



International Civil Aviation Organization

**THE FOURTH MEETING OF IONOSPHERIC
STUDIES TASK FORCE (ISTF/4)**

New Delhi, India, 05 – 07 February, 2014



Agenda Item 4a): Review of progress of tasks and related action items, Task 1 – data collection

CURRENT STATUS OF DATA CONVERSION TOOL AND DATABASE OF GTEX

(Presented by Japan)

SUMMARY

This paper reports on the current status of data conversion tool and database of GTEX. RNX2GTEX 1.0, software to convert RINEX data to GTEX (ver. 1.0) data, is now available from a NICT website. All the RINEX data collected by NICT Database has been converted to GTEX 1.0 data which is ready to copy to the ENRI data server.

1. INTRODUCTION

1.1 GNSS-TEC Exchange (GTEX) format (ver. 1.0, see Table 1) was agreed to be a data sharing format for ionospheric delay in the ICAO ISTF/2.

1.2 In the ISTF/3, “RNX2GTEX 0.1”, software to convert RINEX data to GTEX data (ver. 0.1, see Table 2) was introduced.

1.3 This working paper introduces software “RNX2GTEX 1.0” to convert RINEX data to GTEX data (ver. 1.0) developed by NICT, Japan. The current status of database of GTEX data in NICT Science Cloud is also introduced.

2. DISCUSSION

2.1 RNX2GTEX 1.0 for Linux/Unix consists in a set of programs written in fortran 77 and a shell script. The RNX2GTEX for Linux/Unix is available from the website:

<http://seg-web.nict.go.jp/GPS/DRAWING-TEC/software/RNX2GTEX.tgz>

The tar file includes RNX2GTEX directory, in which there are README, a shell script (RNX2GTEX.sh), Makefile and fortran source codes. Please use the Makefile to compile the fortran source codes. The shell script, RNX2GTEX.sh execute executable file in RNX2GTEX. It is needed to edit directory names (e.g., RINEX_DIR, TEC_DIR, ORBIT_DIR, work_dir etc.) in the shell script. Then, execute RNX2GTEX.sh with arguments of year and day-of-year as follows:

```
[machine]$ ./RNX2GTEX.sh 2013 180
```

Please refer to README for details of installation and usage.

2.2 RNX2GTEX 0.1 for Linux/Unix, previous version of RNX2GTEX which can provide GTEX 0.1, is also available from the website:

http://seg-web.nict.go.jp/GPS/DRAWING-TEC/software/RNX2GTEX_0.1.tgz

The major difference between GTEX ver. 0.1 and ver. 1.0 is that the GTEX ver. 0.1 provides only slant TEC and TEC flag for each satellite at each epoch, and does not include information of RINEX observables to derive slant TEC, satellite zenith angle, and satellite azimuth angle.

2.3 Although RNX2GTEX 1.0 for Windows XP/Vista/7 to provide GTEX 1.0 is still under development, RNX2GTEX 0.1 for GTEX 0.1 can be available from the website:

http://seg-web.nict.go.jp/GPS/DRAWING-TEC/software/RNX2GTEX_WIN.zip

RNX2GTEX for Windows is an application for creating GTEX data files from RINEX data using explorer-like GUI. Please refer to “RNX2GTEX_manual_en.pdf” included in the zip for details of installation and usage. For the moment, windows users are recommended to use the RNX2GTEX 0.1 for Windows XP/Vista/7 and to upload GTEX 0.1 data to the ENRI data server. In the server, GTEX 0.1 data will be converted to GTEX 1.0 using a software to convert GTEX 0.1 to GTEX 1.0.

2.4 NICT has started to convert all the available online GNSS receiver data to GTEX 1.0 using RNX2GTEX 1.0. This database will be available soon via NICT Science Cloud (<http://sc-web.nict.go.jp/> in Japanese only). These GTEX data is ready to copy to the ENRI data server.

3. ACTION BY THE MEETING

3.1 The meeting is invited to do the following:

- a) note the information presented in this paper; and
- b) discuss any relevant matters as appropriate.

TABLE 1

Example of GTEX (version 1.0) derived from daily data of “0132” GNSS station of GEONET.

```

-----|----1|0---|----2|0---|----3|0---|----4|0---|----5|0---|----6|0---|----7|0---|----8|
      1.0          GTEX DATA          GNSS          GTEX VERSION / TYPE
RNX2GTGX V1.0    NICT, JAPAN          PGM / RUN BY
      0          EXPONENT OF TECU
      TEC values in 10^16 el/m^2 (1 TEC Unit) COMMENT
      TEC Status Flag = 0 : Normal data COMMENT
                      = 1 : Lack of observables (TEC=999.) COMMENT
                      = 2 : Too large TEC (TEC=999.) COMMENT
                      = 4 : Cycle slip (TEC discontinuity) COMMENT
                      = 5 : Cycle slip (LLI) COMMENT
                      = 6 : Beginning of arc COMMENT
      TYPES OF DATA = R1 : Raw slant TEC including bias COMMENT
                      A1 : Absolute slant TEC COMMENT
                      R1 or A1 is necessary COMMENT
                      1F : TEC status flag COMMENT
                      10 : Observation data used for TEC COMMENT
                      ZN : Satellite zenith angle COMMENT
                      AZ : Satellite azimuth angle COMMENT
BIAS ESTIMATION PGM
01321310.12o 01321320.12o 01321330.12o RINEX FILE NAME
0132 MARKER NAME
00000 TPS NETG3 3.4 EG3 Jul,02,2010 REC # / TYPE / VERS
TRM29659.00 GSI ANT # / TYPE
-3690821.3891 2897721.3097 4305504.4426 APPROX POSITION XYZ
      42.7294 141.8640 0.0486 POSITION LAT LON ALT
      6 L1 C1 L2 P2 S1 S2 # / TYPES OF OBSERV
      5 R1 1F 10 ZN AZ # / TYPES OF DATA
      30.000 INTERVAL
      2012 5 11 0 0 0.0000000 GPS TIME OF FIRST OBS
END OF HEADER

12 5 11 0 0 0.0000000 0 9G21G 9G18G15G28G 5G27G 8G26
-61.7242 0 L1L2C1P2 32.45 194.42
-33.4733 0 L1L2C1P2 9.32 14.04
-49.7988 0 L1L2C1P2 20.39 9.03
-55.8391 0 L1L2C1P2 83.27 39.34
-43.6837 0 L1L2C1P2 32.21 44.21
-38.7060 0 L1L2C1P2 8.31 3.34
-44.8228 0 L1L2C1P2 74.42 265.99
-31.3004 0 L1L2C1P2 23.01 343.20
-48.7904 0 L1L2C1P2 50.12 115.79
12 5 11 0 0 30.0000000 0 9G21G 9G18G15G28G 5G27G 8G26
    
```

TABLE 2

Example of GTEX (version 0.1) derived from daily data of “0132” GNSS station of GEONET.

```

----|----1|0---|----2|0---|----3|0---|----4|0---|----5|0---|----6|0---|----7|0---|----8|
      0.1          GTEX DATA          GNSS          GTEX VERSION / TYPE
RNX2GTEX V0.1    NICT, JAPAN          PGM / RUN BY
      0          EXPONENT OF TECU
      TEC values in 10^16 el/m^2 (1 TEC Unit) COMMENT
      TEC Status Flag = 0 : Normal data COMMENT
                      = 1 : Lack of observables (TEC=999.) COMMENT
                      = 2 : Too large TEC (TEC=999.) COMMENT
                      = 4 : Cycle slip (TEC discontinuity) COMMENT
                      = 5 : Cycle slip (LLI) COMMENT
                      = 6 : Beginning of arc COMMENT
01321310.12o 01321320.12o 01321330.12o RINEX FILE NAME
0132          MARKER NAME
00000          TPS NETG3          3.4 EG3 Jul,02,2010 REC # / TYPE / VERS
          TRM29659.00          GSI          ANT # / TYPE
-3690821.3891 2897721.3097 4305504.4426 APPROX POSITION XYZ
          42.7294          141.8640          0.0486 POSITION LAT LON ALT
          6 L1 C1 L2 P2 S1 S2 # / TYPES OF OBSERV
          30.000          INTERVAL
          2012 5 11 0 0 0.0000000 GPS TIME OF FIRST OBS
          END OF HEADER

12 5 11 0 0 0.0000000 0 9G21G 9G18G15G28G 5G27G 8G26
-61.7242 0
-33.4733 0
-49.7988 0
-55.8391 0
-43.6837 0
-38.7060 0
-44.8228 0
-31.3004 0
-48.7904 0
12 5 11 0 0 30.0000000 0 9G21G 9G18G15G28G 5G27G 8G26

```
