



GNSS **Analyser**

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Chapter 1

1 Introducing the GNSS Analyser

The **GNSS Analyser** offers graphical time based charts and Google Earth views for analyzing GNSS (Global Navigation Satellite System) data and results. Typically, GNSS Data are native raw data from supported GNSS receiver (as well as ASCII RINEX format) and results are trajectories and baseline vectors as computed by your Post-Processing software.

This guide describes how to use the **GNSS Analyser**.

1.1 Overview

The **GNSS Analyser** is a planning as well as a QA tool for GNSS users. There are three main sections: one for planning, a second to analyze GNSS data set (from different receiver formats) and finally a last one to analyse Post-Processed results with different charts

1. **Planning:** To plan your field survey as well as to check the tracking reliability of your nearest Base Station (from a data provider):
 - a. **Field:** Planning your field operation consists in predicting the best period to record field GNSS data. GNSS almanacs are used to generate different charts.
 - b. **Office:** Planning your office operation by verifying the tracking of your Base Station Providers nearest station. This tool provides you with a tracking history of selected Base Stations. By looking at the historical data, users will ensure to obtain valid base data for post-processing.
2. **Analyzing GNSS data:** GNSS data are raw observations as recorded by GNSS receivers (Carrier phase, pseudoranges and Doppler). This data can be analyzed to evaluate the data quality (tracking quality, cycle slips, SNR, etc.).
3. **Reporting Post-processed GNSS results:** GNSS results as generated by the GNSS post-processing software, such as trajectories and baselines. Results Quality can easily be evaluated by displaying time-based charts and Google Earth Views.

1.2 Prerequisites

It is recommended to have a good knowledge of GNSS field procedures and concepts to better interpret all charts and graphics displayed by the **GNSS Analyser**.

Since Google Earth plug-in is a dependency for the **GNSS Analyser**, users are responsible to install it on their desktop. The Google Earth plug-in uses a network connection for downloading mapping data. If no internet connection is available for your desktop, the Quick View is available as a basic 2D chart without any real world context.

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Chapter 2

2 Getting Started

This chapter introduces the basics about configuring and using the **GNSS Analyser**.

2.1 Starting GNSS Analyser

The **GNSS Analyser** runs using the shortcut available from the Windows **Start Menu > Programs > Effigis > GNSS Analyser**.

2.2 Options

The **Option** window is available in the **File** Menu. From this window, you can select the following parameters:

- **Time:** Available units are **UTC date/time**, **Local date/time** (as set by your PC) and **GPS week and second**.
- **Measure:** Available units are **Meter**, **U.S. Survey foot** and **International foot**.
- **Language:** sets the language for this application.
- **Google Earth:** Boundaries, Roads and Cities layers can be overlaid in Google Earth Views.
- **Activate autosave mode:** When checked, an optimized cached file of your GNSS data is generated to quickly reload your data for the next QA sessions.
- **Synchronize graphic charts using time span:** The time-based charts can be synchronized on time axis. When zooming on a specific view, the time span is adjusted in all the other views.
- **Automatically check for update on startup.** These files are almanacs and catalog for base station providers. You can uncheck this option to accelerate the opening of the **GNSS Analyser** application (time to time updates your files by clicking on 'Check for updates now').
- **Check for updates now:** Click to download available files right away.
- **Save** your current options for the next sessions or only use your changes for the current session.



General options for using this software.

Units

Time:

Measure:

Language

Language: (changing will close the application)

Google Earth

☐ Display Boundaries/Road/Cities layers

☐ Display overlay time control

General

☒ Activate autosave mode

☐ Synchronize graphic charts using time span

☒ Automatically check for update upon startup

Option window

2.3 File Manager

The File Manager presents the data files and GNSS results currently opened in the **GNSS Analyser**:

- **GNSS Project:** A GNSS project is a collection of results as computed by your GNSS Post-processing software. Only one GNSS project can be opened at a time. Opening another GNSS project opens a new window considered as a new **GNSS Analyser** session. A GNSS project contains GNSS features as trajectories or baselines, in differential mode; and static or rover objects in PPP mode.
- **GNSS Data:** Multiple GNSS Data files can be opened in the same session of the **GNSS Analyser**. A GNSS data file can be independently closed unless this file is part of a GNSS project.

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GNSS Project

Filename: C:\Data\GNSSAnalyser\Avion.spr.xml

Trajectories

Name	Start Time	Duration	Antenna Model	Antenna Height
MARJ-100429_CHEMN	1581 371257,5	6:32:09	None	0,000 m

Baselines

Name	Start Time	Duration	Status	RMS	Antenna Model	Antenna Height	Base Antenna Model	Base Antenna Height
MARJ-DRES	1581 345600	6:00:00	Fixed	0.0299	TPSCR3_GGD(CONE)*	0.566 m	None	0.110 m
MARJ-GOET	1581 345600	6:00:00	Float	0.0126	None	0.045 m	None	0.110 m
MARJ-POUS	1581 345600	6:00:00	Fixed	0.0152	None	0.022 m	None	0.110 m

GNSS Raw Data

Name	Start Time	Duration	Path
100429_CHEMN	1581 371257,5	6:32:09	C:\Data\GNSSAnalyser\DATA1\100429_Chernitz.nov
DRES20100429	1581 345600	23:59:30	C:\Data\GNSSAnalyser\DATA2\DRES20100429.obs
GOET20100429	1581 345600	23:59:30	C:\Data\GNSSAnalyser\DATA3\GOET20100429.obs
MARJ20100429	1581 345600	23:59:30	C:\Data\GNSSAnalyser\DATA4\MARJ20100429.obs
POUS20100429	1581 345600	23:59:30	C:\Data\GNSSAnalyser\DATA5\POUS20100429.obs

Close Selected files

File Manager Window

2.4 Recent

In the **File** menu, the **Recent** menu item allows to open the most recent:

- **GNSS Analyser:** Recent GNSS projects opened in **GNSS Analyser**.
- **GNSS Data Files:** Recent GNSS Data files opened in **GNSS Analyser**.
- **EZSurv:** Recent GNSS projects opened in **EZSurv®**.

These items are timely ordered with the last opened file on top of the list.

Recent post-processed projects opened in EZSurv	
GNSS Analyser	Loop.spr C:\SampleData\Loop
GNSS Data Files	Static.spr C:\SampleData\Static
EZSurv	Kinematic.spr C:\SampleData\Kinematic

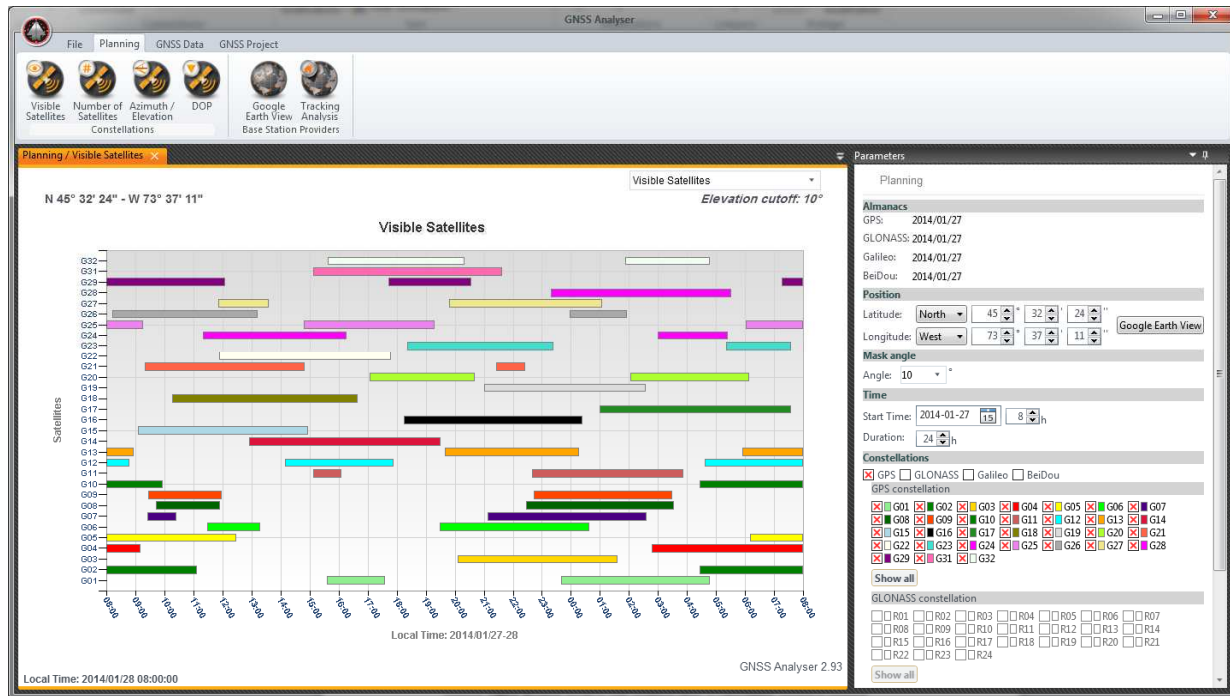
Recent Window

2.5 Windowing

The windowing is designed as a flexible and efficient way to navigate between plan views, charts, results, and options.

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Main window

- On top of the main window, a menu is used to navigate between the three analyses modes. **GNSS Data** mode is only enabled when GNSS data files or a GNSS project with valid files are opened. **GNSS Project** mode is only enabled when a valid GNSS project is opened.



- After selecting a specific mode, available views for this mode are available using main buttons in the toolbar. If a view is already opened, the next time you click the button, the focus is back to the existing view.



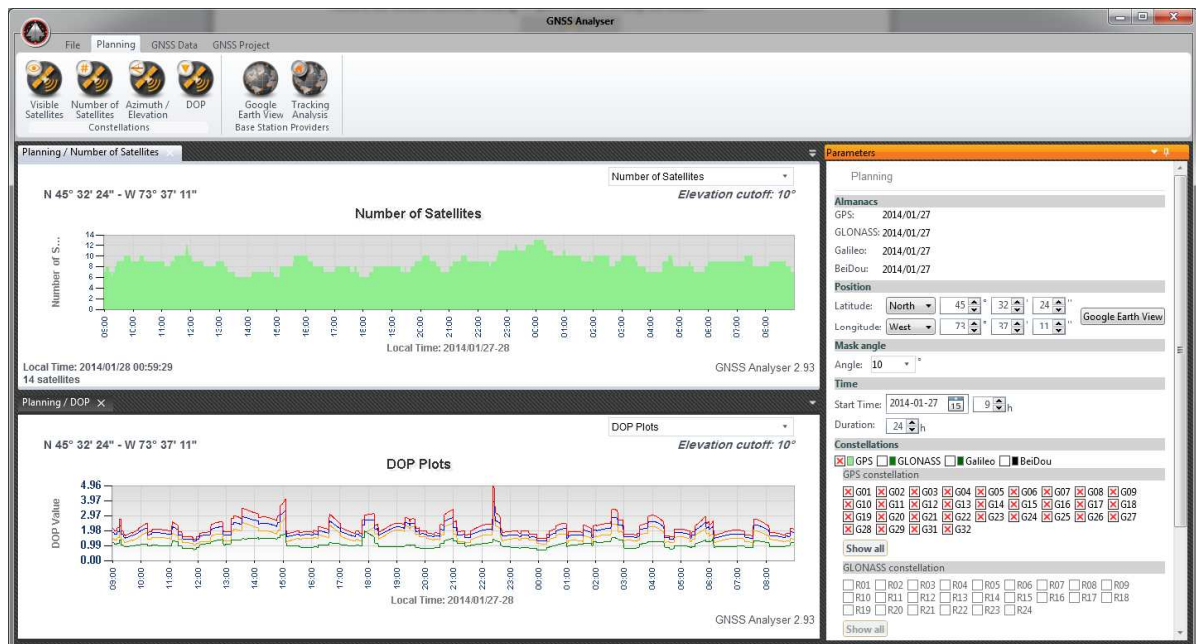
- Views are ordered in tab items.



- You may decide to display only one view at a time or you may want to reorder the current views by reordering these views in multiple panels. To reorder views, left click the tab part of a view and move it, the window becomes floating. A specific control overlay the window:



Move the floating window in one of the five positions. A new panel is created vertically or horizontally depending on the selected positions.



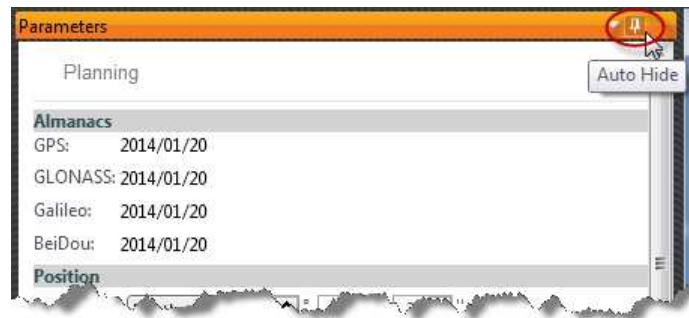
- Within a specific view, you can navigate between GNSS objects (data files, trajectories or baselines) using combo box on top left of the view. For a specific object, using the combo on the top right, you can navigate between different views.



The navigation buttons are used as follows:

- Click the buttons to select the previous or next item in the drop-down list.
- Click the buttons to select the first or last item in the drop-down list.
- Use the drop-down list to select an item directly.

- When activating a specific view, the **Parameters** panel is refreshed according to the selected view. To display the **Parameters** panel, click on the **Parameters** tab on the right side. To dock it to your window, click on the **Auto Hide** button. To close the panel, click on the **Auto Hide** button again.



2.6 Chart interaction

Zooming: When navigating in a plan view, the mouse wheel can be used to zoom in and out. In the Quick View, you can also drag the mouse cursor on View to zoom in and out. When working with a time chart, the mouse drag can be used to zoom in the time axe whereas the mouse wheel can be used to zoom in and out in the vertical axe.

To get back on the original scale, click on the minus sign on the proper axis.



Contextual menu: Using the mouse right click on the chart view, a contextual menu is used to print the chart, copy and paste a specific time span.

❖ In the **GNSS Analyser** settings, if the **Synchronize graphic charts using time span** option is used, when zooming on a specific view, the time span is adjusted in the other views.

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Chapter 3

3 Planning

This chapter introduces the various tools available in the Planning mode. This mode is mainly used to plan a field survey.

3.1 Preparing a survey

The Planning module is a powerful tool that provides rapid and accurate calculations of GNSS satellite visibility, azimuths/elevations and satellite dilution of precision (DOP). The Planning provides easy tools for analyzing and optimizing field operations. It also provides an easy way to analyze chart views.

Although GNSS constellations are now excellent 24 hours a day, in some cases, where a lot of obstructions surround sites to be surveyed, a planning tool is useful to establish the best time of the day where these sites can be surveyed.

3.1.1 Almanacs

An almanac file contains orbital data parameters that allows satellite position computation needed to determine the satellite visibility from a specified location. For best accuracy, an almanac should typically not be older than 30 days.

Almanacs are downloaded automatically from the Internet. The latest almanac is automatically added in your new project.

The validity date of the current almanac is indicated in the **Parameters** panel of all Planning views.

3.1.2 Selecting parameters

You can specify some planning parameters like the observation time, mask angle, site position, etc. As soon as you change one of the following parameters, all opened planning views are **all refreshed** using these new parameters. All planning parameters are calculated with a resolution of 60 seconds.

■ Set Parameters

- In the **Position** section, manually adjust the latitude and longitude of your site or use the **Google Earth View** to select a position on the earth. On the **Google Earth View**, each click is caught to adjust the current site position. Once the position is selected on the earth, close the Google window and continue adjusting other parameters;
- In the **Mask Angle** section, select an elevation cutoff angle (between 0 and 40 degrees). Satellites that are below the mask angle are not included in the analysis;
- Select the starting date and duration of your planning period in the **Time** section. Keep in mind that a planning period must not exceed twenty-four hours. Each day, the satellite constellation repeats itself four minutes earlier than the previous day;
- In the **Constellations** section, select the constellation to be analyzed. GNSS constellations can be analyzed separately or combined. Show or hide satellites using corresponding check boxes. If orbital parameters for a satellite are not in the almanac file, the satellite is not listed.

Parameters

Almanacs
 GPS: 2014/01/20
 GLONASS: 2014/01/20
 Galileo: 2014/01/20
 BeiDou: 2014/01/20

Position
 Latitude: North 45° 32' 24"
 Longitude: West 73° 37' 11" Google View

Mask angle
 Angle: 10°

Time
 Start Time: 20/01/2014 15:13
 Duration: 24h

Constellations
☒ GPS ☐ GLONASS ☐ Galileo ☐ BeiDou

GPS constellation
☒ G01 ☒ G02 ☒ G03 ☒ G04 ☒ G05 ☒ G06 ☒ G07
☒ G08 ☒ G09 ☒ G10 ☒ G11 ☒ G12 ☒ G13 ☒ G14
☒ G15 ☒ G16 ☒ G17 ☒ G18 ☒ G19 ☒ G20 ☒ G21
☒ G22 ☒ G23 ☒ G24 ☒ G25 ☒ G26 ☒ G27 ☒ G28
☒ G29 ☒ G31 ☒ G32 Show all

GLONASS constellation
☐ R01 ☐ R02 ☐ R03 ☐ R04 ☐ R05 ☐ R06 ☐ R07
☐ R08 ☐ R09 ☐ R10 ☐ R11 ☐ R12 ☐ R13 ☐ R14
☐ R15 ☐ R16 ☐ R17 ☐ R18 ☐ R19 ☐ R20 ☐ R21
☐ R22 ☐ R23 ☐ R24 Show all

Galileo constellation
☐ E11 ☐ E12 ☐ E19 ☐ E20 Show all

BeiDou constellation
☐ C01 ☐ C02 ☐ C03 ☐ C04 ☐ C05 ☐ C06 ☐ C07
☐ C08 ☐ C09 ☐ C10 ☐ C11 ☐ C12 ☐ C13 ☐ C14 Show all

3.1.3 Using available views

You can perform various types of analysis that will provide you with the best observation period for your selected site.



These analyses are the following:

- **Visible Satellites:** A view of all satellites visible during the analysis period;
- **Number of Satellites:** A view of the total number of visible satellites. This simple plot is useful for a quick look at the time period over which a sufficient number of satellites are available for your GPS operation (you need at least 4 satellites to compute a 3D position);
- **Azimuth / Elevation:** A rectangular view of the azimuth/elevation visibility data. The horizontal axis represents the azimuth and is labeled 0-360 degrees, where 0 degree corresponds to the north, 90 degrees to the east, 180 degrees to the south, and 270 degrees to the west. The vertical

axis is labeled 0-90 degrees, where 0 degree corresponds to the horizon and 90 degrees to the zenith;

- **DOP:** A Dilution of Precision (DOP) view. This plot allows you to interpret how well the satellite constellation is distributed in the sky. DOP values can range between +/- 1 (it could be less than 1) and infinity. A good GDOP value should not exceed 8. The lower the GDOP value is, the more spread out the satellites are in the sky; therefore, providing good observation conditions. The DOP (Dilution of Precision) can be displayed in several ways:
 - **GDOP:** represents all parameters (longitude, latitude, height and time);
 - **PDOP:** represents 3D parameters (latitude, longitude and height);
 - **HDOP:** represents 2D parameters (latitude and longitude);
 - **NDOP:** represents the north parameters;
 - **EDOP:** represents the east parameters;
 - **VDOP:** represents the height parameters;
 - **TDOP:** represents the time parameters.

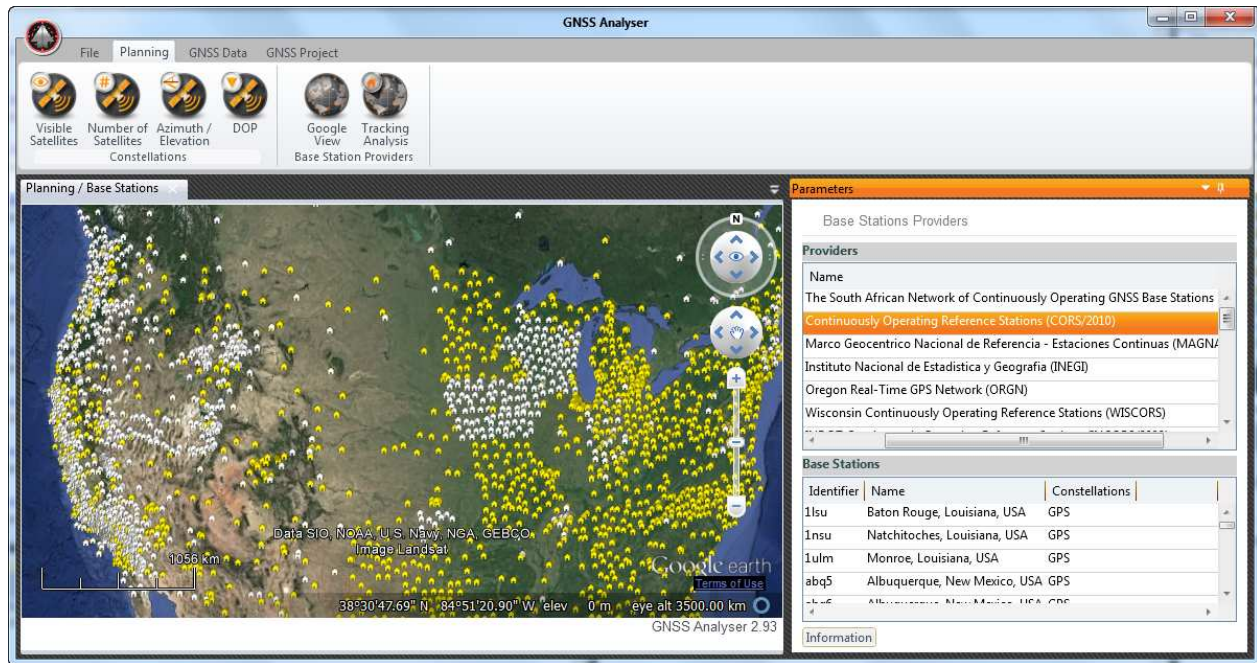


Planning - DOP

3.2 Base stations coverage

The **Google Earth View** module for Base Station Providers is a powerful tool that provides nice and quick display of a worldwide coverage of the Base Stations Providers currently accessible by our post-processing software.

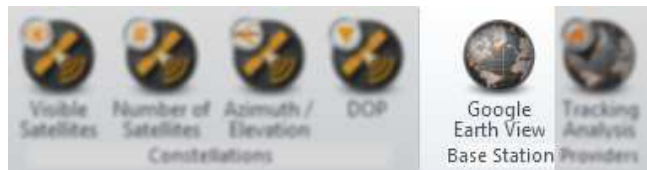
Using this view, you can identify the nearest base station from the area covered by your next field survey.



Planning - Google Earth View (for base stations)

■ Navigating between base stations

- a. From the main menu, select the **Planning** mode. Then click the **Google Earth View** button in the **Base Station Providers** section;



- b. On the top of the **Parameters** panel, you can see a list of Base Station Providers. It the list available in your Post-Processing software (Tools/Options Base Tab). Select a provider to display each of its Base Station in the **Google Earth View**. At the same time, all of its Base Stations are also listed in the data grid (bottom part of the **Parameters** panel);
- c. Selecting a base station in the data grid re-centers the **Google Earth View** on this base station;
- d. All base stations of the selected Provider are always highlighted on the **Google Earth View** using a yellow color;
- e. On the **Google Earth View**, clicking a specific base station displays an information box with quick information;
- f. The **Information** button in the **Parameters** panel, display an external page with detailed information about the selected base station.

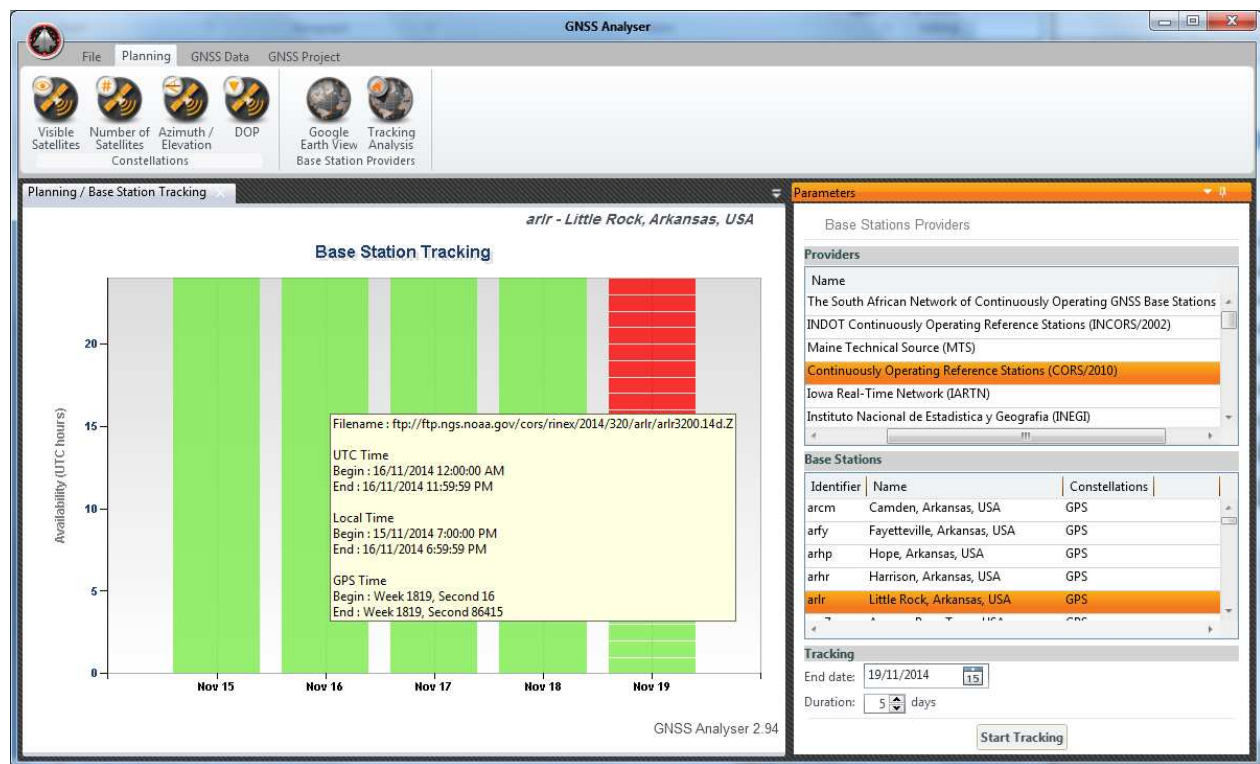
3.3 Base stations files tracking

The main issue in post-processing while working with Base Station Providers is the lack of easy accessible information about tracking performance of each GNSS Base station. Performance is seen here

as day-to-day data availability. The tracking mode displays historical data availability for each Base station being part of a specific Base Station Provider.

Each bar of the historical chart represents a data file. Move the mouse pointer over the chart to see the file name, location and its time coverage. A green bar represents an existing file whereas a red bar represents a non-available file. You may have 24-hour file as well as hourly files. Current day is usually handled with hourly file whereas previous days are usually merged into daily files.

Historical data windows can be set in the **Parameters** panel under **Duration** input box. Some Providers are very slow to respond whereas some others are rather quick. Your Internet connection can also be a reason of a slow rendering.



Planning - Base Station Tracking

- Select a specific base station
- a. From the main menu, select the **Planning** mode. Then click on the **Tracking Analysis** button to launch the View;



- b. From the **Parameters** panel, or the from the **Google Earth View**, select a base station Base Station (you click on it on the map or you simply select it from the data grid);
- c. At every moment you can stop the tracking by clicking the **Stop Tracking** button;

- d. You can also select the **End date** and **Duration** of your analyzing period in the **Tracking** section;
- e. You can resume the tracking by clicking on the **Start Tracking** button;
- f. Green bars indicates available data files whereas red bars indicate a non-available files for some of these reasons:
 - o An issue on the Provider side (for any software or hardware reasons);
 - o The file is simply not available yet (your analysis period **End date** is set in the future).



Some providers generate a unique file that contains the last 24 hour. This file is published at the end of the day. It is the reason why the tracking mode may display red bars during the current day.

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Chapter 4

4 GNSS Data

This chapter presents the different charts available to analyse GNSS data as required to get high accurate positions in post-processing mode.

These charts are useful to detect any possible problem in the GNSS data that could affect post-processing results.

For instance, with some dataset, you might have problems to get accurate fix ambiguity solutions. By using the **GNSS Analyser**, you have all the necessary tools to pinpoint any reasons that could explain such a problem. You can generate charts to analyze satellite tracking, satellite SNR values, azimuth/elevation of your observation as well as the satellite geometry. Cycle slips occurrence can also be displayed on the tracking chart.

4.1 Supported file formats

GNSS data files that can be opened in the **GNSS Analyser** are the following:

- Observation file *.OBS as created by OnPOZ **EZTag CE™** or OnPOZ **EZField™**.
- Native formats from the following GNSS manufacturers: Altus, Ashtech, Carlson, CHC Navigation, Effigis, Geneq, Hemisphere GNSS, ikeGPS, Javad, Kolida, Magellan, NavCom, NovAtel, NVS Technologies AG, Pentax, Septentrio, SiRF, SouthGPS, Stonex, TechGeo, Topcon, u-blox or UniStrong.
- RINEX 2.10, 2.11, 3.00, 3.01 and 3.02 observation files (compressed and uncompressed) for GPS, GLONASS, Galileo or BeiDou.

4.2 GNSS Data views




Specific views to analyze GNSS Data are accessible under **GNSS Data** from the main menu. The following views are available:

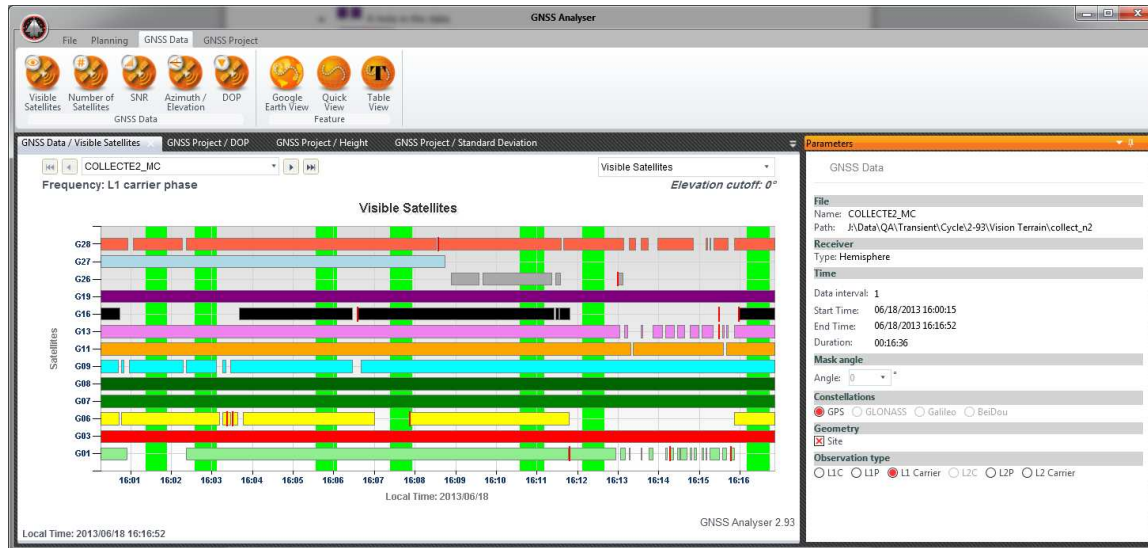


4.2.1 Visible Satellites

Using the **Visible Satellites** view, you can analyze separately the pseudorange (on L1C, L1P, L2C and L2P) and the carrier phase tracking (on L1 or L2). This can be done on GNSS data. The view displays any existing gaps in the recorded data. If you are analyzing carrier phase, cycle slips can also be displayed within the visibility bar.

Each satellite is displayed with a different color. For each satellite, the color represents:

- : Continuous data.
- : A hole in the data.
- : A cycle slip occurrence. A cycle slip is represented as a red color bar and is only displayed on carrier phase data.



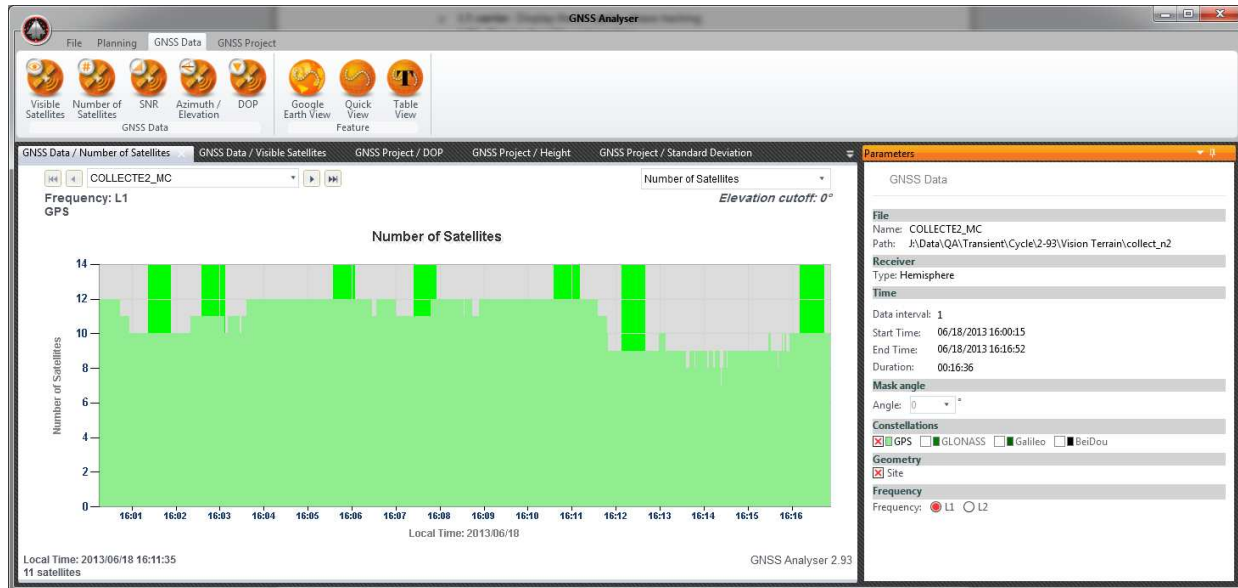
GNSS Data – Visible Satellites

■ Set Parameters

- In the **Mask angle** section, select an elevation cutoff for your analysis. When no orbits are available within project, an elevation cutoff of zero is used.
- In the **Constellations** section, select the constellation to be analyzed:
 - **GPS**: Display GPS constellation only.
 - **GLONASS**: Display GLONASS constellation only.
 - **Galileo**: Display Galileo constellation only.
 - **BeiDou**: Display BeiDou constellation only.
- In the **Geometry** section, select points or sites to be displayed in the background of the view. It will overlay their time span on the background of the view. This gives you an indication if your points/sites have been recorded with a proper constellation.
- In the **Observation type** section, select the signal to be analyzed:
 - **L1C**: Display the L1C code tracking.
 - **L1P**: Display the L1P code tracking.
 - **L1 carrier**: Display the L1 carrier phase tracking.
 - **L2C**: Display the L2C code tracking.
 - **L2P**: Display the L2P code tracking.
 - **L2 carrier**: Display the L2 carrier phase tracking.

4.2.2 Number of satellites

This chart displays the total number of satellites with an elevation angles over the selected mask angle. This simple chart is useful for a quick look at the number of satellite available within the GNSS data file (you need at least 4 satellites to compute a 3D position). You can display your chart for L1 or L2.



GNSS Data – Number of Satellites

■ Set Parameters

- In the **Mask angle** section, select an elevation cutoff for your analysis. When no orbits are available within project, an elevation cutoff of zero is used.
- In the **Constellations** section, select which constellation you want to add to the view:
 - GPS**: Display GPS constellation.
 - GLONASS**: Display GLONASS constellation.
 - Galileo**: Display Galileo constellation.
 - BeiDou**: Display BeiDou constellation.
- In the **Geometry** section, select points or sites to be displayed in the background of the view. It will overlay their time span on the background of the view. This gives you an indication if your points/sites have been recorded with a proper constellation.
- In the **Frequency** section, select which Frequency you want to view:
 - L1**: Display the number of satellites having L1 code data (L1C or L1P).
 - L2**: Display the number of satellites having L2 code data (L2C or L2P).

4.2.3 SNR

This chart is useful to analyze the signal strength from a GNSS Data file. It might help you in detecting weak signal conditions that can be caused by bad antenna cables, bad connectors or simply assessing the observation environment. Low signal level generally means high noise, so data with low signal level might not generate the best positioning results.

The following chart presents SNR values from a data set collected in a very difficult environment. So SNR values for this specific data set are not as good as one would expect to get accurate positioning results.



GNSS Data – SNR

■ Set Parameters

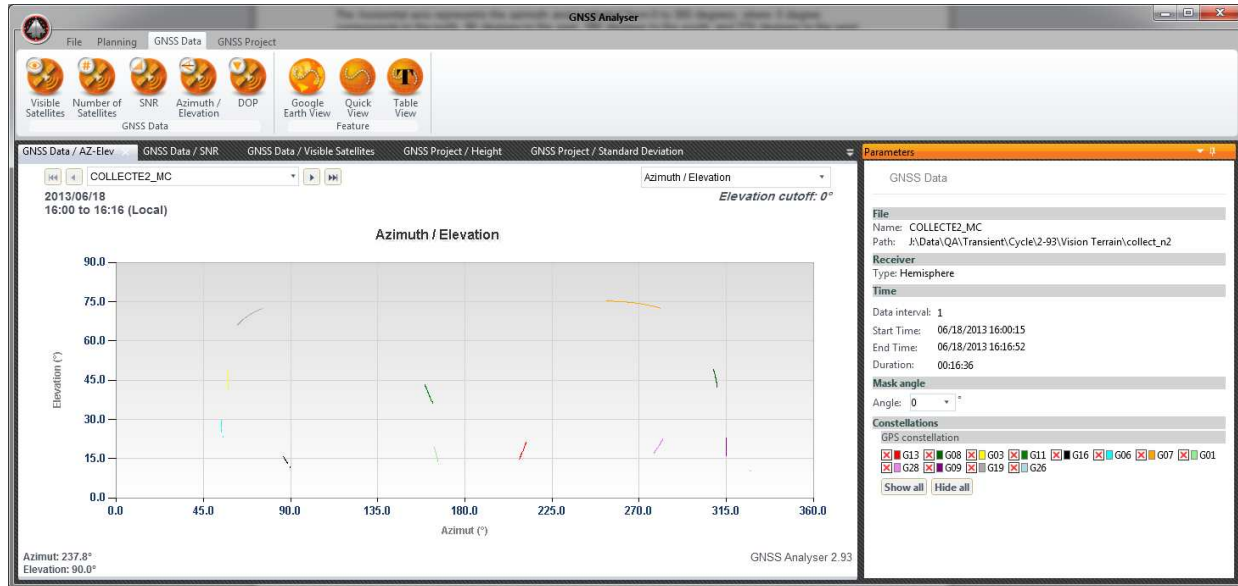
- In the **Mask angle** section, select an elevation cutoff for your analysis. When no orbits are available within project, an elevation cutoff of zero is used.
- In the **Constellation** section, select which constellation you want to analyze:
 - **GPS**: Display GPS constellation only.
 - **GLONASS**: Display GLONASS constellation only.
 - **Galileo**: Display Galileo constellation only.
 - **BeiDou**: Display BeiDou constellation only.
- In the **Geometry** section, select points or sites to be displayed in the background of the view. It will overlay their time span on the background of the view. This gives you an indication if your points/sites have been recorded while signal strength was good.
- In the **Frequency** section, select which frequency you want to analyze:
 - **L1**: Displays L1 SNR.
 - **L2**: Displays L2 SNR.
- In the **Constellations** section, show or hide satellites using corresponding check boxes.

4.2.4 Azimuth/Elevation

The Azimuth/Elevation rectangular plot displays satellites path-in-the-sky during the observation time span.

The horizontal axis represents the azimuth and is labeled from 0 to 360 degrees, where 0 degree corresponds to the north, 90 degrees to the east, 180 degrees to the south, and 270 degrees to the west.

The vertical axis is labeled from 0 to 90 degrees, where 0 degree corresponds to the horizon and 90 degrees to the zenith.



GNSS Data – Azimuth/Elevation

■ Set Parameters

- In the **Mask angle** section, select an elevation cutoff for your analysis. When no orbits are available within project, an elevation cutoff of zero is used.
- In the **Constellations** section, show or hide satellites using corresponding check boxes.

4.2.5 DOP

The DOP (Dilution of Precision) view tells you how well the satellite constellation is distributed in the sky. DOP values can range between +/-1 (it could be less than 1) and infinity. For instance, a good GDOP value should not exceed 8. The lower the GDOP value is, the more spread out the satellites are in the sky; therefore, providing good observation conditions.



GNSS Data – DOP

■ Set Parameters

- In the **Mask angle** section, select an elevation cutoff for your analysis. When no orbits are available within project, an elevation cutoff of zero is used.
- From the **Constellations** section, select which constellation you want to add to the view:
 - **GPS**: Display GPS constellation.
 - **GLONASS**: Display GLONASS constellation.
 - **Galileo**: Display Galileo constellation only.
 - **BeiDou**: Display BeiDou constellation only.
- In the **Geometry** section, select points or sites to be displayed in the background of the view. It will overlay their time span on the background of the view. This gives you an indication if your points/sites have been recorded while DOP condition was good.
- In the **DOP type** section, select the values to be analyzed:
 - **GDOP**: represents all parameters (longitude, latitude, height and time);
 - **PDOP**: represents 3D parameters (latitude, longitude and height);
 - **HDOP**: represents 2D parameters (latitude and longitude);
 - **NDOP**: represents the north parameters;
 - **EDOP**: represents the east parameters;
 - **VDOP**: represents the height parameters;
 - **TDOP**: represents the time parameters.

4.3 Feature Views

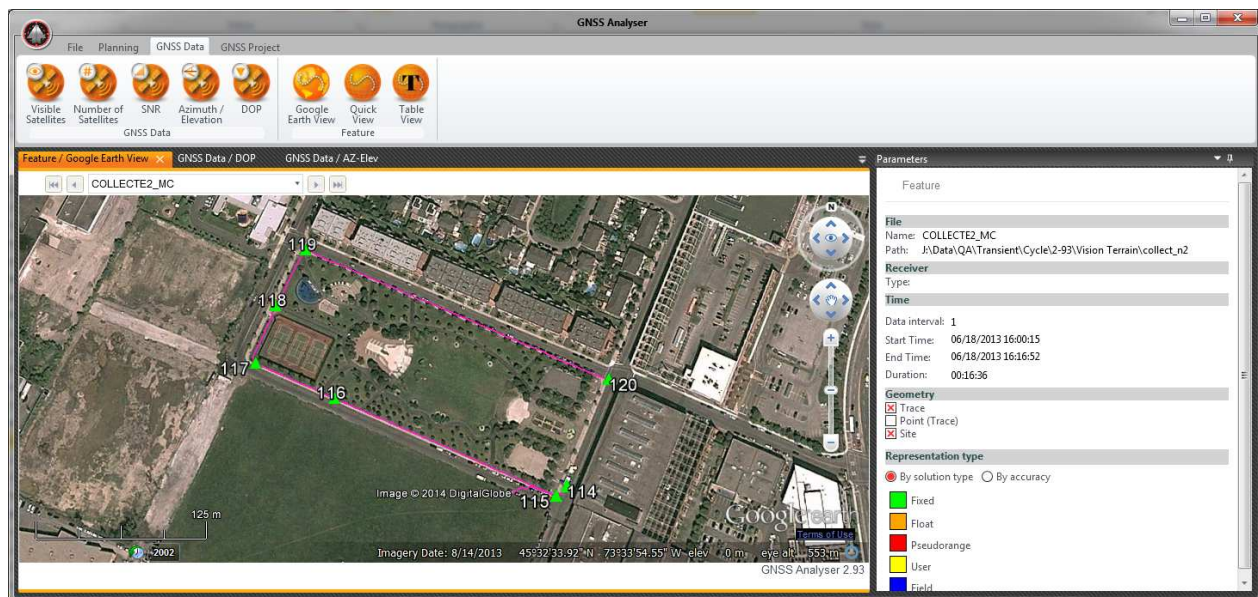
Specific views to analyze features are accessible under **GNSS Data** from the main menu. The following views are available:



4.3.1 Google Earth View

Using **Google Earth View**, you can display your features with a Google Earth background (you need an Internet connection to use it). In **Google Earth View**, specific symbols are used to present the positions accuracy.

❖ Since Google Earth does not use accurate imagery (typical accuracy is +/- few meters), this view cannot be used to evaluate the accuracy of your results. You should see this view as a representation of the shape of your survey with some contextual imagery data.



Feature – Google Earth View

You navigate in the **Google Earth View** exactly the same way as you navigate within Google Earth. When you click on any graphical element, you will get an info box with its WGS84 coordinate (with solution type and horizontal accuracy).

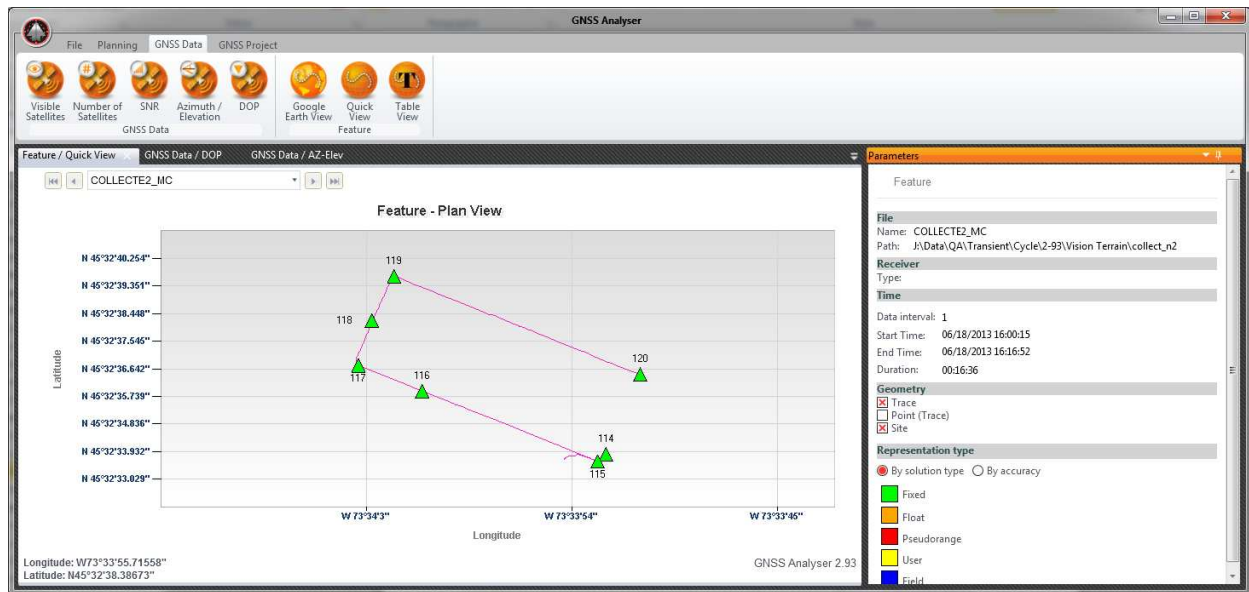
■ Set Parameters


- a. In the **Geometry** section, select which layer to display. It lists features by categories including some pre-defined layers.
 - **Trace**: All positions collected by the receiver displayed as a single continuous line.
 - **Point (Trace)**: Each GNSS position of the trace is symbolized as a point.
 - **Point (xxx)**: Each point is symbolized as a point.

- **Site:** Each site is symbolized as a point.
- **Line (xxx):** Each line is symbolized as a line.
- **Polygon (xxx):** Each polygon is symbolized as a polygon.
- b. In the **Representation type** section, you can control the color for **Point** and **Site**:
 - **By solution type:** Color according to its solution type: Fixed, Float, Pseudorange, Field, Network, User and Offsetted.
 - **By accuracy:** Color according to its position standard deviation.

4.3.2 Quick View

The **Quick View** is similar to the **Google Earth View** (there's obviously no background map). It is very useful when you do not have an Internet connection.

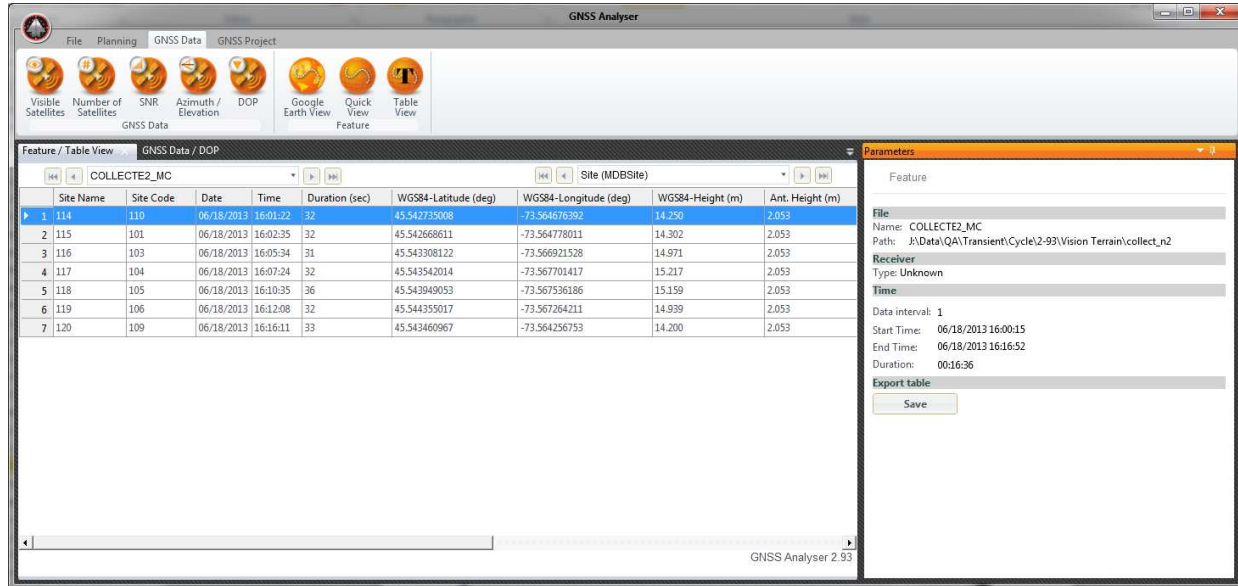


You can navigate in the **Quick View** using your mouse wheel to zoom in and zoom out, or simply drag a square on the **Quick View** by left clicking with your mouse and by releasing the mouse button to zoom. To go back to the original scale, click on the small  sign located on each axis.

When moving your mouse cursor over a **Point**, **Site**, **Line** or **Polygon**, an info box appears containing information (Time, WGS84 coordinates, horizontal accuracy and solution type) for that particular point.

4.3.3 Table View

The **Table View** displays attributes and GNSS position data of all objects of a particular feature.



Feature – Table View

There is a **Save** button in the **Parameters** panel that will export the content of the current view to a CSV file.

GNSS Analyser

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Chapter 5

5 GNSS Projects

This chapter explains how to use the GNSS Projects mode for analyzing GNSS data and results created using our Post-processing software.

❖ With version 2.87 and higher, the post-processor publishes specific metadata in order to let the **GNSS Analyser** read any GNSS project created with your Post-Processor. If your GNSS projects have been saved by a previous version, you will have to re-open them with the post-processor version 2.87 or higher, and save them using the menu **File > Save**.

5.1 Trajectories

Specific views for trajectory results are available using the following button group:



If your project does not include any trajectories, this button group will simply not be displayed.

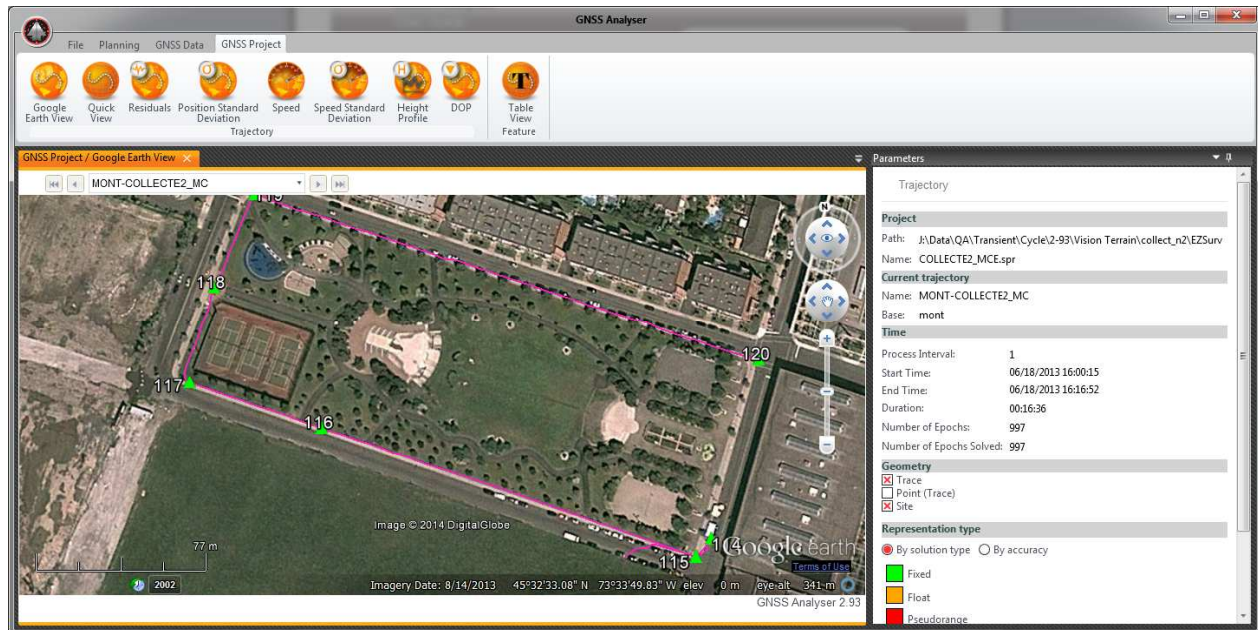
When a specific trajectory is selected with the navigation buttons or drop-down list (situated on left side of the top corner) of the chart area, the **Parameters** panel presents the following standard information (some more information might be displayed depending on the selected chart):

- a. The **Project** section displays information about the GNSS project:
 - o **Path** and **Name** as saved by the Post-processing software;
- b. The **Current trajectory** section displays information about the selected trajectory:
 - o The trajectory **Name** along with the **Base** station used to post-process it. This is the identifier used by the post-processing software. This can be the identifier given by the base station provider.
- c. The **Time** section presents:
 - o **Process Interval** (in unit of second) used in the post-processing software;
 - o **Start Time** and **End Time** of the trajectory (in the selected time unit);
 - o **Duration** of the trajectory (HH:MM:SS);
 - o **Number of Epochs** covering the trajectory;
 - o **Number of Epochs Solved** when post-processed the trajectory.

5.1.1 Google Earth View

Using **Google Earth View**, you can display your trajectories with a Google Earth background (you need an Internet connection to use it). In **Google Earth View**, specific symbols are used to present the positions accuracy.

❖ Since Google Earth does not use accurate imagery (typical accuracy is +/- few meters), this view cannot be used to evaluate the accuracy of your results. You should see this view as a representation of the shape of your survey with some contextual imagery data.



Trajectory - Google Earth View

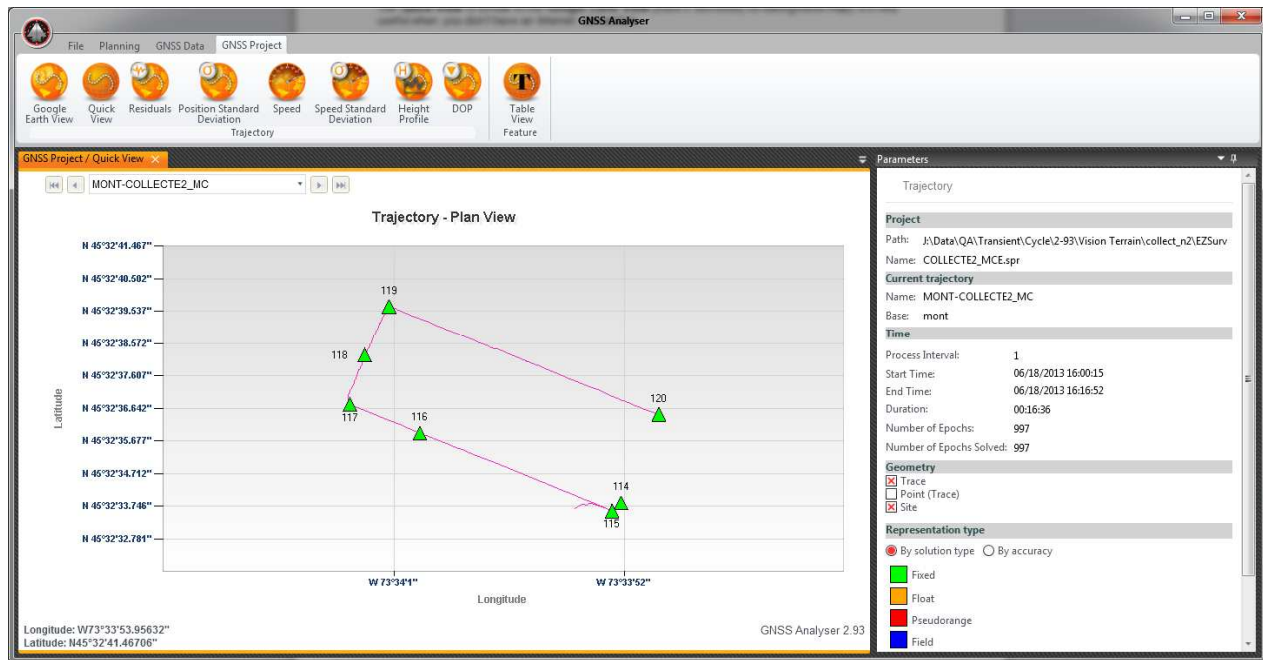
You navigate in the **Google Earth View** exactly the same way as you navigate within Google Earth. When you click on a trajectory point, you will get an info box with its WGS84 coordinate (with solution type and horizontal accuracy).

■ Set Parameters


- a. In the **Geometry** section, select which layer to display. It lists features by categories including some pre-defined layers.
 - **Trace**: All positions in trajectories displayed as continuous lines.
 - **Point (Trace)**: Each GNSS position of the trace is symbolized as a point.
 - **Point (xxx)**: Each point is symbolized as a point.
 - **Site**: Each site is symbolized as a point.
 - **Line (xxx)**: Each line is symbolized as a line.
 - **Polygon (xxx)**: Each polygon is symbolized as a polygon.
- b. In the **Representation type** section, you can control the color for **Point** and **Site**:
 - **By solution type**: Color according to its solution type: Fixed, Float, Pseudorange, Field, Network, User and Offsetted.
 - **By accuracy**: Color according to its position standard deviation.

5.1.2 Quick View

The **Quick View** is similar to the **Google Earth View** (there's obviously no background map). It's very useful when you don't have an Internet connection.



Trajectory - Quick View

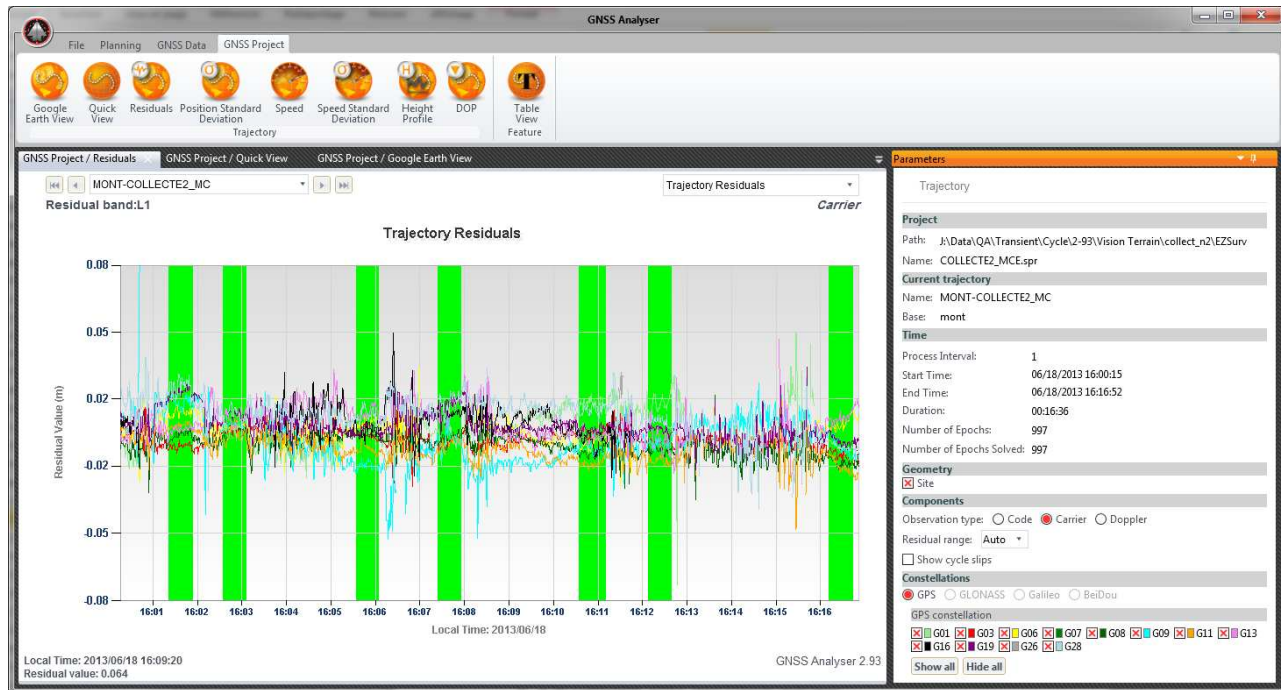
You can navigate in the **Quick View** using your mouse wheel to zoom in and zoom out, or simply drag a square on the **Quick View** by left clicking with your mouse and by releasing the mouse button to zoom. To go back to the original scale, click on the small  sign situated on each axis.

When moving your mouse cursor over a trajectory point, an info box appears containing information (Time, WGS84 coordinates, horizontal accuracy and solution type) of that particular point.

5.1.3 Residuals

The **Residuals** View displays observations residuals for code (pseudorange), Doppler or carrier phase data. When displaying **Residuals**, more parameters are displayed in the **Parameters** panel.

The **Residuals** chart is very useful to detect any problem in a data set. Small carrier phase residuals (few centimeters), from a fixed solution, are typical of accurate positions (centimeter)



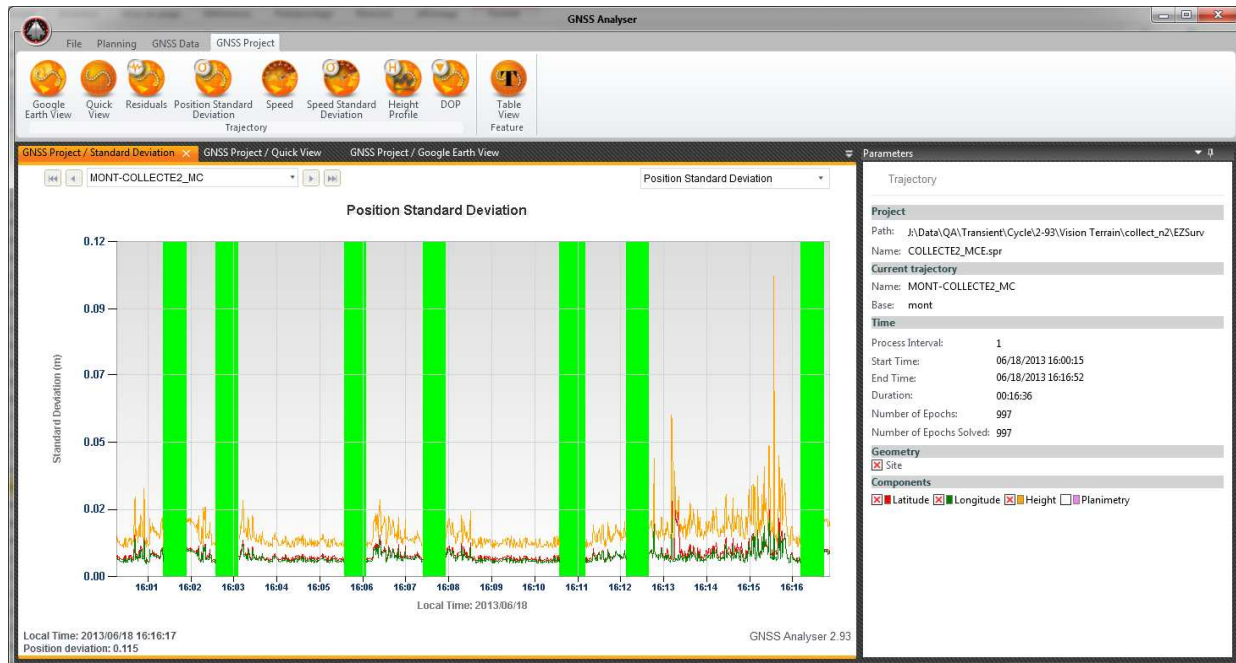
Trajectory - Residuals

■ Set Parameters

- In the **Geometry** section, select points or sites to be displayed in the background of the view. It will overlay their time span on the background of the view. This gives you an indication if your points/sites have been recorded while residuals were good or not.
- In the **Components** section, select a specific observation:
 - Code:** Displays pseudorange residuals;
 - Carrier:** Displays carrier phase residuals ;
 - Doppler:** Displays Doppler residuals.
- In the **Components** section, you could also display the cycle slip occurrence on the chart.
- In the **Components** section, select **Residual range**, to scale the vertical axe between $-Y$ and $+Y$ values (you could also select the **Auto** mode).
- In the **Constellations** section, you can select a specific constellation. Show or hide satellites using corresponding check boxes.
 - GPS:** Displays GPS residuals only.
 - GLONASS:** Displays GLONASS residuals only.
 - Galileo:** Display Galileo constellation only.
 - BeiDou:** Display BeiDou constellation only.

5.1.4 Position/Speed Standard Deviation

These charts display the position and speed standard deviation as computed by the post-processor. It displays the **Latitude**, **Longitude** and **Height** component as well as the **Planimetry** component.



Trajectory - Position Standard Deviation

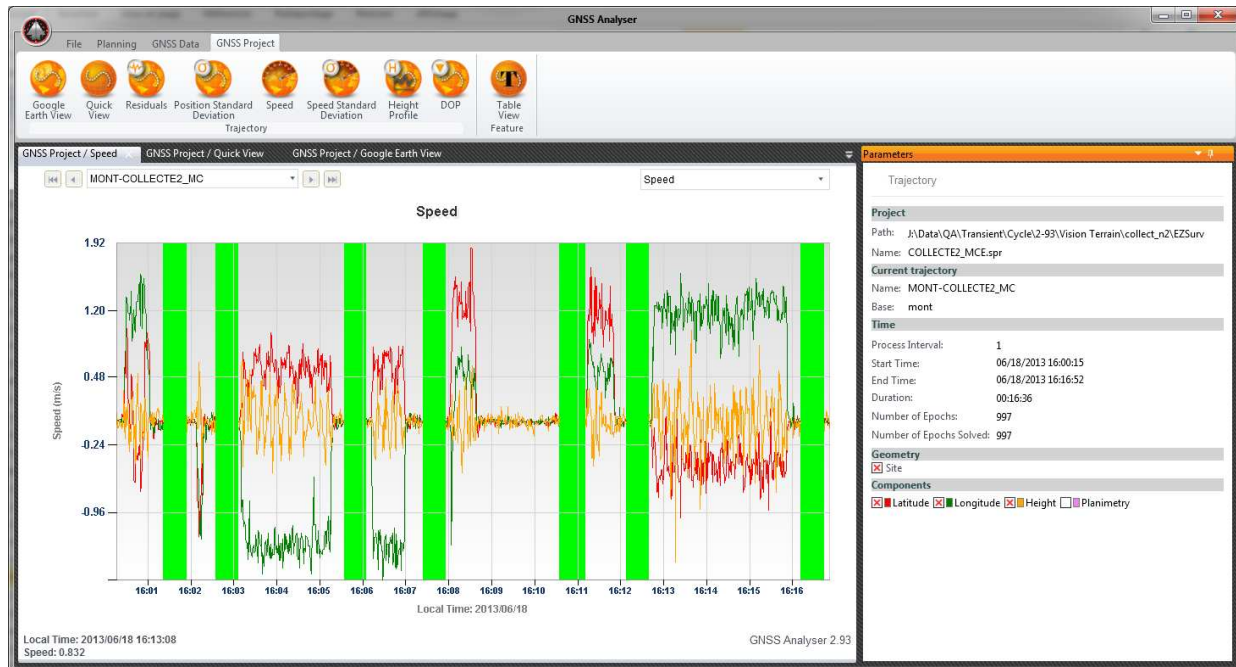
5.1.5 Speed

This chart displays the three speed components (**Latitude**, **Longitude** and **Height**) as well as the **Planimetry** speed component (over ground). It's typically useful for hydrographic as well as aerial surveys.

With the left click, you can zoom on the time axis by clicking on a start time and drag your mouse to the last time. You zoom on the Speed axis using the mouse wheel.

GNSS Analyser

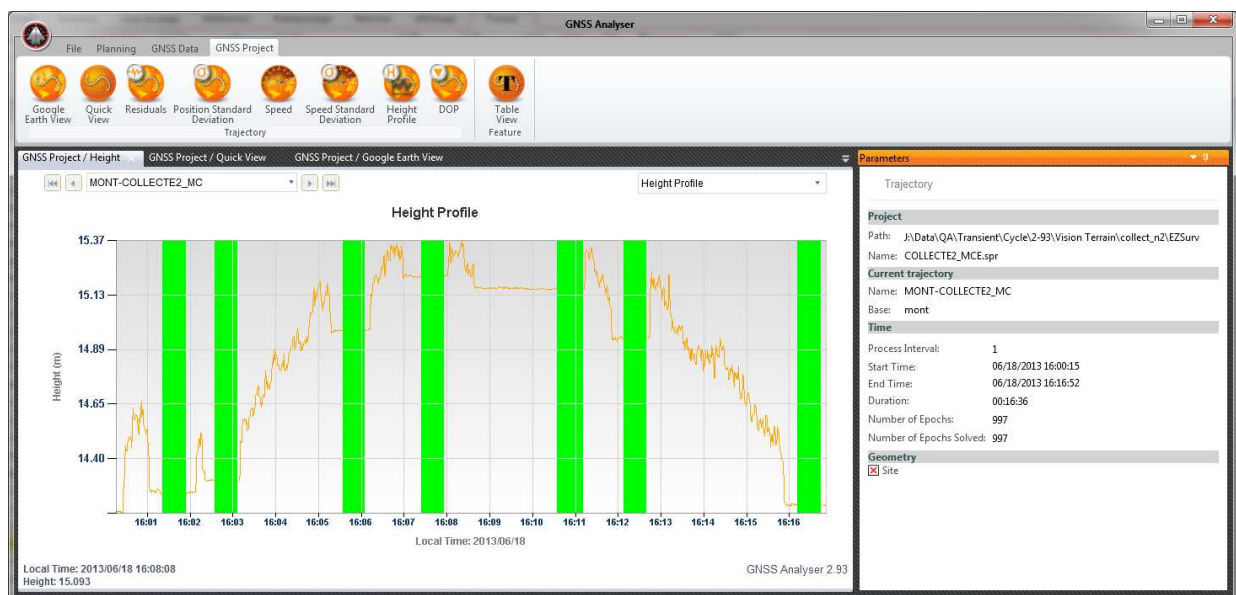
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Trajectory - Speed

5.1.6 Height Profile

This chart displays the Ellipsoidal height of the rover using the WGS84 datum. In Hydrographic and aerial mission, this could be a very useful tool for analyzing the smoothness of the vertical profile (to detect any anomaly).



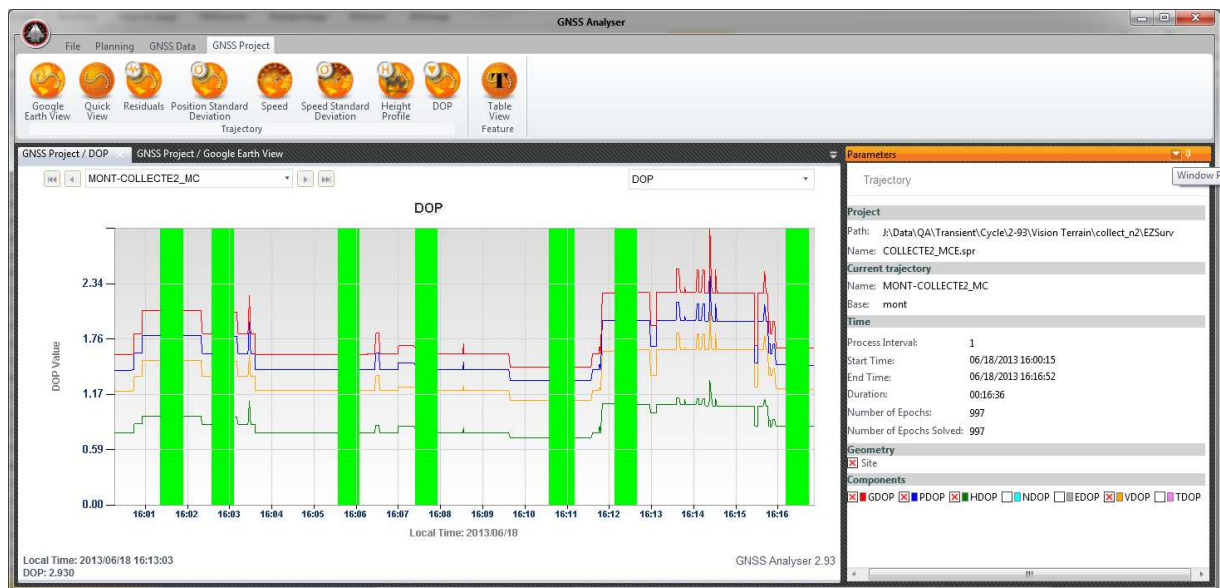
Trajectory - Height Profile

5.1.7 DOP

This chart displays DOP (Dilution of Precision) values for a specific data file of a GNSS project. You select your files using the navigation buttons or drop-down list situated on the top left of the chart.

DOP values can be displayed as follow:

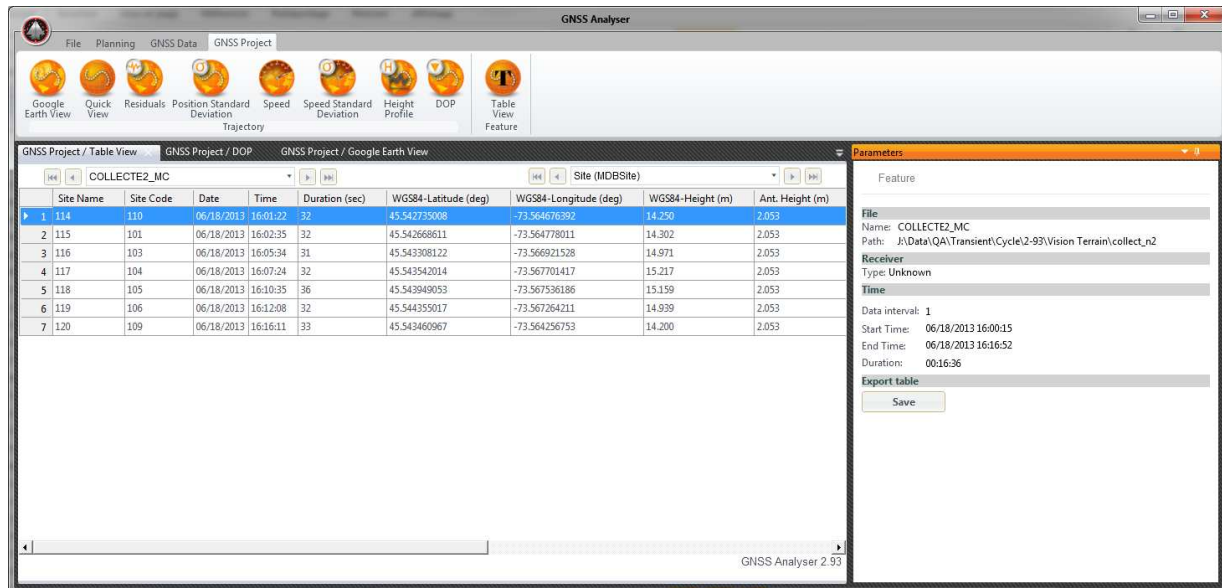
- **GDOP**: represents all parameters (longitude, latitude, height and time);
- **PDOP**: represents 3D parameters (latitude, longitude and height);
- **HDOP**: represents 2D parameters (latitude and longitude - Horizontal);
- **NDOP**: represents the north parameters;
- **EDOP**: represents the east parameters;
- **VDOP**: represents the height parameters;
- **TDOP**: represents the time parameters.



Trajectory - DOP

5.1.8 Table View

The **Table View** displays attributes and GNSS position data of all objects of a particular feature.



Trajectory – Table View

There is a **Save** button in the **Parameters** panel that will export the content of the current view to a CSV file.

5.2 Baselines

Specific views for baseline Results are accessible using the following button group:



If your project does not include any baselines, this button group will simply not be displayed.

When a specific baseline is selected in the view using the navigation buttons or drop-down list, the **Parameters** panel presents the following information:

- The **Project** section displays information about the GNSS project:
 - The project **Path** and **Name** as saved by the Post-processing software;
- The **Current baseline** section displays information on the baseline:
 - Name** as fixed by the Post-processing software;
 - Solution Type** as computed by the post-processing software;
 - Datum** is always WGS84;
 - ECEF Vector** with standard deviation;
 - 3D Distance**;
 - Geodetic Distance**;
- The **Time** section presents:
 - Process Interval** selected in the post-processing software;

- **Start Time** and **End Time** of the baseline (in the selected time unit);
- **Duration** of the baseline observation (HH:MM:SS);
- **Number of Epochs** covering the baseline;
- **Number of Epochs Solved** used to calculate the baseline;

5.2.1 Google Earth View

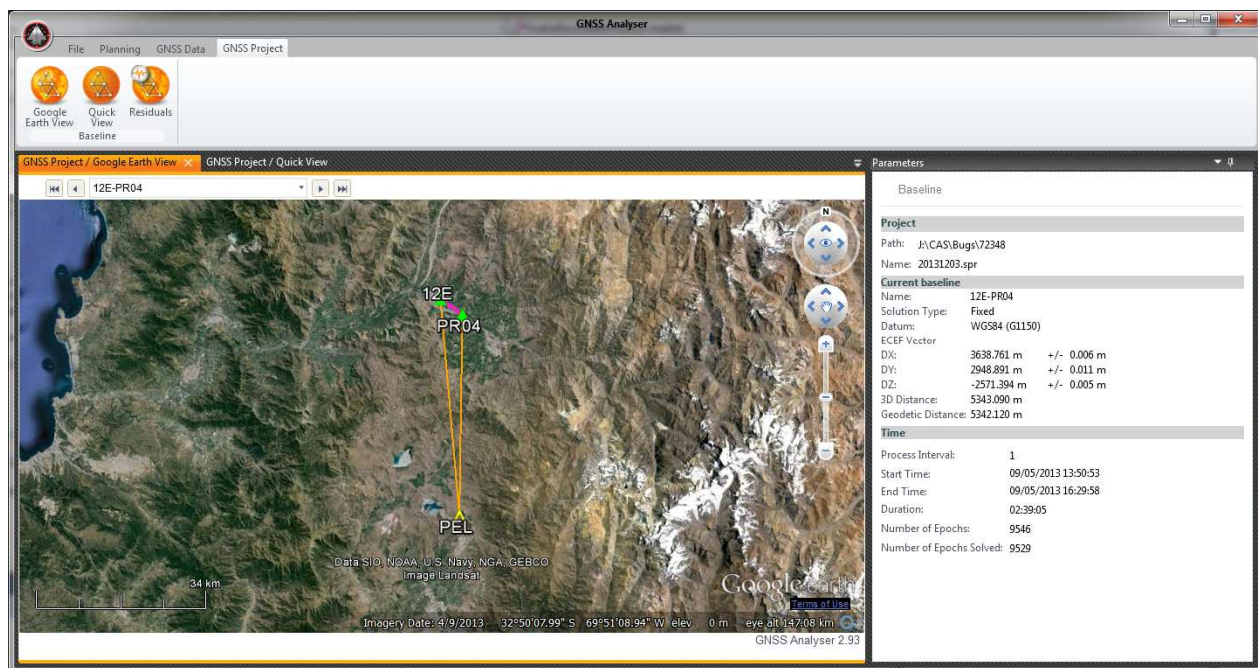
Using **Google Earth View**, you can see your network of baselines displays on a **Google Earth View**.

❖ Since Google Earth does not use accurate imagery (typical accuracy is +/- few meters), this view cannot be used to evaluate the accuracy of your results. You should see this view as a representation of the shape of your survey with some contextual imagery data.

The colors used to identify the status of the baselines and sites are the following:

- a. Orange for Float solution type;
- b. Green for Fixed solution type;

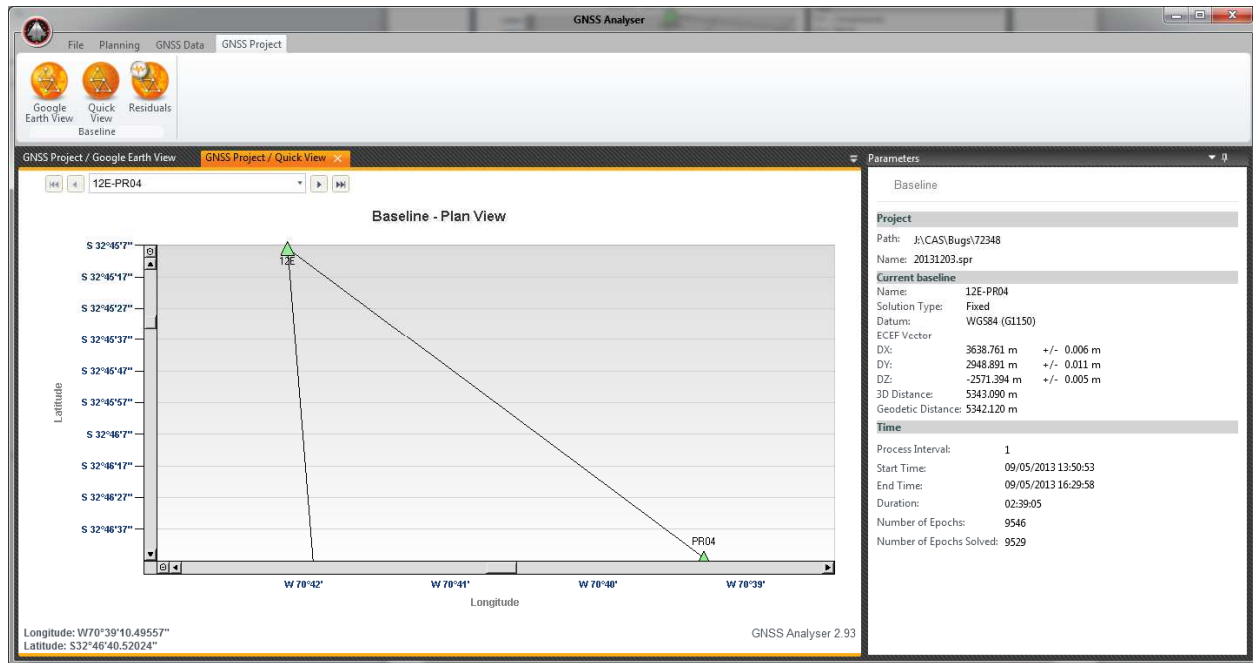
The selected baseline is highlighted in pink.




Baseline - Google Earth View

5.2.2 Quick View

The **Quick View** is similar to the **Google Earth View** (there is obviously no background map). It's very useful when you don't have an Internet connection.



Baseline - Quick View

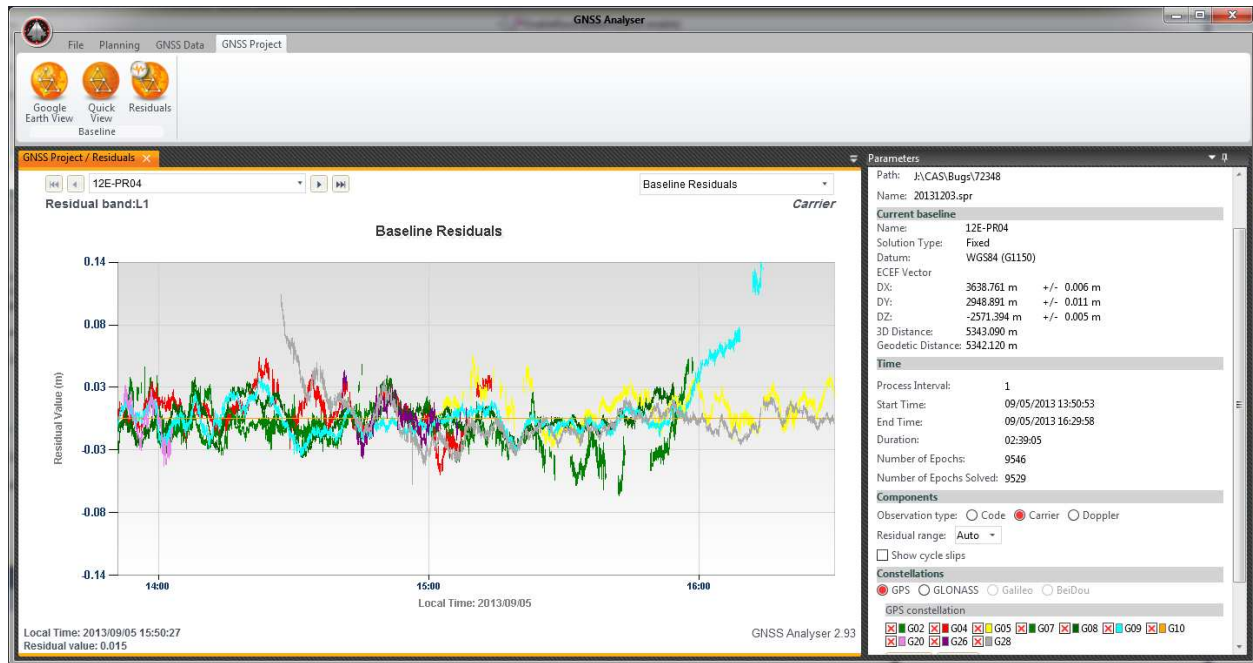
You can navigate in the **Quick View** using your mouse wheel to zoom in and zoom out, or simply drag a square on the **Quick View** by left clicking with your mouse and by releasing the mouse button to zoom. To go back to the original scale, click on the small  sign situated on each axis.

When moving your mouse cursor over a site, an info box appears containing information (name, code, type, time, duration and WGS84 coordinates).

5.2.3 Residual view

The **Residual View** displays observation residuals for code (pseudorange), Doppler or carrier phase data. When displaying residuals, some more parameters are displayed in the **Parameters** panel.

The residual chart is very useful to detect any problem in a data set. Small carrier phase residuals (few centimeters), from a fixed solution are typical of accurate positions (centimeter).



Baselines residual view

■ Set Parameters

- In the **Components** section, select **Observation type**:
 - Code**: Displays pseudorange residuals.
 - Carrier**: Displays carrier phase residuals.
 - Doppler**: Displays Doppler residuals.
- In the **Components** section, select **Residual range**, to scale the vertical axe between -Y and +Y values (you could also select the **Auto** mode).
- In the **Components** section, you could also display the cycle slip occurrence on the chart.
- In the **Constellations** section, you can select a specific constellation. Show or hide satellites using corresponding check boxes.
 - GPS**: displays GPS residuals only.
 - GLONASS**: displays GLONASS residuals only.
 - Galileo**: Display Galileo constellation only.
 - BeiDou**: Display BeiDou constellation only.



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