Continuously Operating Reference Stations and Datum Transformation (CORS-TR)

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147 CORS
2 Control Centers

7/24 RTK service
Datum Transformation

Surveying and mappin
Cadstral works
Geographical Information Systems
Land registry
e-goverment
Granted by
Turkish National Research Council (TÜBİTAK)

Customers
General Command of Mapping
General Directorate of Land Register and Cadastre

Implementing Institute
Istanbul Culture University
CORS-TR Stations

- Existing permanent st. (27)
- CORS_TR st. (147)
CORS-TR STATIONS

geological basement characteristics, stability, electricity, internet connection and security issues

Mainly in
• Meteorological Stations,
• Universities,
• Municipalities,
• Other governmental buildings and fields.
CORS-TR ROOF TYPE PILLAR
CORS-TR GROUND TYPE PILLAR
KONYA Permanent GPS Station
CORS-TR
Control Center

RTK Corrections will be computed and send to users in real time.

Additionally, 30 second GNSS data will be stored for post-processing and will be available for users via internet.
CORS-TR Station
“**Networked Transport of RTCM via Internet Protocol**” will be used.

**NTRIP**, http based general and independent protocol, has been developed by **BKG/Germany** so as to broadcast differential corrections and other types of GNSS information to users via internet.
CLASSICAL DGPS/RTK

Single stations and covering area

(5, 7.5 and 10 km radius)
Network stations and covering area
(40 and 50 km radius)
Interstation distances; mean 80 km, maximum 100 km.
PROCESSING OF CORS-TR GPS DATA

- Existing Permanent stations (tusa)
- 1st Group CORS-TR st. (tus1)
- 2nd Group CORS-TR st. (tus2)
- 3rd Group CORS-TR st. (tus3)
- 4th Group CORS-TR st. (tus4)
CORS-TR DATA PROCESSING

Station data (daily)
- TUSAGA
- CORS-TR
- IGS

IGS Final orbit
- ERP Bulletin B

Global solution files
- higs1a.*
- higs2a.*
- higs3a.*
- higs4a.*
- higs5a.*

Soluton files
- h tusaa.*
- h tus1a.*
- h tus2a.*
- h tus3a.*
- h tus4a.*

GAMIT

GLRED
- Global solution files
- Monthly combinations
- Time series
- In case gross errors

GLRED
- Time series
- Coordinates and velocities (ITRF2005)

GLORG
- Velocities (EUREF)

GLOBK

- Time series
- In case gross errors
Regional IGS Stations used in the data processing
Global IGS Stations used in the data processing
Long term time series of existing permanent stations
Long term time series analysis
(Short term) Time series of COSR-TR stations
For an accurate velocity estimation

East component :

North Component :

Up Component :
Determination of CORS-TR station coordinates in TUREF
CORS-TR Horizontal Velocity Field wrt Eurasia (short term)
GPS meteorology
Preceptable Water Vapor (PW)

\[ ZTD = \frac{0.002277 \cdot p}{1 - 0.00266 \cdot \cos 2\varphi - 0.00028 \cdot h} \]

\[ ZWD = \frac{0.002277 \cdot e \cdot \left( \frac{1255}{T_{\text{Kelvin}}} + 0.05 \right)}{1 - 0.00266 \cdot \cos 2\varphi - 0.00038 \cdot h} \]

\[ ZTD = \text{ZHD} \cdot \text{dmap} + ZWD \cdot \text{wmap} \]

GPS data
- GPS Station: A
- GPS Station: B

Model (x-file) / Meteorological File

ZTD, \( \sigma_{\text{ZTD}} \) estimates:

GAMIT/Global

Earth Rotation Parameters
- Bulletin A
- IGS Orbits
  - (predicted/rapid/final)

SINEX xpi-files

IGS Station: 1
IGS Station: 2

PW = ZWD \cdot \frac{10^4}{R_p \cdot \left( \frac{k}{T_a} + k_r p \right)} \text{ mm}.

\[ \text{sig}^2_{\text{PW}} = \text{sig}^2_{\text{ZWD}} \cdot \frac{10^4}{R_p \cdot \left( \frac{k}{T_a} + k_r p \right)} \]
Comparison (PW/GPS and PW/Radiosonde)

20/04/..yağış yok.
21/04/ 1800-0000 ..<0.1 kg
22/04/ 0000-0600 .... 3 kg.
22/04/ 0600-1200 .... < 0.1 kg
22/04/ 1200-1800 ... 12 kg
22/04/ 1800-0000 ... 8 kg.
23/04/ 0000-0600 ... 10 kg.
23/04/ 0600-1200 ... 9 kg
23/04/ 1200-1800 ... 10 kg
24/04/ ... No rain.
6 and 12 hour rain forecasts

25 Oct 00:00 - 25 Oct 06:00

25 Oct 00:00 - 26 Oct 00:00

Rain 26 Oct 12:00 – 18:00 at maximum level.
Datum transformation works (ED50/WGS84)

Planned GPS obs. ~3000 stations
CORS-TR has been operational since May 2009.

At the moment, corrections are provided in RTCM/CMR+ format via GPRS/EDGE and single frequency receivers (for DGPS) and dual frequency receivers (for RTK) with GPRS modems are able to receive corrections.
Rover GPS Receivers: Should be dual frequency, be able to receive carrier phase corrections (RTCM/CMR) and be able to solve ambiguity with its own software.
ETRS-89 vs TUREF

Coor. Diff. Caused by Anatolian velocity wrt Eurasia

East comp. (mm)
Thanks for your attention.