e. real-time GNSS engines.
- Last year, the BNC software was extended to support real-time Precise Point Positioning (PPP).



Coordinate determination for a rover using code and phase data in ionosphere-free P3/L3 solutions.

Usage of <u>www.igs-ip.net</u>

Usage of real-time GNSS

and densification networks

resources from IGS

disseminated by BKG

68 Countries from latest

1000 User registrations

Status March 25, 2010



Albania Argentina Canada Chile Egypt Estonia Hungary Iceland Kazakhstan Japan Mexico Moldova Northern Ireland Norway Saudia Arabia Serbia Sri Lanka Spain

Argentina	Australia
Chile	China
Estonia	Finland
Iceland	India
Kazakhstan	Kenya
Moldova	Morocco
Norway	Poland
Serbia	Singapore
Sri Lanka	Sweden
United Kingdom	Uruguay

Austria
Croatia
France
Indonesia
Latvia
Netherlands
Portugal
Slovakia
Switzerland
USA

Belgium
Czech Republic
Germany
Iraq
Lothian
New Caledonia
Puerto Rico
Slovenia
Taiwan
Venezuela

Brazil
Denmark
Greece
Ireland
Macedonia
New Zealand
Romania
South Africa
Thailand

Bulgaria Ecuador Hong Kong Italy Malaysia

- Nigeria
- Russia
- South Korea
- Turkey

Vienna, 06 May 2010

Ukraine



PPP Applications based on EUREF and IGS real-time GNSS Resources, Examples



PPP for Frankfurt (FFMJ) and Concepcion (CONZ)



Stations used to check the performance of the PPP in real-time at static mode





CONZ: Post Processing PPP with RTNet using 1 Hz Data and IGS Final Orbit

Pillar after the earthquake



LEICA GRX1200GGPRO TPSCR3_GGD(CONE)





http://news.bbc.co.uk/2/hi/americas/8540625.stm

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Ultra Rapid Orbits and Clocks from RTNet in one Stream: Real-time IGS Pilot Project

To generate the corrections of orbits and clocks to the broadcast ephemerides through an IP port:

Ultra Rapid Orbit from CODE (GPS+GLONASS) (Center for Orbit Determination in Europe) 24h estimated + 24h predicted = 48h Interval: 15 Min. Update in 12h

Clock Corrections from RTNet Stream CLK11 = GPS + GLONASS Messages: 1059,1060, 1065,1066 Orbits: CODE Ultra Rapid Reference Frame: ITRF2005 (GPS Time) Reference Point: APC Analysis Center: BKG / RTNet + BNS Interval: 5 Sec.

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DAVIO CAS

RTNET (50-55 Stations)

at for CLK11

Errors and Corrections so far not considered in PPP with BNC

Effect	Reason	Parameters of correction	Sum of Error
Offset of satellite antenna	Reference point of ephemerides	Correction of coordinates of satellites	For height up to 10 cm and a few cm for horizontal coordinates
Phase center variations of satellite antenna	Discrepancy to the reference point of satellite antenna	Correction of phase observations	For height up to 1 mm
Phase Wind Up	Rotation of satellites	Correction of phase observations	Coordinate changes up to a few mm
Earth's tide	Gravitation effect of the sun and the moon	Correction of station coordinates	A few dm for height and a few cm for horizontal coordinates
Earth's rotation (movement of pol)	Shift of Earh's axis with respect to Earth's crust	Correction of station coordinates	Changes of horizontal coordinates of a few cm
Atmospheric, hydrological, and ocean loading	Reaction of Earth's crust to loading of ocean, atmosphere, and hydrol.	Correction of station coordinates	Changes of height up to 5 cm
Ofset of ground antenna	Reference point of measurements	Correction of station coordinates	For height up tu 5 cm and a few mm for horizontal coordinates
Phase center variations of ground antenna	Discrepancy to the reference point of ground antenna	Correction of phase observations	For height a few mm

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17 Hours real-time PPP for static CONZ





1 Hour real-time PPP for static FFMJ







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Real-time static and kinematic PPP



Results of static and kinematic tests derived using code and phase data in ionospherefree solution (L3)



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VM01 – Introduction of height jump



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VM01 - Introduction of horizontal displacements



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Kinematic real-time PPP











Kinematic real-time PPP Test





There is a close relationship between precipitation and variation of vertically integrated water vapour (IWV)

Rapid variation of volume and position of water vapour in time and space



Potential benefit of PPP in real-time for nowcasting and forecast verification of weather processes ?





GANP: Comparison of ZTD-Values



Standard Atmoshere Model: Height-dependent values for pressure, temperature, and humidity are assumed: H=0, P=1013.25 mbar, T=18°C, Hum.=50%







Thank you