ComNav Technology

User Guide

Post-processing Software ---Compass solution

Version: V 1.9.6

Content

About this User Guide

Thank you for choosing our Post-processing Software - Compass Solution. This User Guide provides introduction of software installation, project management, data processing and reporting. It can help you to get familiarized with its interface and start your project effectively.

Disclaimer

Please read this software disclaimer carefully before installing Compass Solution.

1) Compass Solution software is an intelligent post-processing software owned by ComNav Technology Ltd.
2) ComNav declares that software has been intensively tested, but we make no warranty that it is compatible with all software or hardware systems, or error-free. We are not responsible for any damages, liability or injuries caused by any failure of software performance.

By installing Compass Solution software, you agree to all terms listed above. If you do not accept the terms, please uninstall it immediately.

Technical Assistance

If you have any question and can't find the answer that you need in this manual, please contact your local dealer from which you purchased the M300Pro. Alternatively, please request technical support using the ComNav website at: www.comnavtech.com or technical support email: support@comnavtech.com.

Your Comments

Your feedback about Compass solution software and this User Guide, or other ComNav products will help us to improve with future revisions. Please email your comments to: support@comnavtech.com.

1 Introduction

Compass Solution software is post-processing software designed to process and analyze raw GNSS (Global Navigation Satellite System) data, obtaining high accuracy positioning solution. It can support most of the GNSS satellite constellations (GPS, Glonass, Galileo and BeiDou), and main functions are shown below:

1) Process GNSS observation data in RINEX and ComNav formats.
2) Support differential post-processing in static and kinematic modes.
3) Network adjustment of all processed baseline vectors.
4) Output analysis reports in various formats (HTML, DXF, TXT, and KML).

1.1 Installation

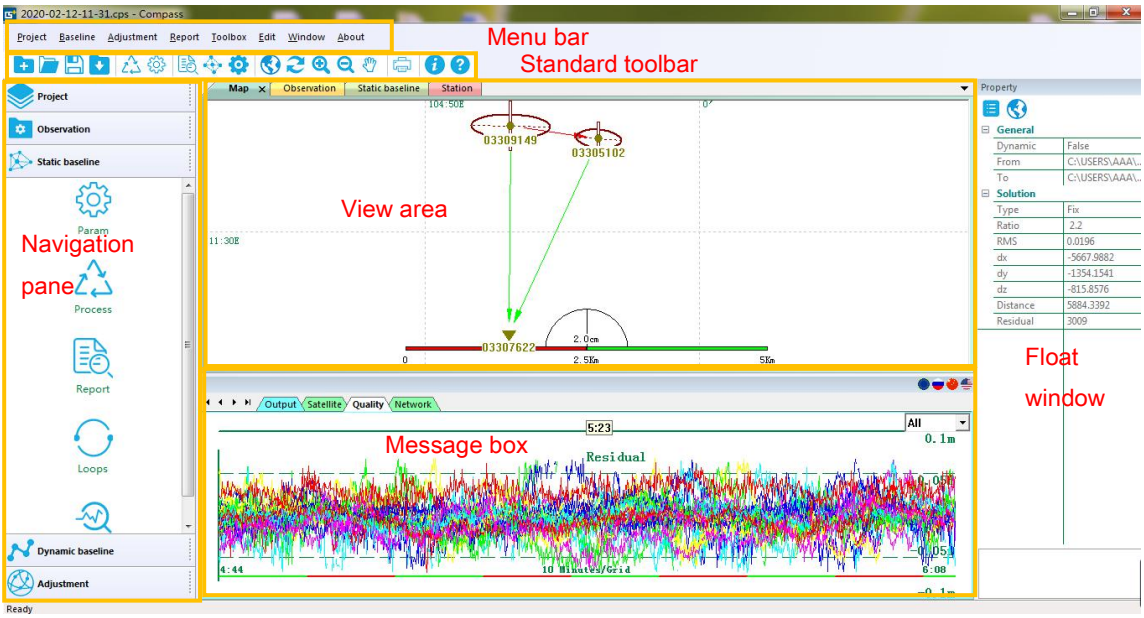
Double-click on compass setup.exe, choose install path to install the software. Please make sure that the main program, dongle and C++2012 are installed completely.

The operation system should be at least or better than:
Windows XP, Windows Server 2003
CPU: core 2.0GHz;
Internal memory > 4G, HD>500 G;
Screen resolution: 1280*1024.

1.2 User Interface

This section describes the user interface and main menus of Compass Solution software.

- Menu Bar: Contains all functional menus.
- Standard Toolbar: Quickly access the frequently used functions, including import observation files, baseline processing, network adjustment and so on.
- View Area: The main display window.
- Navigation Pane: Navigate to view your raw data and help you to process in static or kinematic modes.
- Float window: Show the information of raw or processed data.
- Message box: Contains the output message, satellite, quality of observation and the network.



1.2.1 Menu Bar

The menu bar includes Project, Baseline, Adjustment, Report, Toolbox, Edit, Window and About. The main functions of each menu are described below:

- Project: Create, open, save, close the project and import raw data.
- Baseline: Process all or selected baselines, baseline setup and analyse baselines.
- Adjustment: Check observation files, check network, adjustment report setup, adjustment setup and run adjustment.
- Report: Check detailed report and output report in various formats, including DXF, TXT, KML.
- Toolbox: Datum manager, antenna manager, coordinate convert, customize and edit toolbar.
- Edit: Undo, delete the selected items and check the property of observation sites.
- Window: Map view and configuration, zoom in or out map, etc.
- About: Help and about compass solution.

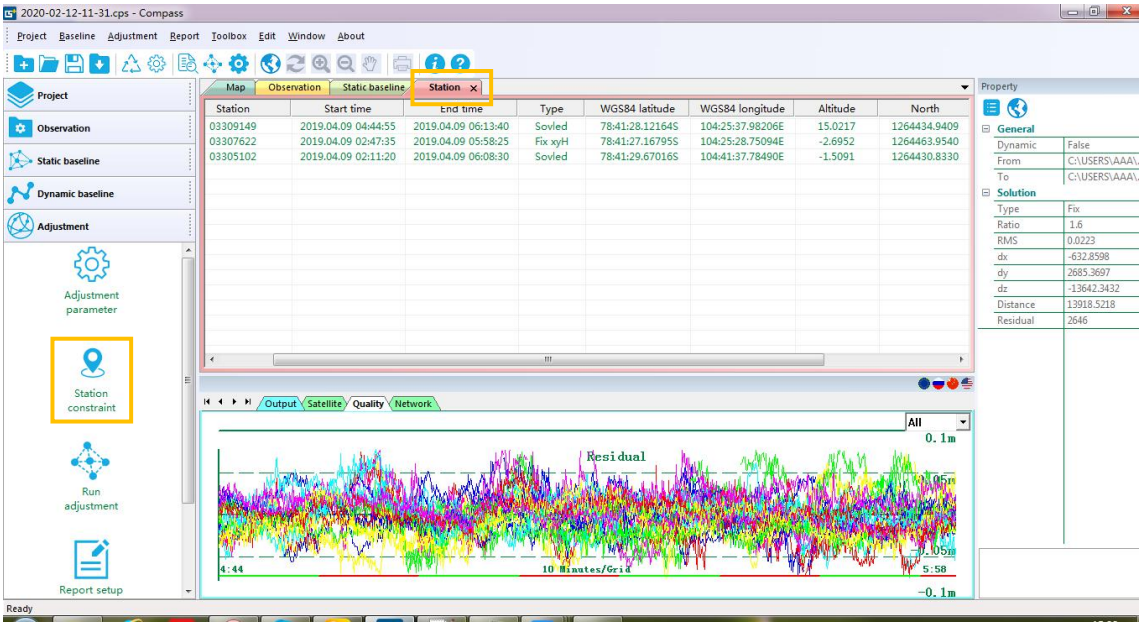
1.2.2 Navigation Pane

It contains five tabs: Project, Observation, Static baseline, Dynamic baseline and Adjustment.

- Project: Project list, including create a new project or open an existing project and view the property of the project.

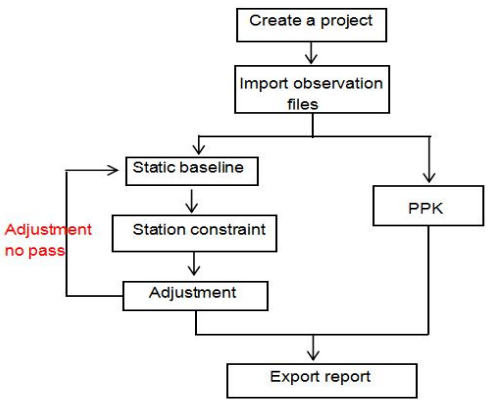
- Observation: Show the detailed information of observation files, including import files and add or delete Ephemeris files.
- Static baseline: Static baseline list, including baseline process, setup for process, export baseline report, etc.
- Dynamic baseline: Dynamic baseline list, including baseline process, setup for process, export report and setup report.
- Adjustment: Including adjustment setup, station constraint, run adjustment, setup and export adjustment report.

If you want to change the display in the view area, you need click the particular display items in navigation Pane, then the selected items will be shown in the view area.



1.3 Workflow

The figure shows the workflow of Compass Solution software, which will give you a clear view of post-processing.



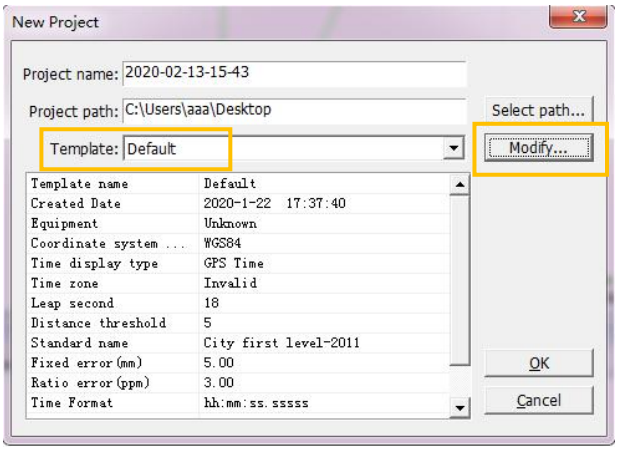
2 Project Management

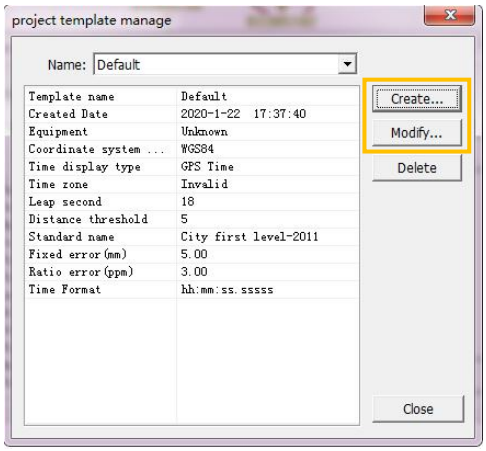
In this chapter you can learn how to create a new project and import raw data files.

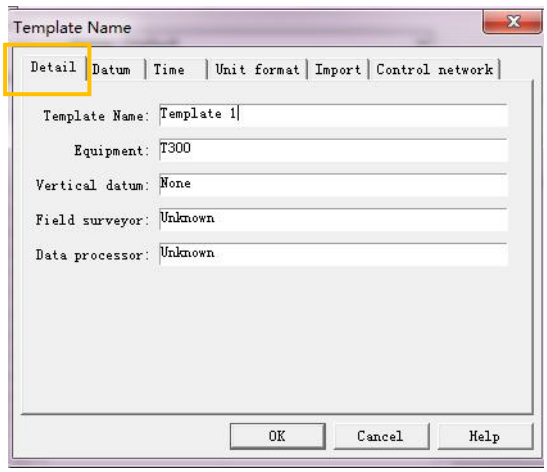
2.1 Create a new project

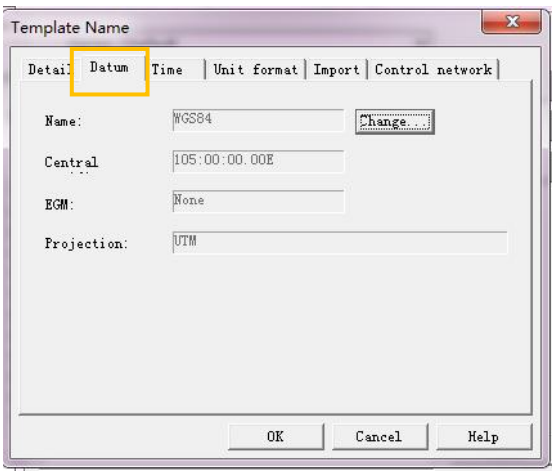
Firstly, you should install Compass solution software properly, and download GNSS raw data from the receiver to your PC. Then, run **Compass Solution** -> click **Project** -> **Create**, then:

1) Enter a project name.
2) Choose the project path.
3) Select a template. There are some details of project, datum and time in the template. If the default template does not meet your need, you can click ***Modify*** to create a template or modify the default template.This design may help you create a project quickly.





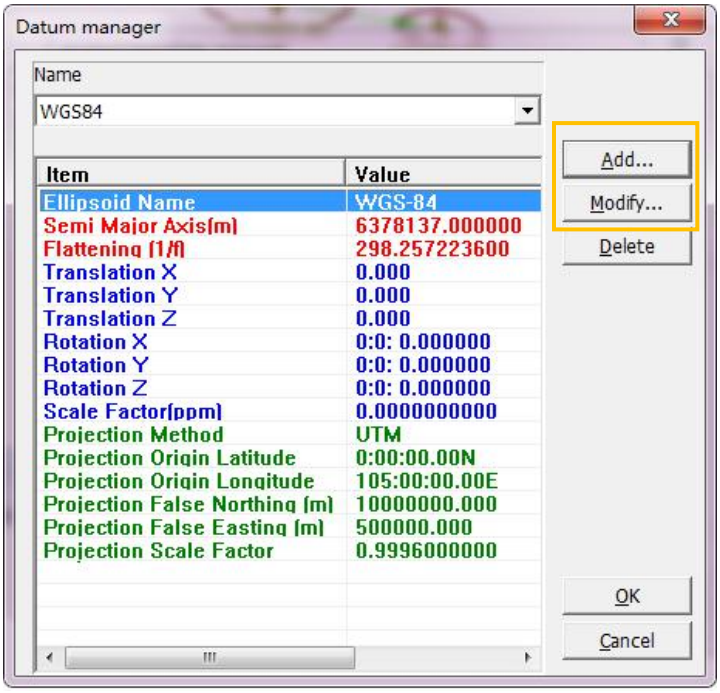




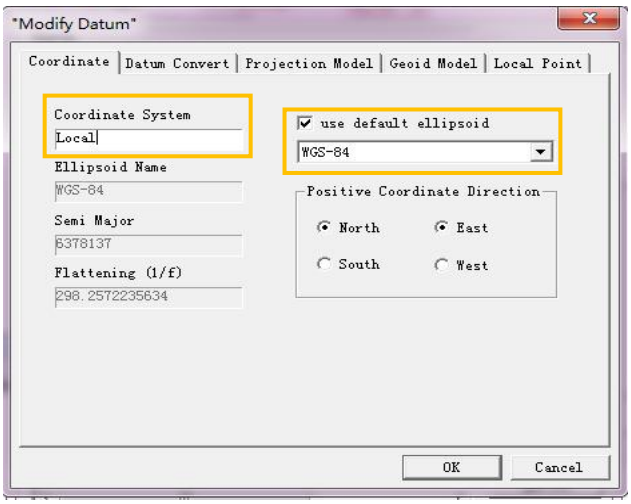
4) Choose a datum what you need. You can change the datum in the template. There

are some datums for you to choose. Not only that, you can also modify the datum or add a datum.

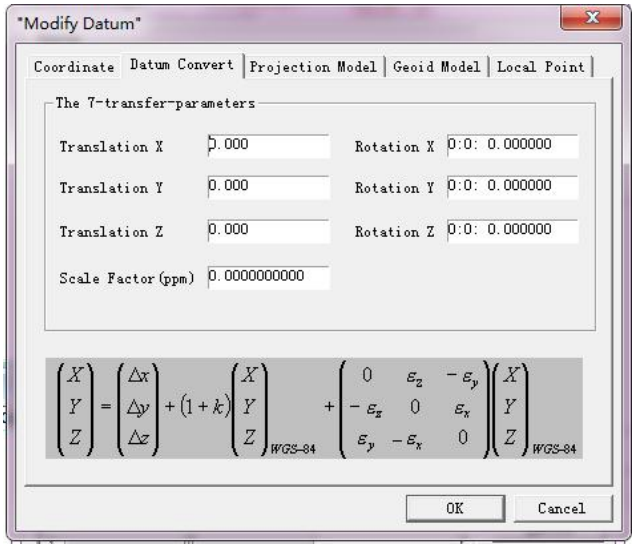
Click ***Add*** to define new datum, you can input proper parameters (ellipsoid and projection) for your new coordinate system; also Click ***Modify*** to edit the currently datum.



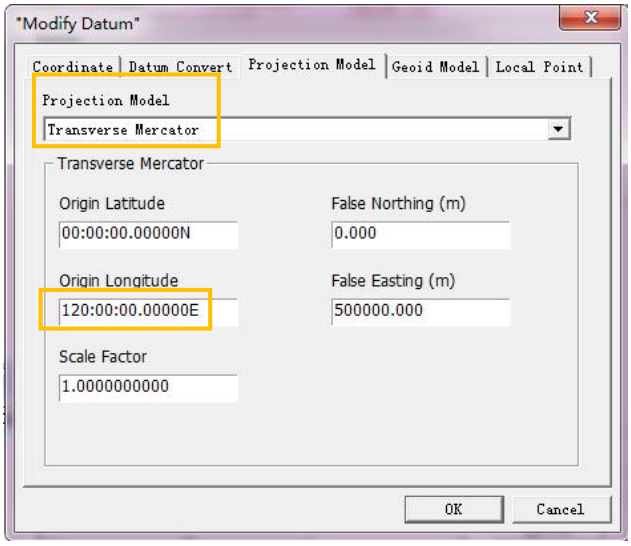
Firstly check on "use default ellipsoid", select the proper ellipsoid from the list, and then enter the Coordinate System Name.



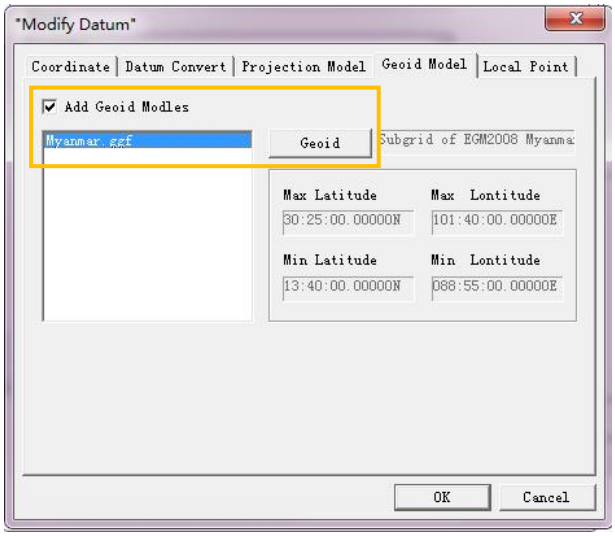
Enter 3 or 7 parameters if needed.



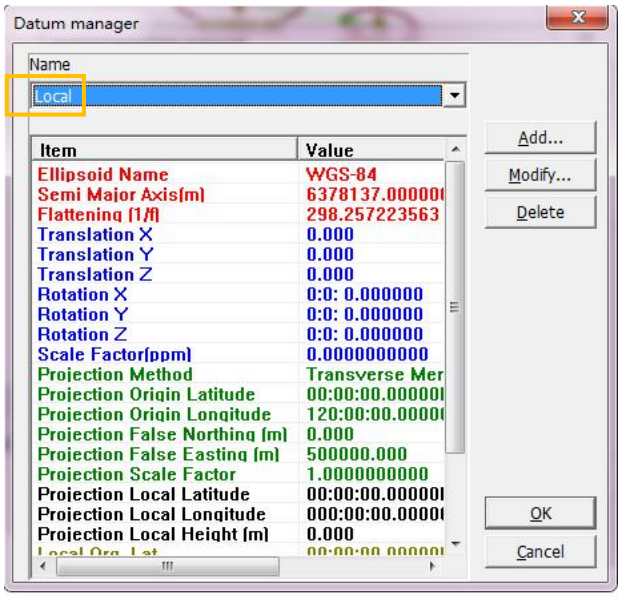
Select the proper projection model, and enter parameters according to the project location.



In Geoid Models, check on ***Add Geoid Modules*** to select a Geoid model or check off ***Add Geoid File*** and click Geoid to input a Geoid model. Then click ***OK*** to finish datum modify.



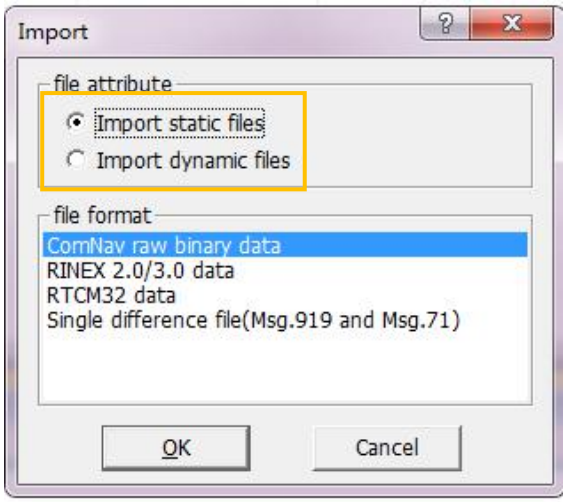
Then you can select the coordinate system what you built before, click ***OK*** to active this datum in the current project.



Tips: 1) After create a new template, remember to check some parameter.The coordinate system and its parameters also can be edited in ***Toolbox -> Datum manager****; 2) To download GNSS raw data to your PC, please reference to* ***Compass receiver utility User Guide****.*

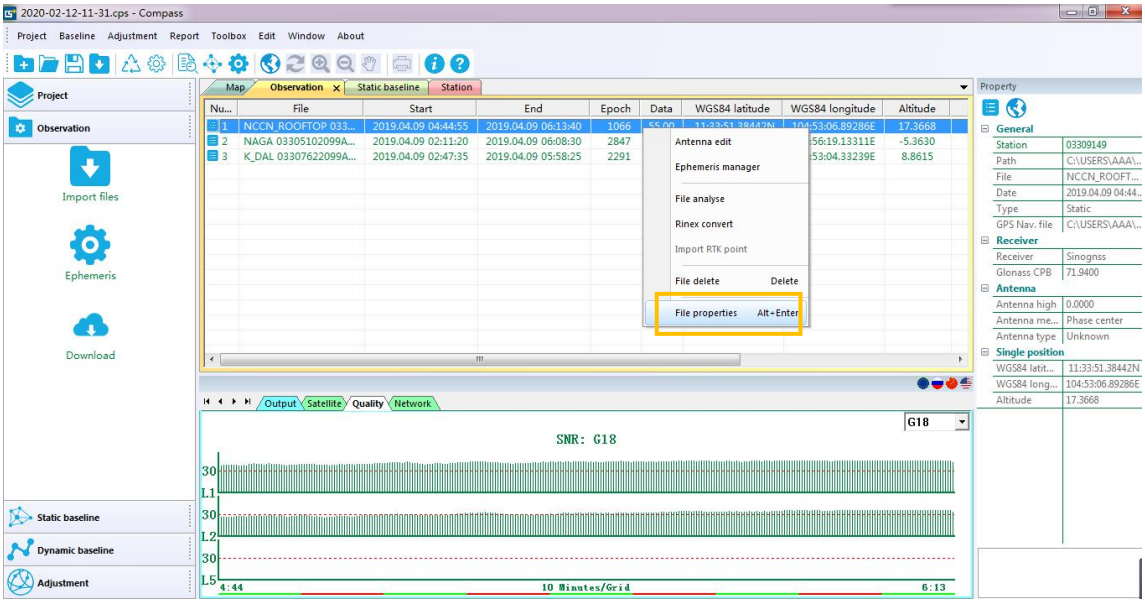
2.2 Import raw observation files

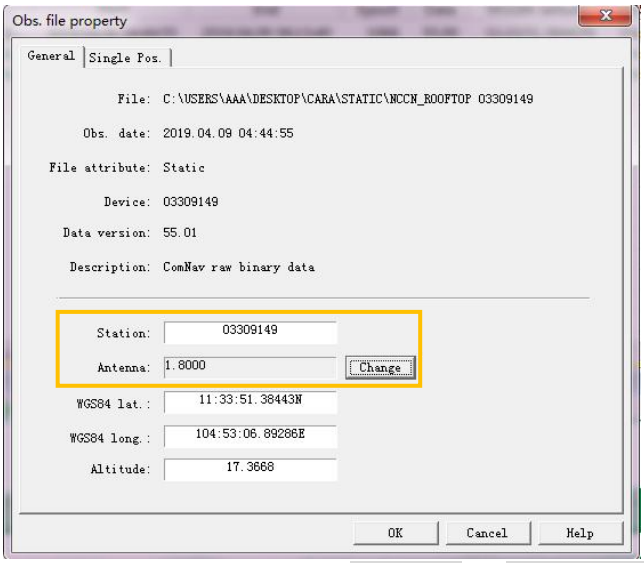
If you want to import GNSS raw data, click **Observation** -> select **Import files** in the navigation pane. You can choose static or dynamic files to import. For PPK and dynamic data, you need check on “Import dynamic files”.



Tip: 1)Compass solution can support data in ComNav format, RINEX, RTCM,etc; 2)Will prompt to modify the central meridian after importing the file according to the actual longitude.

After importing the raw data, right-click on the file name to edit properties, including station name and antenna information.

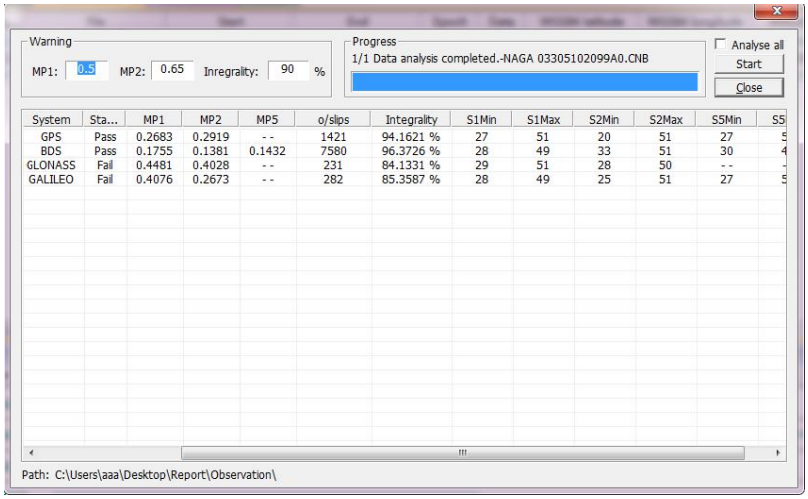




As for antenna type, you can add or modify *in* ***Toolbox -> GNSS antenna.***

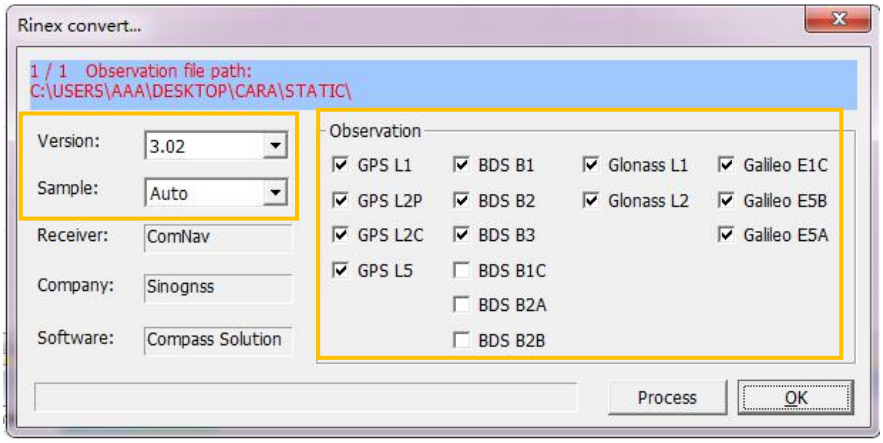
1. File analyse:

You can also right-click the observation file to analyse, check the value of MP1, MP2, MP5 and integrality to judge the quality of the data.



2. Rinex convert:

Convert a file to RINEX format, right-click the file to do rinex convert. Setup the version of the Rinex file, sample interval and choose the type of observations. The default converted Rinex file is stored in the same path as the observation file.



3 Baseline processing

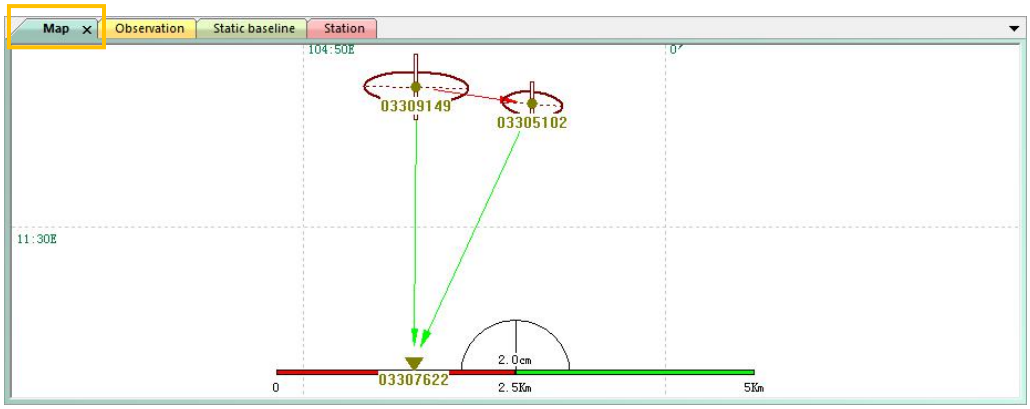
This chapter will help you to process GNSS raw data in static and PPK mode respectively, which may let you know the basic settings in the software.

3.1 Static baseline processing

In static mode, Compass Solution can directly process baseline vectors of different sites with simultaneously recorded GNSS raw data. We recommended that at least 3 receivers observe at the same time to form the simultaneously loop of baselines.

3.1.1 View

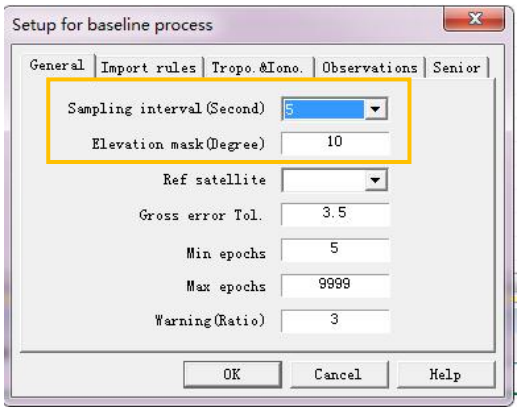
The static baseline vector will be automatically formed after importing GNSS raw data. You can click ***Map*** in view area to check the baseline vectors.

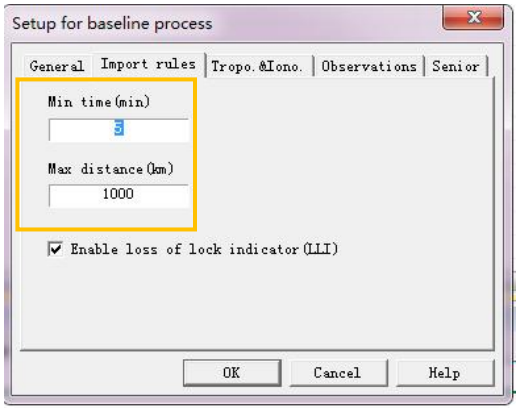


3.1.2 Baseline Process Settings

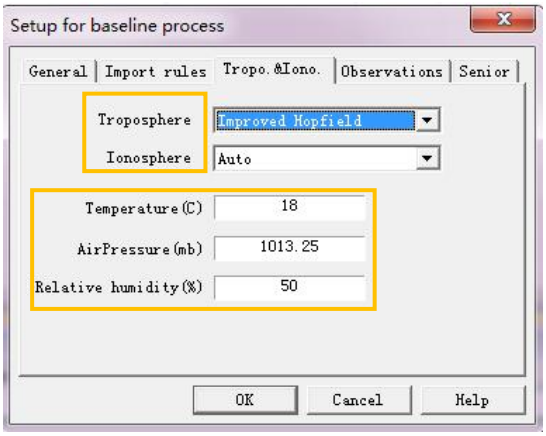
Before starting static baseline processing, click **Static baseline**-> **Param** in the

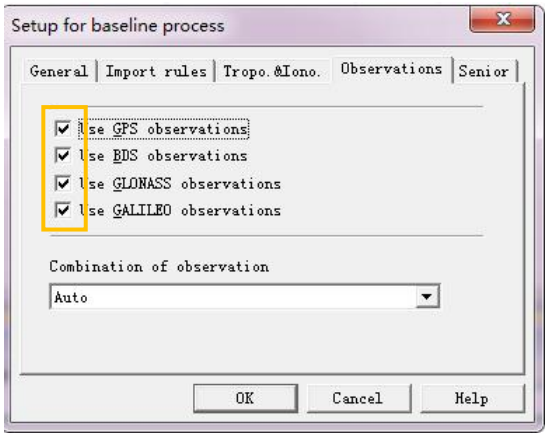
Navigation Pane to setup parameters for processing. These settings are related to data import rules, observations, troposphere &ionosphere and some senior settings.

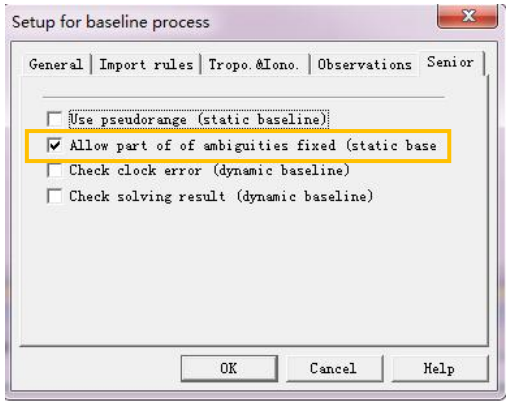




- **Sampling interval:** the data processing interval, the value should be greater than the interval what you used during recording the data.
- **Elevation mask:** the minimum mask angle to be used. When the data is in good quality, the mask should be between 10 and 15 degrees. The default value is 10.
- **Min Time (Min)**: the minimum observation period of GNSS raw data to form the baseline.
- **Max Distance (km)**: the maximum observation distance of GNSS raw data to form the baseline.



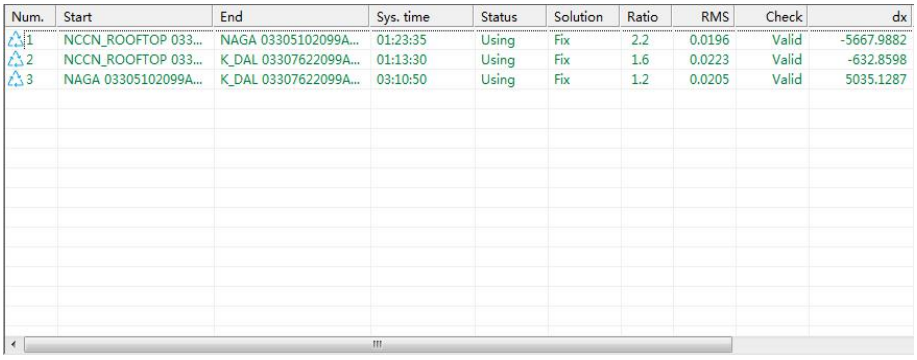




- Select proper correction model for Troposphere and Ionosphere.
- Weather parameters: Temperature, AirPressure and Relative humidity.
- Allow you to disable satellites individually so that data from these satellites will not be part of the solution.
- The static solution method defaults to allow part of ambiguities fixed. An appropriate solution can be selected according to the current baseline processing result.

3.1.3 Static Baseline process

After setup some parameters for baseline processing, click **Static baseline**-> **Process** in the Navigation Pane to process static baseline.



Num.	Start	End	Sys. time	Status	Solution	Ratio	RMS	Check	dx
1	NCCN_ROOFTOP 033...	NAGA 03305102099A...	01:23:35	Using	Fix	2.2	0.0196	Valid	-5667.9882
2	NCCN_ROOFTOP 033...	K_DAL 03307622099A...	01:13:30	Using	Fix	1.6	0.0223	Valid	-632.8598
3	NAGA 03305102099A...	K_DAL 03307622099A...	03:10:50	Using	Fix	1.2	0.0205	Valid	5035.1287

After all baseline processed, check the quality value (Solution, Radio and RMS) and baseline information (dx,dy,dz,ds) in the view area. For get a high-accuracy result, you also need check:

- Solution value from Unsolved to Fix
- The smaller the RMS value, the better the accuracy of the solution
- Check: valid

Alternatively, click **Static baseline**-> **Loops** to check PPM value of loop and detailed baseline processing information.

Loops	Type	Status	Closure dis.(m)	X error(m)	Y error(m)	Z error(m)	Relative error(pp...
C0(03309149,03305102,03307622)(3B...	Simultaneous...	Pass	34162.137099	-0.000214	-0.008528	-0.010347	0.130849

If the baseline RMS and Ratio values cannot meet standard requirements, edit the baseline or change some parameters manually and process it again.

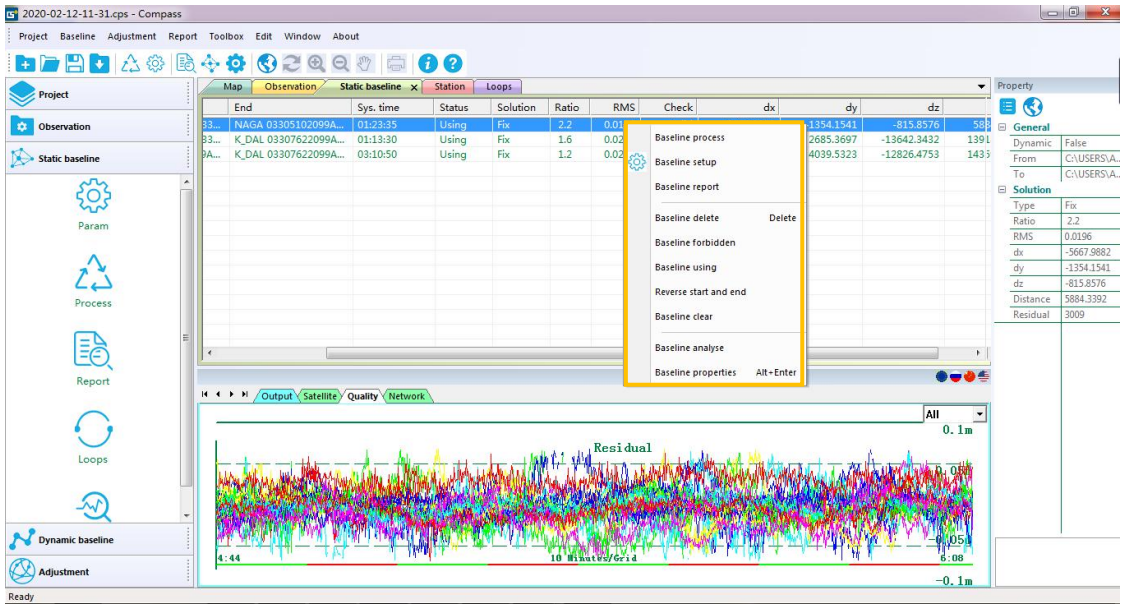
1. Delete bad observation data in the message box. You can delete more interrupted satellite data or delete locally poor time periods.

Tip:If you want to clear what you selected, you can right-click it and delete.

After change some parameters or edit satellites, please process this baseline again to acquire a better result.

2. Besides, you can also edit baselines, including:

- Baseline process: Shortcut to baseline processing.
- Baseline setup: Shortcut to baseline processing setting.
- Baseline report: Create report for baseline processing result.
- Baseline delete: Delete this baseline from your project, which is not recommended.
- Baseline forbidden: Forbid this baseline to be part of the solution, used only when the baseline without good accuracy.
- Baseline using: Allow this baseline to be part of the network adjustment.
- Reverse start and end: Reverse the direction of baseline vector.
- Baseline analyse: Analyze the carrier pseudorange accuracy of the static zero baseline, usually used to detect the reliability of the raw data output by the receiver.
- Baseline properties: Include general information, fix solution and float solution.

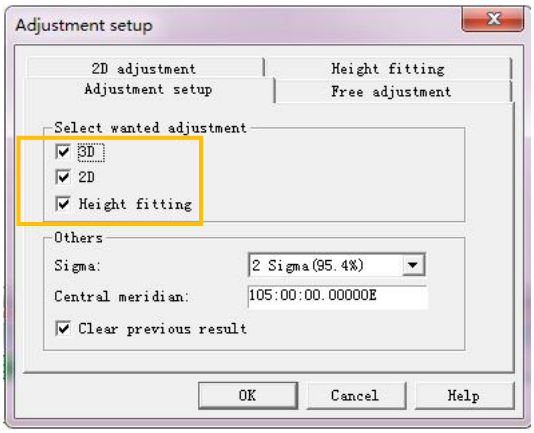


Tip: Baseline analyse is only useful for static zero baselines.

3.1.4 Network Adjustment

1. Setup adjustment parameter

Click **Adjustment-> Adjustment parameter** in the Navigation Pane.The settings include adjustment setup, free adjustment setup, 2D adjustment setup and height fitting options.

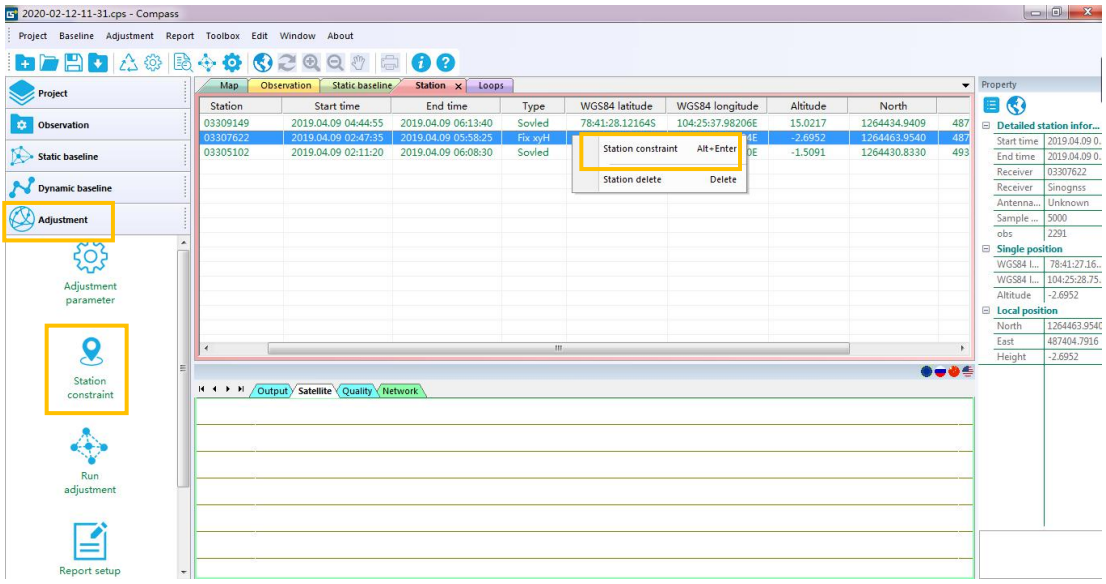


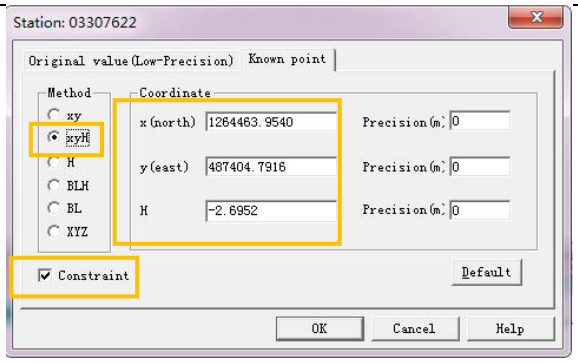
- 3D: WGS84 coordinate as control points
- 2D: Horizontal adjustment, use local gird coordinates as control points
- Height Fitting: Height adjustment

Tip: we recommend that you apply 2D & Height to adjust baselines.

2. Constraint known point

To ensure all stations within your local grid coordinate system, at least 1 station should be fixed on a known point. Click **Adjustment-> Station constraint**, then choose a station or right-click the station, then click **Station constraint** to enter coordinate values(check on constraint).

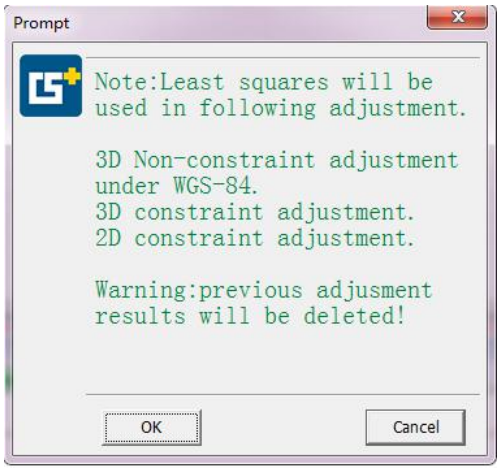




*Tip: You can get the default coordinate value under current coordinate system by clicking Default. It should not be a big difference between the **default** value with the **known** value; otherwise, check the coordinate system parameters.*

3. Run Adjustment

Click **Adjustment->Run Adjustment,** click ***OK*** to complete adjustment.

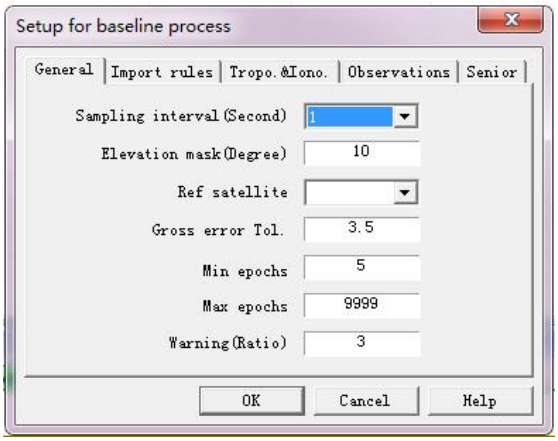


3.2 PPK (Post-Processing Kinematic)

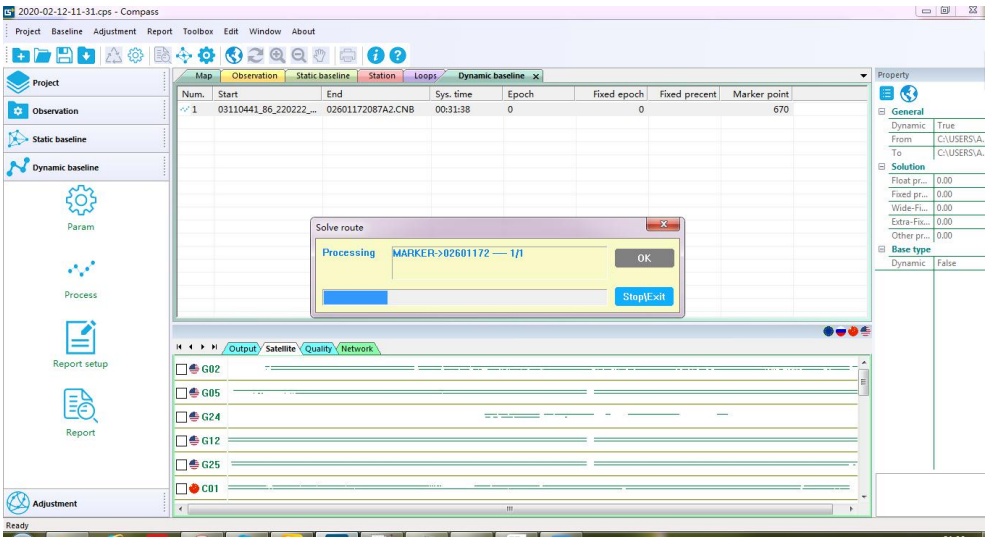
For PPK (Post processed Kinematic) mode, it can process trajectories of rover combined with base station static data. Commonly, set the sampling interval of base station as 1/s and fix it on the known point.The dongle is needed to active the PPK function, make sure the dongle is connecting to your PC and installed the drive properly.

3.2.1 Dynamic baseline processing

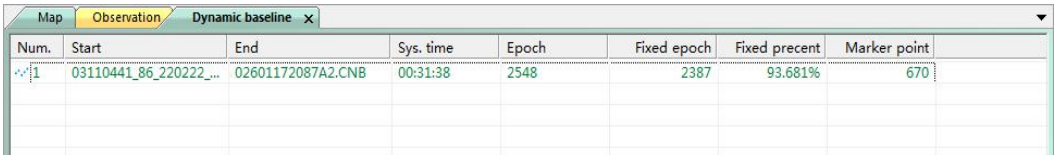
Setting up process parameters for the dynamics baseline, which should be the same as static baseline processing setting (the sampling interval is 1/s).



Click **Dynamic baseline->Process** or right-click on the file's name to process this baseline alone. The figure is shown below:

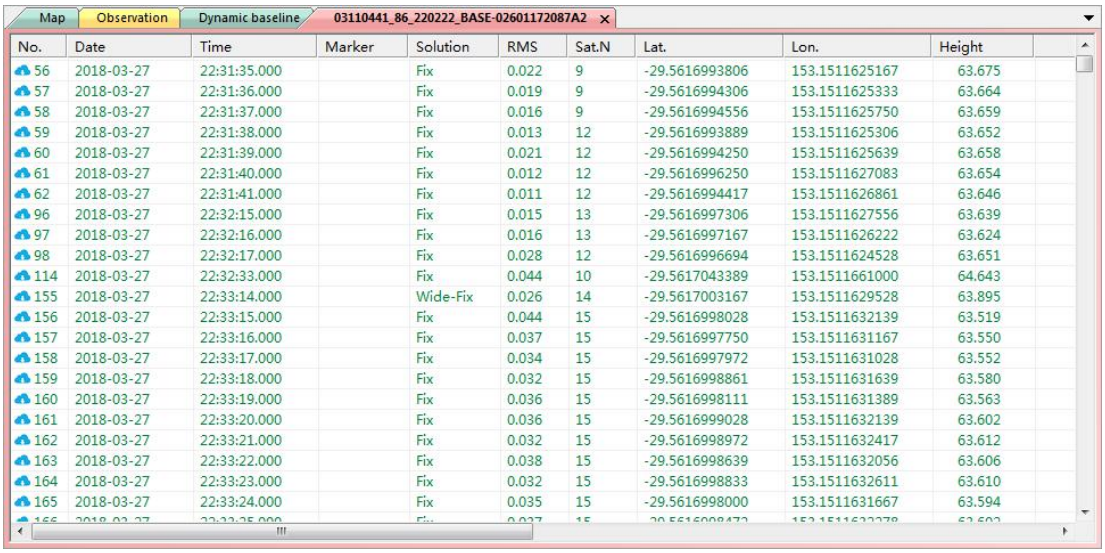


After finish dynamic baseline processing, you will see the baseline information, like Epoch num, Fixed epoch and Fixed percent, etc.



Num.	Start	End	Sys. time	Epoch	Fixed epoch	Fixed precent	Marker point
1	03110441_86_220222_...	02601172087A2.CNB	00:31:38	2548	2387	93.681%	670

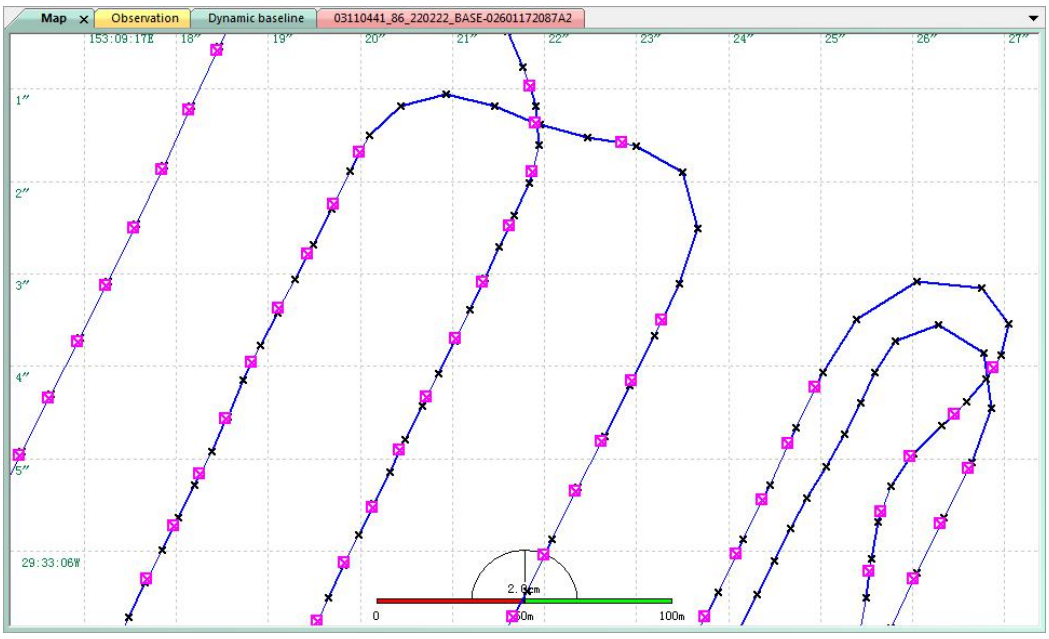
Double click on the dynamic baseline to check detailed information of each point.



No.	Date	Time	Marker	Solution	RMS	Sat.N	Lat.	Lon.	Height
56	2018-03-27	22:31:35.000		Fix	0.022	9	-29.5616993806	153.1511625167	63.675
57	2018-03-27	22:31:36.000		Fix	0.019	9	-29.5616994306	153.1511625333	63.664
58	2018-03-27	22:31:37.000		Fix	0.016	9	-29.5616994556	153.1511625750	63.659
59	2018-03-27	22:31:38.000		Fix	0.013	12	-29.5616993889	153.1511625306	63.652
60	2018-03-27	22:31:39.000		Fix	0.021	12	-29.5616994250	153.1511625639	63.658
61	2018-03-27	22:31:40.000		Fix	0.012	12	-29.5616996250	153.1511627083	63.654
62	2018-03-27	22:31:41.000		Fix	0.011	12	-29.5616994417	153.1511626861	63.646
96	2018-03-27	22:32:15.000		Fix	0.015	13	-29.5616997306	153.1511627556	63.639
97	2018-03-27	22:32:16.000		Fix	0.016	13	-29.5616997167	153.1511626222	63.624
98	2018-03-27	22:32:17.000		Fix	0.028	12	-29.5616996694	153.1511624528	63.651
114	2018-03-27	22:32:33.000		Fix	0.044	10	-29.5617043389	153.1511661000	64.643
155	2018-03-27	22:33:14.000		Wide-Fix	0.026	14	-29.5617003167	153.1511629528	63.895
156	2018-03-27	22:33:15.000		Fix	0.044	15	-29.5616998028	153.1511632139	63.519
157	2018-03-27	22:33:16.000		Fix	0.037	15	-29.5616997750	153.1511631167	63.550
158	2018-03-27	22:33:17.000		Fix	0.034	15	-29.5616997972	153.1511631028	63.552
159	2018-03-27	22:33:18.000		Fix	0.032	15	-29.5616998861	153.1511631639	63.580
160	2018-03-27	22:33:19.000		Fix	0.036	15	-29.5616998111	153.1511631389	63.563
161	2018-03-27	22:33:20.000		Fix	0.036	15	-29.5616999028	153.1511632139	63.602
162	2018-03-27	22:33:21.000		Fix	0.032	15	-29.5616998972	153.1511632417	63.612
163	2018-03-27	22:33:22.000		Fix	0.038	15	-29.5616998639	153.1511632056	63.606
164	2018-03-27	22:33:23.000		Fix	0.032	15	-29.5616998833	153.1511632611	63.610
165	2018-03-27	22:33:24.000		Fix	0.035	15	-29.5616998000	153.1511631667	63.594

3.2.2 Map View

After process dynamic baseline , you can have a look at trajectories of your rover in through click ***Map*** in the view area.



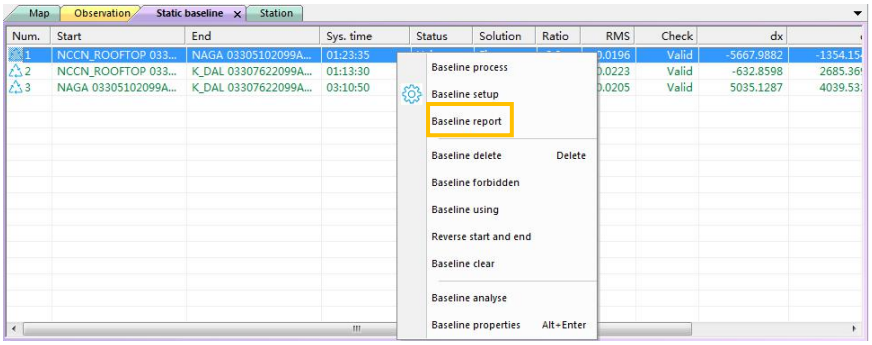
4 Export the report

This chapter will introduce how to export processing reports.

4.1 Static Report

1. Baseline report:

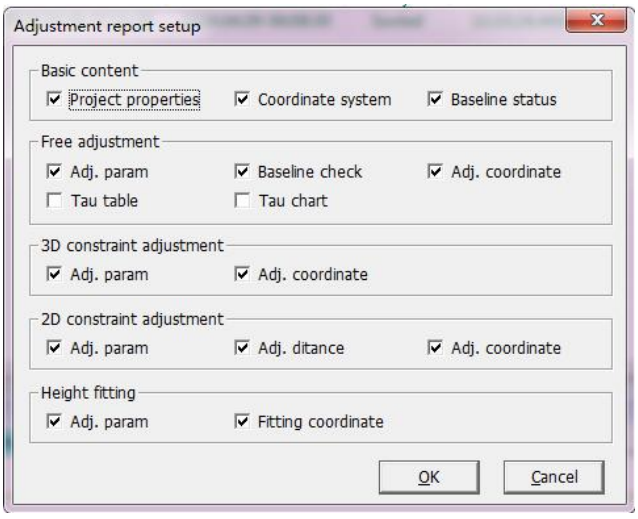
Select a baseline and right-click ***Baseline report*** to output static baseline report. This file will in the same path as the project file (Report>>Static Baseline).



2. Network adjustment report:

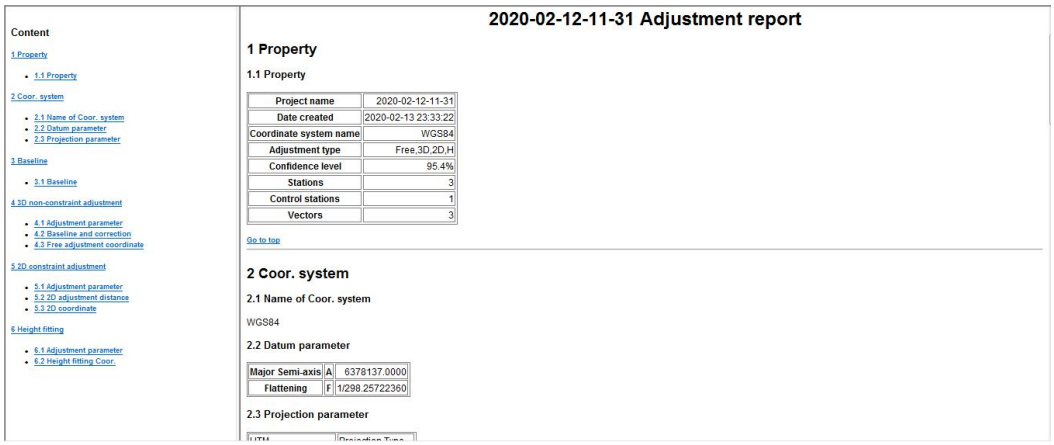
A) Report setup:

Click **Adjustment -> Report setup** to do some settings. It contains five parts: base content, free adjustment, 3D constraint adjustment, 2D constraint adjustment and height fitting, which help you to check the result of baselines and adjustments.



B) Output report:

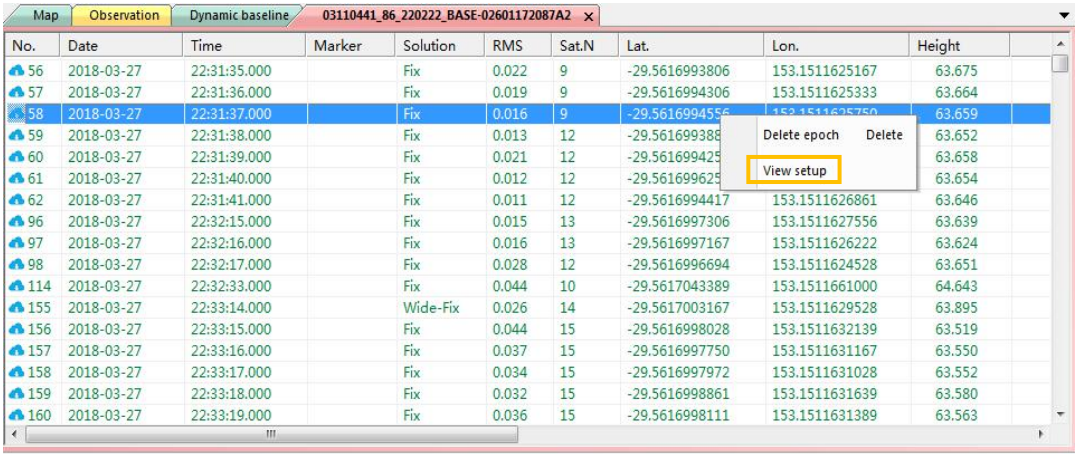
After setup the report, you can click ***Adjustment report*** to get a report. It's a *.html file.



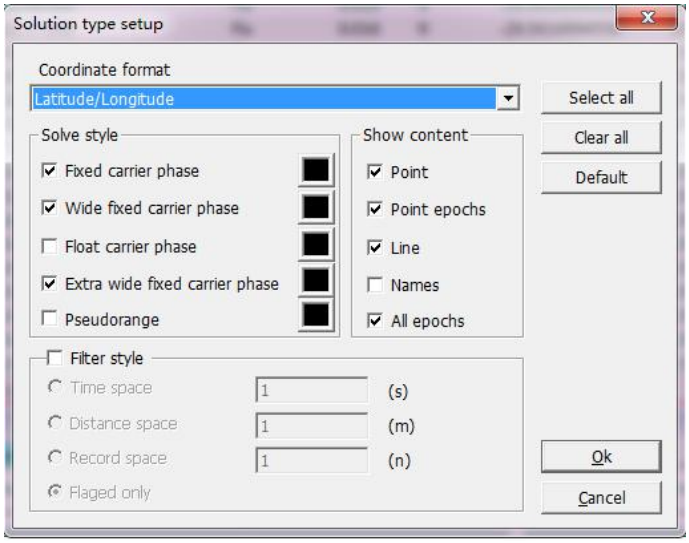
Other report formats can be exported, including brief report, DXF, TXT and KML. You can choose it in ***Report*** in the menu bar.

4.2 PPK Report

Double-click on this baseline to check the detailed information.



In the detailed information page, right click to select ***View setup*** to set the solution type.



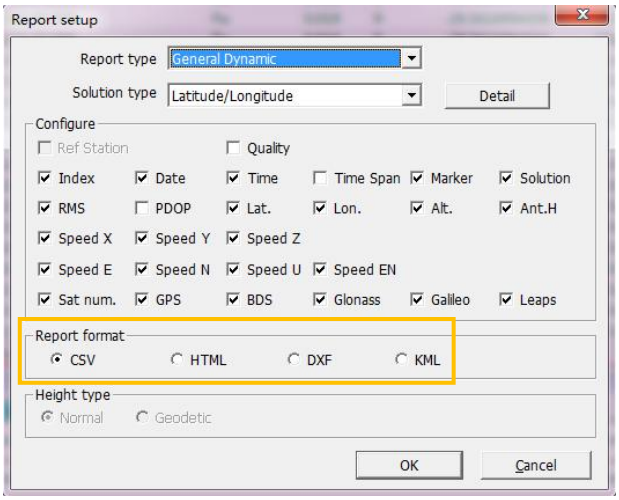
Coordinate format:

- Latitude/longitude: export the report in WGS84 coordinate system
- Projection: export the report in local grid coordinate system.
- Relative 2D coordinate: Horizontal distance relative to base station
- Relative distance: 3D distance relative to base station

Solve style: Filter the processing results, commonly choose Fixed carrier phase (centimeter accuracy).

1. Report setup:

Click **Dynamic baseline**->**Report setup** to choose the report format and configure the information of report. There are four format--CSV,HTML,DXF,KML for you to choose. We recommend to save the report in *.csv format, which makes it easier to analyze post-processing result. And the KML allows you to save files in the format accepted by Google Earth.



2. Output report:

After setup the report, go to click **Report** in the Navigation Pane. The output report will be automatically opened and saved in the same path as the project file.