RTK Lib
Open source GNSS Software for GNSS Solutions

Ryan Ruddick & Bart Thomas (Geoscience Australia)

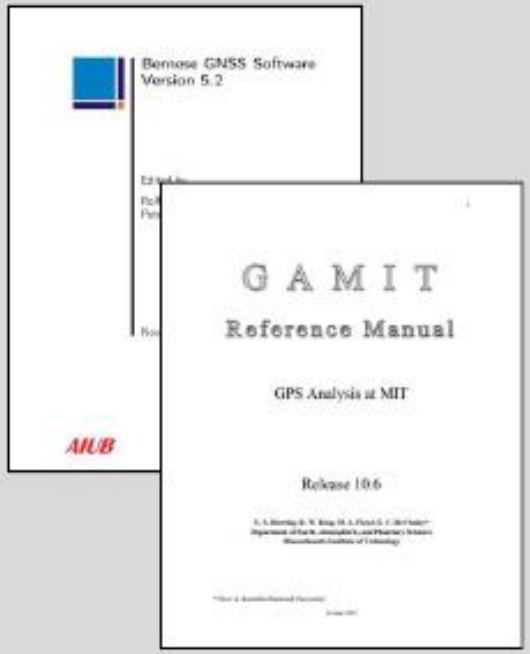
Andrick Lal (Pacific Community)

Resources

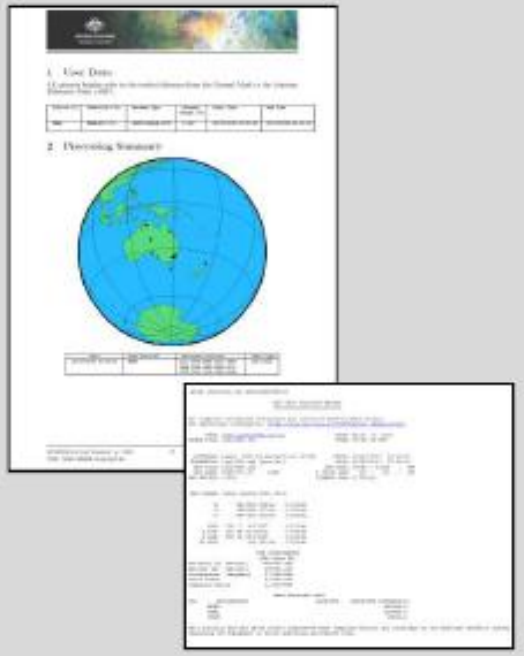
- RTKLIB homepage http://www.rtklib.com
- GIT repository https://github.com/tomojitakasu/RTKLIB/
- Windows binaries https://github.com/tomojitakasu/RTKLIB_bin
- Tutorial files ftp://ftp.ga.gov.au/geodesyoutgoing/gnss/pub/RFIP_2018/

GNSS Analysis Software

Commercial



Scientific



Online

What is RTKLIB?

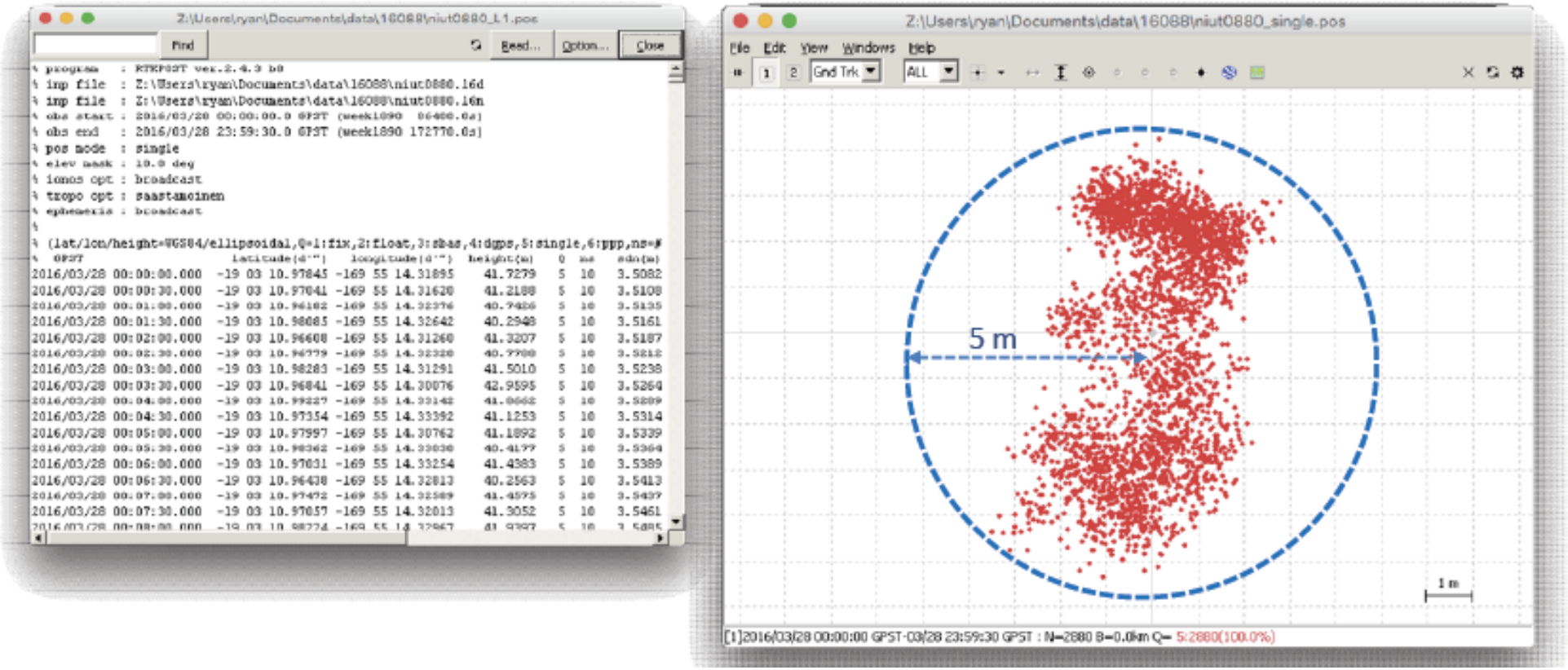
- An open source package for GNSS positioning and analysis.
- Developed my Mr Tomoji Takasu of the Tokyo University of Marine Science and Technology.

- Support for multi-GNSS.
- Positioning modes for both real-time and post-processing.
- Supports standard formats and protocols.
- GUI and CUI on Windows and CUI on Linux.

- Freely distributed from www.rtklib.com under a BSD license.

Use Case – Static Post-Processing

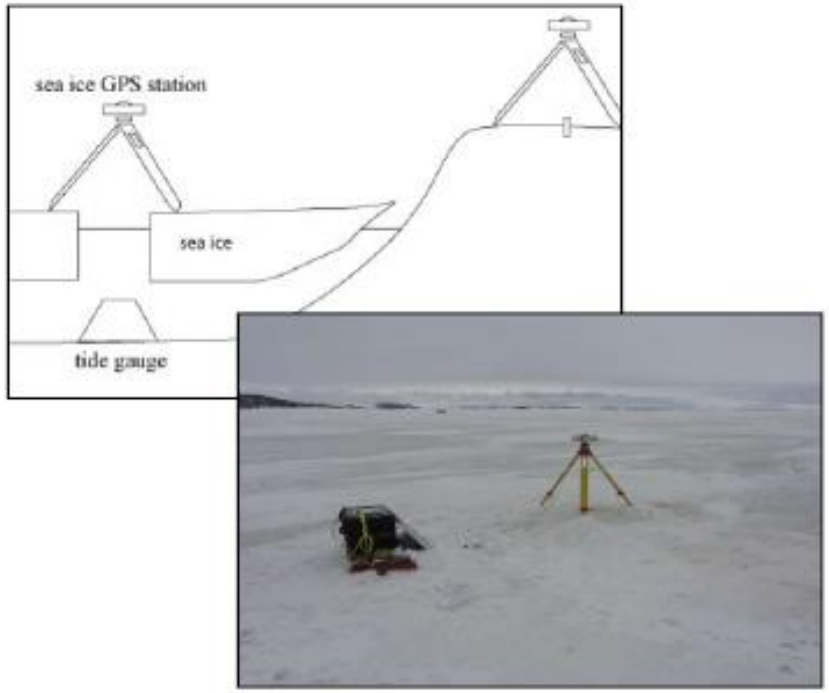
- RTKPOST
- RTKPLOT

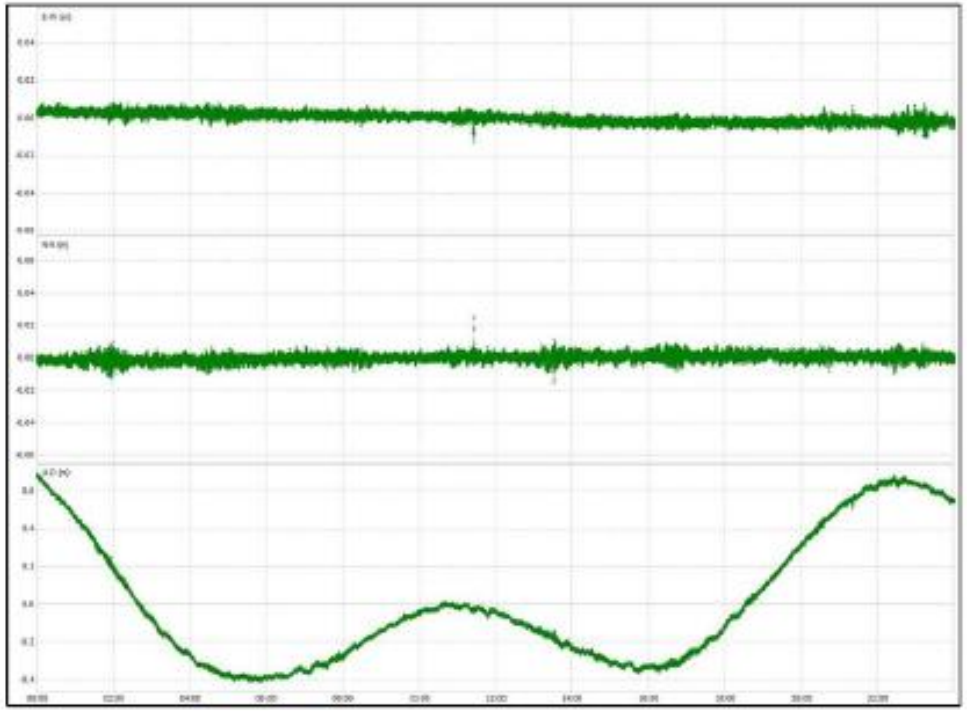


Use Case – Kinematic Processing

Floating Tide Gauge

- RTKPOST in Kinematic mode.
- RTKPLOT to view the results.



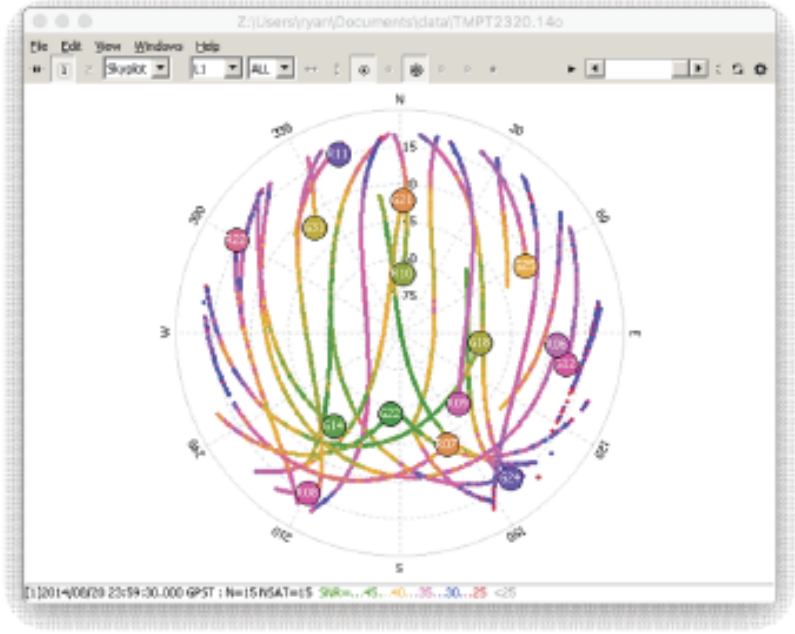


Use Case – Observation Data Quality

RTKPLOT can be used to assess the quality of RINEX observation data and to assist in planning the ideal time to undertake a GNSS occupation.

<u>Visual analysis includes:</u>

- Satellite availability
- Dilution of Precision (DOP)
- Signal to Noise ratio (SNR)
- Multipath



Installation of RTKLib (Windows)

If you would like to follow the tutorial please download the latest RTKLib Windows binary files from:

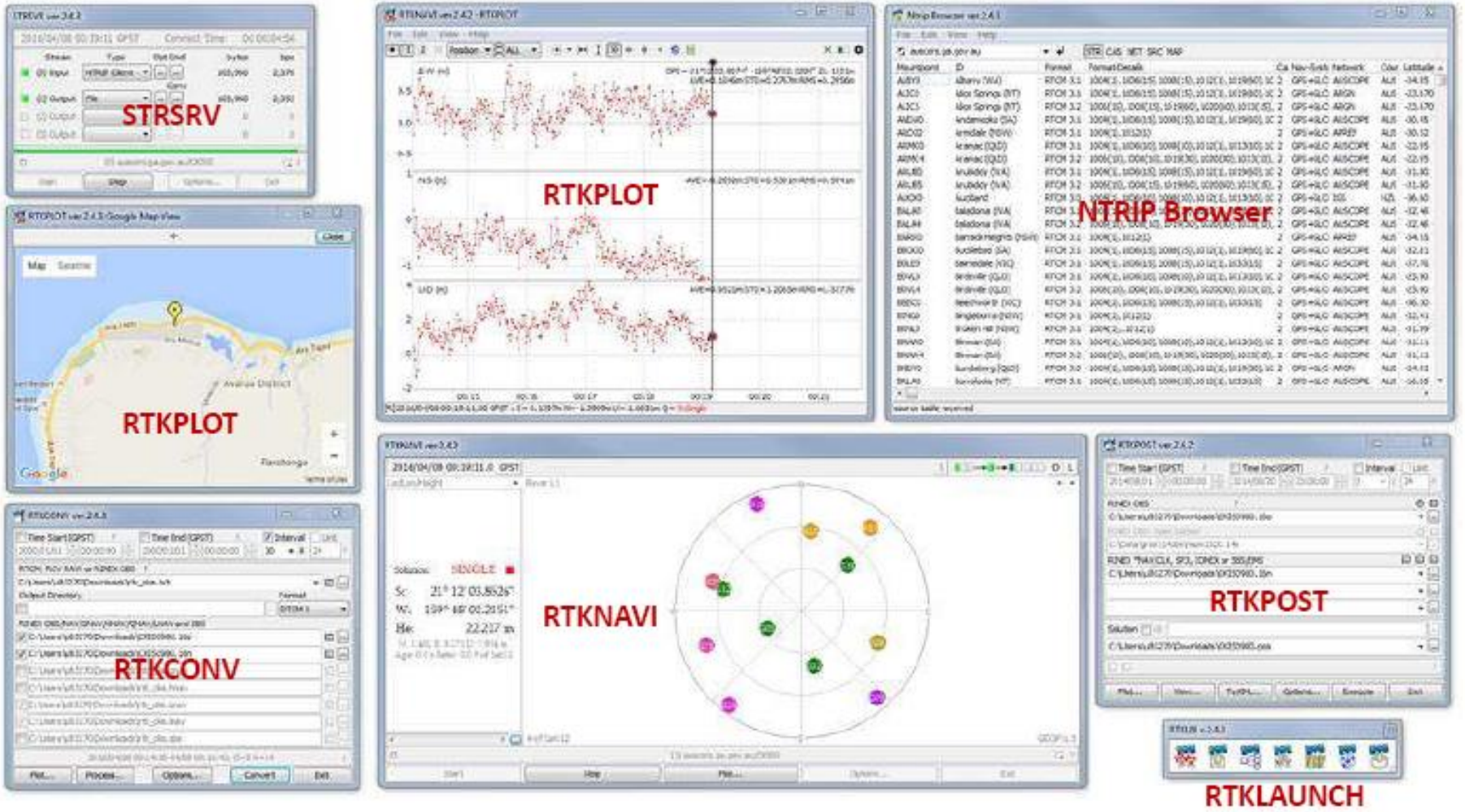
https://github.com/tomojitakasu/RTKLIB_bin/archive/master.zip

To open unzip and open the **RTKLIB_bin-master** directory.

bin (contains the executables)

To begin, double click on the executable **rtklaunch.exe**.

RTKLib Applications (Windows GUI)



Post processing tutorial

Tutorial Scenario (1)

Task: Generate Geocentric Datum of Australia 2020 (GDA2020) coordinates for the survey mark CA16.

Steps

1) Using **RTKLib** process a short baseline between *CA16* and the Continuously Operating Reference Station *MENA*.

Tutorial Scenario (2)

Required Files

Observation Data (*.*o)

- ca160670.17o (campaign/rover station)
- mena0670.17o (reference/base station)

Navigation Data (*.*n)

- brdc0670.17n (broadcast)

Precise Satellite Orbits (*.*sp3)

- igs19393.sp3

Antenna Phase Centre Model (*.*atx)

- igs14.atx

Data

- Rover station: CA16
- Base station: MENA
- Dates: 08/03/2017 (DOY067, GPS Week 19393)
  07/03/2018 (DOY066, GPS Week 19913)
- 24 hours static observation
- GPS L1+L2

Base Station Coordinates

Point (GDA 2020)	X (m)	Y (m)	Z (m)
MENA (DOY 067 2017)	-4611310.958 ± 11 mm	2583118.192 ± 11 mm	-3558095.376 ± 14 mm
MENA (DOY 066 2018)	-4611310.955 ± 11 mm	2583118.193 ± 11 mm	-3558095.379 ± 13 mm

Reference Station Data

http://www.igs.org

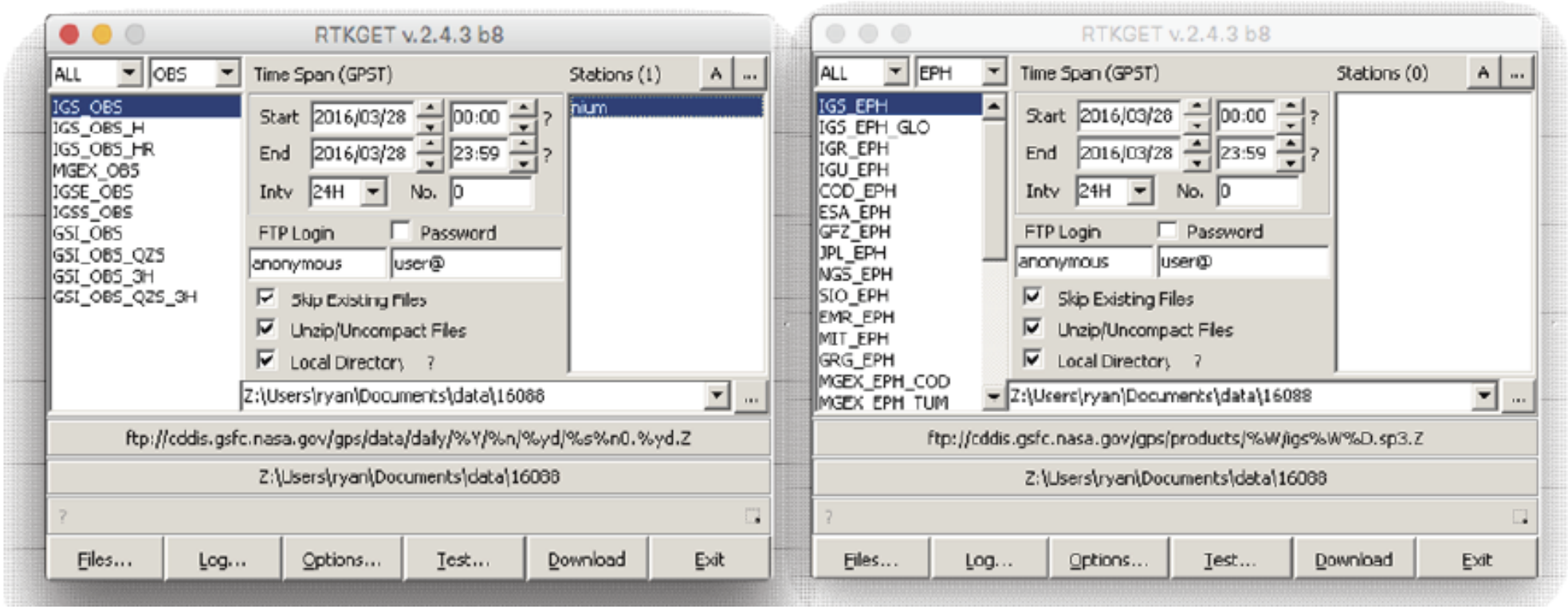
Precise Satellite Orbits

Type	Accuracy	Latency	Updates	Sample Interval
Broadcast	~100 cm	Real-time	-	daily
Ultra-Rapid (predicted half)	~5 cm	Real-time	at 03,09,15,21 UTC	15 min
Ultra-Rapid (observed half)	~3 cm	3 – 9 hours	at 03,09,15,21 UTC	15 min
Rapid	~2.5 cm	17 – 41 hours	at 17 UTC daily	15 min
Final	~2.5 cm	12 – 18 days	every Thursday	15 min

ftp://cddis.gsfc.nasa.gov/gps/products/

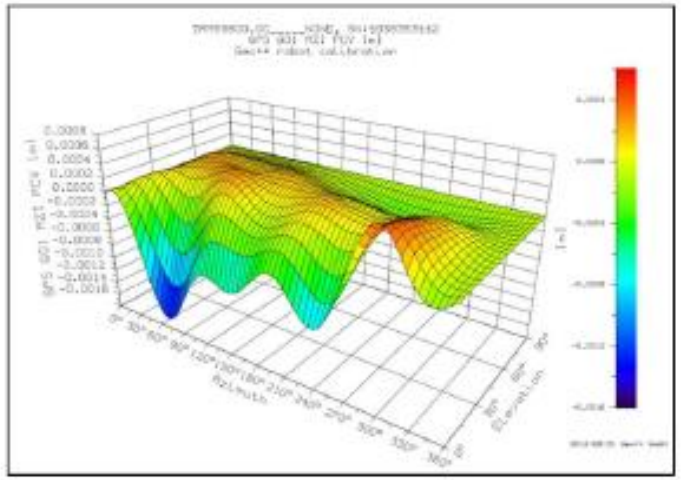
RTKGET

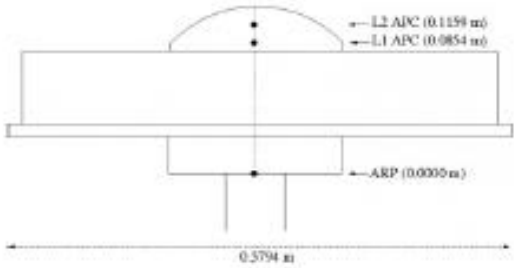
RTKGET can be used to download IGS products, such as reference station data, satellite orbits, clock files and Earth orientation parameters.



Antenna Phase Centre Variation Models

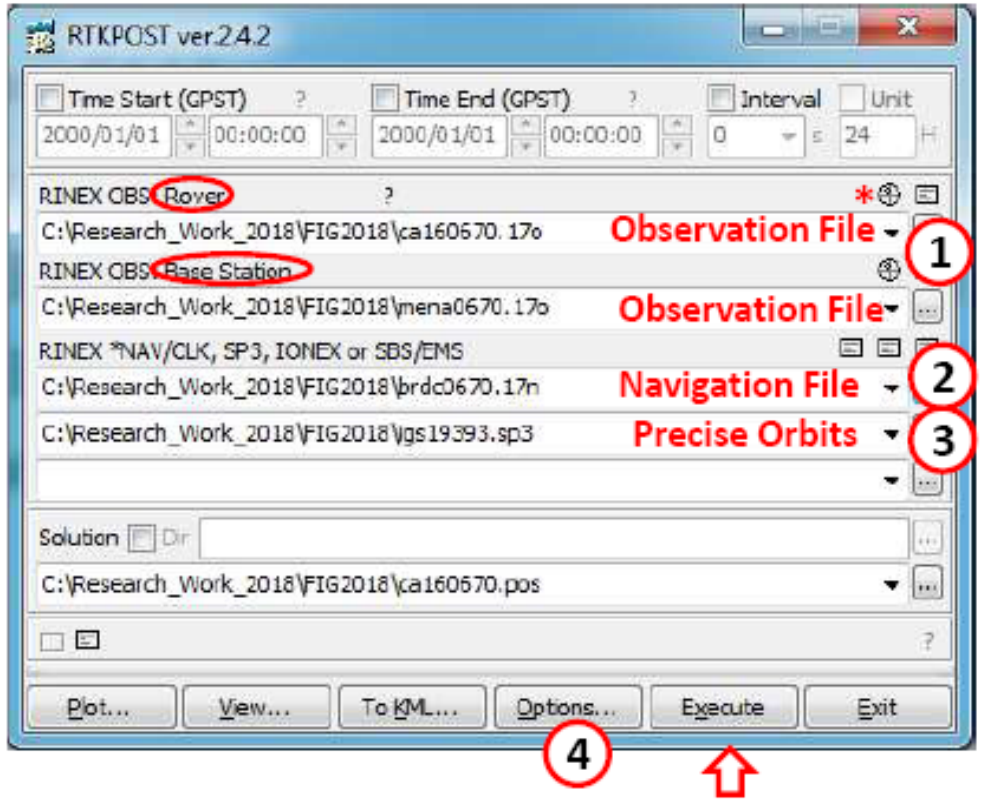
- The antenna PC is the part of the antenna that receives the signal.
- Due to manufacturing differences and satellite geometry PC's vary between antennas.
- Robotic antenna calibrations are available that provide models to correct for the PC variation.
- ftp://ftp.igs.org/pub/station/general/igs14.atx



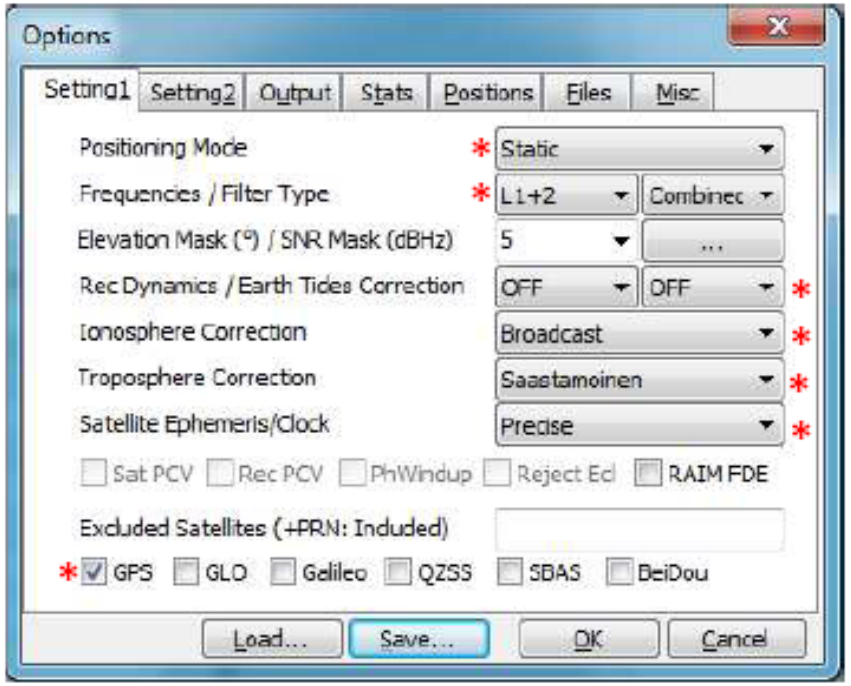


Static Post-Processing – Options (RTKPOST)

- Import data, set up processing configuration and execute processing.

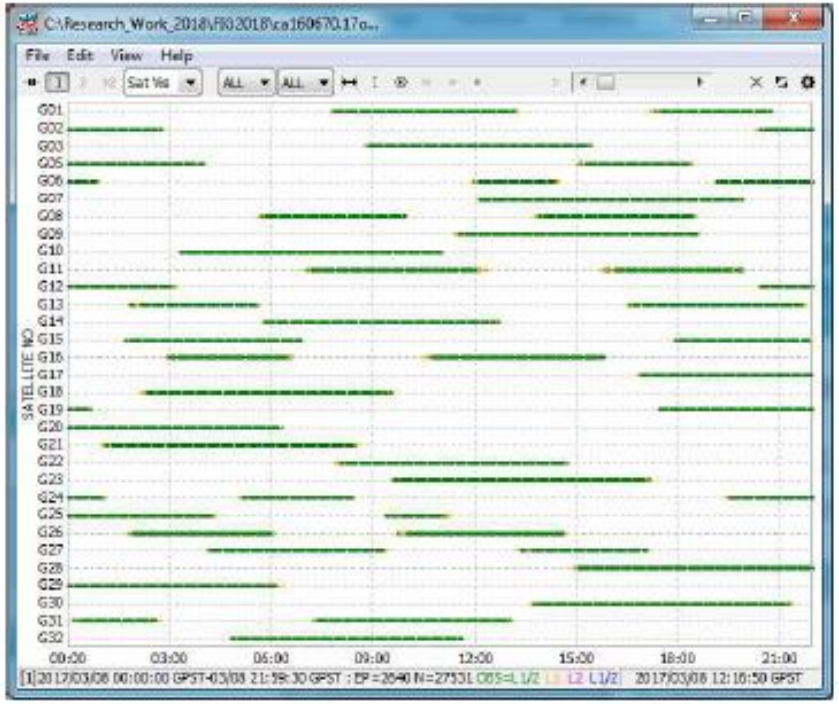


Setting 1

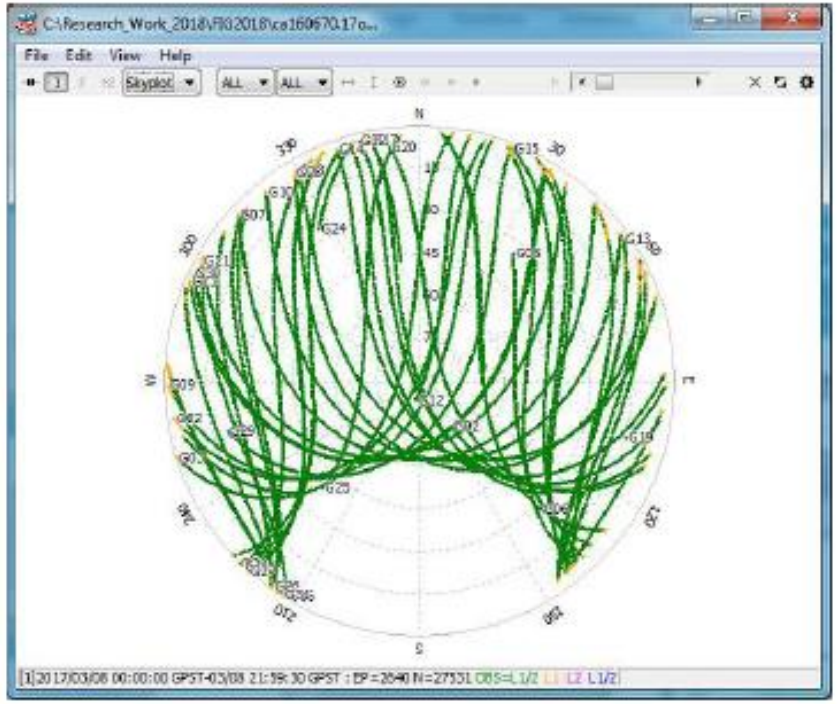


Observation Data Quality

Satellite Visibility

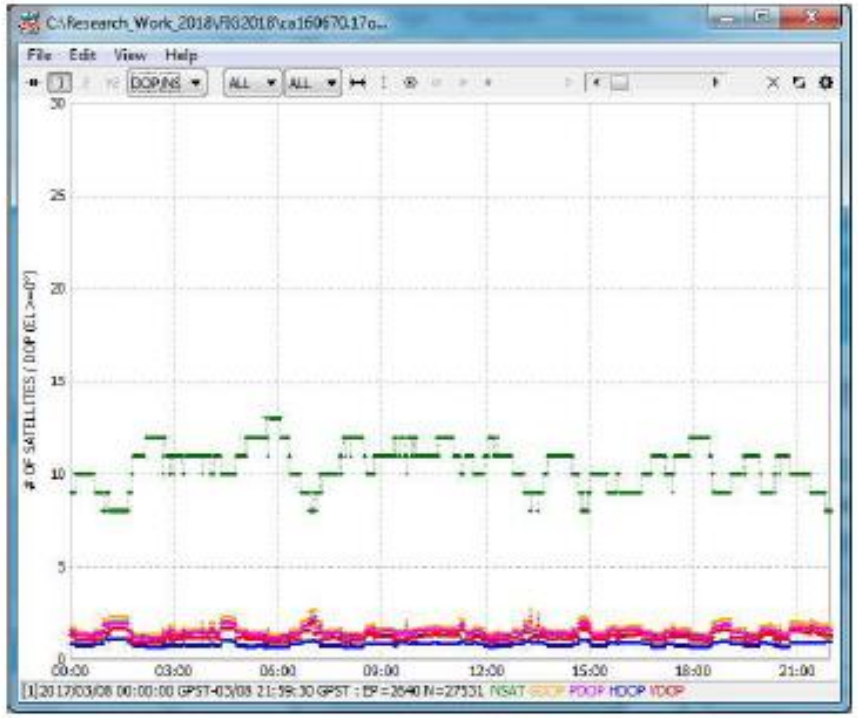


Skyplot

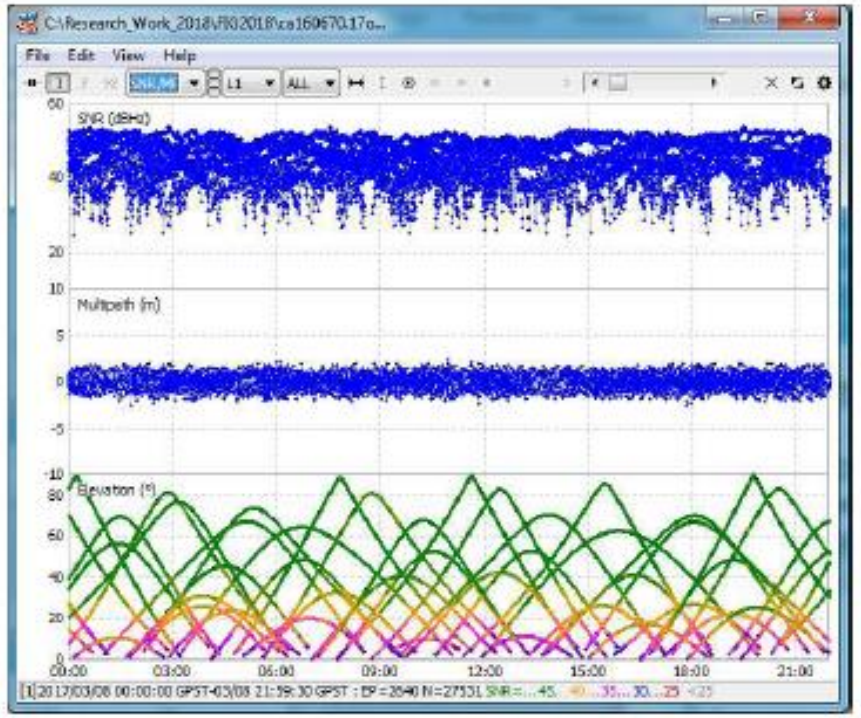


Observation Data Quality

Number of Satellites and DOP

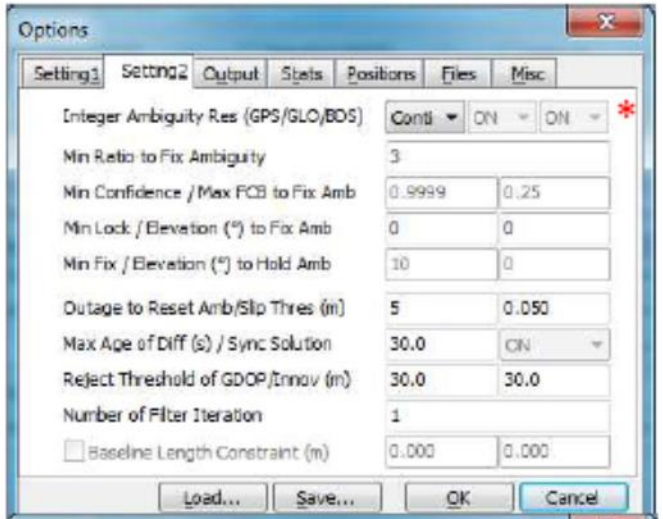


SNR, Multipath, Elevation

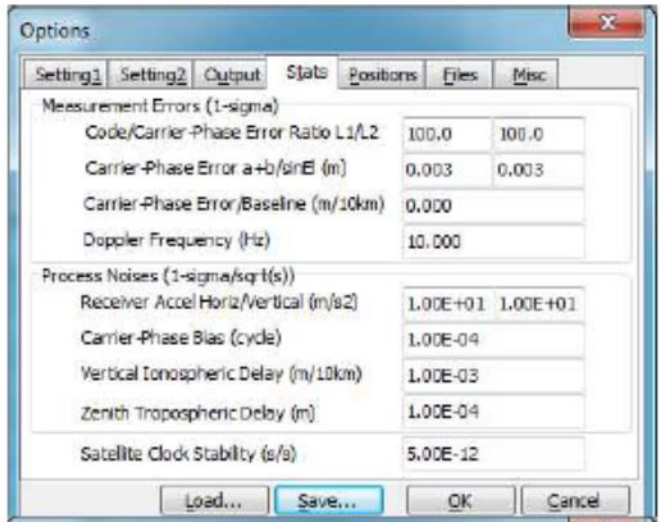


Static Post-Processing – Options (RTKPOST)

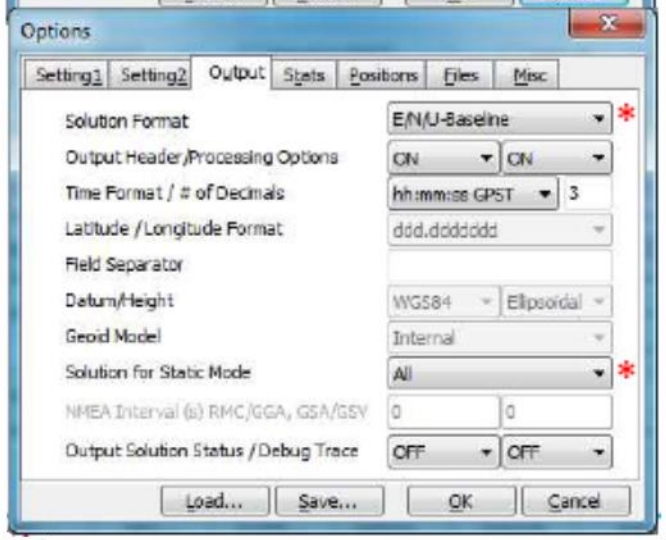
Setting 2



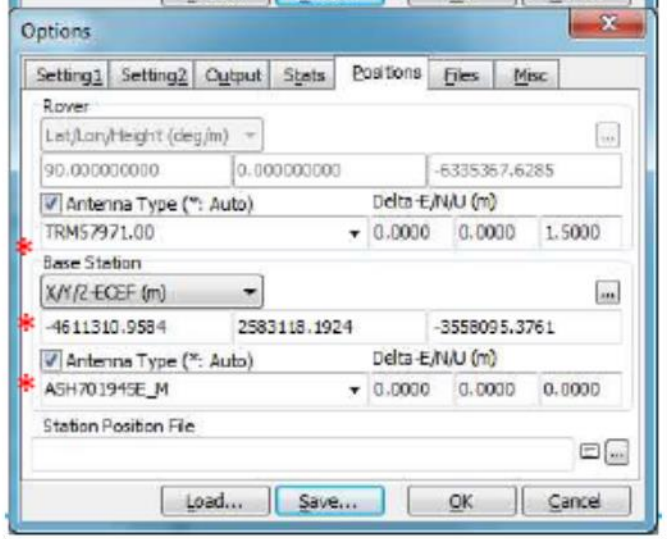
Stats



Output

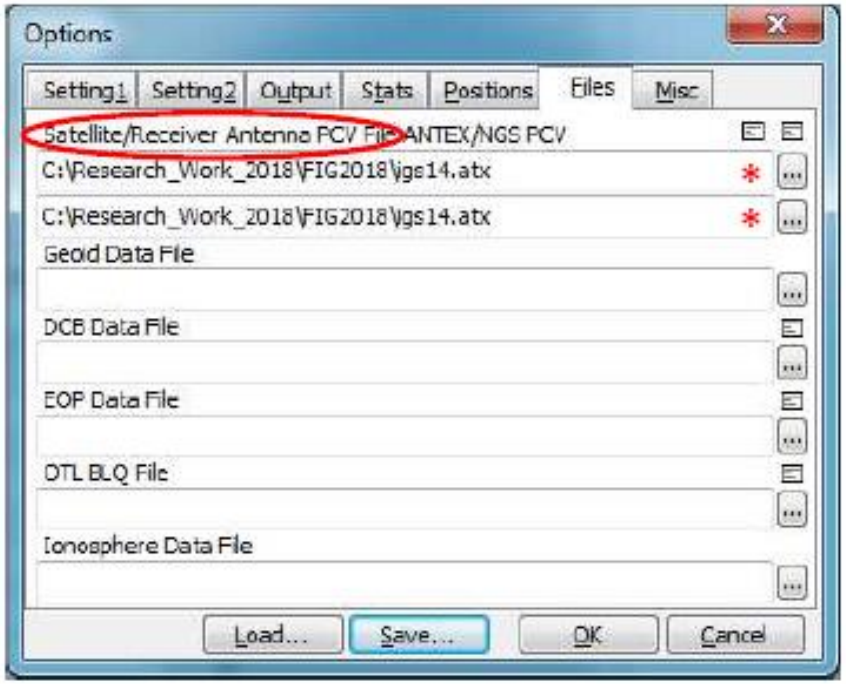


Positions

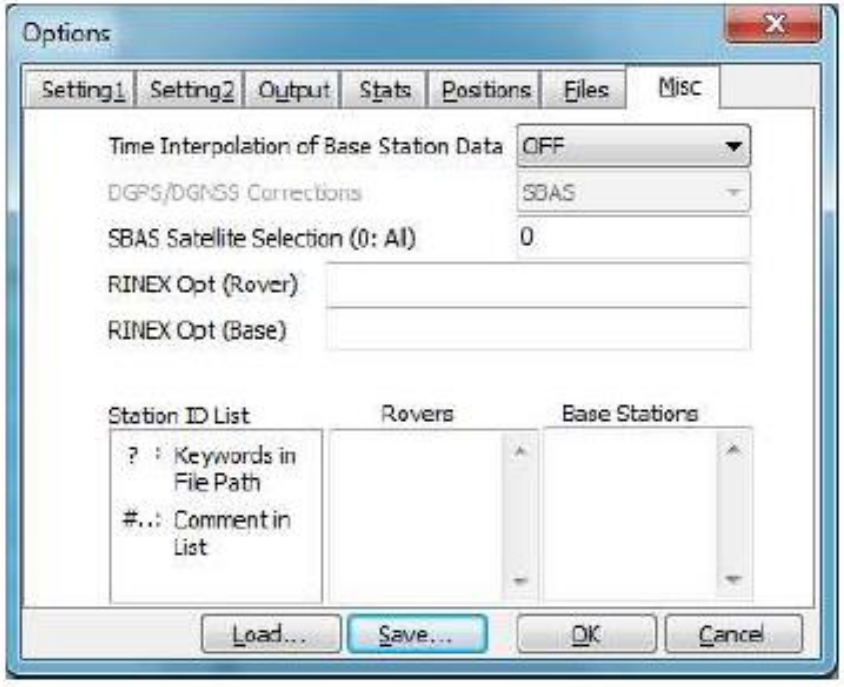


Static Post-Processing – Options (RTKPOST)

Files

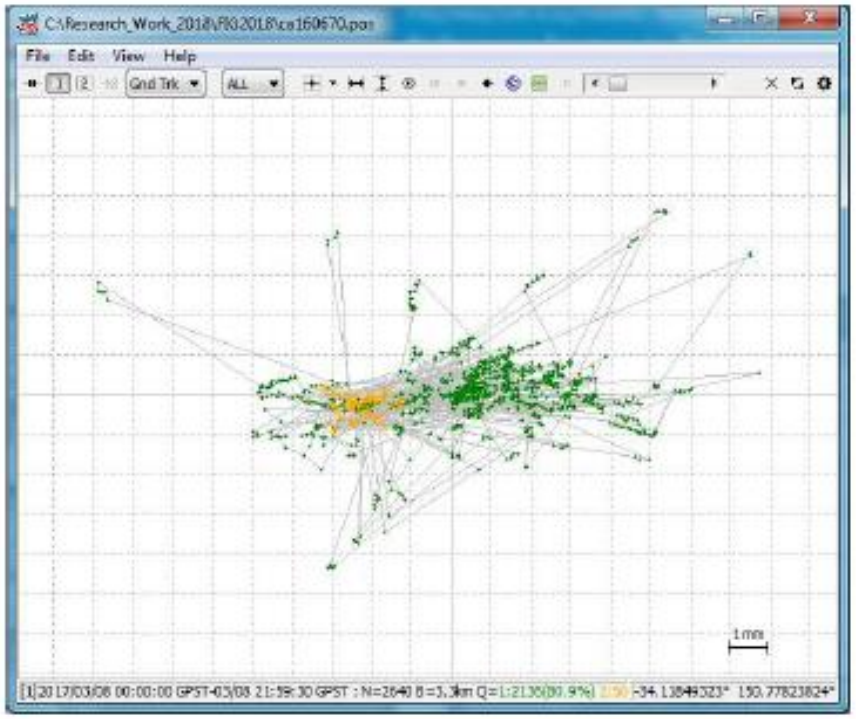


Misc

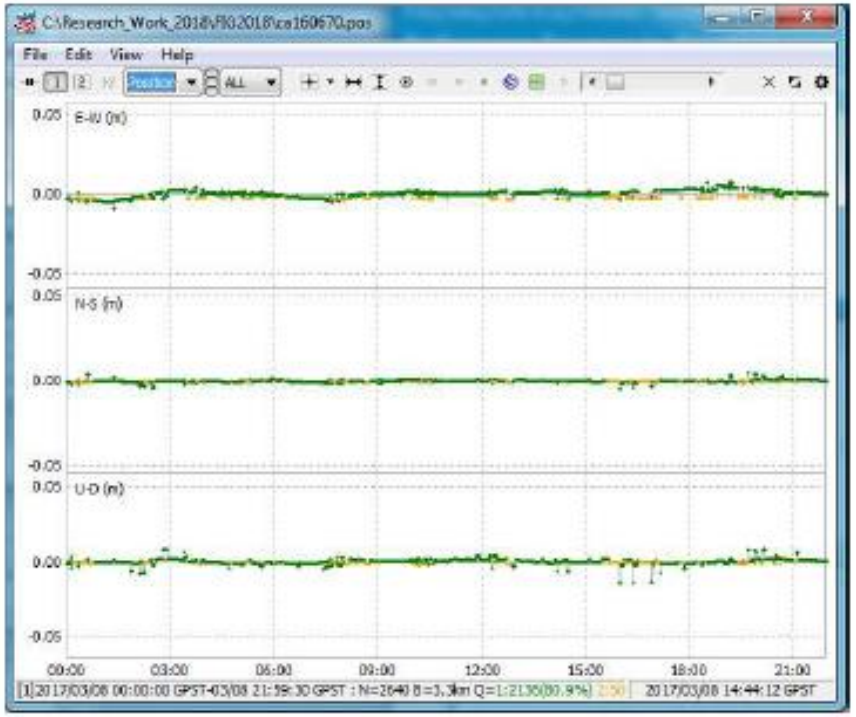


Plot (RTKPLOT)

Ground Track



Position



Comparison of Solutions (RTKPLOT)

DOY 067 2017

Point (GDA 2020)	X (m)	Y (m)	Z (m)
CA16 (RTKLIB)	-4613300.916 ± 4 mm	2580586.721 ± 4 mm	-3557416.539 ± 3 mm
CA16 (AUSPOS)	-4613300.917± 11 mm	2580586.721 ± 11 mm	-3557416.542 ± 14 mm
	ΔX 1 mm	ΔY 0 mm	ΔZ 3 mm

DOY 066 2018

Point (GDA 2020)	X (m)	Y (m)	Z (m)
CA16 (RTKLIB)	-4613300.918 ± 10 mm	2580586.720 ± 8 mm	-3557416.535 ± 8 mm
CA16 (AUSPOS)	-4613300.918± 11 mm	2580586.723 ± 11 mm	-3557416.544 ± 13 mm
	ΔX 0 mm	ΔY 3 mm	ΔZ 9 mm

Overview

- Introduction and installation of RTKLIB.

Tutorial

- Files required for post-processing
- Looking at observation data quality
- Baseline post-processing

Questions?