

# ***GAMP II - GOOD* Users Guide**

## **Version 2.0**

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**GAMP II - GOOD (Gnss Observations and prOducts Downloader)** is a powerful and easy-to-use lightweight GNSS observations and product downloading toolkit, which is developed by the SASIN (SpAtial SurveyIng and Navigation) group at Shandong University of Science and Technology (SDUST). The current version is 2.0, which is more stable and powerful. Hence, we decide to make it available for global GNSS users, and we are convinced that more and more GNSS users will benefit from GAMP II - GOOD. **The source codes of GAMP II - GOOD is now available at GitHub (<https://github.com/zhouforme0318/GAMP-II-GOOD>).** We dedicated to create a more powerful GNSS data downloading tool, which can help each GNSS user to get rid of the trouble as much as possible in GNSS data and product downloading.

## Features

The main feature of GOOD is the convenient and efficient downloading of various GNSS observations and products. Specifically, they are

- IGS daily, hourly, and high-rate observations with short file name (RINEX version 2.xx)
- MGEX daily, hourly, and high-rate observations with long file name (RINEX version 3.xx)
- IGS + MGEX (taking the union of IGS and MGEX, while MGEX is preferred) daily, hourly, and high-rate observations
- Curtin University of Technology (CUT) daily observations with long file name (RINEX v3.xx)
- Geoscience Australia (GA) daily, hourly, and high-rate observations with long file name (RINEX v3.xx)
- Hong Kong CORS 30-s, 5-s, and 1-s observations with long file name (RINEX version v3.xx)
- NGS/NOAA CORS daily observations with short file name (RINEX v2.xx)
- EUREF Permanent Network (EPN) observations (long file name in RINEX v3.xx and short file name in RINEX v2.xx)
- Plate Boundary Observatory (PBO) observations (long file name in RINEX v3.xx and short file name in RINEX v2.xx)
- Various types of broadcast ephemeris, i.e., GPS- and GLONASS-only in RINEX v2.xx, mixed types in RINEX v3.xx and v4.xx for multiple GNSS
- Various types of IGS, MGEX, and other analysis center (AC) final, rapid, and ultra-rapid precise orbit and clock products, CNES real-time orbit and clock products in offline file format
- Various types of IGS final and ultra-rapid earth rotation/orientation parameter (ERP/EOP)
- ORBEX (ORBit EXchange format) products from five institutions, i.e., CODE, GFZ, GRG, WHU, and CNES
- GPS and GLONASS differential code bias (DCB) products from CODE and multi-GNSS differential signal bias (DSB) products from CAS
- Code observable-specific signal bias (OSB) products from six institutions, i.e., CAS, CODE, GFZ, GRG, WHU, and CNES
- IGS weekly SINEX solutions
- Various types of final, rapid, hourly rapid, 15-min rapid, 1-day and 2-day predicted global ionosphere map (GIM) products
- Rate of TEC index (ROTI) products
- CODE and IGS final tropospheric products
- IGS ANTEX format antenna phase center corrections

**But it is not limited to these, users can use the source code to expand its functionalities**

according to their needs.

## Version

- Vers. 1.0
  - 2021/04/16 new (by Feng Zhou @ SDUST)
  - 2021/04/20 MGEX multi-GNSS precise products option added (by Feng Zhou @ SDUST)
- Vers. 1.1
  - 2021/04/23 IGN and WHU FPT archives added (by Feng Zhou @ SDUST)
  - 2021/04/30 the day before and after the current day for precise satellite orbit and clock products downloading is added (by Feng Zhou @ SDUST and Zan Liu @ CUMT)
- Vers. 1.2
  - 2021/04/30 CNES real-time orbit, clock, bias files (in offline mode) option added (by Feng Zhou @ SDUST)
  - 2021/05/01 from DOY 345/2020, 'brdcDDD0.YYn' was converted from '.Z' to '.gz' (by Feng Zhou @ SDUST and Zan Liu @ CUMT)
  - 2021/05/01 added the full path of third-party softwares (by Feng Zhou @ SDUST and Yudan Yi)
- Vers. 1.3
  - 2021/05/05 add 'GetRoti' for rate of TEC index (ROTI) file downloading (by Feng Zhou @ SDUST and Lei Liu @ WHU)
- Vers. 1.4
  - 2021/05/06 add the compatibility for changing directory (chdir) in Windows and Linux OS (by Feng Zhou @ SDUST)
  - 2021/05/07 add the option 'printInfoWget' in configure file for (not) printing the information of running 'wget' (by Feng Zhou @ SDUST and Hong Hu @ AHU)
  - 2021/05/08 add IGS and MGEX hourly observation (30s) downloading (by Feng Zhou @ SDUST and Menghao Li @ HEU)
- Vers. 1.5
  - 2021/05/10 modify some codes to make GOOD adaptable to different compression form (i.e., '.Z' or '.gz') (by Feng Zhou @ SDUST)
  - 2021/05/12 add the option for IGR, IGU, GFU (from GFZ), and WUU (from WHU) products as well as the site-specific broadcast ephemeris files downloading (by Feng Zhou @ SDUST and Menghao Li @ HEU)
  - 2021/05/15 sub-directory (i.e., daily, hourly, and highrate) creation for observation downloading (by Feng Zhou @ SDUST and Menghao Li @ HEU)
- Vers. 1.6
  - 2021/05/18 modify some codes to make configuration file and program look more concise (by Feng Zhou @ SDUST and Menghao Li @ HEU)
  - 2021/05/21 add the extraction and conversion for the 'all' option in IGS and MGEX observation downloading (by Feng Zhou @ SDUST)
- Vers. 1.7
  - 2021/06/01 add 'getObc', 'getObg', and 'getObh' options for Curtin University of Technology (CUT), Geoscience Australia (GA), and Hong Kong CORS observation downloading (by Feng Zhou @ SDUST)

- 2021/07/16 modify `"*_R_"` to `"*"` for CRX file naming convention (by Feng Zhou @ SDUST)
- Vers. 1.8
 

2021/09/01 add various types of (i.e., ESA, GFZ, IGS, WHU) and rapid (i.e., CODE, NRCAN, ESA, GFZ, IGS) orbit and clock products for downloading (by Feng Zhou @ SDUST and Sermet Ogutcu @ NEU)

2021/09/04 add the option for NGS/NOAA CORS (from Amazon Web Services (AWS)) and EUREF Permanent Network (EPN) observation downloading (by Feng Zhou @ SDUST)

2021/09/05 fix the bug of broadcast ephemeris downloading via WHU FTP before and after 2020 (by Feng Zhou @ SDUST and Zan Liu @ CUMT)

2021/09/06 modify the setting of directories of GNSS observations and products to make them more elastic (by Feng Zhou @ SDUST and Caoming Fan @ SDU)
  - Vers. 1.9
 

Please refer to the header component of `FtpUtil.cpp`
  - Vers. 2.0
 

Please refer to the header component of `FtpUtil.cpp`

### How to run GOOD?

1. For Windows OS, type **'Win + R'** to open the running dialog box and **'cmd'** to open the terminal. For Linux/Mac OS, one need to open the terminal. After that, one need to enter into the directory where the executable GAMP II - GOOD is or give the full path of the executable GAMP II - GOOD through the terminal or set the environmental variable for GAMP II - GOOD.

**NOTE: Double-clicking the executable program does not work for data downloading.**

**There are two ways to run GOOD:**

2. One is to run the executable program **'run\_GOOD'** with the modified configuration file. Type **'run\_GOOD gamp\_GOOD.cfg'**, and one will get some scrolling information that **'wget'** gives if **'printInfoWget = 1'** is set. The corresponding GNSS observations and products will be downloaded and saved in the directories according to the configuration file **'gamp\_GOOD.cfg'**.
3. The other one is to run a python script **'run\_GOOD.py'** to generate the corresponding configuration file via command line. i.e., **'python run\_GOOD.py -dir\_main D:\data -time 2022 32 3 -ftp whu -obs daily igs site\_igs.list 0 24'**, which will download the IGS observations according to **'site.list'** for three consecutive days for the start of February 1, 2022. More information can refer to the help information of **'run\_GOOD.py'**, which can be accessed by typing **'python run\_GOOD.py'** or **'python run\_GOOD.py -h'**. Some examples are shown below:
  - 1) **'python run\_GOOD.py -dir\_main D:\data -time 2022 32 3 -ftp cddis -obs daily igs site\_igs.list 0 24'**;
  - 2) **'python run\_GOOD.py -dir\_main D:\data -time 2022 32 3 -ftp cddis -nav daily mixed3 igs 0 24 -orbclk igs 0 24 -eop igs 0 24'**;
  - 3) **'python run\_GOOD.py -dir\_main D:\data -time 2022 32 3 -ftp whu -obs daily igs site\_igs.list 0 24 -nav daily mixed3 igs 0 24'**;
  - 4) **'python run\_GOOD.py -dir\_main D:\data -time 2022 32 3 -ftp whu -snx -roti -atx'**;
  - 5) **'python run\_GOOD.py -dir\_main D:\data -time 2022 32 3 -ftp whu -obs daily igs site\_igs.list 0 24 -nav daily mixed3 igs 0 24 -orbclk igs 0 24 -eop igs 0 24 -obx cod\_m -dsb cod -snx -ion all -roti -trop igs site\_igs.list -atx'**.

**NOTE:** The main directory should be given in advance, then the executable program

‘run\_GOOD’ and the station list ‘site\_\*.list’ need to be placed in the main directory, and the configuration file generated by the python script ‘run\_GOOD.py’ is also in the main directory.

The key to master the basic operation of GOOD is to be familiar with the contents of configuration file ‘gamp\_GOOD.cfg’, and details are shown as follows:

1. For the components of ‘The directories of GNSS observations and products’, they are used for GNSS data and product storage. One can get the description of every sub-directory after the sign ‘%’. It is noted that one should only modified the component which is behind ‘=’ and before ‘%’. Note that the storage directories contain root/main directory ‘mainDir’ and some sub-directories (i.e., ‘obsDir’, ‘navDir’, et al.). If the setting of ‘mainDir’ is ‘C:\data’ and ‘obsDir’ is ‘obs’, the observations will be downloaded in the directory of ‘C:\data\obs’ on Windows.

**NOTE:** It is recommended that one can modify the setting of ‘mainDir’, while one don’t need to modify the setting of sub-directory. Keeping the default setting for each sub-directory is OK.

2. ‘3partyDir’: (optional) The directory where third-party softwares (i.e., ‘wget’, ‘gzip’, ‘crx2rnix’ etc) are stored. This option is not needed if you have set the path or environment variable for them. **There are two items for the setting of ‘3partyDir’:**

**1<sup>st</sup> item:** the switch (0: off 1: on);

**2<sup>nd</sup> item:** The absolute path where third-party softwares are stored.

3. ‘logFile’: The log file with full path that gives the indications of whether the data downloading is successful or not. **There are two items for the setting of ‘logFile’:**

**1<sup>st</sup> item:** (0: off 1: overwrite mode 2: append mode);

**2<sup>nd</sup> item:** The absolute/full path where log file is stored.

4. ‘procTime’: The setting of start time for processing. there are two choices: one is year, month, day, while the other is year, day of year. The last parameter is number of consecutive days for data downloading.

**1<sup>st</sup> item:** can be set to 1 or 2 (1: year month day ndays 2: year doy ndays).

5. ‘minusAdd1day’: The setting of the day before and after the current day for precise satellite orbit and clock products downloading. **There is one item for the setting of ‘minusAdd1day’:**

**1<sup>st</sup> item:** the switch (0: off 1: on).

6. ‘printInfoWget’: Printing the information generated by ‘wget’. **There is one item for the setting of ‘printInfoWget’:**

**1<sup>st</sup> item:** the switch (0: off 1: on).

7. ‘ftpDownloading’: The setting of the master switch for data downloading. **There are two items for the setting of ‘ftpDownloading’:**

**1<sup>st</sup> item:** the switch (0: off 1: on);

**2<sup>nd</sup> item:** the FTP archive, i.e., cddis, ign, or whu.

8. ‘getObs’: GNSS observation data downloading option. **There are six items for the setting of ‘getObs’:**

**1<sup>st</sup> item:** (0: off 1: on);

**2<sup>nd</sup> item:** ‘daily’, ‘hourly’, ‘highrate’, ‘30s’, ‘5s’, or ‘1s’;

**3<sup>rd</sup> item:** ‘igs’, ‘mgex’, ‘igm’, ‘cut’, ‘ga’, ‘hk’, ‘ngs’, ‘epn’, ‘pbo2’, ‘pbo3’, or ‘pbo5’;

**4<sup>th</sup> item:** ‘all’ (observation files downloaded in the whole directory) or the ull path of site list (observation files downloaded site-by-site according to the site list file);

**5<sup>th</sup> item:** Start hour (00, 01, 02, ...);

**6<sup>th</sup> item:** The consecutive hours, i.e., '01 3' denotes 01, 02, and 03.

**NOTE:** The 5<sup>th</sup> and 6<sup>th</sup> items are valid ONLY when the 2<sup>nd</sup> item is 'hourly', 'highrate', '5s', or '1s'.

**NOTE:** If the 3<sup>rd</sup> item is 'igs', 'mgex', 'igm', or 'ga', the 2<sup>nd</sup> item can be 'daily', 'hourly', or 'highrate'; If the 3<sup>rd</sup> item is 'cut', 'ngs', 'epn', 'pbo2', 'pbo3', or 'pbo5', the 2<sup>nd</sup> item should be 'daily'; If the 3<sup>rd</sup> item is 'hk', the 2<sup>nd</sup> item can be 1) '30s', '5s', or '1s' 2) '30s', '05s', or '01s'. However, '30 s', '5 s', or '1 s' is NOT allowed.

**NOTE:** If the 3<sup>rd</sup> item is 'hk' or 'ngs', the 4<sup>th</sup> item should ONLY be the full path of site list.

**INFO:** The 2<sup>nd</sup> item 'igs' is for IGS observation (RINEX version 2.xx, short name 'd');

The 2<sup>nd</sup> item 'mgex' is for MGEX observation (RINEX version 3.xx, long name 'crx');

The 2<sup>nd</sup> item 'igm' is for the union of IGS and MGEX (IGS + MGEX, while the priority of MGEX sites is higher) observation with respect to the site name;

The 2<sup>nd</sup> item 'cut' is for Curtin University of Technology (CUT) observation (RINEX version 3.xx, long name 'crx');

The 2<sup>nd</sup> item 'ga' is for Geoscience Australia (GA) observation (RINEX version 3.xx, long name 'crx');

The 2<sup>nd</sup> item 'hk' is for Hong Kong CORS observation (RINEX version 3.xx, long name 'crx');

The 2<sup>nd</sup> item 'ngs' is for NGS/NOAA CORS observation (RINEX version 2.xx, short name 'd');

The 2<sup>nd</sup> item 'epn' is for EUREF Permanent Network (EPN) observation (RINEX version 3.xx, long name 'crx' and RINEX version 2.xx, short name 'd');

The 2<sup>nd</sup> item 'pbo2' is for Plate Boundary Observatory (PBO) observation (RINEX version 2.xx, short name 'd');

The 2<sup>nd</sup> item 'pbo3' is for Plate Boundary Observatory (PBO) observation (RINEX version 3.xx, long name 'crx');

The 2<sup>nd</sup> item 'pbo5' is for Plate Boundary Observatory (PBO) observation (taking the union of pbo2 and pbo3 (pbo2 + pbo3), while the priority of pbo3 sites is higher).

9. 'getNav': Various broadcast ephemeris downloading option. **There are seven items for the setting of 'getNav':**

**1<sup>st</sup> item:** (0: off 1: on);

**2<sup>nd</sup> item:** 'daily' or 'hourly';

**3<sup>rd</sup> item:** 'gps', 'glo', 'bds', 'gal', 'qzs', 'irn', 'mixed3', 'mixed4', or 'all';

**4<sup>th</sup> item:** Analysis center (i.e., 'igs', 'dlr', 'ign', 'gop', or 'wrđ') that carries out the combination of broadcast ephemeris for mixed navigation data. From CDDIS or WHU FTP, 'igs' and 'dlr' can be downloaded, and from IGN, 'igs' and 'ign' can be downloaded. The downloading of 'gop' and/or 'wrđ' is via the other FTP addresses;

**5<sup>th</sup> item:** ONLY the full path of site.list is valid if the 2<sup>nd</sup> item is 'hourly';

**6<sup>th</sup> item:** Start hour (00, 01, 02, ...);

**7<sup>th</sup> item:** The consecutive hours, i.e., '01 3' denotes 01, 02, and 03.

**NOTE:** The 5<sup>th</sup>, 6<sup>th</sup>, and 7<sup>th</sup> items are valid ONLY when the 2<sup>nd</sup> item 'hourly' is set.

**NOTE:** If the 2<sup>nd</sup> item is 'daily', the 3<sup>rd</sup> item should be 'gps', 'glo', 'mixed3', or 'mixed4'; If the 2<sup>nd</sup> item is 'hourly', the 3<sup>rd</sup> item can be 'gps', 'glo', 'bds', 'gal', 'qzs', 'irn', 'mixed', or 'all'.

**NOTE:** The 4<sup>th</sup> item is valid ONLY when the 3<sup>rd</sup> item is 'mixed3'.

**NOTE:** The 3<sup>rd</sup> item 'mixed3' is for RINEX 3.xx, while 'mixed4' is for RINEX 4.xx.

10. 'getOrbClk': Satellite final/rapid/ultra-rapid precise orbit and clock downloading option. **There**

are four items for the setting of 'getOrbClk':

**1<sup>st</sup> item:** (0: off 1: on);

**2<sup>nd</sup> item:** Analysis center (i.e., IGS final: 'cod', 'emr', 'esa', 'gfz', 'grg', 'igs', 'jpl', 'mit', 'all', 'cod+igs', 'cod+gfz+igs', ...; MGEX final: 'cod\_m', 'gfz\_m', 'grg\_m', 'whu\_m', 'all\_m', 'cod\_m+gfz\_m', 'grg\_m+whu\_m', ...; rapid: 'cod\_r', 'emr\_r', 'esa\_r', 'gfz\_r', 'igs\_r'; ultra-rapid: 'esa\_u', 'gfz\_u', 'igs\_u', 'whu\_u'; real-time: 'cnt'). **NOTE:** The option of 'cnt' is for real-time precise orbit and clock products from CNES offline files;

**3<sup>rd</sup> item:** Start hour (00, 06, 12, or 18 for esa\_u and igs\_u; 00, 03, 06, ... for gfz\_u; 01, 02, 03, ... for whu\_u);

**4<sup>th</sup> item:** The consecutive sessions, i.e., '00 3' denotes 00, 06, and 12 for esa\_u and/or igs\_u, 00, 03, and 06 for gfz\_u, while 00, 01, and 02 for whu\_u.

**NOTE:** The 3rd and 4th items are valid ONLY when the 2nd item 'esa\_u', 'gfz\_u', 'igs\_u', or 'whu\_u' is set.

```

/* cod_m: CODE multi-GNSS final orbit and clock products
   gfz_m: GFZ multi-GNSS final orbit and clock products
   grg_m: CNES multi-GNSS final orbit and clock products
   whu_m: WHU multi-GNSS final orbit and clock products
*/
std::vector<string> acMGEX = { "cod_m", "gfz_m", "grg_m", "whu_m" };
for (int i = 0; i < acMGEX.size(); i++)
{
    if (ac_i == acMGEX[i])
    {
        prodType = PROD_FINAL_MGEX;

        break;
    }
}

/* cod_r: CODE rapid orbit and clock products
   emr_r: NRCAN rapid orbit and clock products
   esa_r: ESA rapid orbit and clock products
   gfz_r: GFZ rapid orbit and clock products
   igs_r: IGS rapid orbit and clock products
*/
std::vector<string> rapidAc = { "cod_r", "emr_r", "esa_r", "gfz_r", "igs_r" };
for (int i = 0; i < rapidAc.size(); i++)
{
    if (ac_i == rapidAc[i])
    {
        prodType = PROD_RAPID;

        break;
    }
}

/* cod: CODE final orbit and clock products
   emr: NRCAN final orbit and clock products
   esa: ESA final orbit and clock products
   gfz: GFZ final orbit and clock products
   grg: CNES final orbit and clock products
   igs: IGS final orbit and clock products
   jpl: JPL final orbit and clock products
   mit: MIT final orbit and clock products
*/
std::vector<string> finalAcIGS = { "cod", "emr", "esa", "gfz", "grg", "igs", "jpl", "mit" };
for (int i = 0; i < finalAcIGS.size(); i++)
{
    if (ac_i == finalAcIGS[i])
    {
        prodType = PROD_FINAL_IGS;

        break;
    }
}

/* cod_m: CODE multi-GNSS final orbit and clock products
   gfz_m: GFZ multi-GNSS final orbit and clock products
   grg_m: CNES multi-GNSS final orbit and clock products
   whu_m: WHU multi-GNSS final orbit and clock products
*/
std::vector<string> acMGEX = { "cod_m", "gfz_m", "grg_m", "whu_m" };
for (int i = 0; i < acMGEX.size(); i++)
{
    if (ac_i == acMGEX[i])
    {
        prodType = PROD_FINAL_MGEX;

        break;
    }
}

```

11. ‘getEop’: Earth rotation/orientation parameter (ERP/EOP) downloading option. **There are four items for the setting of ‘getEop’:**

**1<sup>st</sup> item:** (0: off 1: on);

**2<sup>nd</sup> item:** Analysis center (i.e., final: 'cod', 'emr', 'esa', 'gfz', 'grg', 'igs', 'jpl', 'mit'; ultra-rapid: 'esa\_u', 'gfz\_u', 'igs\_u');

**NOTE:** The 3rd and 4th items are valid ONLY when the 2nd item is 'esa\_u', 'gfz\_u', or 'igs\_u'.

12. ‘getObx’: ORBEX (ORBit EXchange format) for satellite attitude information downloading option. **There are two items for the setting of ‘getObx’:**

**1<sup>st</sup> item:** (0: off 1: on);



- 2<sup>nd</sup> item:** Analysis center (i.e., final/rapid: 'cod\_m', 'gfz\_m', 'grg\_m', 'whu\_m', 'all\_m'; real-time: 'cnt'). **NOTE:** The option of 'cnt' is for real-time ORBEX from CNES offline files.
13. 'getDsb': Differential code/signal bias (DCB/DSB) downloading option. **There are two items for the setting of 'getDsb':**
- 1<sup>st</sup> item:** (0: off 1: on);
- 2<sup>nd</sup> item:** Analysis center (i.e., 'cod', 'cas', 'all');
- NOTE:** DCBs from CODE are for GPS and GLONASS, while DSBs from CAS are for multiple GNSS.
14. 'getOsb': Observable-specific signal bias (OSB) downloading option. **There are two items for the setting of 'getOsb':**
- 1<sup>st</sup> item:** (0: off 1: on);
- 2<sup>nd</sup> item:** Analysis center (i.e., final/rapid: 'cas\_m', 'cod\_m', 'gfz\_m', 'grg\_m', 'whu\_m', 'all\_m'; real-time: 'cnt'). **NOTE:** The option of 'cnt' is for real-time OSBs from CNES offline files.
15. 'getSnx': IGS weekly SINEX downloading option. **There is one item for the setting of 'getSnx':**
- 1<sup>st</sup> item:** (0: off 1: on).
16. 'getIon': Global ionosphere map (GIM) downloading option. **There are two items for the setting of 'getIon':**
- 1<sup>st</sup> item:** (0: off 1: on);
- 2<sup>nd</sup> item:** Analysis center (i.e., final: 'cas', 'cod', 'emr', 'esa', 'igs', 'jpl', 'upc', 'all', 'cas+cod', 'cas+cod+igs', ...; rapid: 'cas\_r', 'cod\_r', 'esa\_r', 'igs\_r', 'jpl\_r', 'upc\_r', 'all\_r', 'cas\_r+cod\_r', 'cas\_r+cod\_r+igs\_r', ...; hourly rapid: 'emr\_hr', 'upc\_hr'; 15-min rapid: 'upc\_0.25hr'; predicted: 'cod\_1d', 'cod\_2d').
17. 'getRoti': Rate of TEC index (ROTI) downloading option. **There is one item for the setting of 'getRoti':**
- 1<sup>st</sup> item:** (0: off 1: on).
18. 'getTrp': CODE/IGS tropospheric product downloading option. **There are three items for the setting of 'getTrp':**
- 1<sup>st</sup> item:** (0:off 1:on);
- 2<sup>nd</sup> item:** Analysis center (i.e., 'igs' or 'cod');
- 3<sup>rd</sup> item:** 'all' (tropospheric product downloaded in the whole directory) or the full path of site.list (tropospheric product files downloaded site-by-site according to the 'site.list', i.e., cut0, gmsd, jfng, ...) is valid.
- NOTE:** The 3rd item is valid ONLY when the 2nd item 'igs' is set.
19. 'getAtx': ANTEX format antenna phase center correction downloading option. **There is one item for the setting of 'getAtx':**
- 1<sup>st</sup> item:** (0: off 1: on).

**NOTE: If some GNSS data cannot be successfully downloaded, check your network first. Then, check if the file exists on the remote server. Finally, rerun 'run\_GAMP\_GOOD gamp\_good.cfg' to try again. Don't worry, once the data has been downloaded, it will not be downloaded repeatedly.**

Any suggestions, corrections, and comments about *GAMP II - GOOD* are sincerely welcomed and could be sent to:

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**It is recommended to acknowledge GAMP II - GOOD toolkit or the *GAMP* paper published in GPS Solutions (<https://link.springer.com/article/10.1007/s10291-018-0699-9>) when you find it useful!**

Some FTP addresses are listed as follows:

For Curtin University of Technology (CUT) observation files:  
<http://saegnss2.curtin.edu/ldc/rinex3/daily/>

For Geoscience Australia (GA) observation files: <ftp://ftp.data.gnss.ga.gov.au/>

For Hong Kong CORS observation files: <ftp://ftp.geodetic.gov.hk/rinex3/>

For CODE DCB and tropospheric product files: <ftp://ftp.aiub.unibe.ch/CODE/>

For CNES real-time orbit and clock products in offline mode: [http://www.ppp-wizard.net/products/REAL\\_TIME/](http://www.ppp-wizard.net/products/REAL_TIME/)

For IGS ANTEX file: <https://files.igs.org/pub/station/general/>

```
/**
 * @brief   : init - Get FTP archive for CDDIS, IGN, or WHU
 * @param[I]: none
 * @param[0]: none
 * @return  : none
 * @note    :
 */
void FtpUtil::init()
{
    /* FTP archive for CDDIS */

    _ftpArchive.CDDIS.push_back("https://gdc.cddis.eosdis.nasa.gov/pub/gnss/data/daily");
    /* IGS daily observation (30s) files */

    _ftpArchive.CDDIS.push_back("https://gdc.cddis.eosdis.nasa.gov/pub/gnss/data/hourly");
    /* IGS hourly observation (30s) files */

    _ftpArchive.CDDIS.push_back("https://gdc.cddis.eosdis.nasa.gov/pub/gnss/data/highrate");
    /* IGS high-rate observation (1s) files */

    _ftpArchive.CDDIS.push_back("https://gdc.cddis.eosdis.nasa.gov/pub/gnss/data/daily");
    /* MGEX daily observation (30s) files */
}
```

```

_ftpArchive.CDDIS.push_back("https://gdc.cddis.eosdis.nasa.gov/pub/gnss/data/hourly");
/* MGEX hourly observation (30s) files */

_ftpArchive.CDDIS.push_back("https://gdc.cddis.eosdis.nasa.gov/pub/gnss/data/highrate");
/* MGEX high-rate observation (1s) files */

_ftpArchive.CDDIS.push_back("https://gdc.cddis.eosdis.nasa.gov/pub/gnss/data/daily");
/* broadcast ephemeris files */
_ftpArchive.CDDIS.push_back("https://gdc.cddis.eosdis.nasa.gov/pub/gnss/products");
/* IGS SP3 files */
_ftpArchive.CDDIS.push_back("https://gdc.cddis.eosdis.nasa.gov/pub/gnss/products");
/* IGS CLK files */
_ftpArchive.CDDIS.push_back("https://gdc.cddis.eosdis.nasa.gov/pub/gnss/products");
/* IGS EOP files */
_ftpArchive.CDDIS.push_back("https://gdc.cddis.eosdis.nasa.gov/pub/gnss/products");
/* IGS weekly SINEX files */

_ftpArchive.CDDIS.push_back("https://gdc.cddis.eosdis.nasa.gov/pub/gnss/products/mgex");
/* MGEX SP3 files */

_ftpArchive.CDDIS.push_back("https://gdc.cddis.eosdis.nasa.gov/pub/gnss/products/mgex");
/* MGEX CLK files */

_ftpArchive.CDDIS.push_back("https://gdc.cddis.eosdis.nasa.gov/pub/gnss/products/mgex");
/* MGEX ORBEX files */

_ftpArchive.CDDIS.push_back("https://gdc.cddis.eosdis.nasa.gov/pub/gnss/products/bias");
/* MGEX DSB files */

_ftpArchive.CDDIS.push_back("https://gdc.cddis.eosdis.nasa.gov/pub/gnss/products/mgex");
/* MGEX OSB files */

_ftpArchive.CDDIS.push_back("https://gdc.cddis.eosdis.nasa.gov/pub/gnss/products/ionex")
;          /* global ionosphere map (GIM) files */

_ftpArchive.CDDIS.push_back("https://gdc.cddis.eosdis.nasa.gov/pub/gnss/products/ionex")
;          /* Rate of TEC index (ROTI) files */

_ftpArchive.CDDIS.push_back("https://gdc.cddis.eosdis.nasa.gov/pub/gnss/products/troposp
here/zpd"); /* IGS final tropospheric product files */

/* FTP archive for IGN */
_ftpArchive.IGN.push_back("ftp://igs.ign.fr/pub/igs/data");

```

```

/* IGS daily observation (30s) files */
    _ftpArchive.IGN.push_back("ftp://igs.ign.fr/pub/igs/data/hourly");
/* IGS hourly observation (30s) files */
    _ftpArchive.IGN.push_back("ftp://igs.ign.fr/pub/igs/data/highrate");
/* IGS high-rate observation (1s) files */
    _ftpArchive.IGN.push_back("ftp://igs.ign.fr/pub/igs/data");
/* MGEX daily observation (30s) files */
    _ftpArchive.IGN.push_back("ftp://igs.ign.fr/pub/igs/data/hourly");
/* MGEX hourly observation (30s) files */
    _ftpArchive.IGN.push_back("ftp://igs.ign.fr/pub/igs/data/highrate");
/* MGEX high-rate observation (1s) files */
    _ftpArchive.IGN.push_back("ftp://igs.ign.fr/pub/igs/data");
/* broadcast ephemeris files */
    _ftpArchive.IGN.push_back("ftp://igs.ign.fr/pub/igs/products");
/* IGS SP3 files */
    _ftpArchive.IGN.push_back("ftp://igs.ign.fr/pub/igs/products");
/* IGS CLK files */
    _ftpArchive.IGN.push_back("ftp://igs.ign.fr/pub/igs/products");
/* IGS EOP files */
    _ftpArchive.IGN.push_back("ftp://igs.ign.fr/pub/igs/products");
/* IGS weekly SINEX files */
    _ftpArchive.IGN.push_back("ftp://igs.ign.fr/pub/igs/products/mgex");
/* MGEX SP3 files */
    _ftpArchive.IGN.push_back("ftp://igs.ign.fr/pub/igs/products/mgex");
/* MGEX CLK files */
    _ftpArchive.IGN.push_back("ftp://igs.ign.fr/pub/igs/products/mgex");
/* MGEX ORBEX files */
    _ftpArchive.IGN.push_back("ftp://igs.ign.fr/pub/igs/products/mgex/dcb");
/* MGEX DSB files */
    _ftpArchive.IGN.push_back("ftp://igs.ign.fr/pub/igs/products/mgex");
/* MGEX OSB files */
    _ftpArchive.IGN.push_back("ftp://igs.ign.fr/pub/igs/products/ionosphere");
/* global ionosphere map (GIM) files */
    _ftpArchive.IGN.push_back("ftp://igs.ign.fr/pub/igs/products/ionosphere");
/* Rate of TEC index (ROTI) files */
    _ftpArchive.IGN.push_back("ftp://igs.ign.fr/pub/igs/products/troposphere");
/* IGS final tropospheric product files */

/* FTP archive for WHU */
    _ftpArchive.WHU.push_back("ftp://igs.gnsswhu.cn/pub/gps/data/daily");
/* IGS daily observation (30s) files */
    _ftpArchive.WHU.push_back("ftp://igs.gnsswhu.cn/pub/gps/data/hourly");
/* IGS hourly observation (30s) files */
    _ftpArchive.WHU.push_back("ftp://igs.gnsswhu.cn/pub/highrate");

```

```

/* IGS high-rate observation (1s) files */
    _ftpArchive.WHU.push_back("ftp://igs.gnsswhu.cn/pub/gps/data/daily");
/* MGEX daily observation (30s) files */
    _ftpArchive.WHU.push_back("ftp://igs.gnsswhu.cn/pub/gps/data/hourly");
/* MGEX hourly observation (30s) files */
    _ftpArchive.WHU.push_back("ftp://igs.gnsswhu.cn/pub/highrate");
/* MGEX high-rate observation (1s) files */
    _ftpArchive.WHU.push_back("ftp://igs.gnsswhu.cn/pub/gps/data/daily");
/* broadcast ephemeris files */
    _ftpArchive.WHU.push_back("ftp://igs.gnsswhu.cn/pub/gps/products");
/* IGS SP3 files */
    _ftpArchive.WHU.push_back("ftp://igs.gnsswhu.cn/pub/gps/products");
/* IGS CLK files */
    _ftpArchive.WHU.push_back("ftp://igs.gnsswhu.cn/pub/gps/products");
/* IGS EOP files */
    _ftpArchive.WHU.push_back("ftp://igs.gnsswhu.cn/pub/gps/products");
/* IGS weekly SINEX files */
    _ftpArchive.WHU.push_back("ftp://igs.gnsswhu.cn/pub/gps/products/mgex");
/* MGEX SP3 files */
    _ftpArchive.WHU.push_back("ftp://igs.gnsswhu.cn/pub/gps/products/mgex");
/* MGEX CLK files */
    _ftpArchive.WHU.push_back("ftp://igs.gnsswhu.cn/pub/gps/products/mgex");
/* MGEX ORBEX files */
    _ftpArchive.WHU.push_back("ftp://igs.gnsswhu.cn/pub/gps/products/mgex/dcb");
/* MGEX DSB files */
    _ftpArchive.WHU.push_back("ftp://igs.gnsswhu.cn/pub/gps/products/mgex");
/* MGEX OSB files */
    _ftpArchive.WHU.push_back("ftp://igs.gnsswhu.cn/pub/gps/products/ionex");
/* global ionosphere map (GIM) files */
    _ftpArchive.WHU.push_back("ftp://igs.gnsswhu.cn/pub/gps/products/ionex");
/* Rate of TEC index (ROTI) files */
    _ftpArchive.WHU.push_back("ftp://igs.gnsswhu.cn/pub/gps/products/troposphere/new");
/* IGS final tropospheric product files */
} /* end of init */

```