Processing of raw GNSS data

Automated Survey Systems

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CONTENT

- Get raw data of permanent GNSS stations
- Post-process with different scenarios
- Open-source software RTKLIB (demo5 fork): https://rtklibexplorer.wordpress.com/
- Used last week
- Use GUI
- Use CLI

RAW DATA OF PERMANENT STATIONS

- Free data for scientific and educational purposes
- IGS: https://igs.org/
- EUREF: https://epncb.oma.be/
- …
- Task to do: find and download raw data of BUTE, BME1 or other stations in your country

BUTE PERMANENT STATION

- Download from web
  - *http://www.epncb.oma.be/_networkdata/siteinfo4onestation.php?station=BUTE00HUN*
  - *One-day session, in RINEX 3 format*
- Download directly from command prompt
  - *Copy the link*
  - *Open a command prompt and use wget. Install if it is needed*
  - *wget http://www.epncb.oma.be/pub/RINEX/2025/085/BUTE00HUN_R_20250850000_01D_30S_MO.crx.gz*

Navigation data

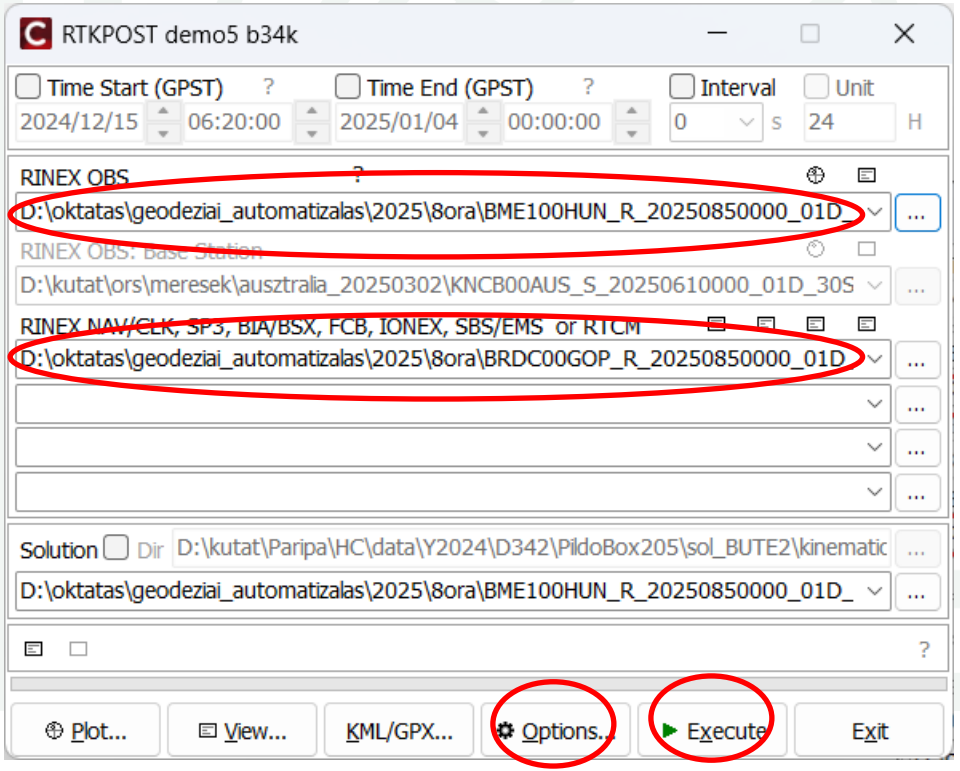
- Download directly from the command prompt, use wget http://www.epncb.oma.be/pub/RINEX/BRDC/2025/BRDC00GOP_R_20250850000_01D_MN.rnx.gz

UNCOMPRESSING

- Work in the command prompt
- Gzip (install if it is needed): c:\gzip\bin\gzip.exe BUTE00HUN_R_20250850000_01D_30S_MO.crx.gz -d
- Hatanaka decompression (e.g. in c:\rtklib\crx2rnx): c:\rtklib_demo5_b34k\crx2rnx.exe BUTE00HUN_R_20250850000_01D_30S_MO.crx
- Check out the compact RINEX and RINEX files

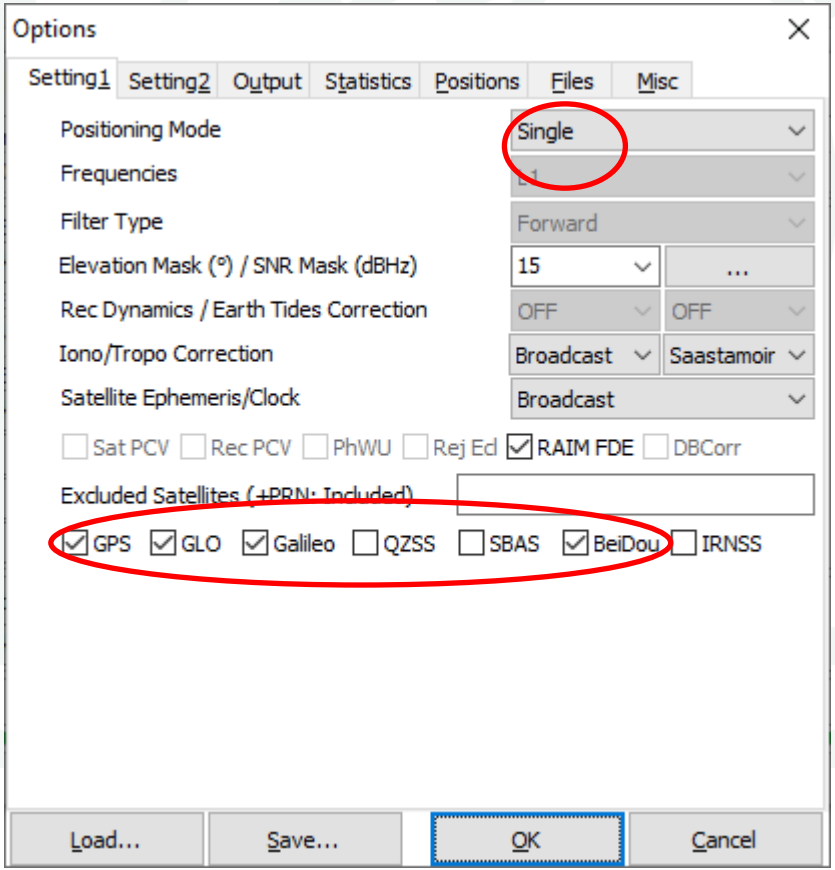
POST-PROCESS - SPP

- Launch RTKPOST
- BME1 as rover



SPP - SETTINGS

- Single
- GPS+GLO+GAL+BDS

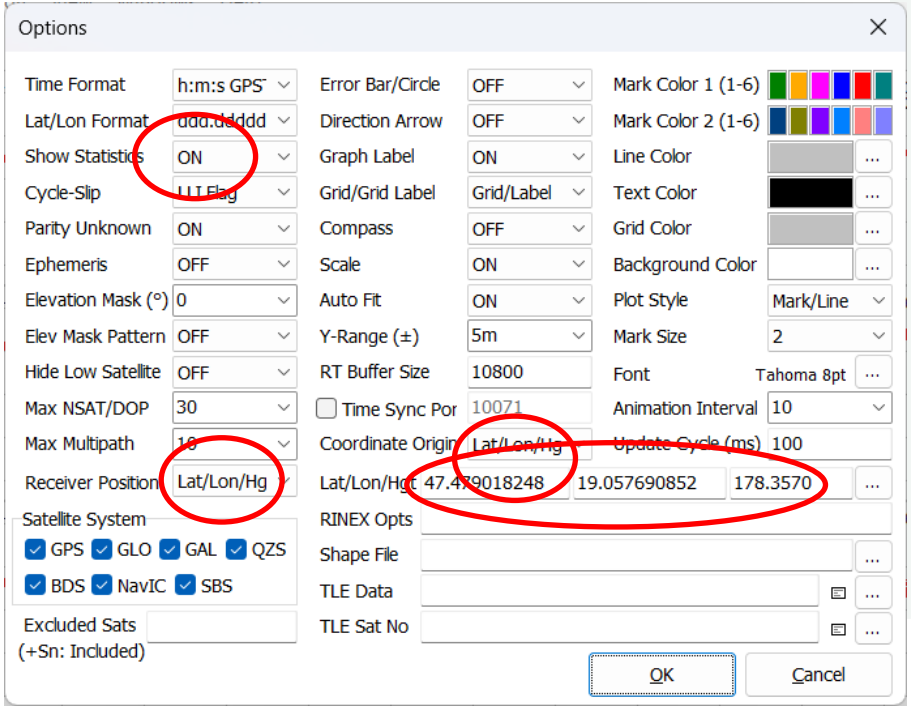


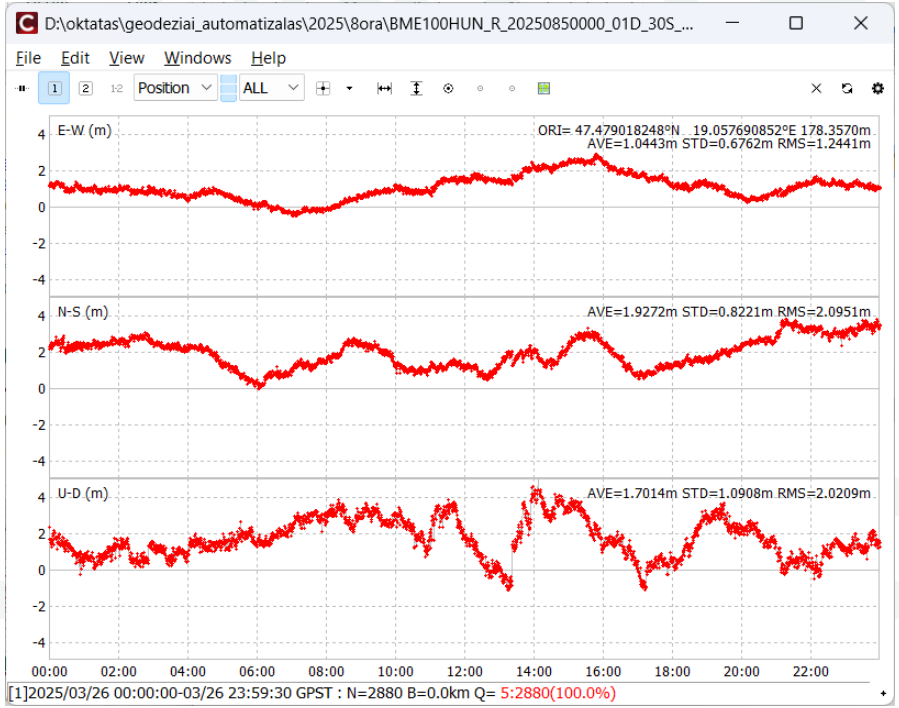
TRUE POSITIONS

- http://www.epncb.oma.be/_productsservices/coordinates/crd4station.php?station=BME100HUN
- Use ETRF2000
- Convert cartesian to geodetic
  - *Online: https://www.apsalin.com/cartesian-to-geodetic-on-ellipsoid/*
  - *With proj: cs2cs -f "%.8f" +proj=cart +to +proj=latlong*
- BUTE: 4082001.374 1410144.840 4678052.896
- 47.4790182480 19.0576908520 178.357

PLOT THE RESULTS

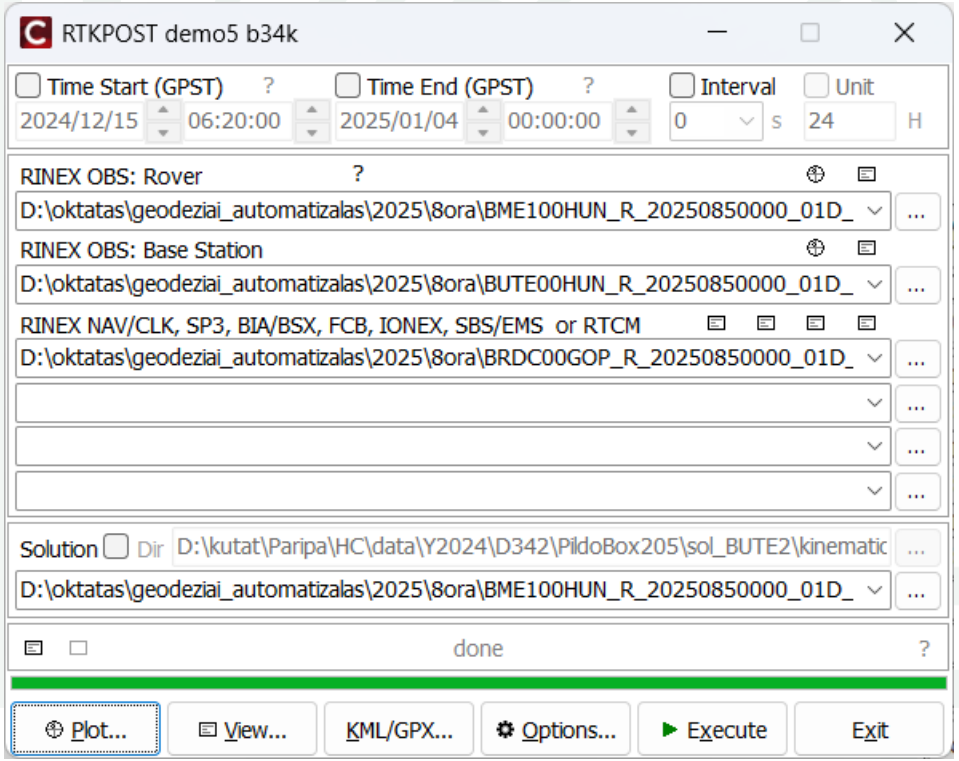
Set coordinate origin to the true position



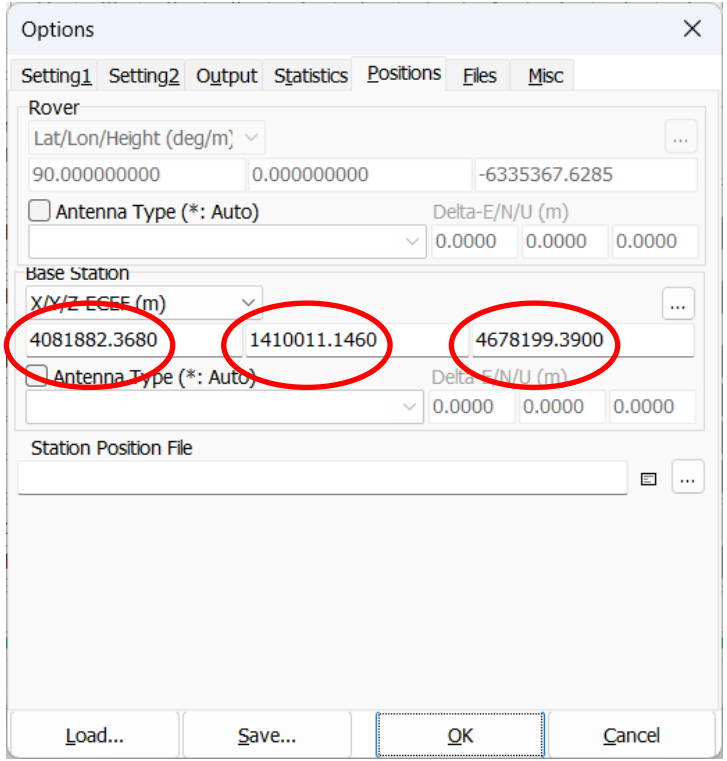


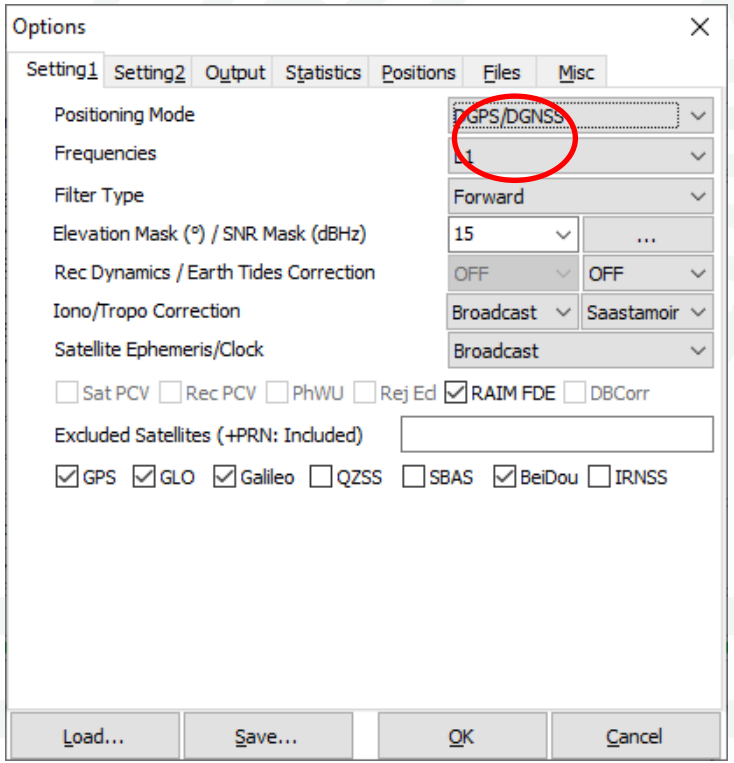
POST-PROCESS - DGPS

- Base: BUTE, rover: BME1

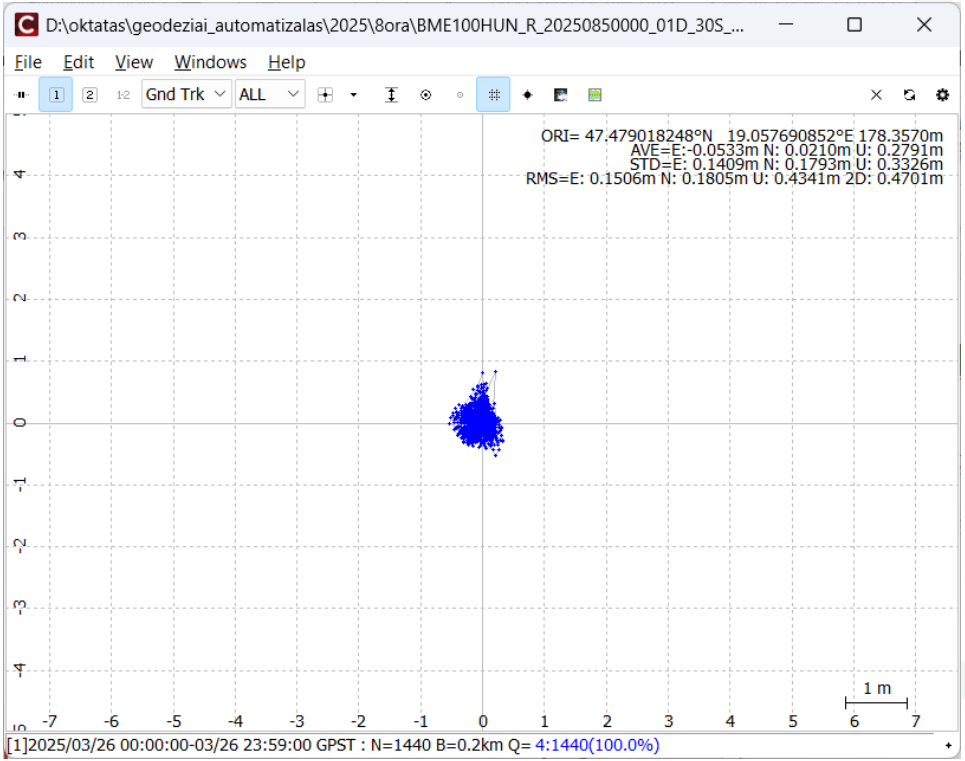


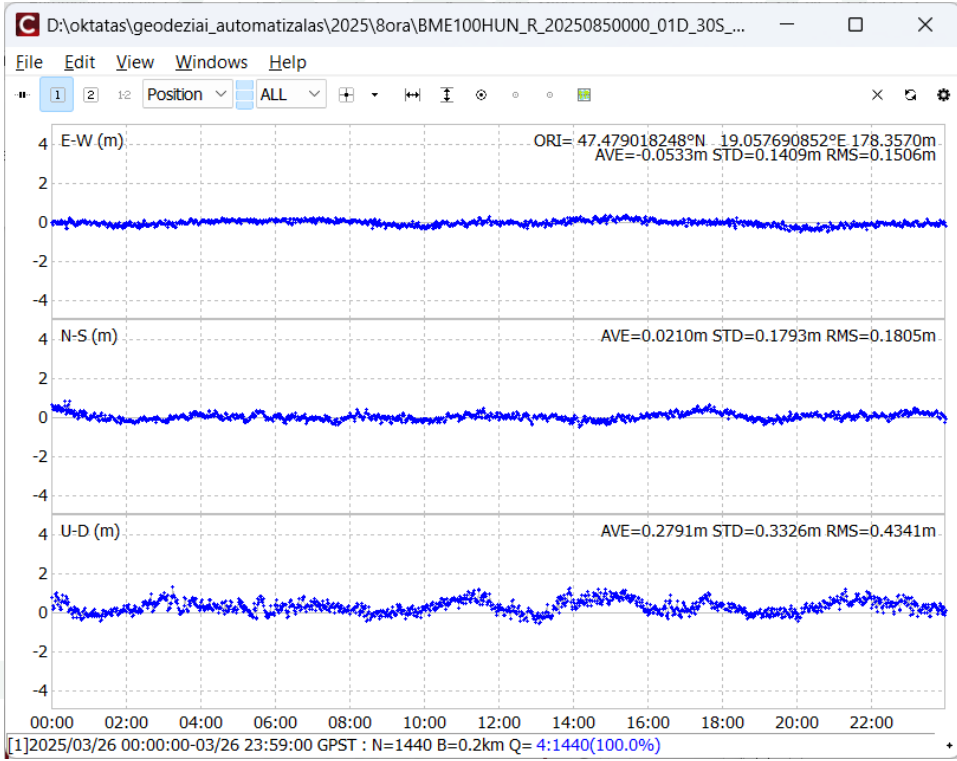
POST-PROCESS - DGPS





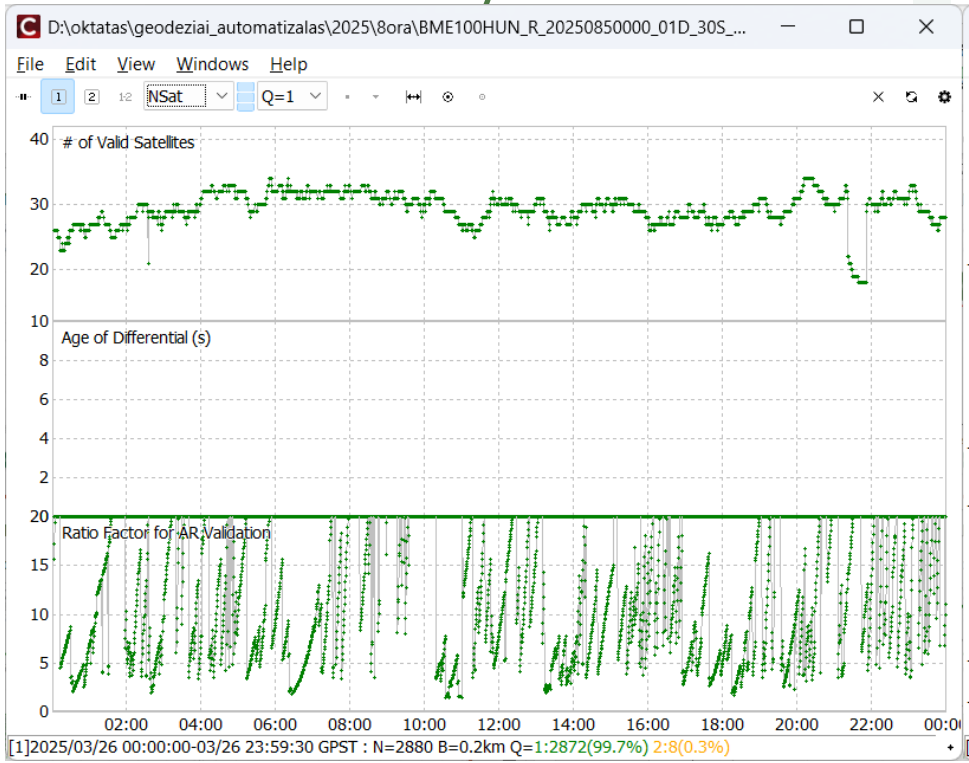
PLOT THE RESULTS

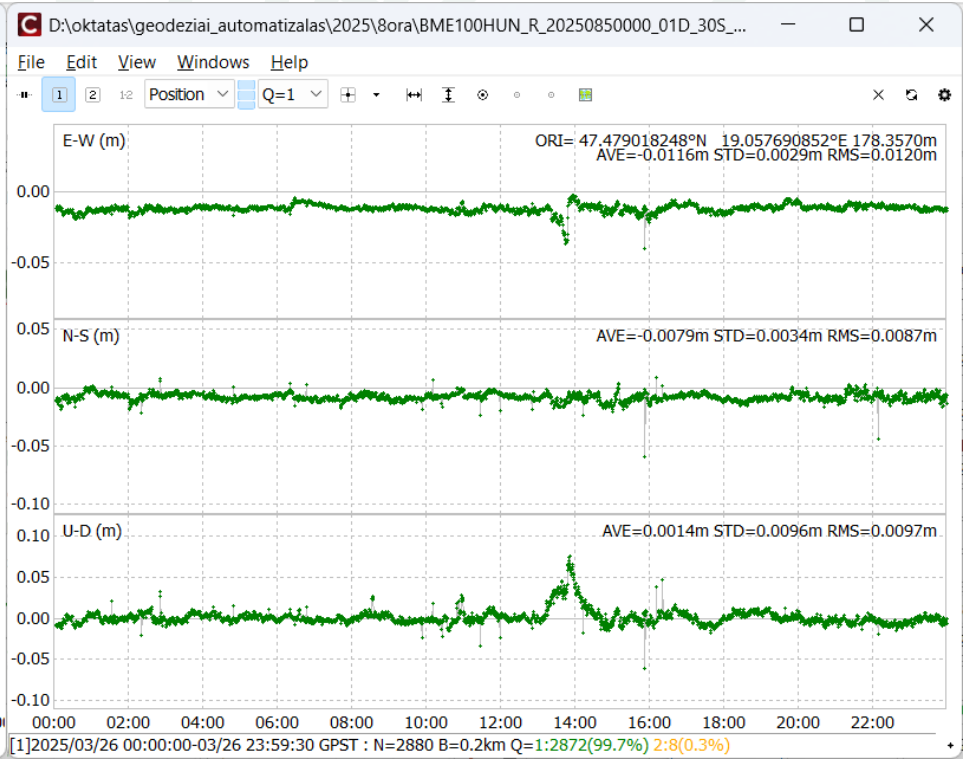




POST-PROCESS – KINEMATIC

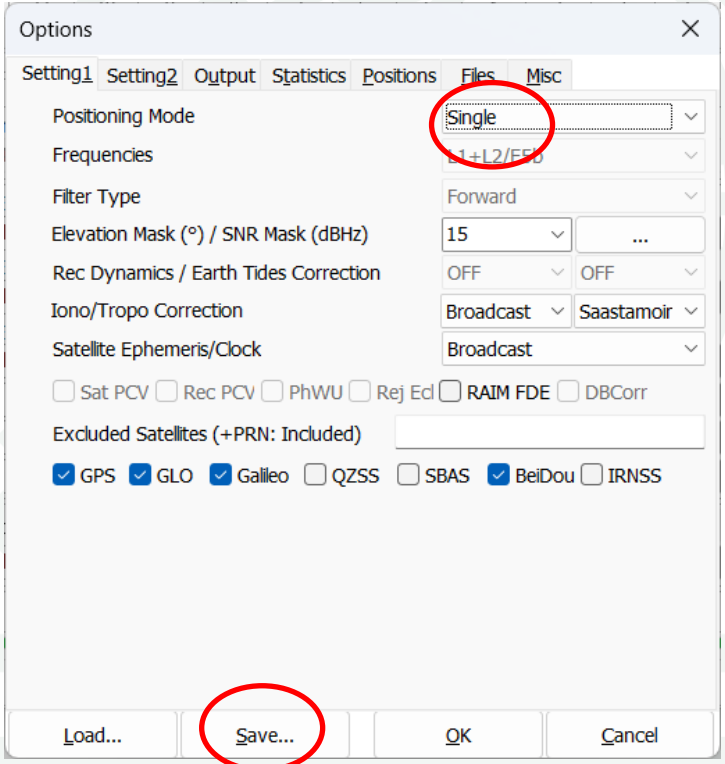
Turn off Rec Dynamics





POST-PROCESS IN CLI

- In GUI save the settings into a config file (e.g. spp.conf)



POST-PROCESS IN CLI - SPP

- Open a command prompt
- Type: c:\rtklib_demo5_b34k\rnx2rtkp.exe -k spp.conf BME100HUN_R_20250850000_01D_30S_MO.rnx BRDC00GOP_R_20250850000_01D_MN.rnx -o BME100HUN_R_20250850000_01D_30S_MO.pos
- All the settings are in the conf file, all you need to give are the output file name, RINEX observation and navigation file names
- You can give the full path if the files are in different directories which is highly recommended
- Some parameters can be given in the command prompt, see the help

POSS-PROCESS IN CLI - DGPS

- c:\rtklib_demo5_b34k\rnx2rtkp.exe -k dgps.conf BME100HUN_R_20250850000_01D_30S_MO.rnx BRDC00GOP_R_20250850000_01D_MN.rnx BUTE00HUN_R_20250850000_01D_30S_MO.rnx -o BME100HUN_R_20250850000_01D_30S_MO.pos
- Give the rover observation file at first

TASKS TO DO

- run rnx2rtkp in kinematic mode
- plot the results (pos files) using rtkplot
- develop your own script to make the plots in Python
- develop Python scripts to run rnx2rtkp (see the handout in the moodle)