

2016

PPP Manual

using RTKLIB

Supported by GNSS TUTOR

This manual consisted of following tasks.

A. Data acquisition part

Slide 3 – 7

B. Analyzing process part

Slide 8 - 12

A

Data Acquisition from Web

✓ We need the following data to do PPP. So please go to the URL which supported each data and download it.

Slide 4-5

- Observation file and Navigation message file (.16o and .16n)

Slide 6

- Final products file and Clock file (.sp3 and .clk) → <ftp://igs.bkg.bund.de/IGS/products/orbits/>

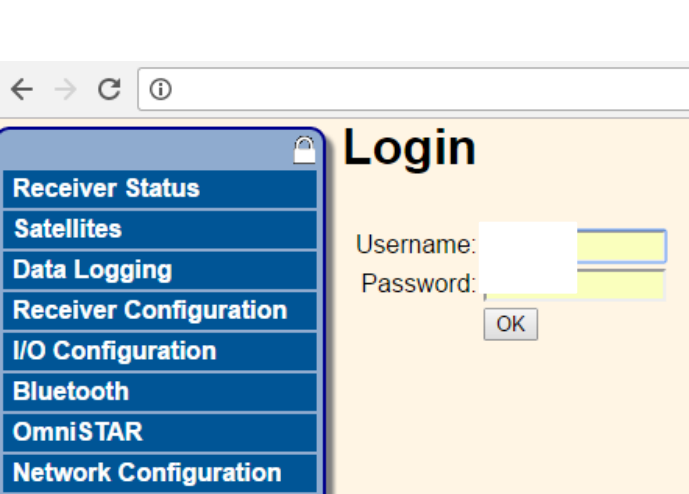
Slide 7

- DCB file (.DCB) → <ftp://ftp.unibe.ch/aiub/CODE/2016/>
- Antenna file (.atx) → <ftp://igs.org/pub/station/general/>

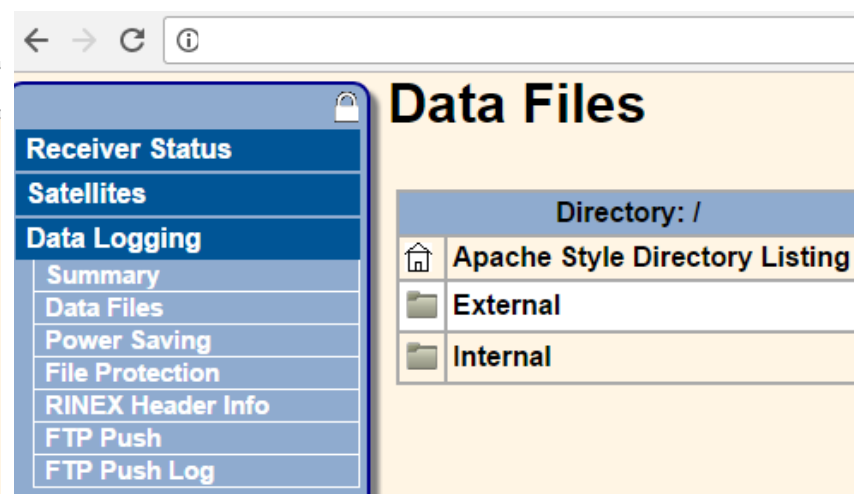
A

Observation File and Navigation Message File ①

✓ Please get the observation data.



(i) Login



(ii) Go to "Data Files".

	Filename		Created	Size
	5245K53320201611162100B.T02	Convert	2016-11-16T21:00:00 GPS	6.197 MB
	5245K53320201611161800B.T02	Convert	2016-11-16T18:00:00 GPS	5.836 MB
	5245K53320201611161500B.T02	Convert	2016-11-16T15:00:00 GPS	4.680 MB
	5245K53320201611161200B.T02	Convert	2016-11-16T12:00:00 GPS	5.415 MB
	5245K53320201611160900B.T02	Convert	2016-11-16T09:00:00 GPS	4.965 MB
	5245K53320201611160600B.T02	Convert	2016-11-16T06:00:00 GPS	5.185 MB
	5245K53320201611160300B.T02	Convert	2016-11-16T03:00:00 GPS	5.172 MB
	5245K53320201611160000B.T02	Convert	2016-11-16T00:00:00 GPS	5.104 MB

In case of 3h_1hz of Internal on Nov. 16th

(iii) Internal or External → hour&hertz → year → month → day → Please select the time span which you want to analyze.

Click Filename, then starting to download T02 file.

A

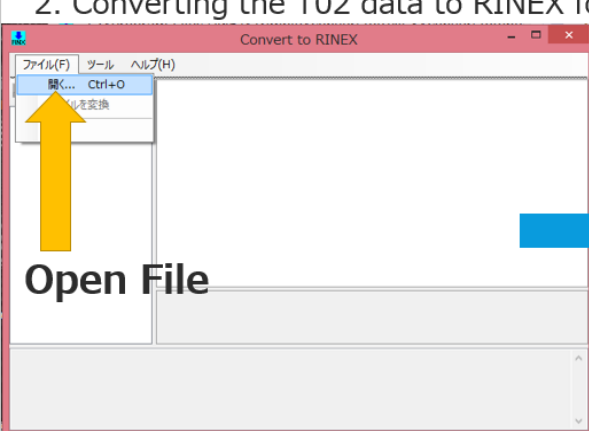
Observation File and Navigation Message File ②

1. Start-up freeware; "Convert To RINEX" →
2. Converting the T02 data to RINEX format

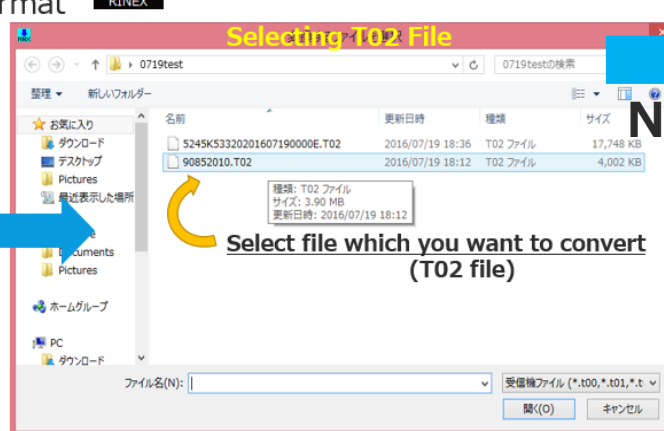


2. Converting the T02 data to RINEX format

Select "Convert file"

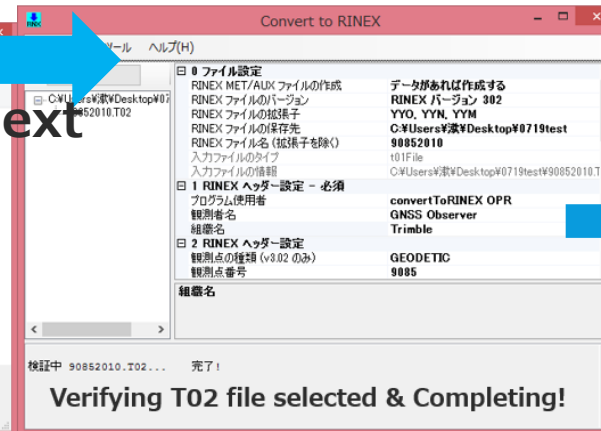


Open File

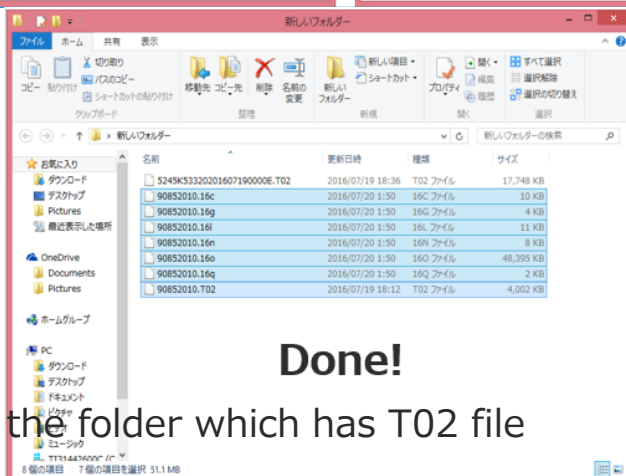
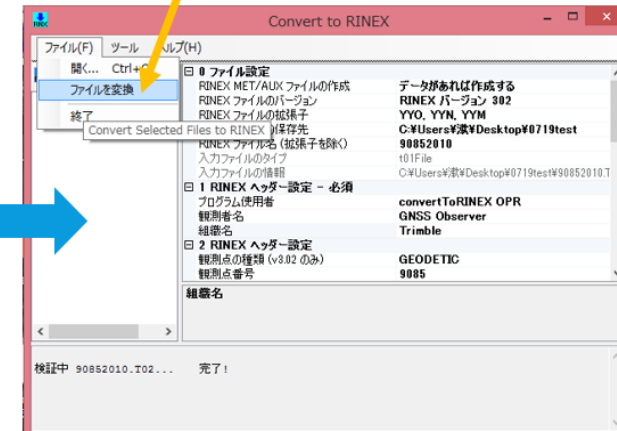


Select file which you want to convert (T02 file)

Next



Verifying T02 file selected & Completing!



Done!

3. Move to the folder which has T02 file

Then, Created .16o and .16n
These files are needed in the process of RTKPOST.

A

Final Products File and Clock File ①

✓ Please access the site "GPS Date Calendar". → <http://adn.agi.com/GNSSWeb/>

Check the week number and the day number.

October		November 2016					December
Sun	Mon	Tue	Wed	Thu	Fri	Sat	
		1 1921:2 897:172800 306	2 1921:3 897:259200 307	3 1921:4 897:345600 308	4 1921:5 897:432000 309	5 1921:6 897:518400 310	
6 1922:0 898:0 311	7 1922:1 898:86400 312	8 1922:2 898:172800 313	9 1922:3 898:259200 314	10 1922:4 898:345600 315	11 1922:5 898:432000 316	12 1922:6 898:518400 317	
13 1923:0 899:0 318	14 1923:1 899:86400 319	15 1923:2 899:172800 320	16 1923:3 899:259200 321	17 1923:4 899:345600 322	18 1923:5 899:432000 323	19 1923:6 899:518400 324	
20 1924:0 900:0 325	21 1924:1 900:86400 326	22 1924:2 900:172800 327	23 1924:3 900:259200 328	24 1924:4 900:345600 329	25 1924:5 900:432000 330	26 1924:6 900:518400 331	
27 1925:0 901:0 332	28 1925:1 901:86400 333	29 1925:2 901:172800 334	30 1925:3 901:259200 335				

In case of
Nov. 13rd

1918/
1919/
1920/
1921/
1922/
1923/
BSW50/
BSW52/

FTP site

2016/10/27 23:46:00
2016/11/03 11:46:00
2016/11/13 23:46:00
2016/11/11 17:37:00
2016/11/16 11:43:00
2016/11/17 3:13:00
2016/05/25 17:51:00
2016/05/11 0:00:00

Download "19***.clk.Z"

[親データ]	igr19230.clk.Z	568 kB	2016/11/14 17:30:00
	igr19230.erp.Z	396 B	2016/11/14 17:30:00
	igr19230.sp3.Z	94.9 kB	2016/11/14 17:30:00
	igr19231.clk.Z	568 kB	2016/11/15 17:30:00
	igr19231.erp.Z	391 B	2016/11/15 17:30:00
	igr19231.sp3.Z	94.8 kB	2016/11/15 17:30:00
	igr19232.clk.Z	597 kB	2016/11/16 17:30:00
	igr19232.erp.Z	393 B	2016/11/16 17:30:00
	igr19232.sp3.Z	94.9 kB	2016/11/16 17:30:00

Download "19***_**.sp3.Z"

	igu19230_00.erp.Z	461 B	2016/11/13 3:13:00
	igu19230_00.sp3.Z	185 kB	2016/11/13 3:13:00
	igu19230_06.erp.Z	461 B	2016/11/13 9:13:00
	igu19230_06.sp3.Z	185 kB	2016/11/13 9:13:00
	igu19230_12.erp.Z	453 B	2016/11/13 15:13:00
	igu19230_12.sp3.Z	186 kB	2016/11/13 15:13:00
	igu19230_18.erp.Z	461 B	2016/11/13 21:13:00
	igu19230_18.sp3.Z	185 kB	2016/11/13 21:13:00

2016/11/18

And unzip these files. These files are needed in the process of RTKPOST.

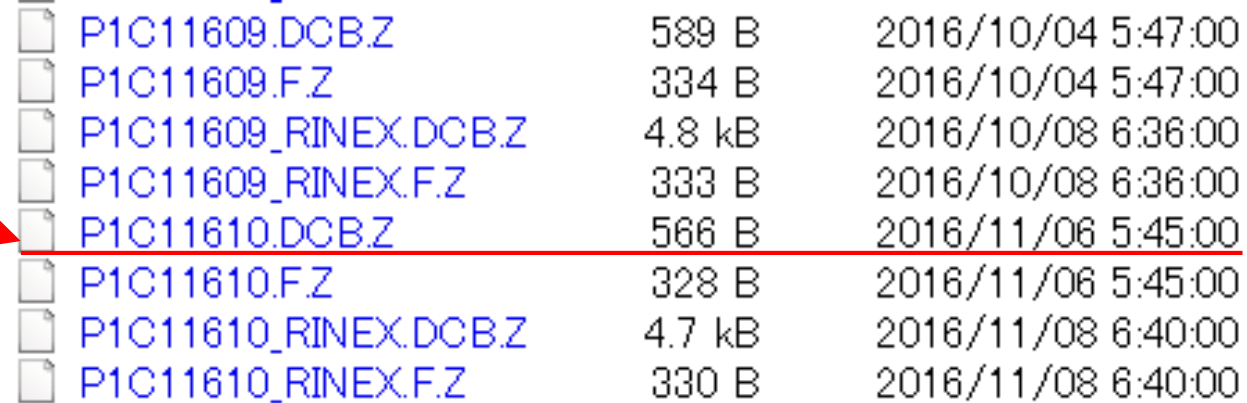
A

DCB File and Antenna File

✓ Please get the latest DCB file.

P1C1.DCB

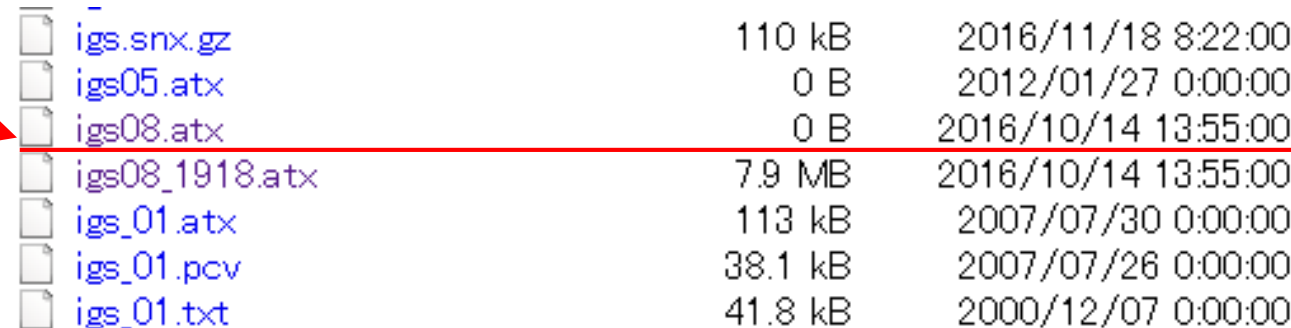
And, unzip it.



[-]	P1C11609.DCB.Z	589 B	2016/10/04 5:47:00
[-]	P1C11609.F.Z	334 B	2016/10/04 5:47:00
[-]	P1C11609_RINEX.DCB.Z	4.8 kB	2016/10/08 6:36:00
[-]	P1C11609_RINEX.F.Z	333 B	2016/10/08 6:36:00
[-]	<u>P1C11610.DCB.Z</u>	566 B	2016/11/06 5:45:00
[-]	P1C11610.F.Z	328 B	2016/11/06 5:45:00
[-]	P1C11610_RINEX.DCB.Z	4.7 kB	2016/11/08 6:40:00
[-]	P1C11610_RINEX.F.Z	330 B	2016/11/08 6:40:00

✓ Please get the latest Antenna file.

igs08.atx



[-]	-		
[-]	igs.snx.gz	110 kB	2016/11/18 8:22:00
[-]	igs05.atx	0 B	2012/01/27 0:00:00
[-]	<u>igs08.atx</u>	0 B	2016/10/14 13:55:00
[-]	igs08_1918.atx	7.9 MB	2016/10/14 13:55:00
[-]	igs_01.atx	113 kB	2007/07/30 0:00:00
[-]	igs_01.pcv	38.1 kB	2007/07/26 0:00:00
[-]	igs_01.txt	41.8 kB	2000/12/07 0:00:00

Analyzing Method Using RTKPOST in RTKLIB



RTKPOST: post processing analysis GUI App.

Input the RINEX observation and navigation message files.



- Single frequency Point Positioning
- Differential GNSS
- Real Time Kinematic
- **Precise Point Positioning**

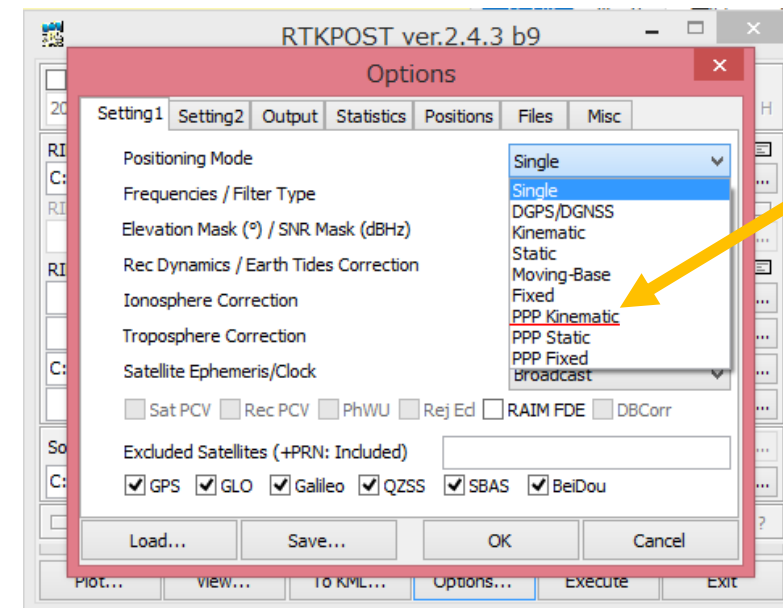
Download latest version (2.4.2) from here! ↓

<http://rtklib.com/> or

<https://github.com/tomojitakasu/RTKLIB>

Manual: http://www.rtklib.com/prog/manual_2.4.2.pdf

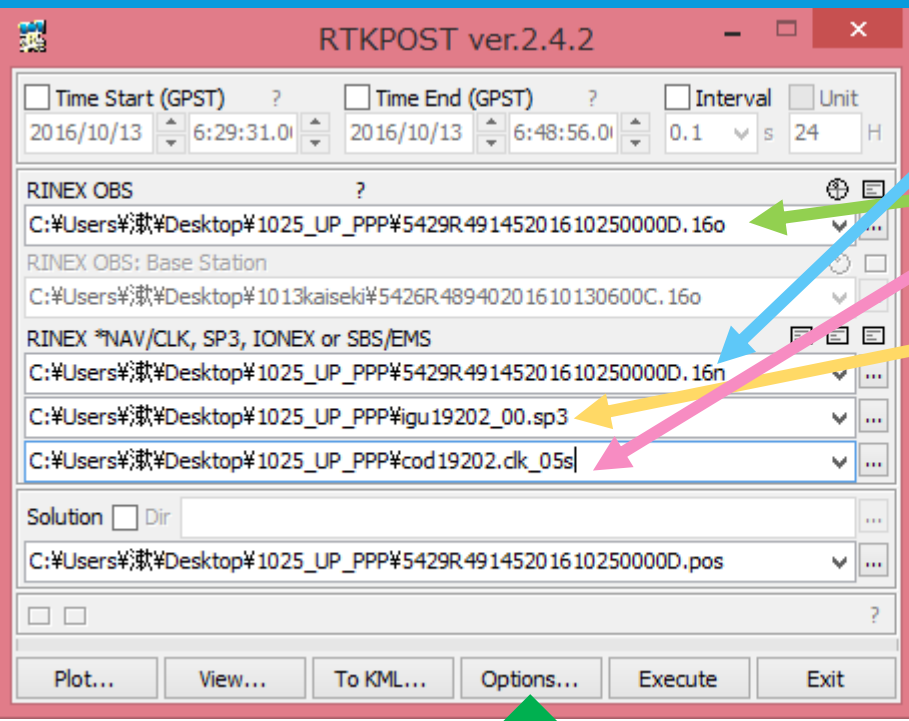
2016/11/18



Setting in
Options...

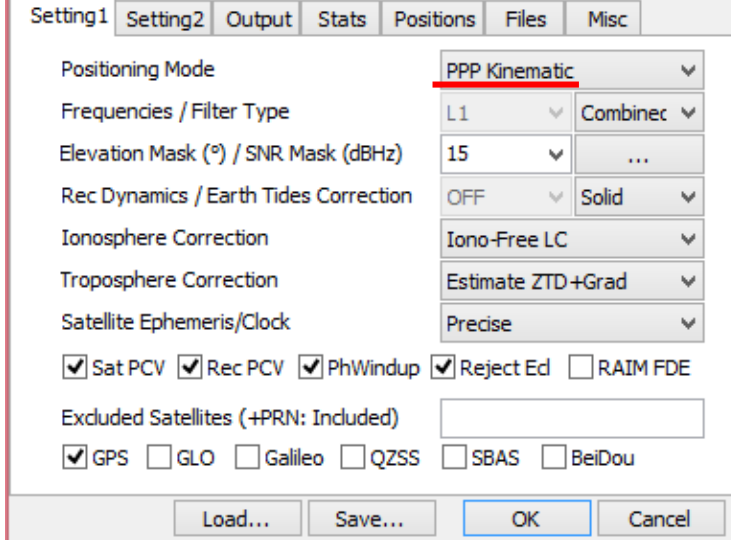
B

Process of RTKPOST ①

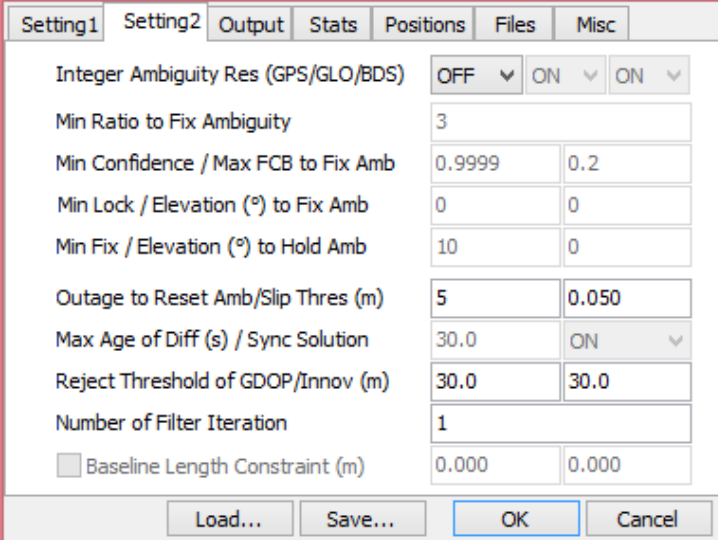


- Input following files ↓
- 5429R49145201610250000D.16n ← Navigation message file
 - 5429R49145201610250000D.16o ← Observation file
 - cod19202.clk_05s ← Clock file
 - igs08.atx
 - igu19202_00.sp3 ← Last Product file
 - P1C1_ALL.DCB

Setting 1



Setting 2



Click here, then set up screen appears.

2016/11/18

B

Process of RTKPOST ②

Output

Setting1 Setting2 Output Stats Positions Files Misc

Solution Format Lat/Lon/Height

Output Header/Processing Options ON ON

Time Format / # of Decimals ww ssss GPST 3

Latitude / Longitude Format ddd.ddddddd

Field Separator ,

Datum/Height WGS84 Ellipsoidal

Geoid Model Internal

Solution for Static Mode Single

NMEA Interval (s) RMC/GGA, GSA/GSV 0 0

Output Solution Status / Debug Trace OFF OFF

Load... Save... OK Cancel

Stats

Setting1 Setting2 Output Stats Positions Files Misc

Measurement Errors (1-sigma)

Code/Carrier-Phase Error Ratio L1/L2 1000.0 1000.0

Carrier-Phase Error a+b/sinE1 (m) 0.003 0.003

Carrier-Phase Error/Baseline (m/10km) 0.000

Doppler Frequency (Hz) 10.000

Process Noises (1-sigma/sqrt(s))

Receiver Accel Horiz/Vertical (m/s2) 1.00E+01 1.00E+01

Carrier-Phase Bias (cycle) 1.00E-04

Vertical Ionospheric Delay (m/10km) 1.00E-03

Zenith Tropospheric Delay (m) 1.00E-04

Satellite Clock Stability (s/s) 5.00E-12

Load... Save... OK Cancel

Positions

Setting1 Setting2 Output Stats Positions Files Misc

Rover

Lat/Lon/Height (deg/m) 90.000000000 0.000000000 -6335367.6285

Antenna Type (*: Auto) Delta-E/N/J (m) * 0.0000 0.0000 0.0000

Base Station

Lat/Lon/Height (deg/m) 14.535447734 121.040652679 86.4503

Antenna Type (*: Auto) Delta-E/N/J (m) 0.0000 0.0000 0.0000

Station Position File

Load... Save... OK Cancel

Files

Option

Setting1 Setting2 Output Stats Positions Files Misc

Satellite/Receiver Antenna PCV File ANTEX/NGS PCV C:\Users\...\Desktop\1025_UP_PPP\igs08.atx

Geoid Data File C:\Users\...\Desktop\1025_UP_PPP\igs08.atx

DCB Data File C:\Users\...\Desktop\1025_UP_PPP\P1C1_ALL.DCB

EOP Data File

OTL BLQ File

Ionosphere Data File

Load... Save... OK Cancel

名前 Input following files ↓

- 5429R49145201610250000D.16n
- 5429R49145201610250000D.16o
- cod19202.clk_05s
- igs08.atx ← Antenna file
- igu19202_00.sp3
- P1C1_ALL.DCB ← DCB file

Misc

Setting1 Setting2 Output Stats Positions Files Misc

Time Interpolation of Base Station Data OFF

DGPS/DGNSS Corrections SBAS

SBAS Satellite Selection (0: All) 0

RINEX Opt (Rover)

RINEX Opt (Base)

Station ID List

? : Keywords in File Path

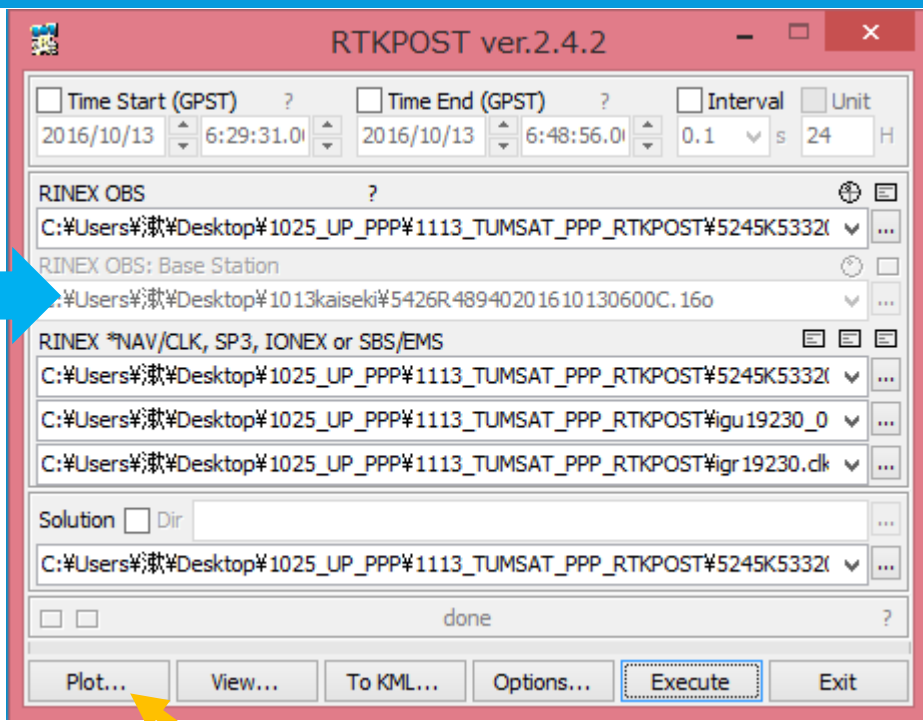
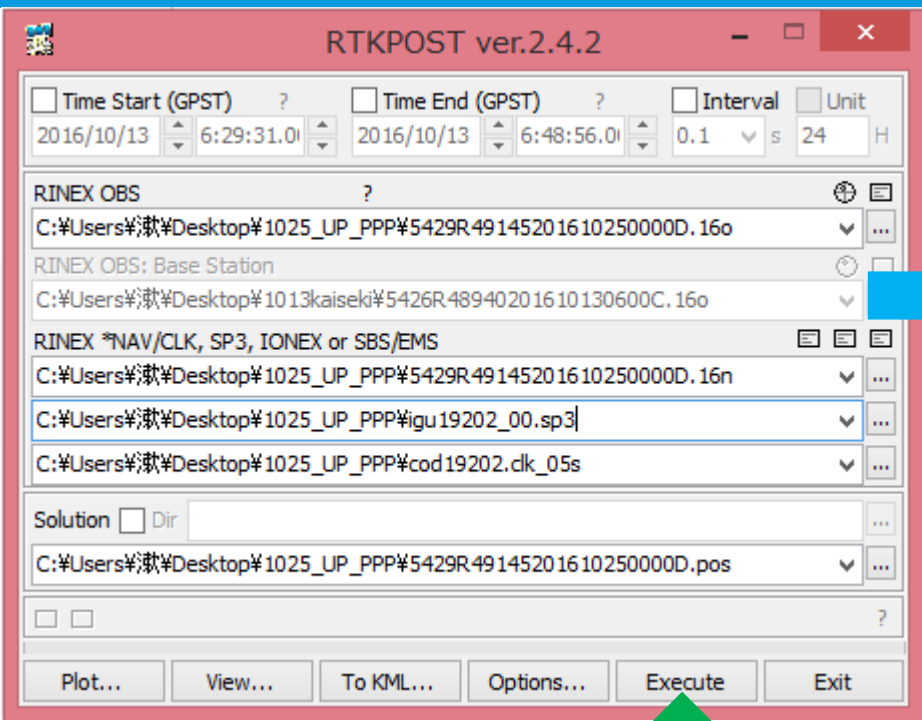
#..: Comment in List

Load... Save... OK Cancel

Then, Click "OK".

B

Process of RTKPOST ③



Go to the folder...

- 5245K53320201611130000B.16c
- 5245K53320201611130000B.16g
- 5245K53320201611130000B.16l
- 5245K53320201611130000B.16n
- 5245K53320201611130000B.16o
- 5245K53320201611130000B.16q
- 5245K53320201611130000B.pos
- 5245K53320201611130000B.T02
- igr19230.clk
- igs08.atx
- igu19230_00.sp3
- P1C1_ALL.DCB

Click "Execute", then starting to post-process.

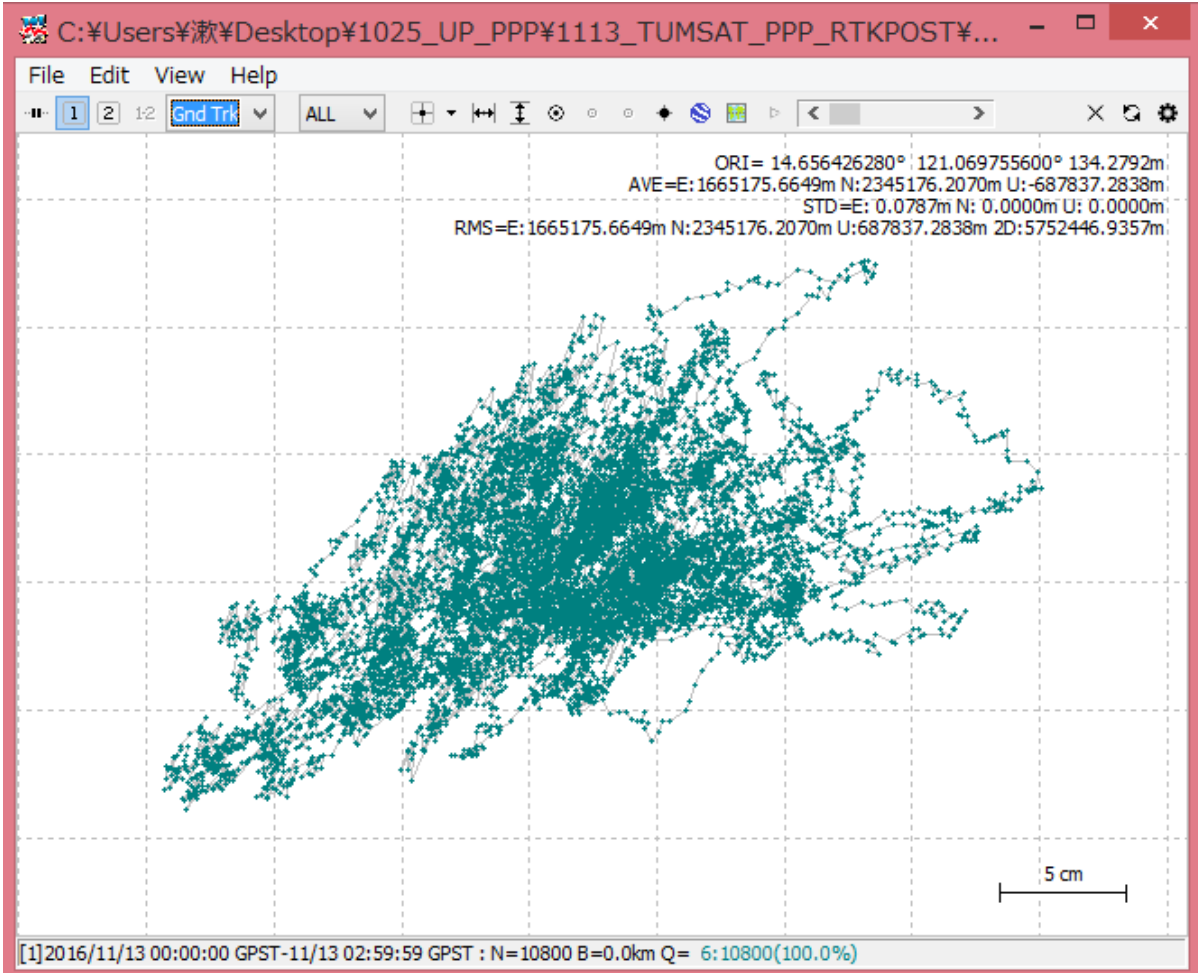
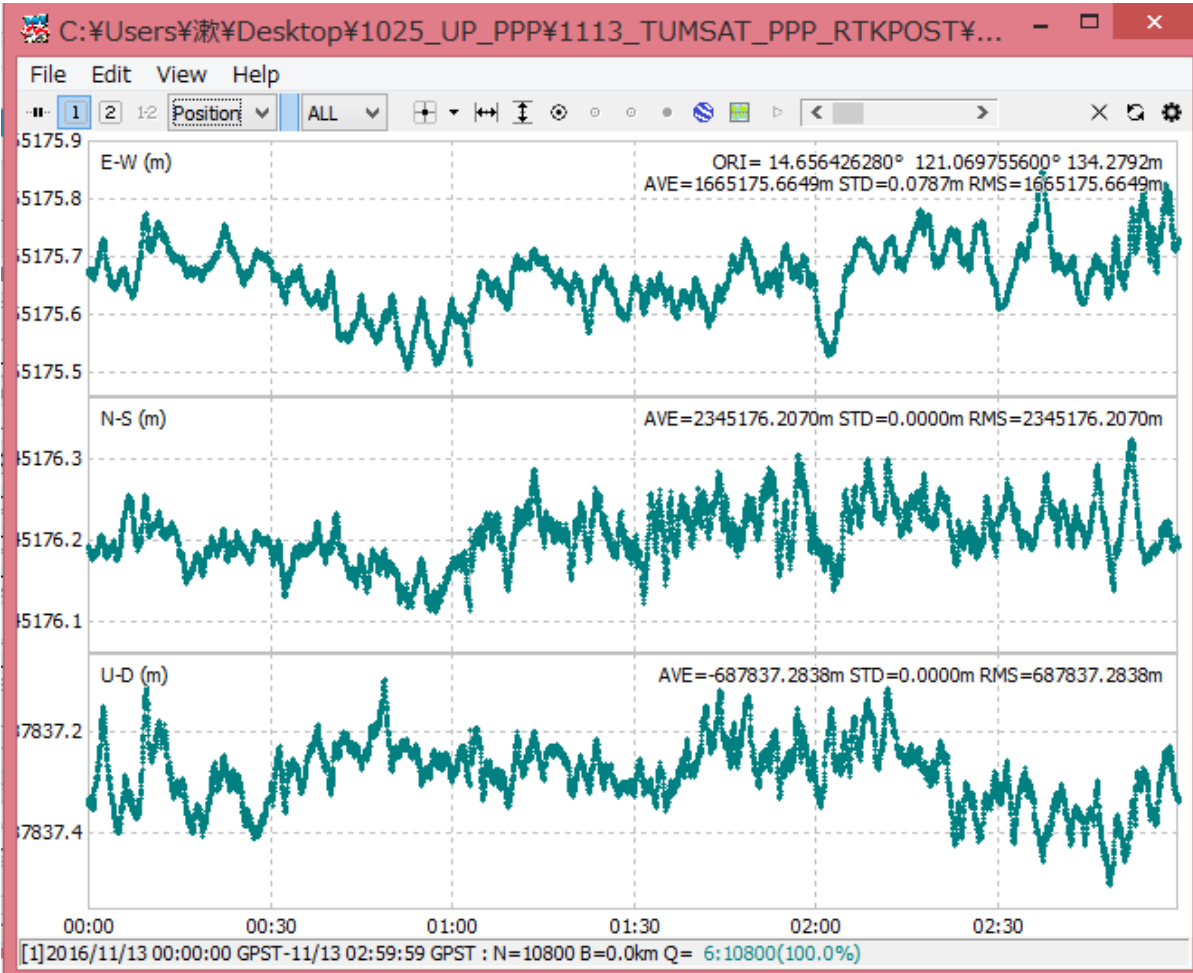
Done!

Click "Plot...", then the result appears.

POS file generated!

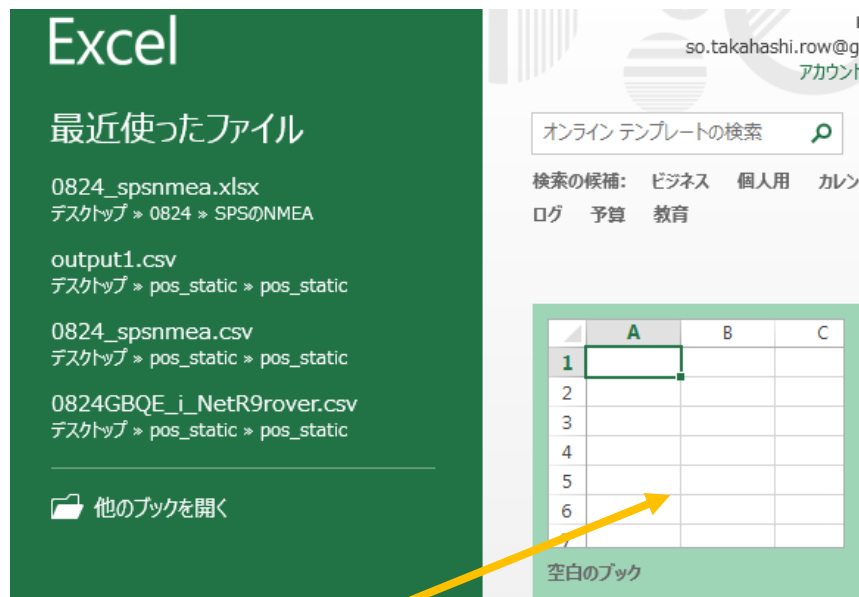
B

Process of RTKPOST ④



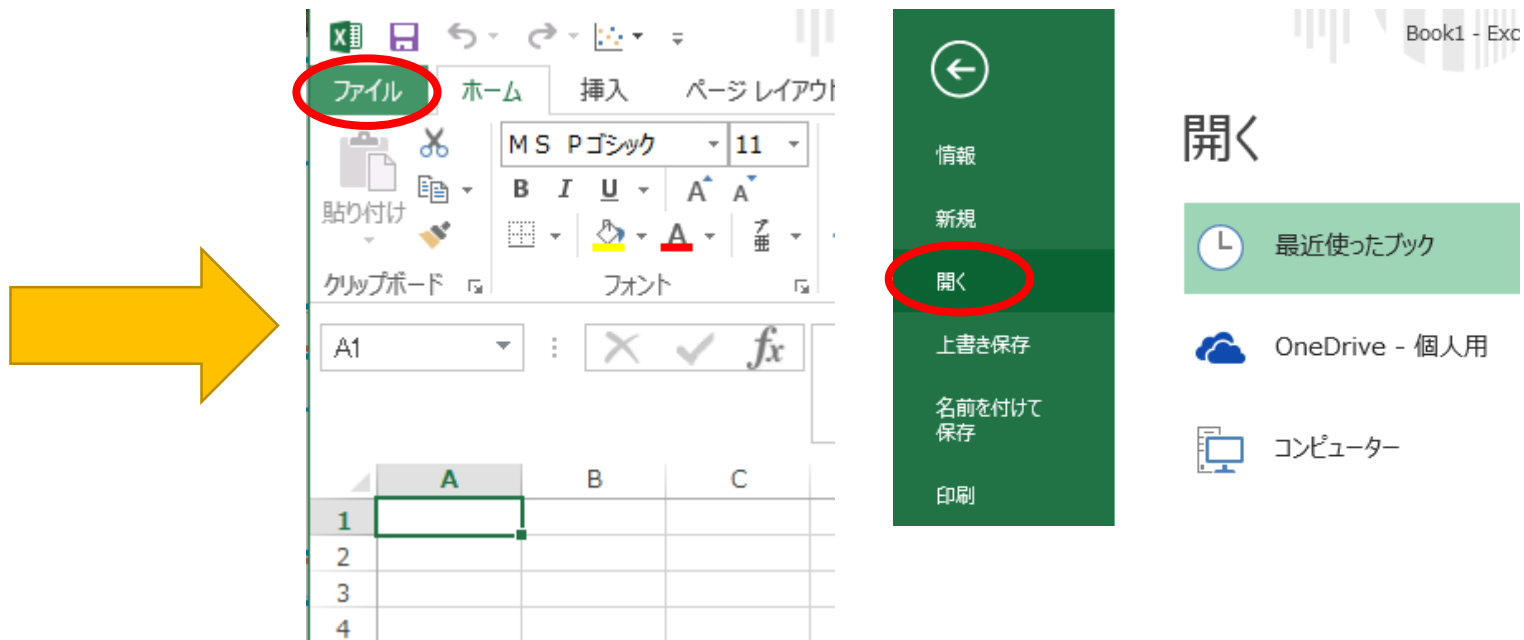
How to use ***.pos file ①

✓ pos file → csv file



Start-up Excel file

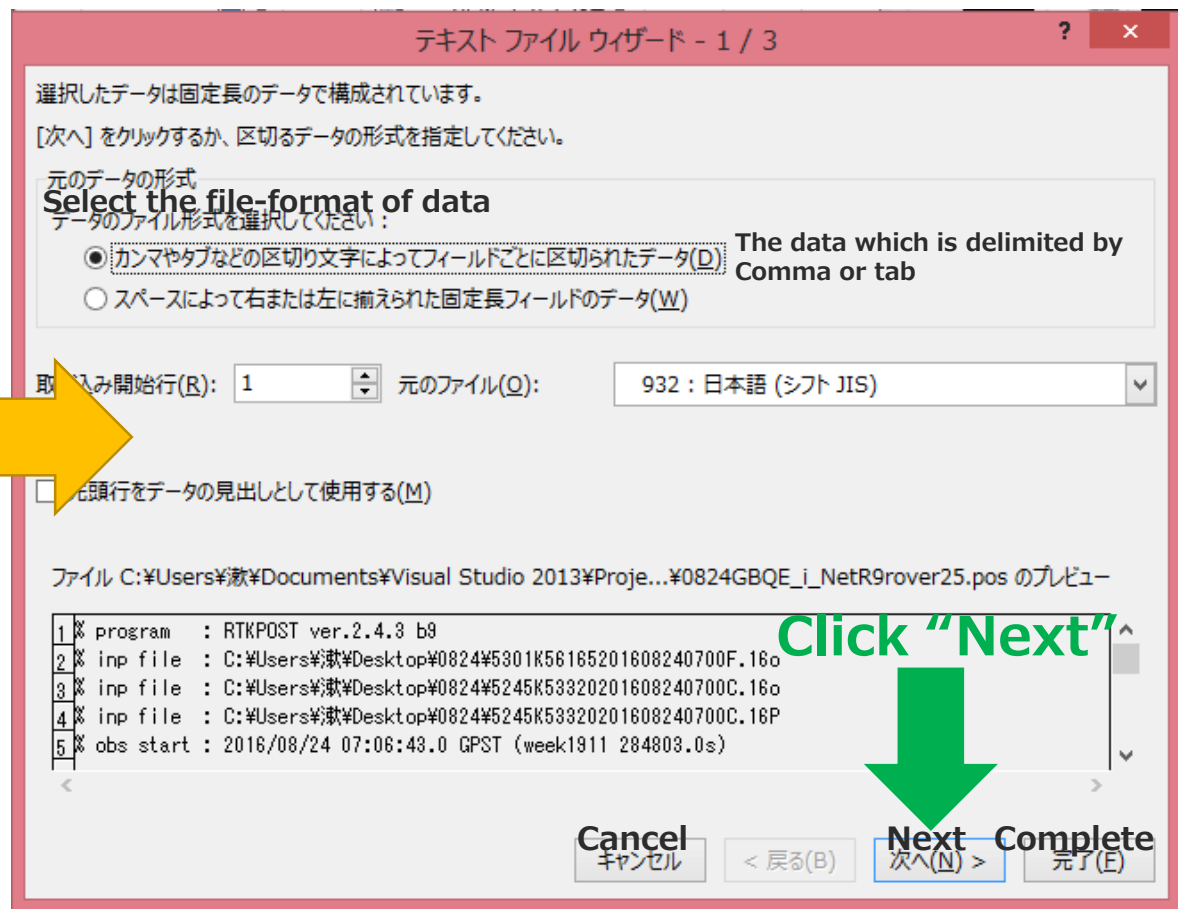
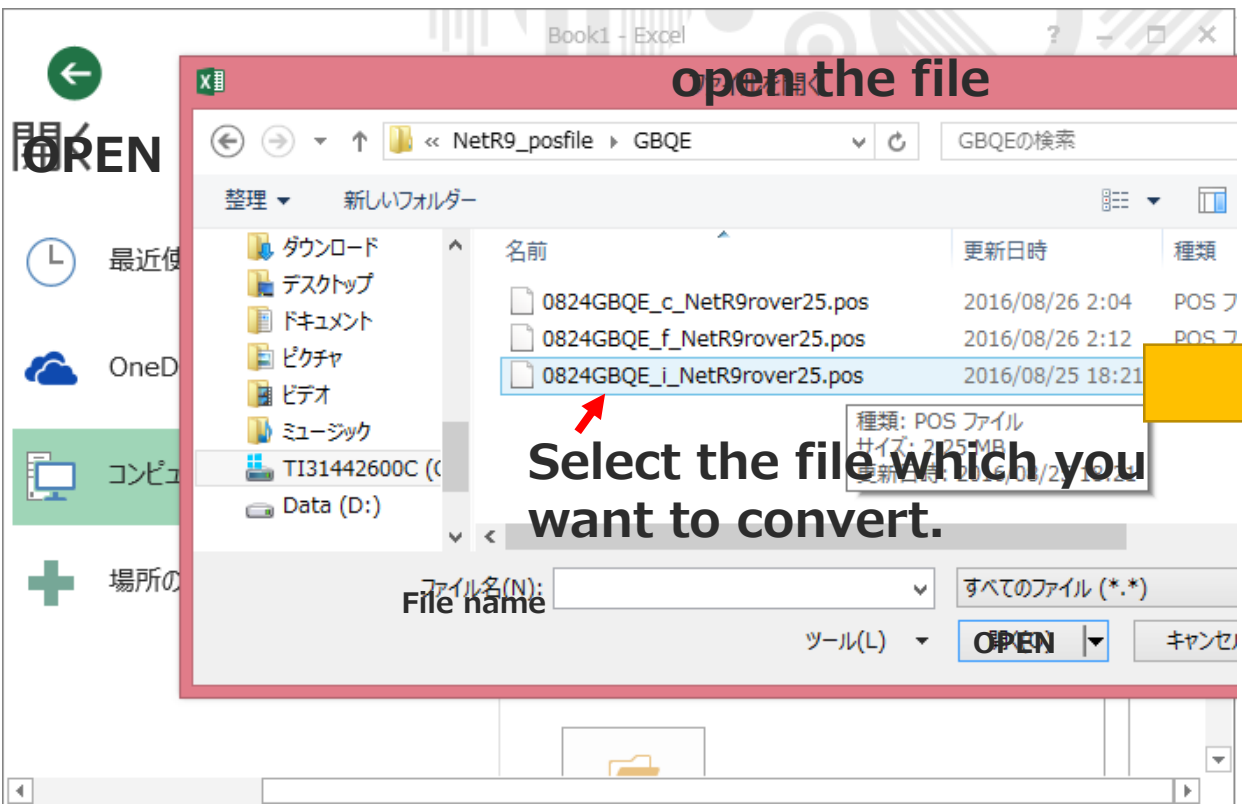
Click "File" & "Open"



Open pos file & change the format (pos→csv)

How to use ***.pos file ②

For example...



How to use ***.pos file ③

テキスト ファイル ウィザード - 2 / 3

フィールドの区切り文字を指定してください。[データのプレビュー] ボックスには区切り位置が表示されます。

区切り文字

- タブ(T)
- セミicolon(M)
- カンマ(C) Comma**
- スペース(S)
- その他(O):

連続した区切り文字は 1 文字として扱う(R)

文字列の引用符(Q):

データのプレビュー(P)

```

% program : RTKPOST ver.2.4.3 b9
% inp file : C:\Users\%user%\Desktop\0824\5301K56165201608240700F.16o
% inp file : C:\Users\%user%\Desktop\0824\5245K53320201608240700C.16o
% inp file : C:\Users\%user%\Desktop\0824\5245K53320201608240700C.16P
% obs start : 2016/08/24 07:06:43.0 GPST (week1911 284803.0s)
    
```

キャンセル < 戻る(B) 次へ(N) > 完了(E)

Delete column A

	A	B	C	D	E	F	G	H	I	J		
1	% program	:	RTKPOST	ver.2.4.3	b9							
2	% inp file	:	C:\Users\%user%\Desktop\0824\5301K56165201608240700F.16o									
3	% inp file	:	C:\Users\%user%\Desktop\0824\5245K53320201608240700C.16o									
4	% inp file	:	C:\Users\%user%\Desktop\0824\5245K53320201608240700C.16P									
5	% obs start	:	2016/08/24 07:06:43.0	GPST	(week1911 284803.0s)							
6	% obs end	:	2016/08/24 07:37:17.0	GPST	(week1911 286637.0s)							
7	% pos mode	:	kinematic									
8	% freqs	:	L1+L2									
9	% solution	:	forward									
10	% elev mask	:	25.0	deg								
11	% dynamics	:	off									
12	% tide corr	:	off									
13	% ionos opt	:	broadcast									
14	% tropo opt	:	saastamoinen									
15	% ephemeris	:	broadcast									
16	% navi sys	:	gps galileo qzss									
17	% amb res	:	instantaneous									
18	% val thres	:	3.0									
19	% antenna1	:		(0.0000	0.0000	0.0000)					
20	% antenna2	:		(0.0000	0.0000	0.0000)					
21	% ref pos	:	139.7922		59.741							
22	%	:										
23	% (lat/lon/Q=1	:	fix	2:float	3:sbas	4:dgps	5:single	6:ppp	ns=# of satellites)			
24	% GPST	:	latitude(de	longitude(d	height(m)	Q	ns	sdn(m)	sde(m)	sdu(m)	sdne(m)	
25		:	1911	284803	35.66758	139.7911	39.4763	1	13	0.0036	0.0045	0.0129
26		:	1911	284803.1	35.66758	139.7911	39.4753	1	13	0.0036	0.0045	0.0129
27		:	1911	284803.2	35.66758	139.7911	39.4817	1	13	0.0036	0.0045	0.0129
28		:	1911	284803.3	35.66758	139.7911	39.4803	1	13	0.0036	0.0045	0.0129
29		:	1911	284803.4	35.66758	139.7911	39.4803	1	13	0.0036	0.0045	0.0129

Click "Complete"



How to use ***.pos file ④

Delete line 1-24

Q=1	2	3	4	5	6	ns=# of satellites)			
latitude(deg)	longitude(deg)	height(m)	Q	ns	sdr(m)	sde(m)	sdu(m)	sdne(m)	
284803	35.66758	139.7911	39.4763	1	13	0.0036	0.0045	0.0129	
284803.1	35.66758	139.7911	39.4753	1	13	0.0036	0.0045	0.0129	
284803.2	35.66758	139.7911	39.4817	1	13	0.0036	0.0045	0.0129	
284803.3	35.66758	139.7911	39.4803	1	13	0.0036	0.0045	0.0129	
284803.4	35.66758	139.7911	39.4802	1	13	0.0036	0.0045	0.0129	

Then, the remaining data is

A B C D E F ...
GPST, latitude(deg), longitude(deg), height(m), Q, ns, ...



It is easy to analyze the data on IDE
(Integrated Development Environment)

You can use EXCEL or
your own program...