GNSS Data Processing for High-Accuracy Single, DPGS and Kinematic

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Schedule

- GNSS data processing and accuracy comparison using RTKLIB
  - Use Sample Data
- Learn how to use RTKILIB/RTKNAVI for real-time data processing
- Learn other tools of RTKLIB
- Log GNSS Data outside for RTK and PPP
- Other

Objectives

- Learn how to post-process GNSS data using RTKLIB software
  - Data Conversion Methods
  - Data Check and Data Plots
  - Data Post-Processing Methods: Single, DGPS and Kinematic
- Learn data processing methods
  - Single Method
    - Standard GNSS Accuracy: Few meters to 10m
  - DGPS Method
    - Differential Correction, Code-phase Observation
    - Meter level accuracy
  - Kinematic method
    - Differential Correction with Code and Carrier phase observation
    - Centimeter level accuracy
- Compare accuracy levels
  - Compare accuracy between Single, DPGS and Kinematic methods

Data Files

- Two data sets “STATIC” and “DYNAMIC” are provided.
- “STATIC” contains data for a fixed point, no antenna movement.
- “DYNAMIC” contains data logged by mounting GPS antenna on a vehicle.
- Unzip the files to STATIC and DYNAMIC folders.

Data ID	Purpose	Type	File Name	File Type	Receiver Model	Receiver Type	Frequency and Satellites	Observation Mode	Purpose
KDB01	Static Observation	Base-Station	NetR9_181215.binex	BINEX	Trimble NetR9	High-End Survey Grade	Multi-Frequency Multi-System	Static	Use as Base-Station
		Rover	F9P_181215_static.ubx	UBX	U-blox F9P	Low-Cost	Dual-Frequency Multi-System	Static	Static Data Analysis
KDB02	Dynamic Observation	Base-Station	ECJ02_base	UBX	U-blox F9P	Low-Cost	Dual-Frequency Multi-System	Static	Use as Base-Station or Static Rover
		Rover	F9P_dynamic_rover_RTKsample	UBX	U-blox F9P	Low-Cost	Dual-Frequency Multi-System	Dynamic	Dynamic Data Analysis

Base-Station Position Data

- For DPGS, KINEMATIC or other data processing methods where a Base-station data are used, it is necessary to provide Base-Station's coordinates.

Data ID	LAT	LON	HT	Location	Receiver Model	Antenna Type	Remarks
KDB 001	35.66634207	139.79221086	59.771	Tokyo	Trimble NetR9		High-End Survey Grade Receiver
KDB 002	35.66633434	139.79220132	59.746	Tokyo	U-blox F9P		Low-Cost Receiver

Data Processing Flow

Get Base and Rove Data Files

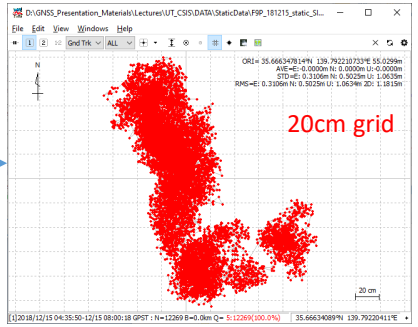
It may be UBX, SBF, BINEX, RTCM or other proprietary formats

Check Data File Formats

Convert All files to RINEX Format Use RTKCONV

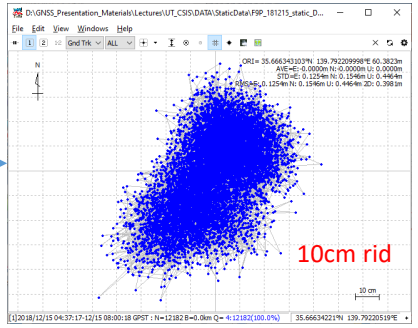
Post Process ROVER Data using SINGLE Option Use RTKPOST

OUTPUT



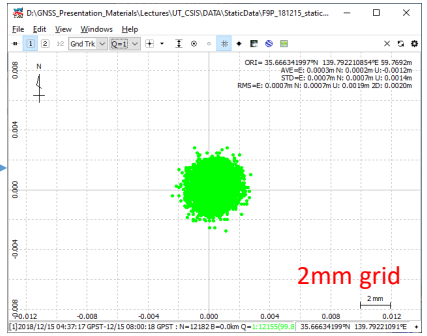
Post Process ROVER Data using DGPS Option Use RTKPOST

OUTPUT



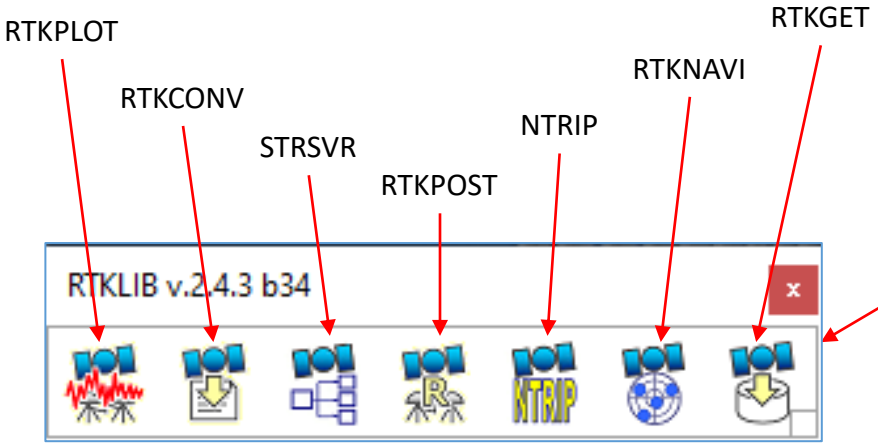
Post Process ROVER Data using KINEMATIC Option Use RTKPOST

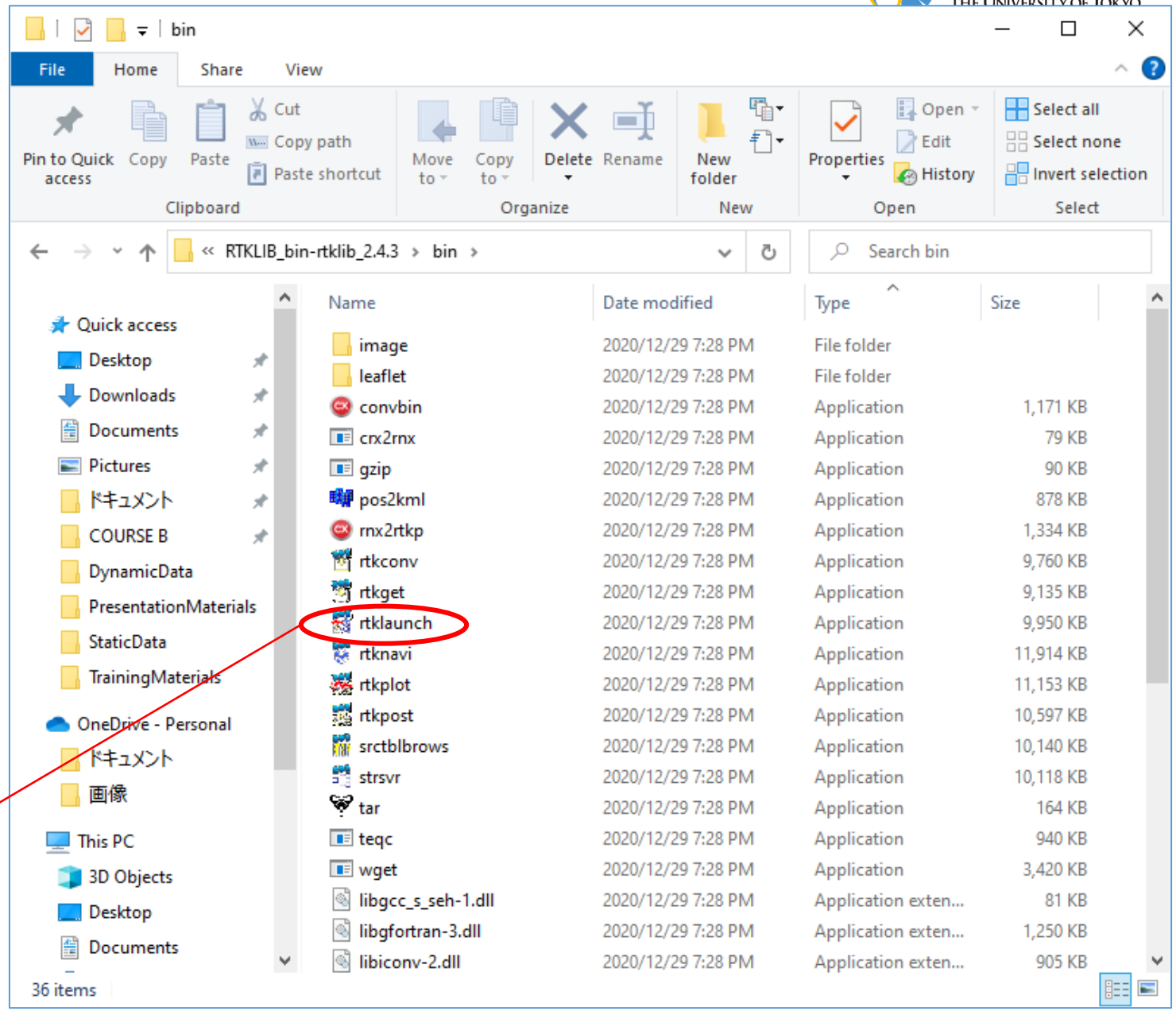
OUTPUT



Launch RTKLIB Menu

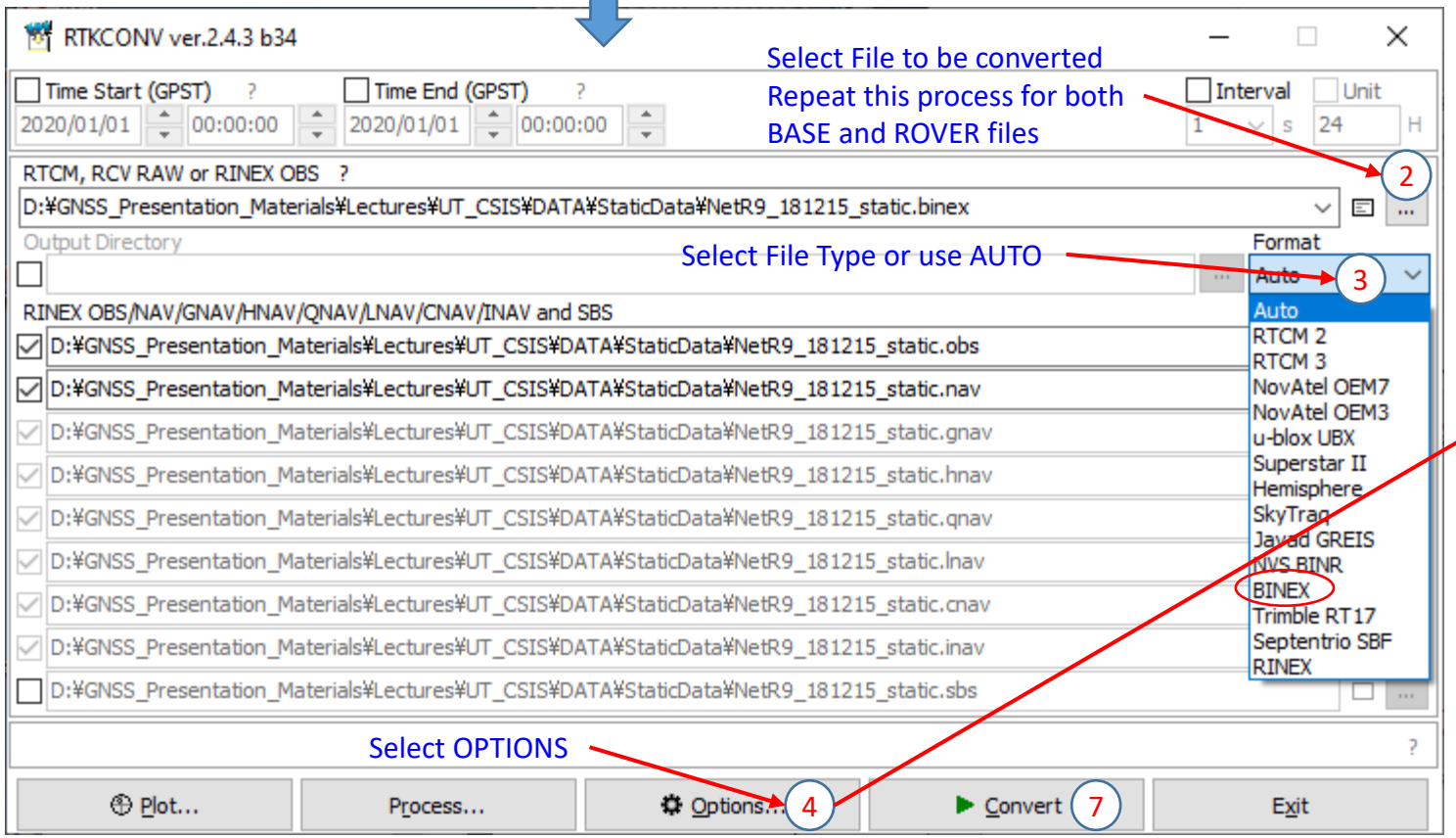
- Go to RTKLIB Folder
- Go to BIN Folder
- Double Click RTKLAUNCH.exe file
- Or create a shortcut to RTKLAUNCH.exe file and copy this shortcut to Desktop for easy access





Convert GNSS Data File to RINEX Format for Post-Processing

Select RTKCONV

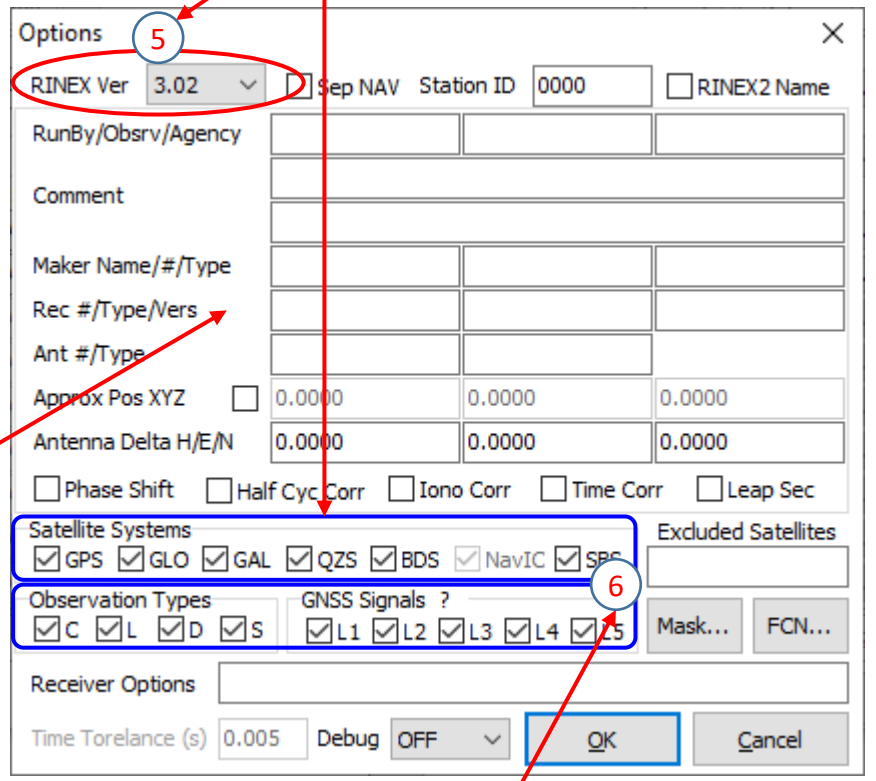


Select File to be converted
Repeat this process for both
BASE and ROVER files

Select File Type or use AUTO

Select OPTIONS

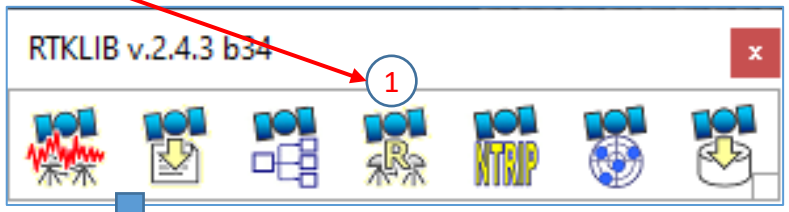
Select RINEX Version, 3.02 is OK
Select higher version if NAVIC data is available

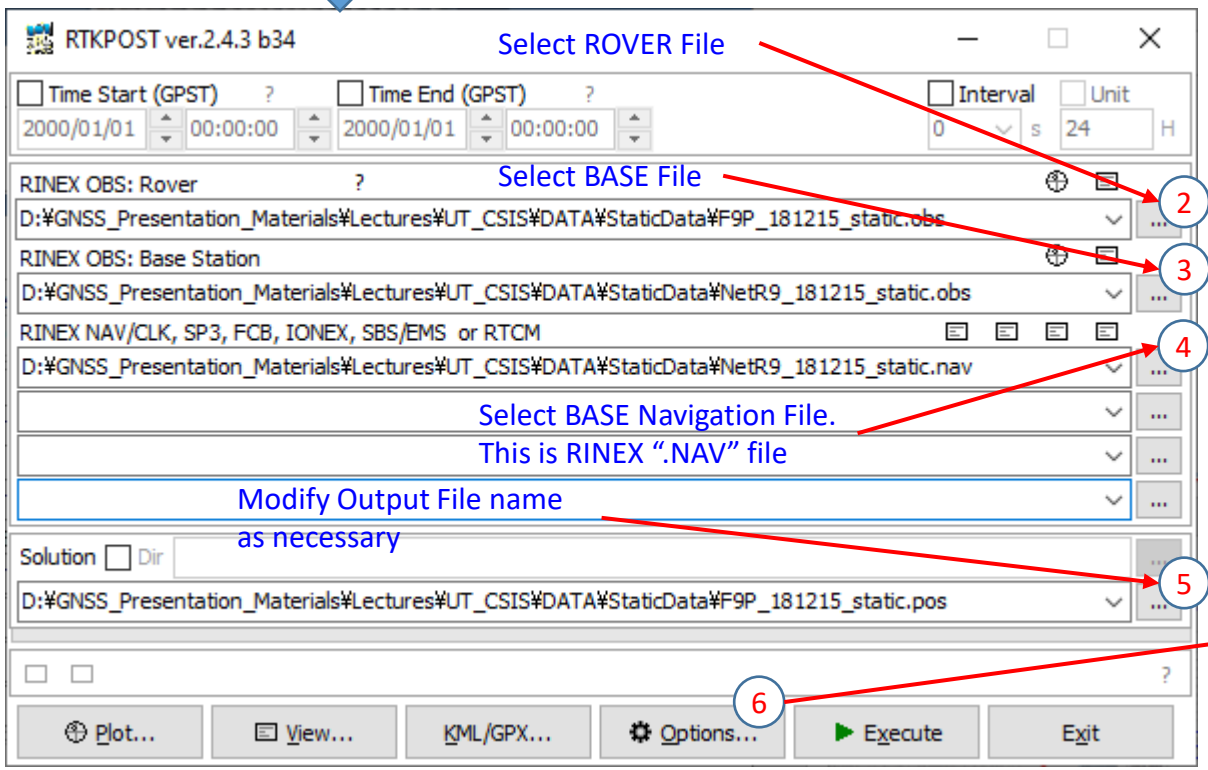


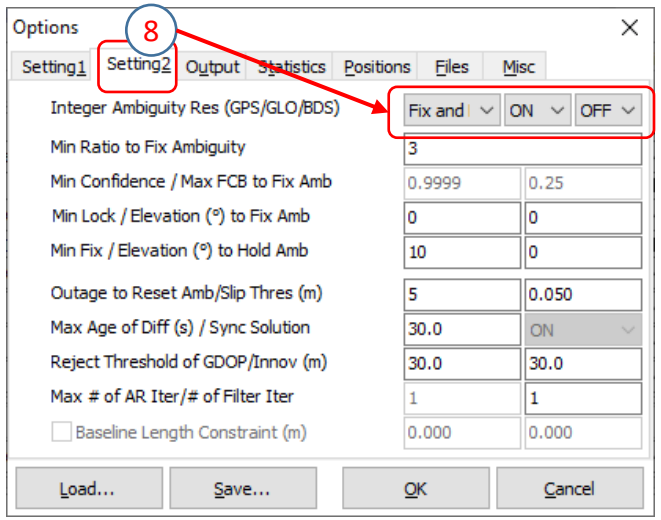
Use Default selections
You may change if necessary

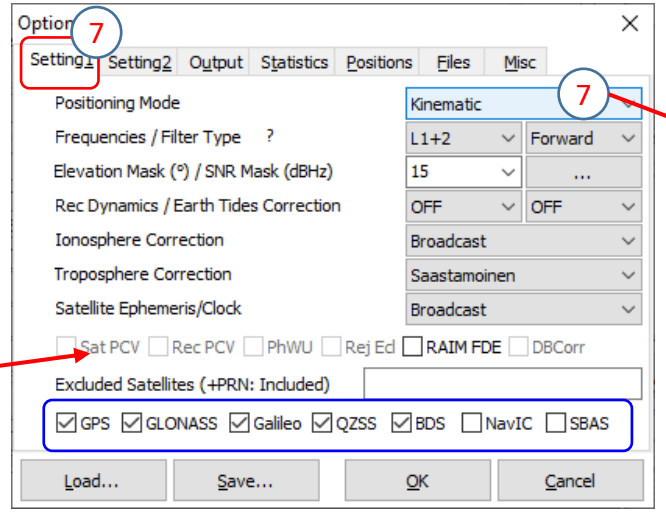
GNSS Data Post-Processing

Select RTKPOST

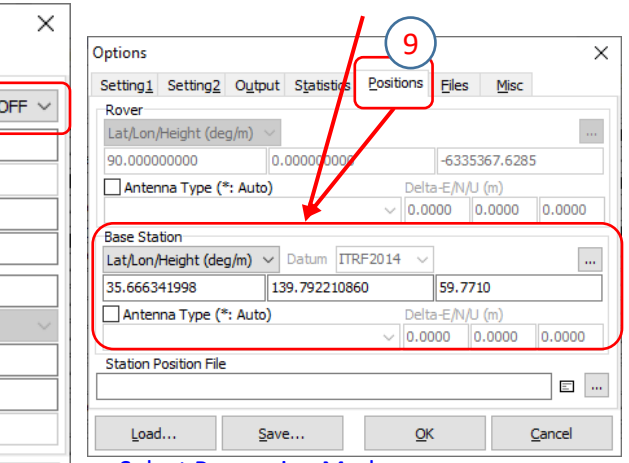




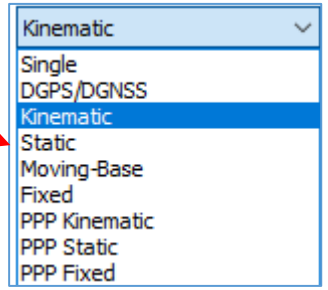




Input Base-station Coordinates or select Coordinate File

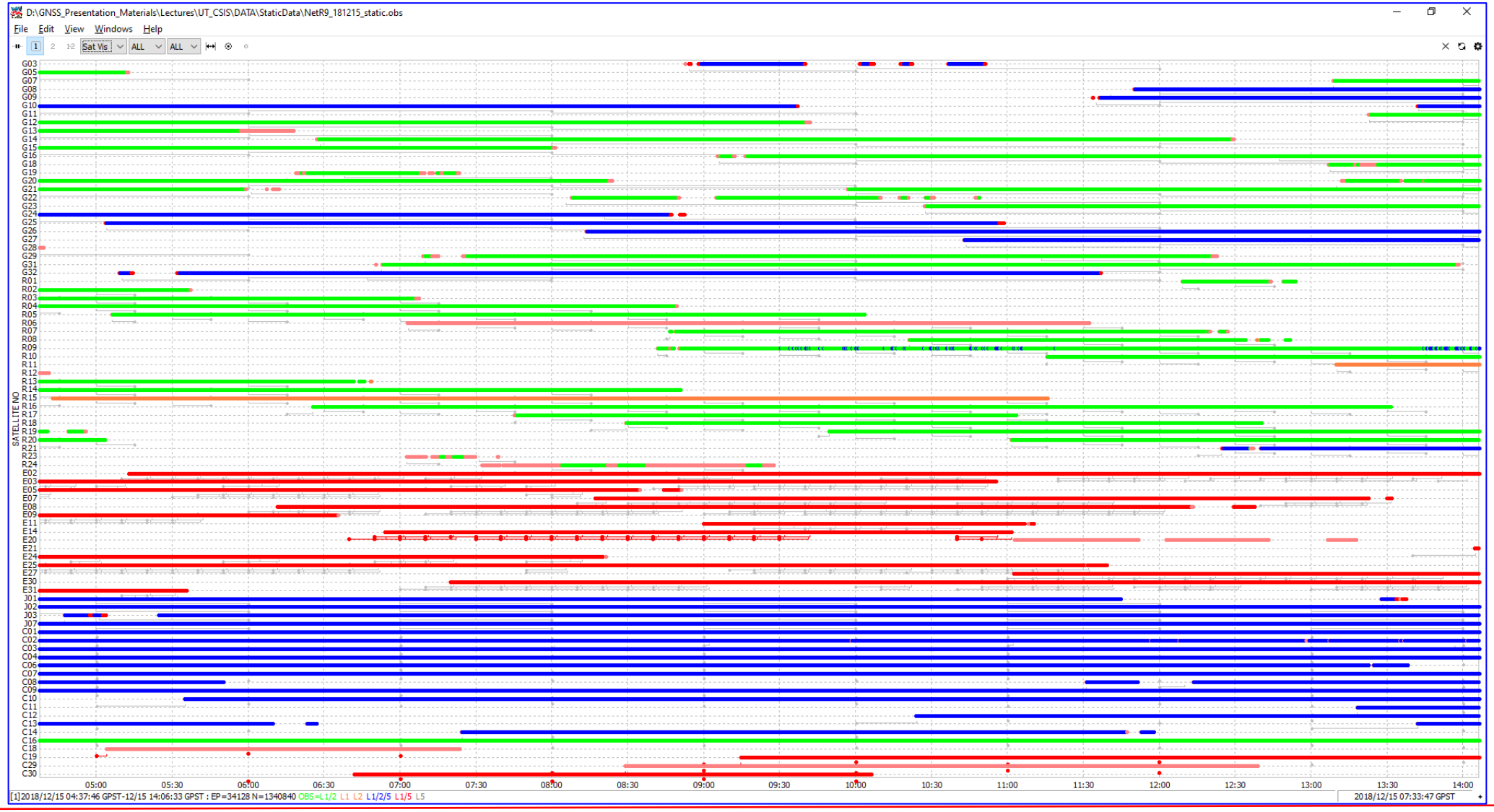


Select Processing Mode
Try with different modes



- Single: Standard Position Computation
  - (only Rover Data is necessary)
  - Few Meters accuracy: 3- 30m
- DGPS: DGPS Correction (code-Phase)
  - (Base and Rover Data necessary)
  - Meter level accuracy, 1 – 3m
- Kinematic: RTK
  - (Base and Rover Data necessary)
  - Centimeter level accuracy

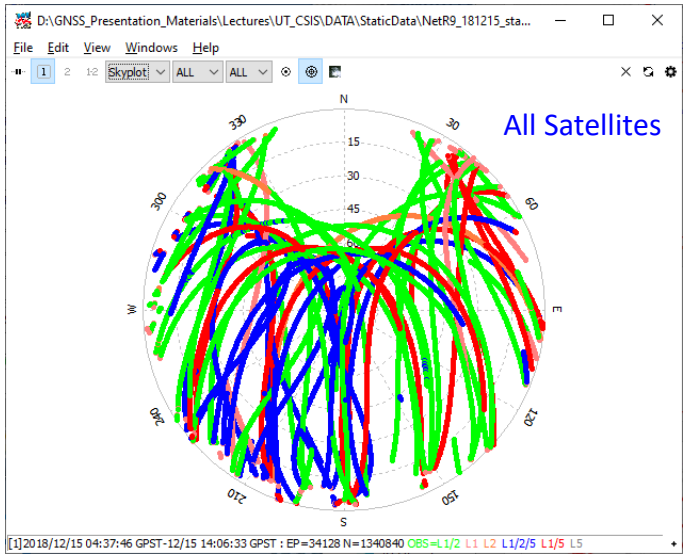
Base-Station: Satellite Visibility Plot

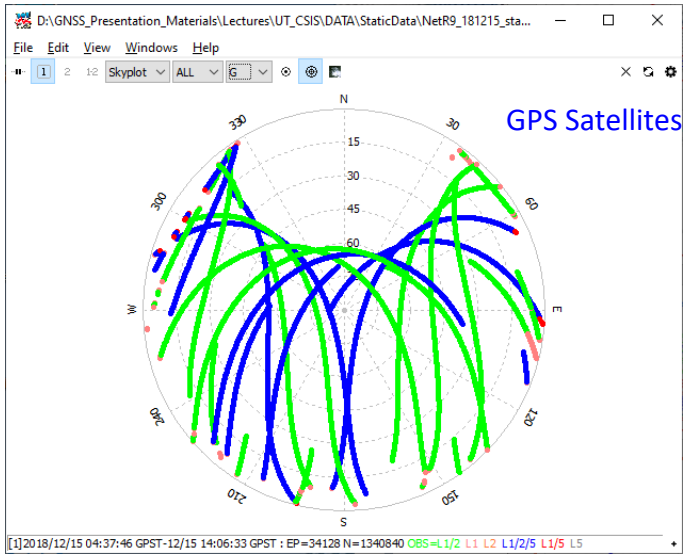


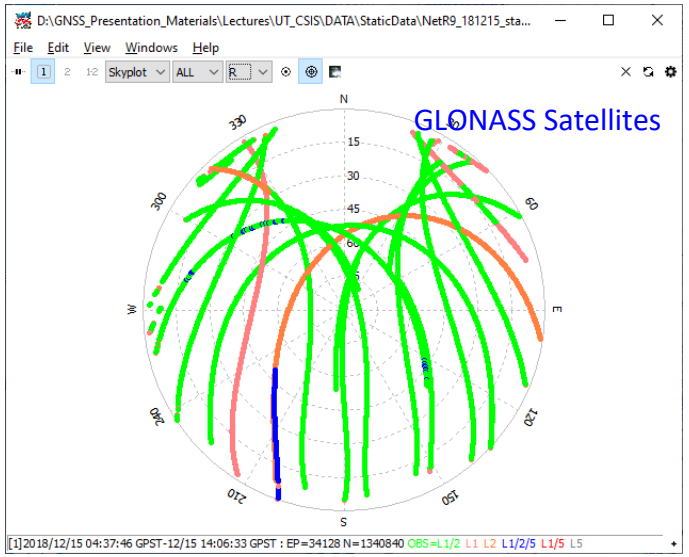
Visible Satellites

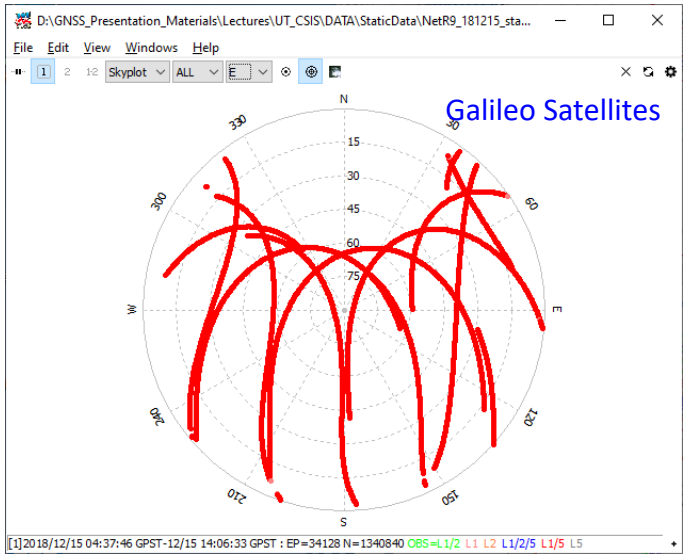
TIME, UTC

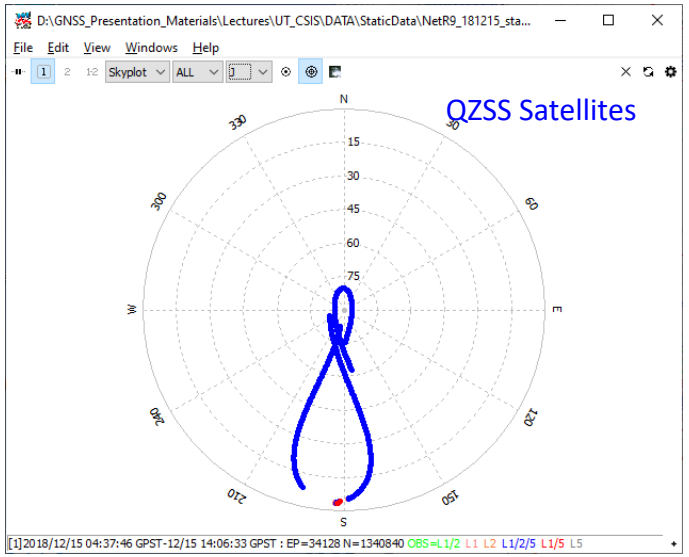
Base-Station: Skyplot

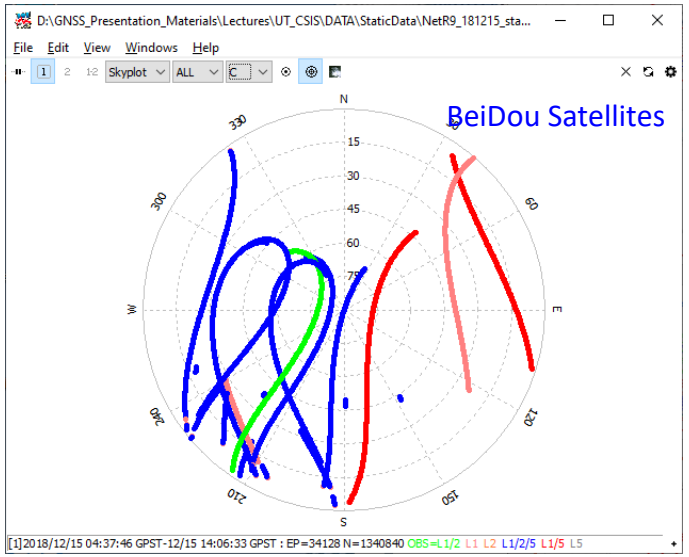




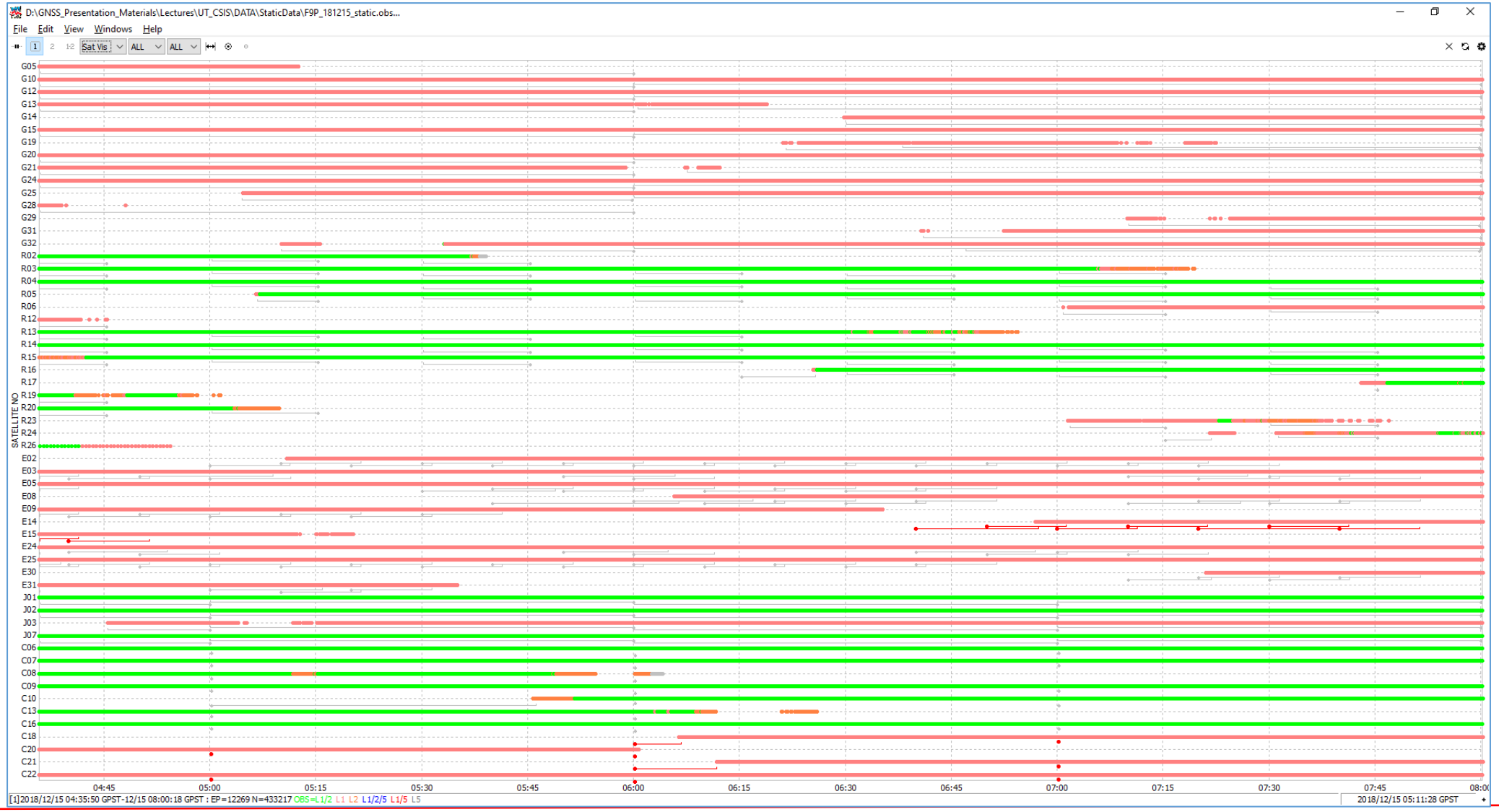








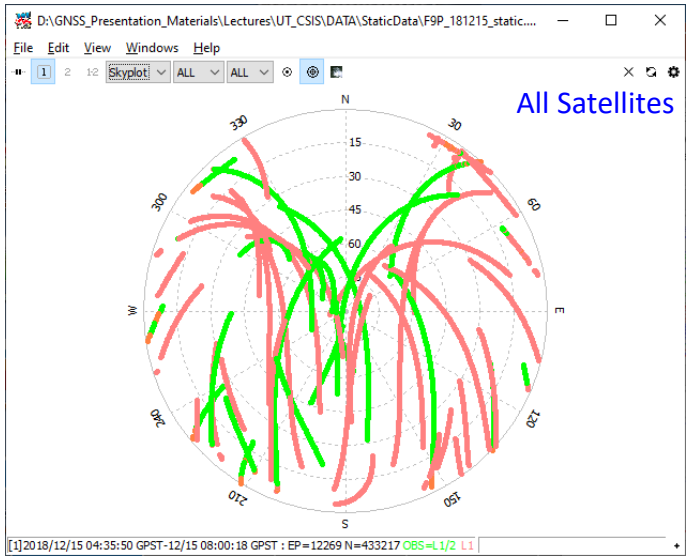
Rover: Satellite Visibility Plot

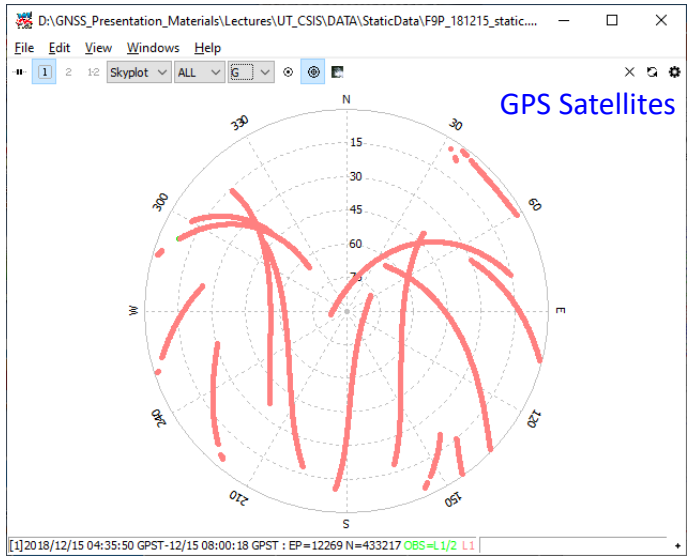


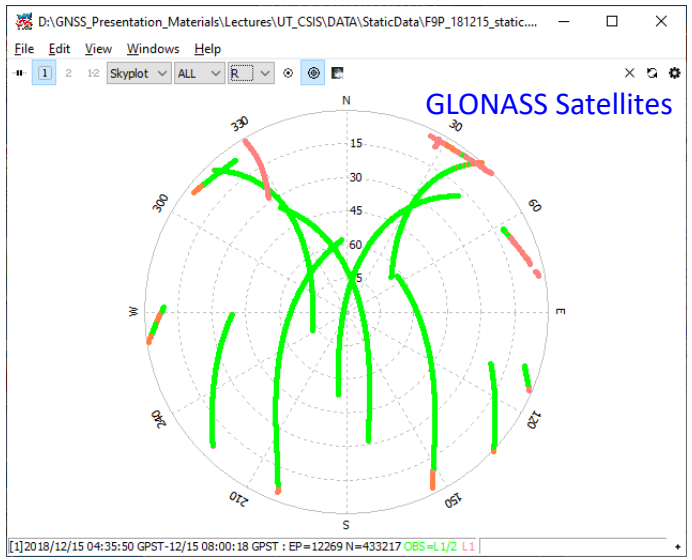
Visible Satellites

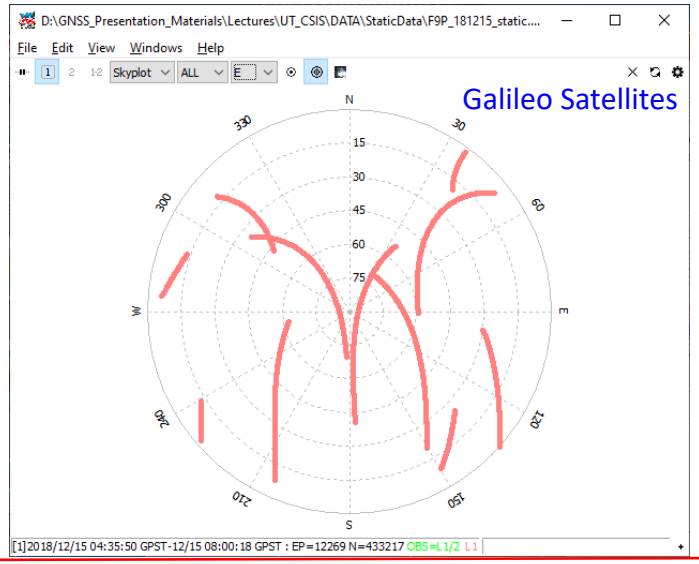
TIME, UTC

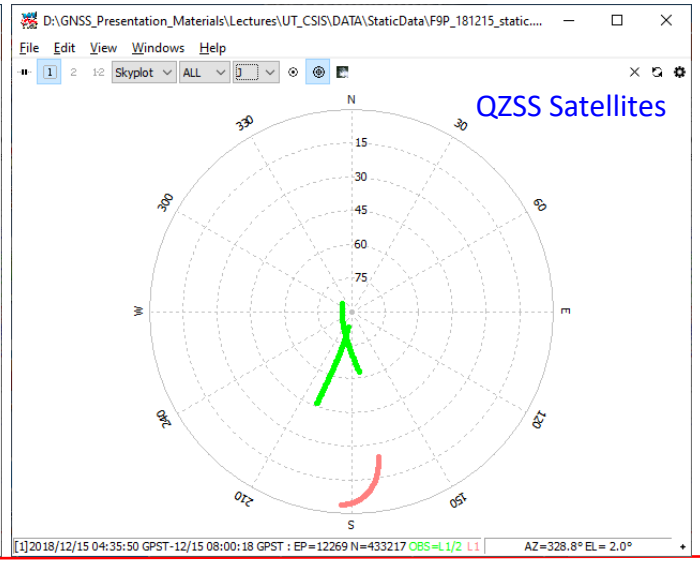
Rover: Skyplot

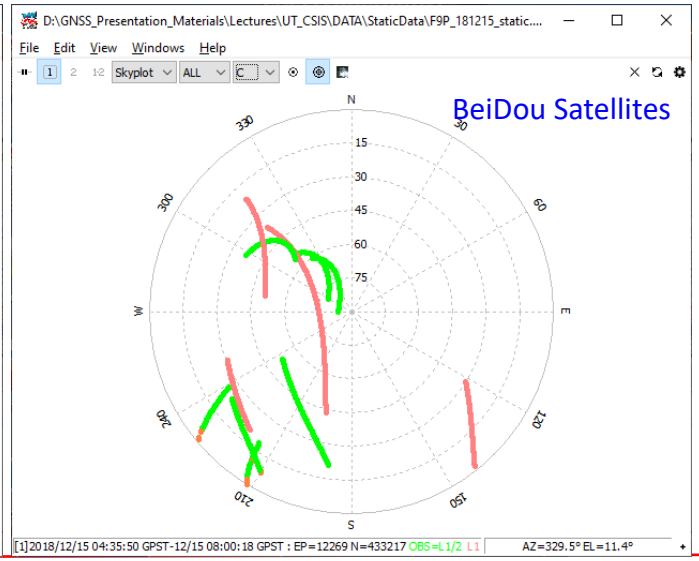


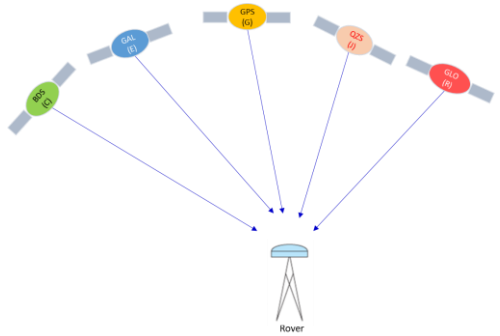




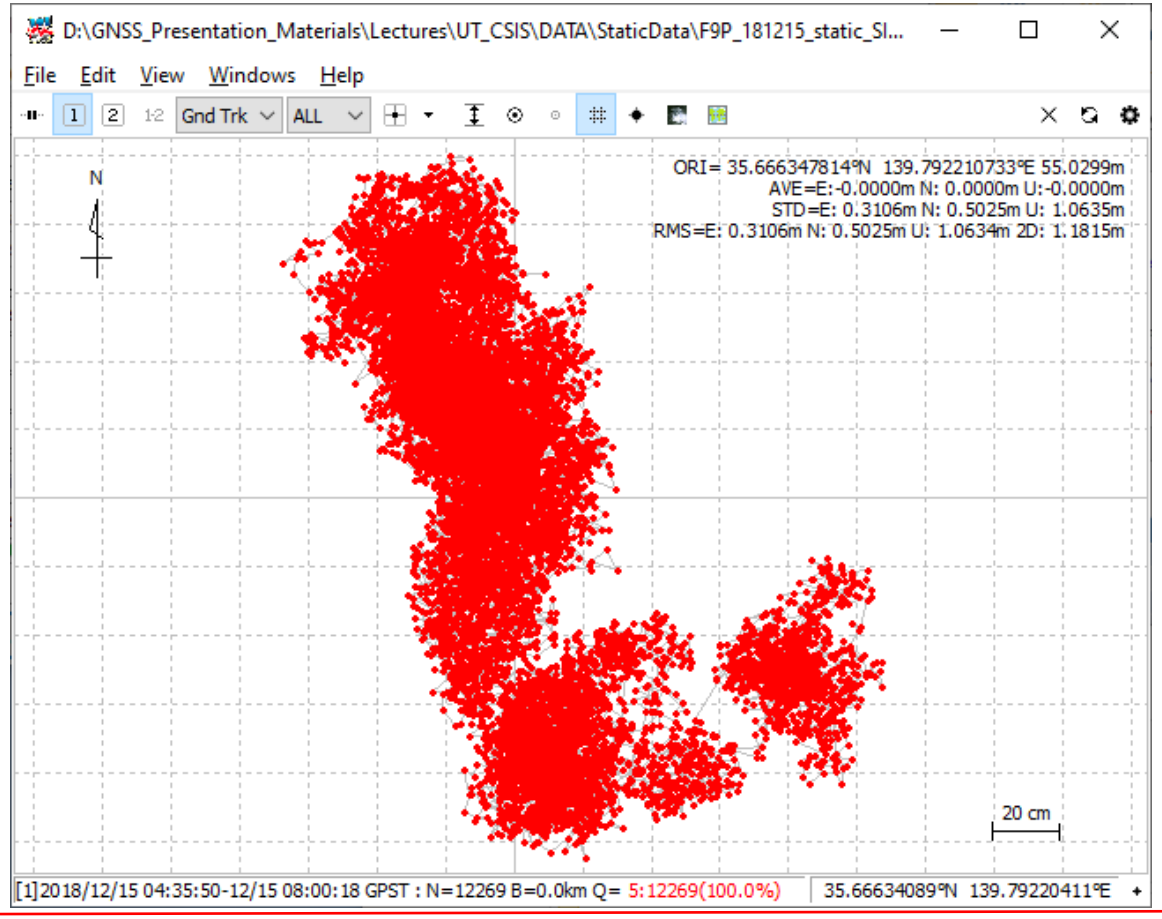


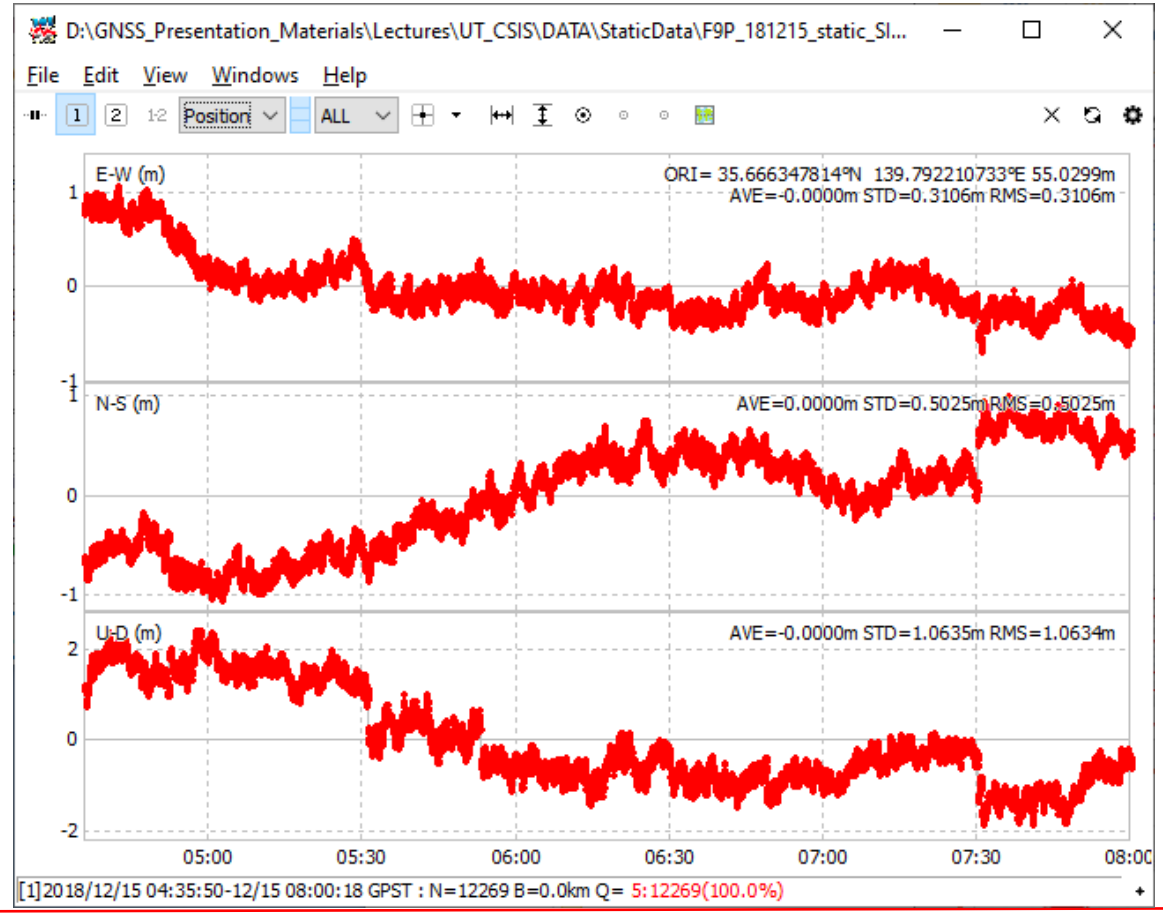




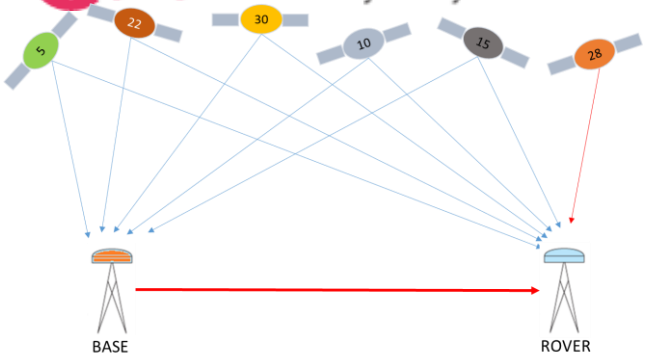


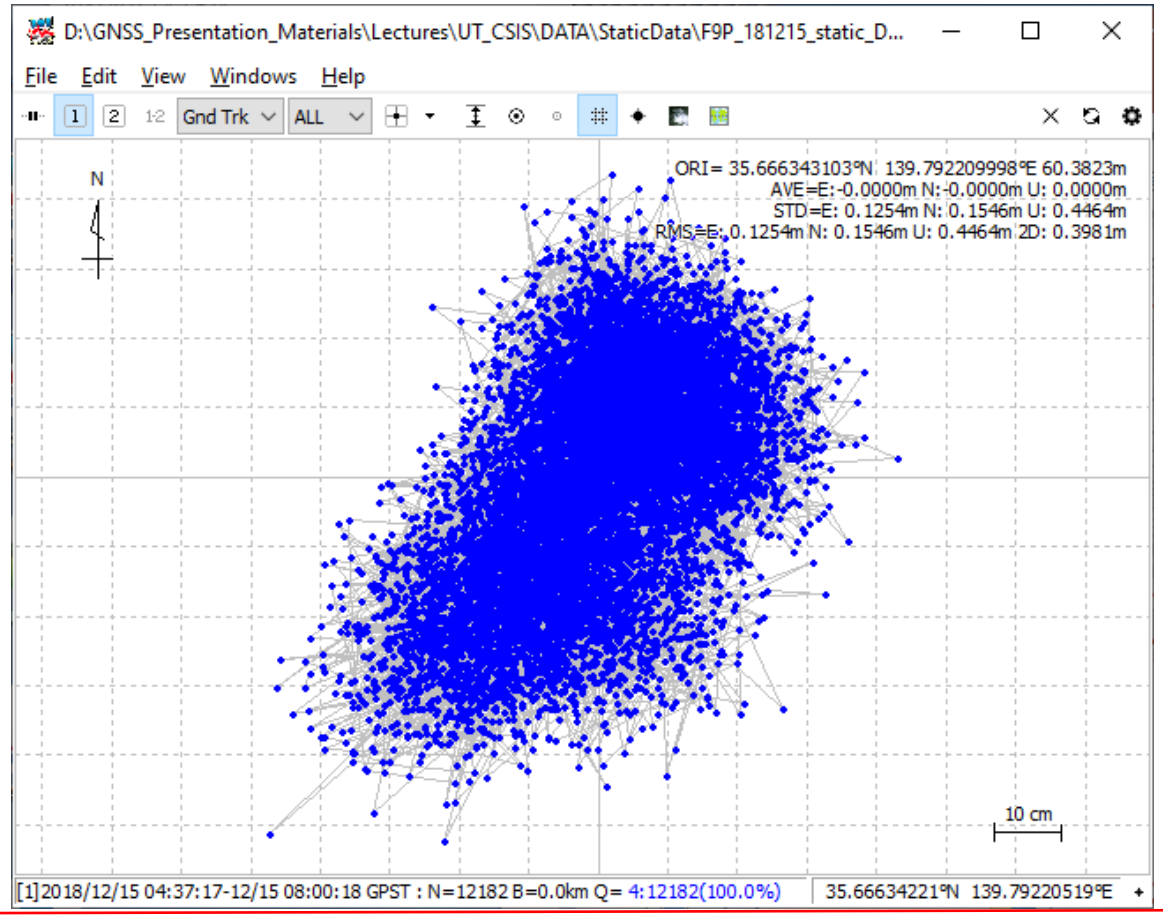
GNSS Data Processing: Single

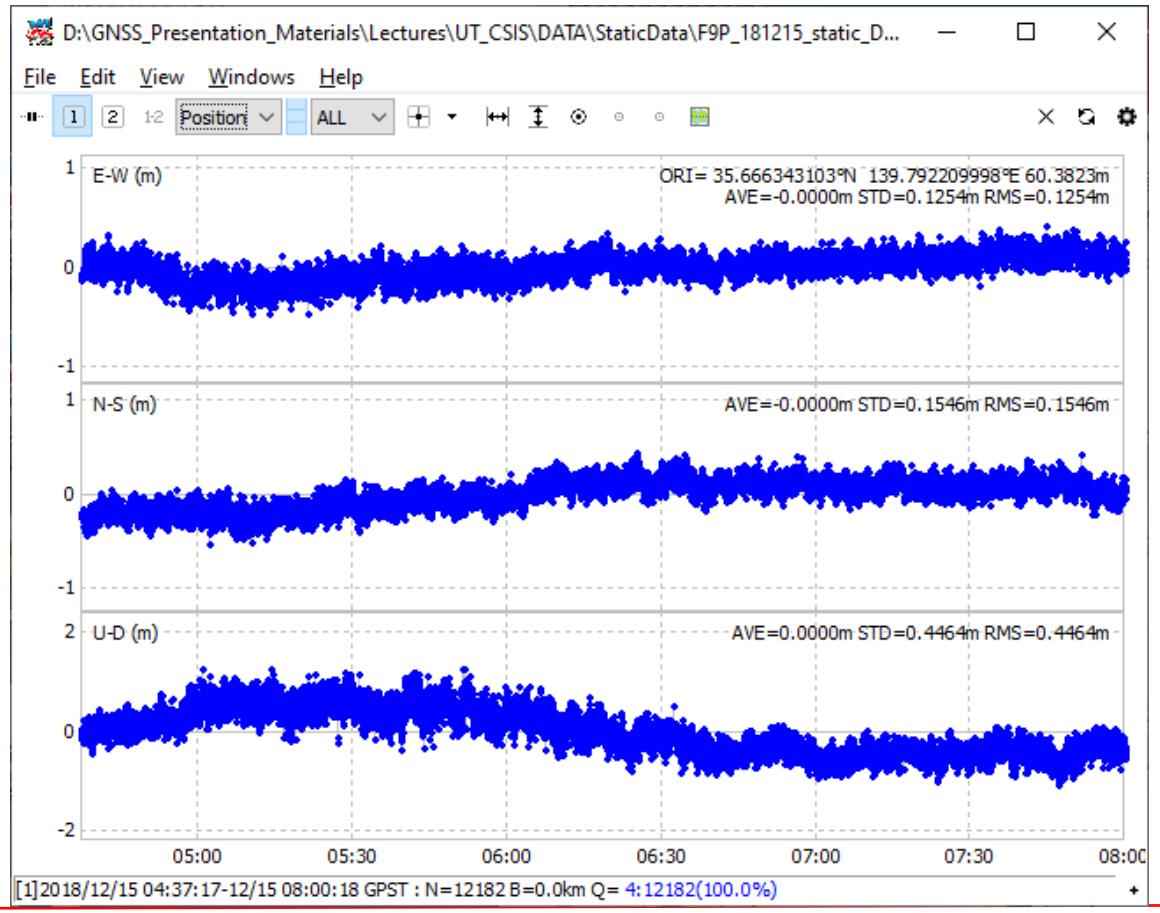




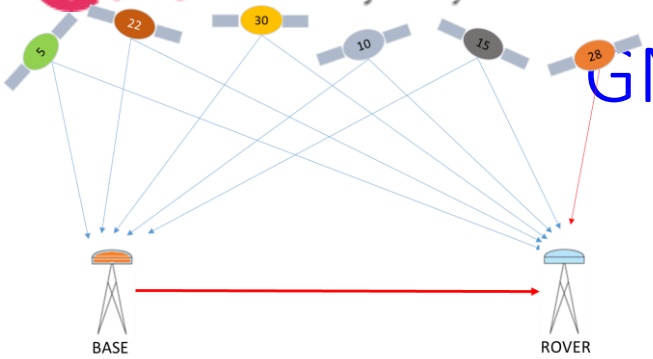
GNSS Data Processing: DGPS

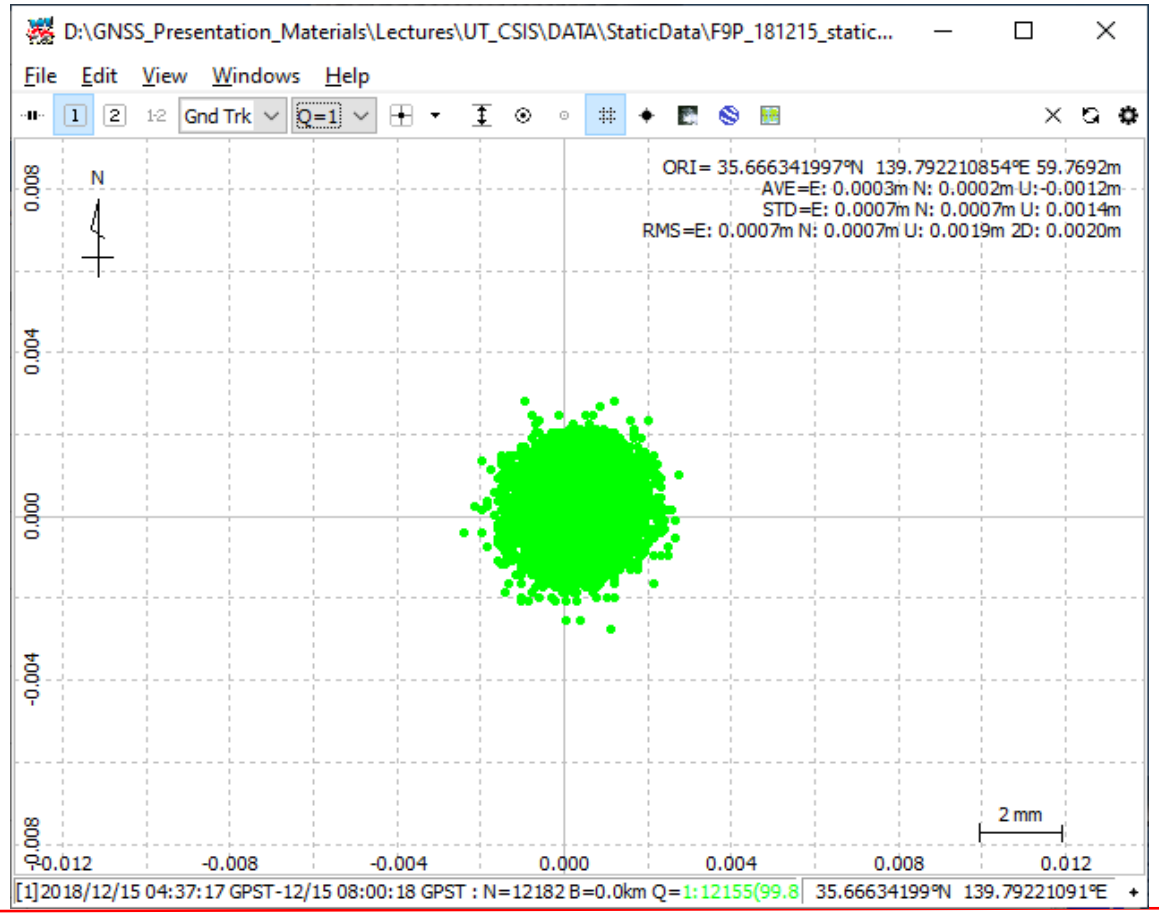


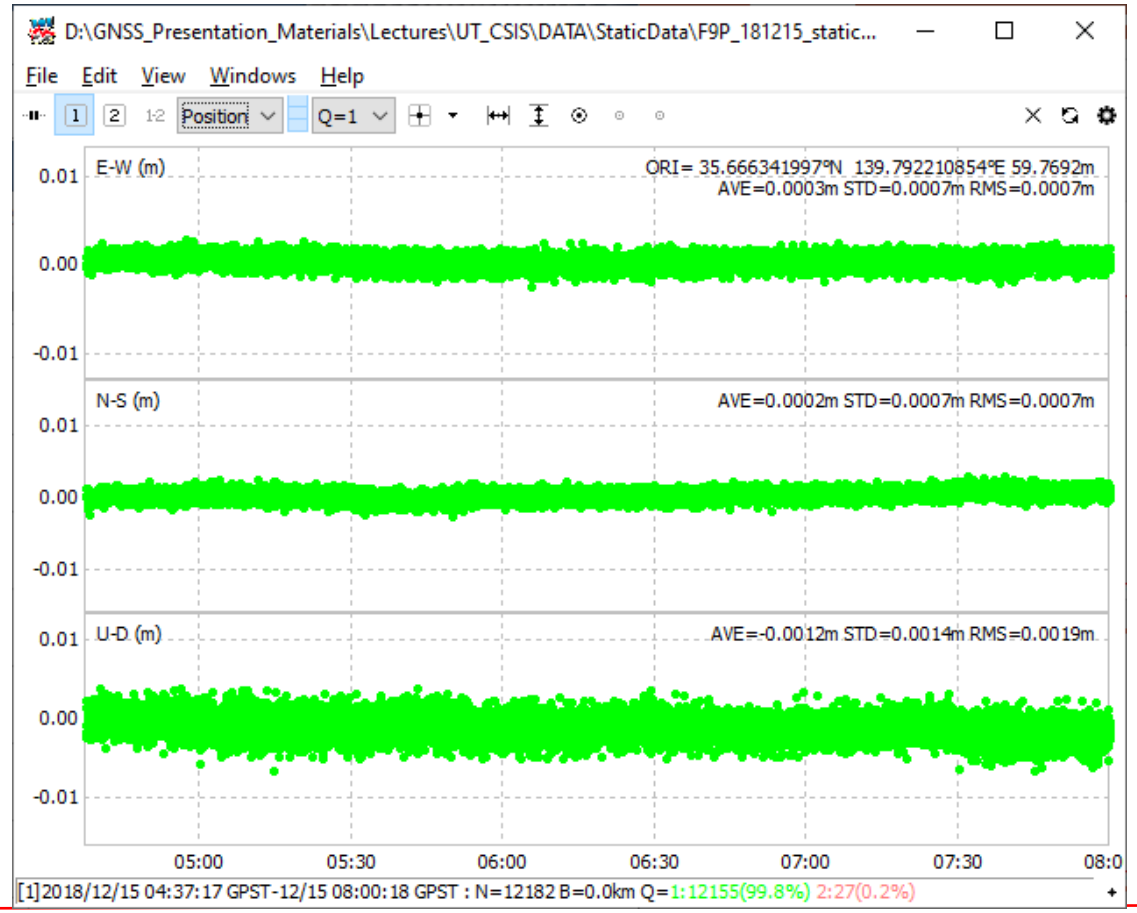




GNSS Data Processing: Kinematic







GNSS Data Processing: Single, DGPS, Kinematic