November 26, 2012

Technical guidelines for using R2CGGTTS V5.1

Since Version 5.0, the old Visual Basic 6 interface should not be used, only the Fortran code (now "RINEX_CGGTTS.f.V51") is to be used and compiled on your own system with an appropriate Fortran 77 compiler ("gfortran" for example).

What's new in R2CGGTTS 5.1:

The improvements of version 5.1 with respect to version 5.0 are the following ones:

- Some vector dimensions were increased in order to manage the variatons of the number of GLONASS satellites.
- The software was adapted in order to manage RINEX files containing only GPS data and having no type letter in front of the PRN
- The selection of the codes to be used for the GLONASS ionosphere-free combination is now determined using their availability at the first observation epoch, and the same ionosphere-free combination is then used for all satellites of the same constellation.
    - For each frequency the code appearing for the largest number of satellites is chosen.
    - If there is equality for C and P code of a given frequency, then the P code is preferred.
- Read "TIME OF FIRST OBS" to determine system time (GPS or GLO) in which mixed RINEX observations are expressed.
- The software now works even if not all the file names are specified in InputFile. In that case the standard file names as indicated below are used.
- The reading of GLONASS navigation files was adapted so that only the data at 15:00 or 45:00 min are stored. An index IOE from 1 (0h15) to 48 (23h45) is assigned to each ephemeris.
- A unique broadcast ephemeris is used for a whole track and the IOE used is now reported. Except for the first track of the day, the ephemeris used is the one of which reference time just precedes the middle of the track.
- A mistake was corrected in the GLONASS MDIO computation: in version V5.0, a random GPS TGD value was removed from GLONASS MDIO, causing errors of several ns. The REFSYS values were not affected.

What's new in R2CGGTTS 5.0:

In this document, **fields in bold** highlight changes compared to R2CGGTTS V4.3.The improvements of version 5.0 with respect to version 4.x are the following ones:

- Ability to produce GLONASS iono-free CGGTTS data, combining P1/C1 with P2/C2 (C2 is preferentially used if both P2 and C2 are available).
- Deals with optional receiver clock offset "RCV CLOCK OFFSET APPL" (Rinex2.10 and onwards) if exists in the Rinex.
- # / TYPES OF OBSERV in Rinex files increased up to 18.
- Maximum number of satellites by epoch increased up to 36.
- Unhealthy satellites not used.
- Use GPS C2 if GPS P2 is not available..
- REFGPS fields renamed REFSYS, SRGPS renamed in SRSYS.
- Columns PS1 and PS2 representing the codes used for combination (L1P or L1C, L2P or L2C) have been added after the last column of the CGGTTS format.

Before starting:

Compile the Fortran 77 code on your own system with appropriate compiler.

Input/Output files:

(All the files have to be placed in the same directory)

INPUT FILES:

- rinex_obs : *rinex observation file*
- rinex_obs_p : *rinex observation file of the next day*[1]
- rinex_nav : *GPS navigation file*
- rinex_nav_p : *GPS navigation file of the next day*
- **rinex_nav_glo** : *GLONASS navigation file*[2]
- **rinex_nav_glo_p** : *GLONASS navigation file of the next day*[2]
- biasC1P1.dat : *Needed if GPS P1 code is missing in Rinex observation file*
- **biasC2P2.dat** : *Needed if GPS P2 code is missing in Rinex observation file*

- **paramCGGTTS.dat** : *!! New format*
  Contains all parameters related to the receiver
  (created by user, see further)
- **inputFile.dat** : *To fit names of input files according to the need*
  (created by user, see further)

[1] If rinex_obs_p is absent, the program will run but the last track of the day may be lost.
[2] If the rinex_nav_glo are absent, the program will run but no GLONASS data will be generated.

OUTPUT FILES:

- CGGTTS.gps *: CGGTTS GPS only file*
- **CGGTTS.glo** ***: CGGTTS GLONASS only file (if GLONASS data exists)***
- **CGGTTS.mix** ***: CGGTTS mixed GPS and GLONASS (if GLONASS data exists)***
- cggtts.log *: Log of execution*

Description of the files to be provided by the user:

paramCGGTTS.dat :

It contains all useful information that will appear in the header and parameters that will be used for CGGTTS file creation. The description of the file format is the following:

REV DATE YYYY-MM-DD	A 30	Date of last modification of the parameters
RCVR _____	A30	Type of receiver and serial number
CH _____	integer	Number of channels
LAB NAME _____	A30	Name of the laboratory
X COORDINATE _____.____	F16.4	X coordinate of antenna phase center (m)
Y COORDINATE _____.____	F16.4	Y coordinate of antenna phase center (m)
Z COORDINATE _____.____	F16.4	Z coordinate of antenna phase center (m)
COMMENTS _____	A30	All kind of comments
REF _____	A30	Laboratory reference
INT DELAY P1 XR+XS _____.____	F16.X	Receiver + antenna internal delay (GPS P1) (ns)
INT DELAY P1 GLO **_____.____**	**F16.X**	**Receiver + antenna internal delay (GLONASS P1) (ns)**
INT DELAY P2 XR+XS _____.____	F16.X	Receiver + antenna internal delay (GPS P2) (ns)
INT DELAY P2 GLO **_____.____**	**F16.X**	**Receiver + antenna internal delay (GLONASS P2) (ns)**
ANT CAB DELAY _____.____	F16.X	Antenna cable delay (ns)
CLOCK CAB DELAY XP+XO _____.____	F16.X	Delay to receiver reference (ns)
LEAP SECOND **_____**	Integer	**Number of leap seconds**

An example of paramCGGTTS.dat file is given below :

```
REV DATE
2002-07-01
RCVR
```

```
Z-XII3T
CH
12
LAB NAME
BP1B
X COORDINATE
 4476537.4101
Y COORDINATE
  600431.3929
Z COORDINATE
 4488761.1633
COMMENTS
NO COMMENTS
REF
BP1B
INT DELAY P1 XR+XS (in ns)
100.0
INT DELAY P1 GLO (in ns)
100.0
INT DELAY P2 XR+XS (in ns)
105.0
INT DELAY P2 GLO (in ns)
105.0
ANT CAB DELAY (in ns)
20.0
CLOCK CAB DELAY XP+XO (in ns)
50.0
LEAP SECOND
15
```

inputFile.dat :

This file is useful for an automatic generation of filenames fitted to the required day, but is not mandatory. If it is absent, input files must be named as indicated in the section “Input/Output files” above and the MJD will be entered interactively.
The description of the file format is the following: (example taken for day of year 65 of year 2011, for “ssss” receiver). If the file is used, only the lines with * are mandatory.

```
FILE_RINEX_NAV                  *
brdc0640.11N                    *
FILE_RINEX_NAV_P                *
brdc0650.11N                    *
FILE_RINEX_NAV_GLO
brdc0640.11G
FILE_RINEX_NAV_GLO_P
brdc0650.11G
FILE_RINEX_OBS                  *
ssss0640.11O                    *
FILE_RINEX_OBS_P
ssss0650.11O

FILE_CGGTTS_LOG
```

Execution:

Ensure that all required data are available in the same directory as the binary file.
Start the binary file, it will process the data and output files will be created.

file_cggtts_log	
FILE_CGGTTS_OUT	
ssss55625.gps	
FILE_CGGTTS_GLO	
ssss55625.glo	
FILE_CGGTTS_MIX	
ssss55625.mix	
MODIFIED_JULIAN_DAY	*
55625	*

If you encounter any trouble processing your data, please report to pascale.defraigne@oma.be or aharmeg@bipm.org.