Stonex® GQuickPosition

User Manual

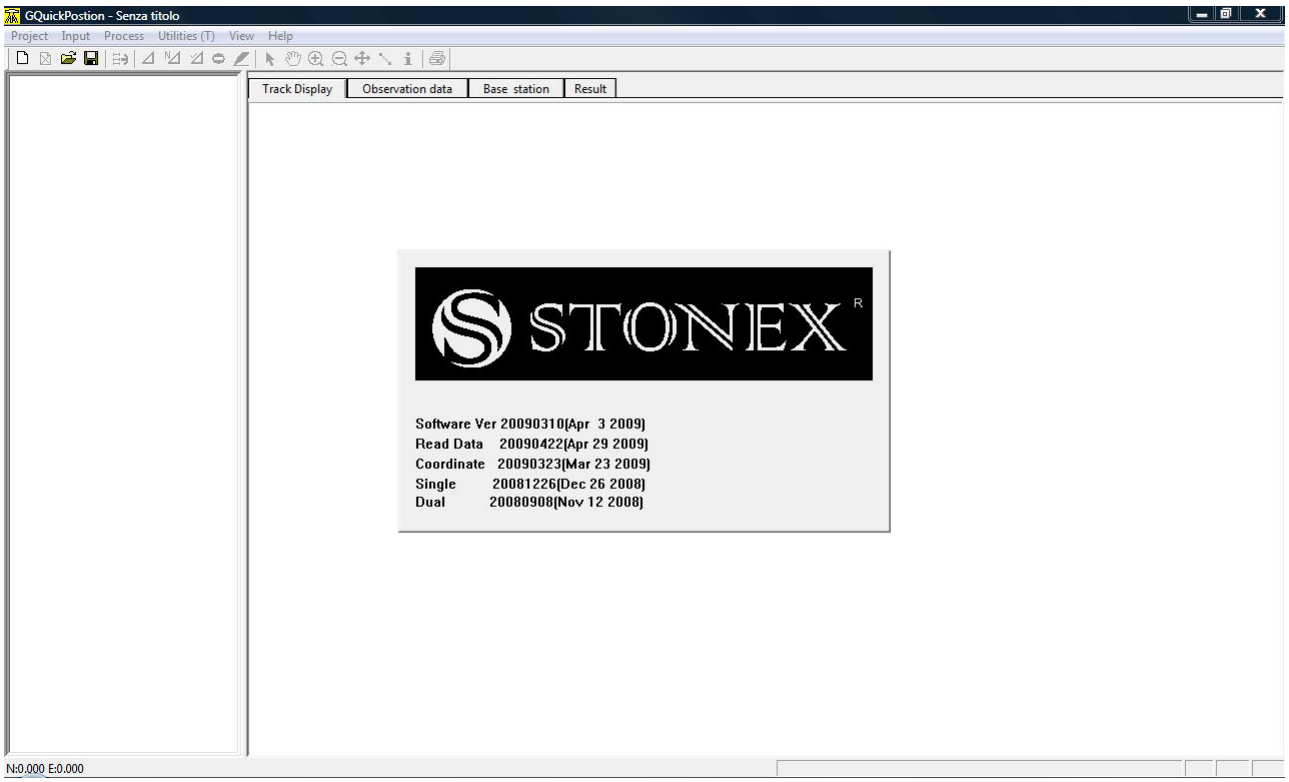

Table of Contents

Introduction

STONEX® GQuickPosition is a simple to use software, which allows you to process your kinematic data collected during your survey obtaining the maximum accuracy. Together with STONEX® GPS Processor it represents an effective post-processing tool.
It can process different kind of data: STONEX® data format (.STH) and the standard RINEX format from various GPS receivers.
You can choose the proper processing parameters (minimum epoch number for ambiguity solution, satellite elevation cut-off, etc.) in order to adapt the software to different conditions.
For gaining the maximum accuracy you can also import IGS precise orbits (.sp3 files).
With this software user can conveniently choose different coordinate system or self-defines ellipsoid projection parameters in order to use every national or regional reference system.
The computation time is low, the accuracy and repeatability are comparable with most of commercial software.
The software graphic interface is outstanding, so that you can immediately verify the outcome of the results. They are saved in the professional format file of STONEX® with the postfix of .GQP.
STONEX® GQuickPosition is based on VC++ language.

If you are not familiar with GPS processing features, we suggest to read a general GPS book in order to better understand the contents of this manual. Anyway you can ask for any technical support to our address support@stonexeurope.com or contact your local dealer.

This is the February 2010 release of the STONEX® GQuickPosition user guide.

Chapter I : Software installation

I.1 Hardware and software requirements

- Operative System: WINDOWS 98, WINDOWS ME, WINDOWS 2000, WINDOWS XP, WINDOWS VISTA, WINDOWS 7
- Hardware environment: CPU exceeding PII MMX 200 MHz, RAM memory exceeding 32 MB, HD space exceeding 4 GB, at least 100 MB storage space, Screen: at least 256 colours, 800*600 resolving power.

I.2 Installing steps

Double click on the installation file, it is showed as follows (fig. 1.1):

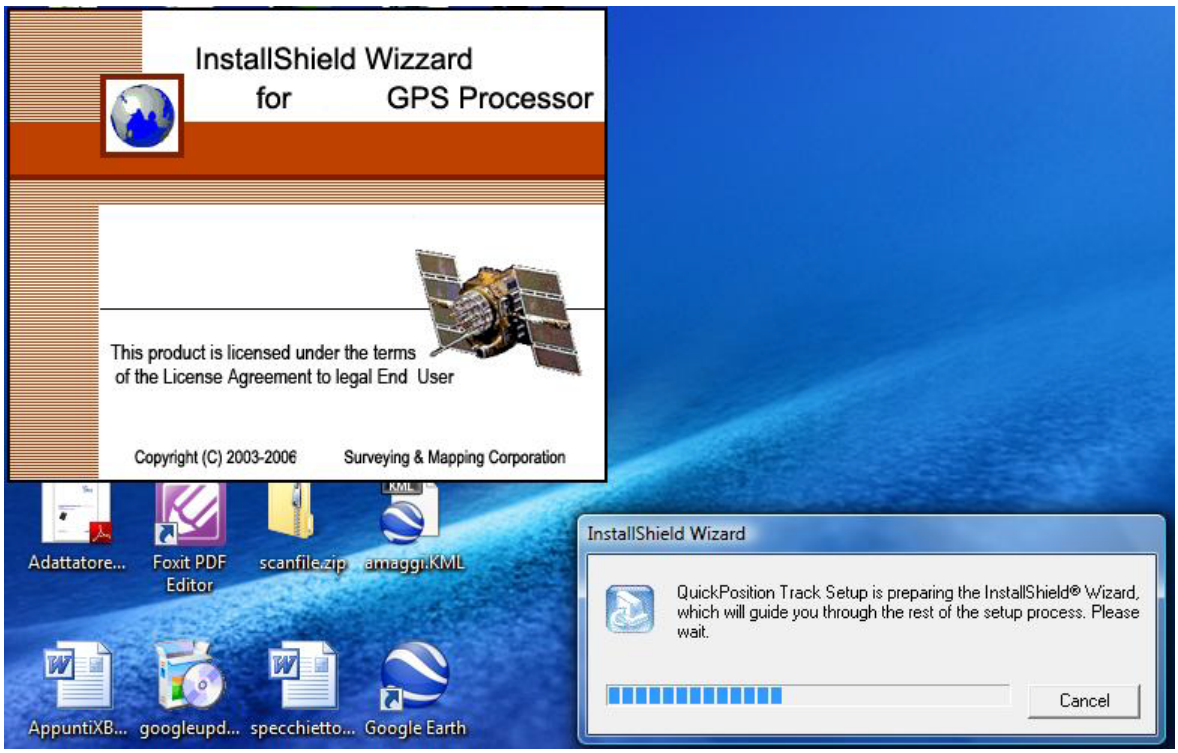

Fig. 1.1 – Software unpacking

The software unpacks itself automatically. After finished, it is showed a window of installation as follows (fig. 1.2):

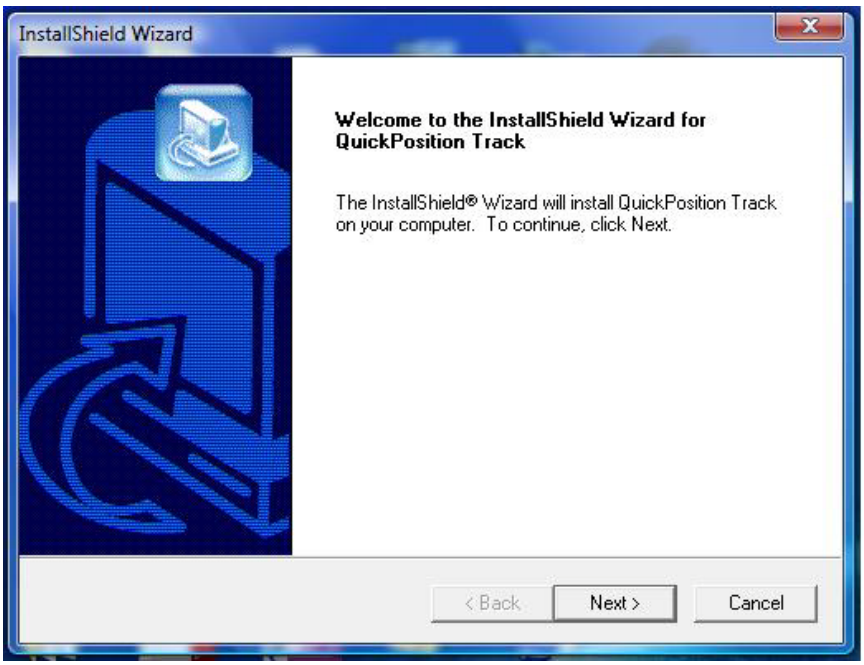

Fig. 1.2 First window of installation

Click "Next" to start the installation. Then it is showed the user's agreement (fig. 1.3):

Fig. 1.3 – User's agreement

If you agree, click on "Yes" and the installation continues. Software asks you the installation path (fig. 1.4):

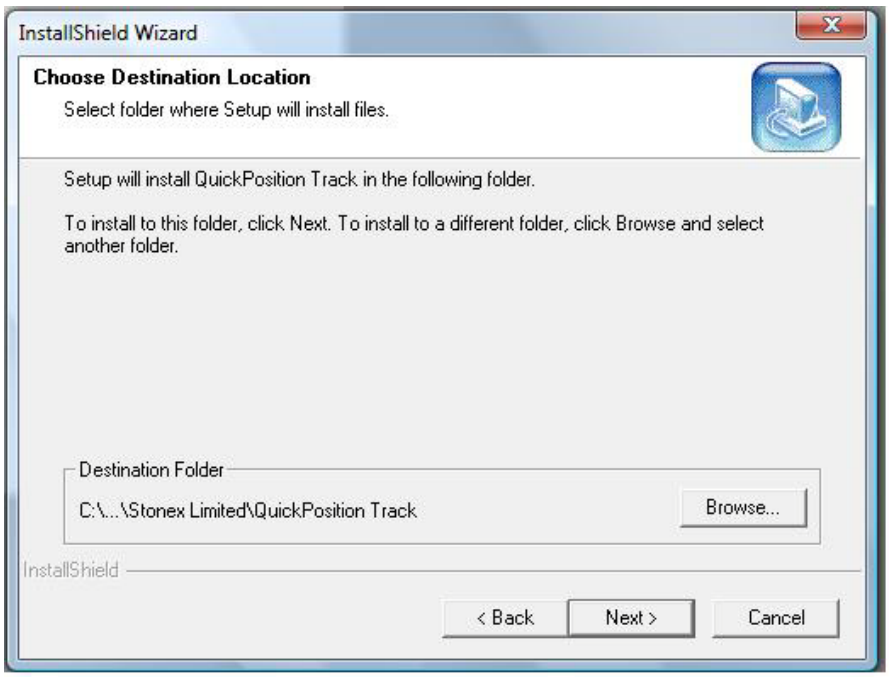

Fig. 1.4 – Choosing the installation path

Clicking "browse" in fig 1.4 you can select the proper path in which installing the software, otherwise the default path "C:\Program Files\Stonex Limited\QuickPosition Track" is used. After the selection, click "next'. Then you can see the course of installation (fig. 1.5).

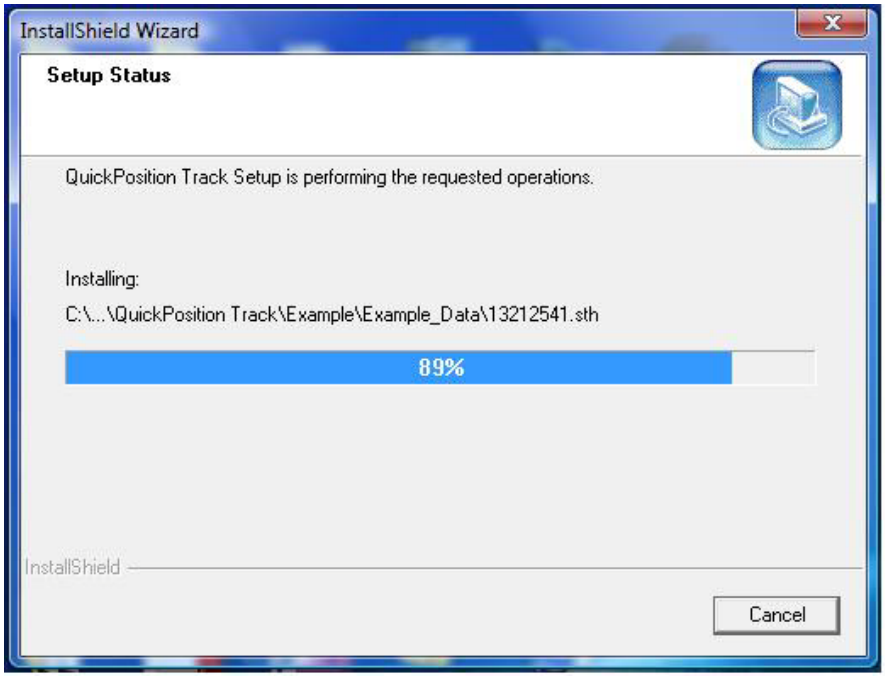

Fig. 1.5 – The progress of installation

When the software is completely installed, it is showed a window like fig. 1.6.

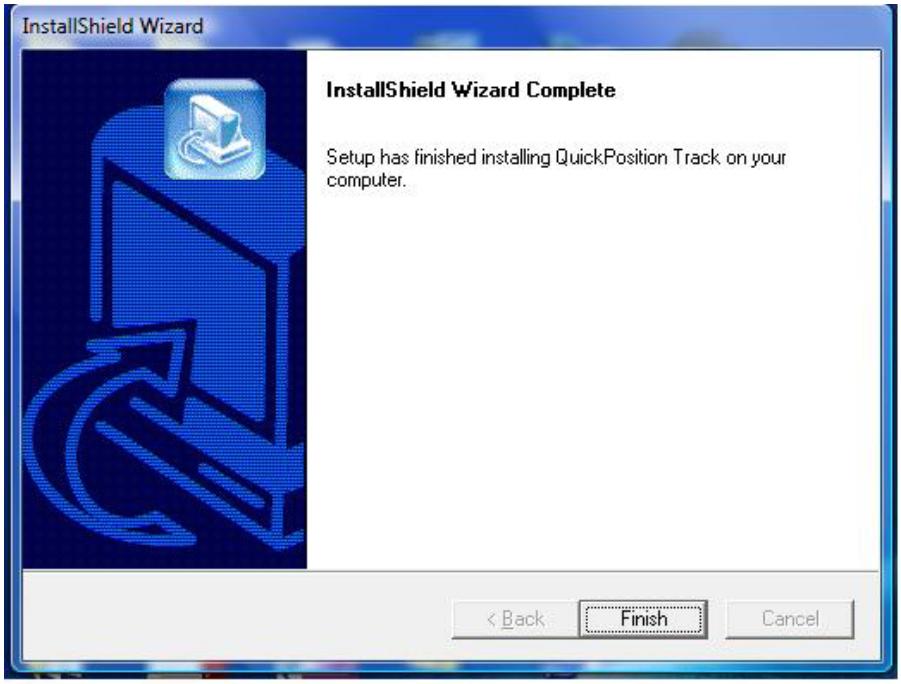

Fig. 1.6 – The last window of installation

Click "Finish" to complete the installation. Software creates a shortcut icon called "Quick Position Track" on desktop.

Chapter II : First actions

Click on “QuickTrack Position” icon, the first screen you see is like fig. 2.1:

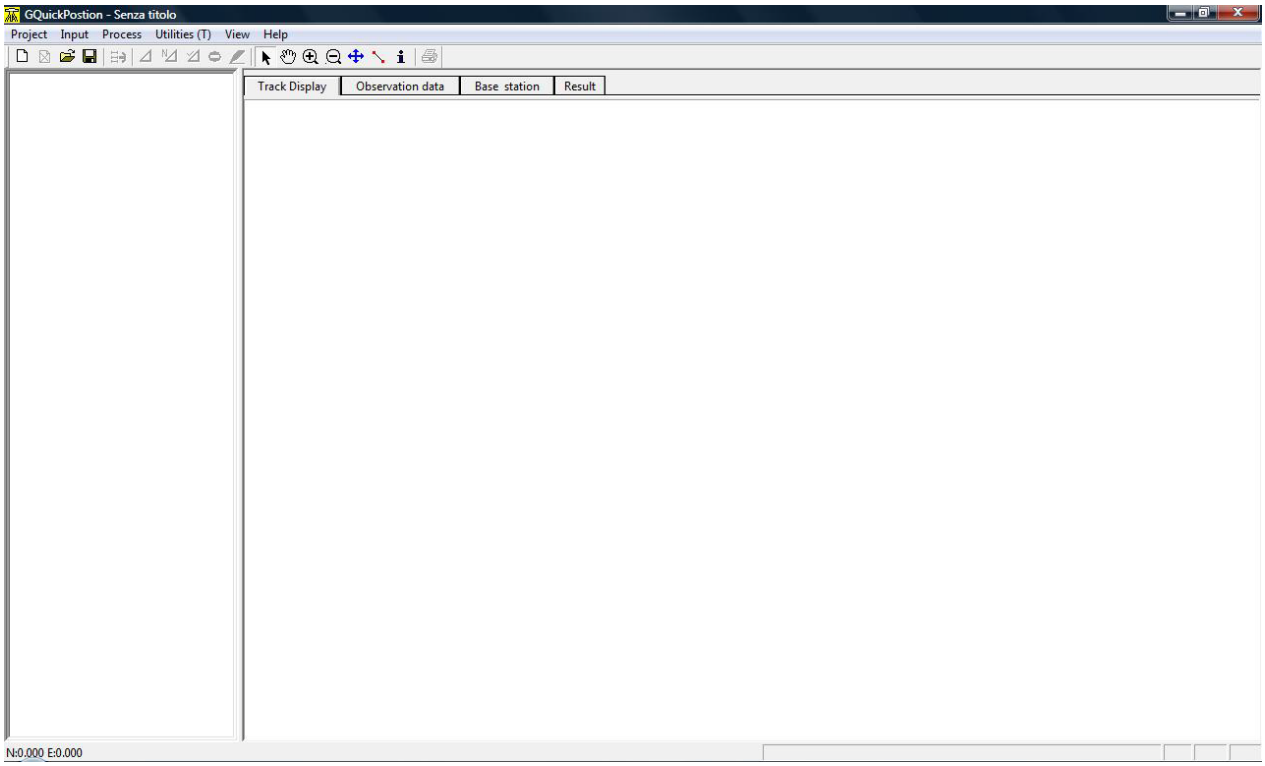

Fig. 2.1 – Main interface

The main interface consists of (from top to bottom) a menu bar, a tools bar, two windows and a status bar: the window on the left shows a summary of the situation, the window on the right can show the details of four different pages.

You must create a new empty project before using the software. In the menu bar click on “Project”, then click on “New”, a window like fig. 2.2 is open:

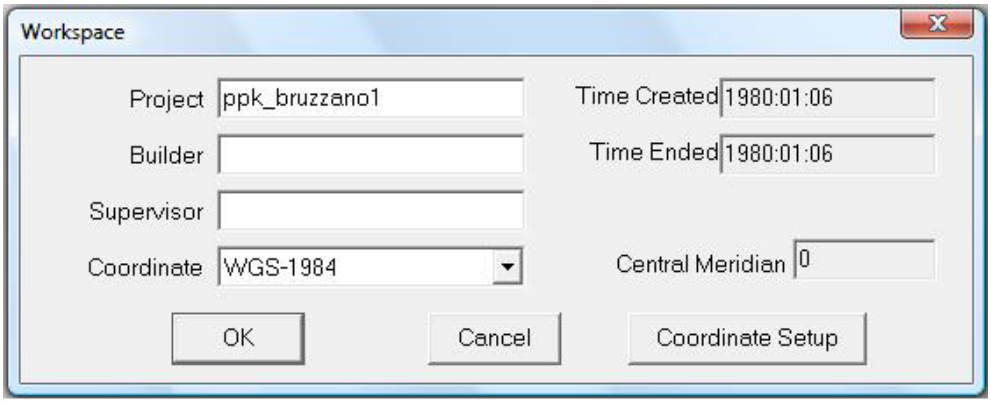

Fig. 2.2 – Project settings

Into "Project" box you must insert the project name， you can also insert builder's name and supervisor name. In "Coordinate" box you can choose the coordinates system: there is a list containing world most used coordinate systems, however, if you don't find your system, click on "Coordinate Setup" box and define a new item. The coordinate system settings window is opened (fig. 2.3):

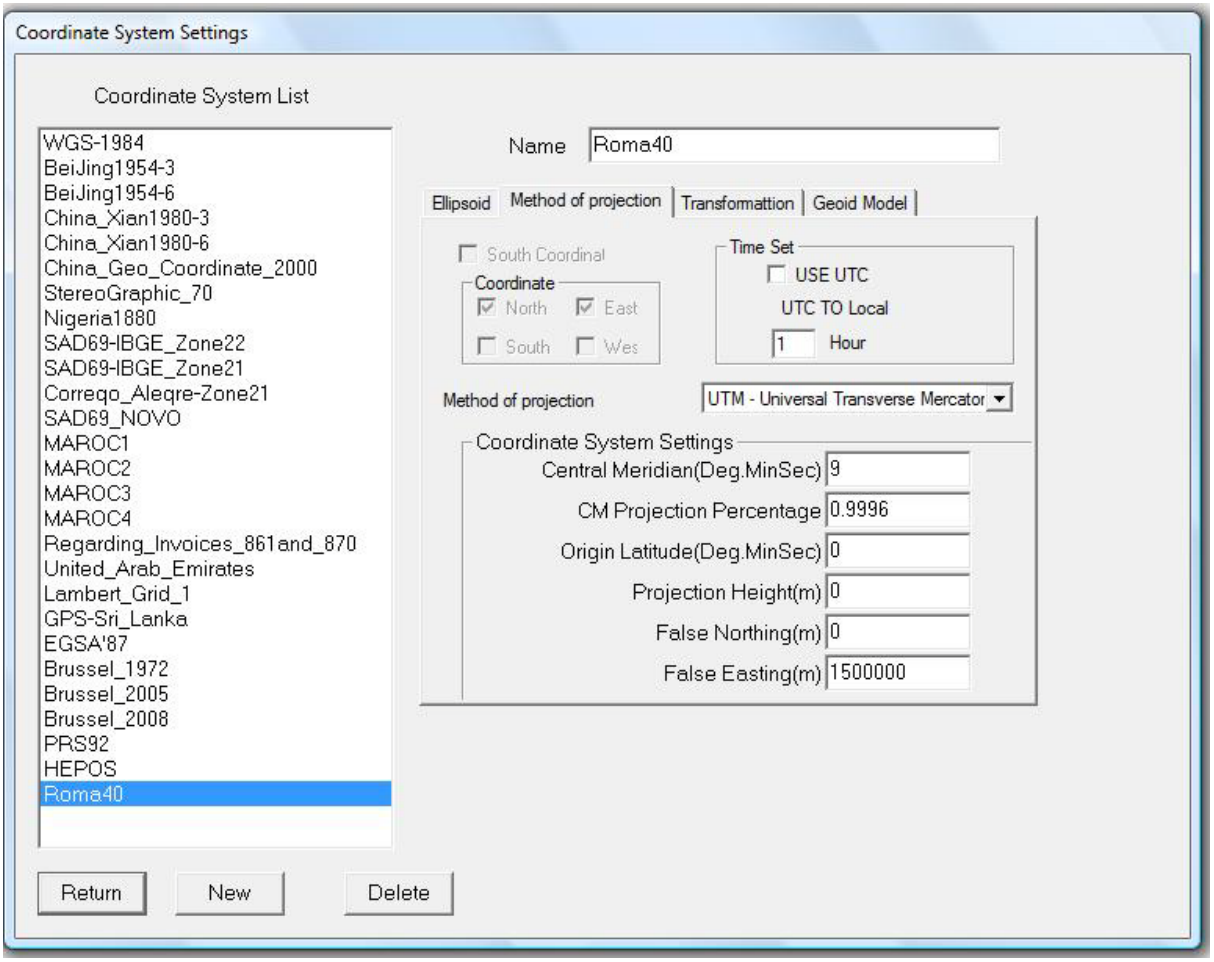

Fig. 2.3 – Coordinate system settings

In this window you can set all parameters necessary to correctly define a coordinate system (ellipsoid parameters, method of projection, geoid model, etc.). Moreover you can modify one of the default systems. When you have finished click on “Return” to come back to project settings window.

In the “Central meridian” box, you can see what is the central meridian of the selected coordinate system.

Chapter III : Main functions

III.1 Moving through the pages

After the selection of a new project, the main interface appears like fig. 3.1:

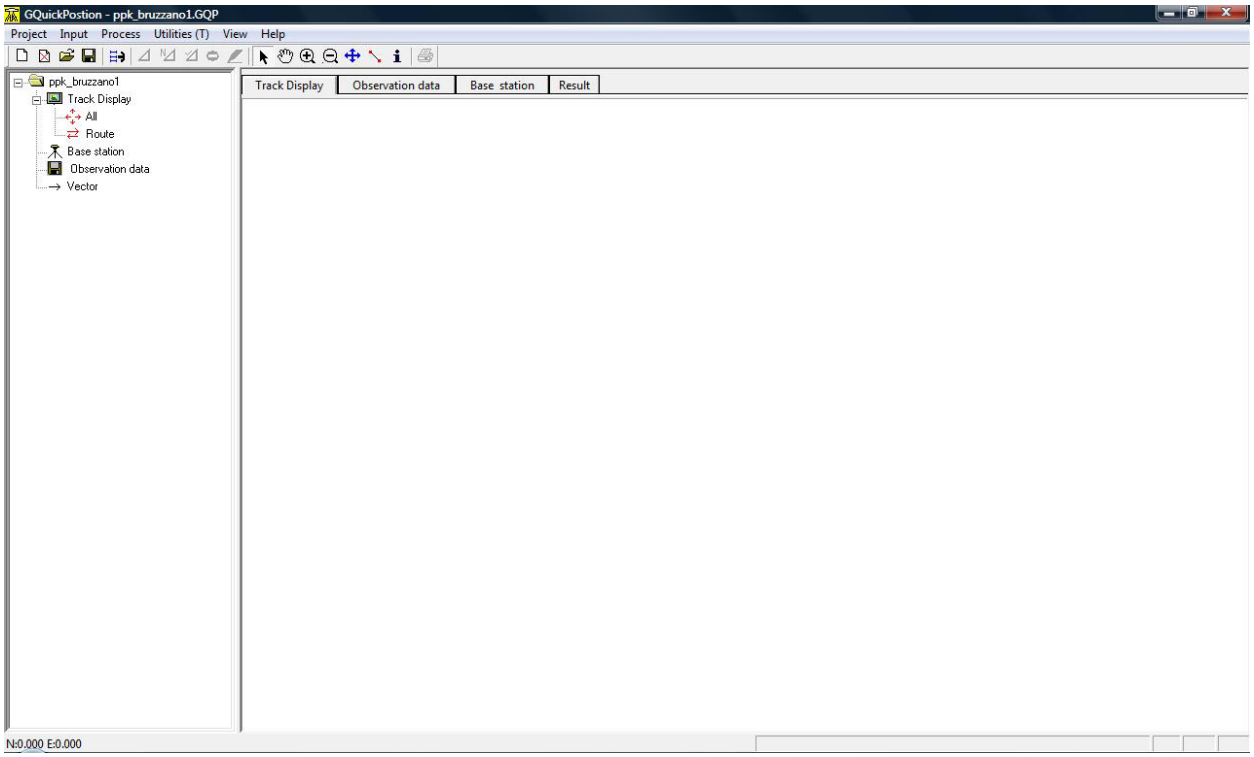

Fig. 3.1 – Main interface after starting a new project

You can see in the window on the left a list of item which can be considered as the components of the project. You can expand them for viewing the elements which compose them, or with a double click you can open the corresponding pages on the left window and display all the detail.

Track Display: It shows on a map the positions of collected point and the tracks joining the points. In the following pictures you can see an example map (fig. 3.2).

Fig. 3.2 – Example map of a baseline

Base station: It shows the coordinates of base stations of the project. By default WGS-84 ellipsoidal coordinate are showed, but user can define Cartesian WGS-84 or local projection coordinates (see as example fig. 3.3).

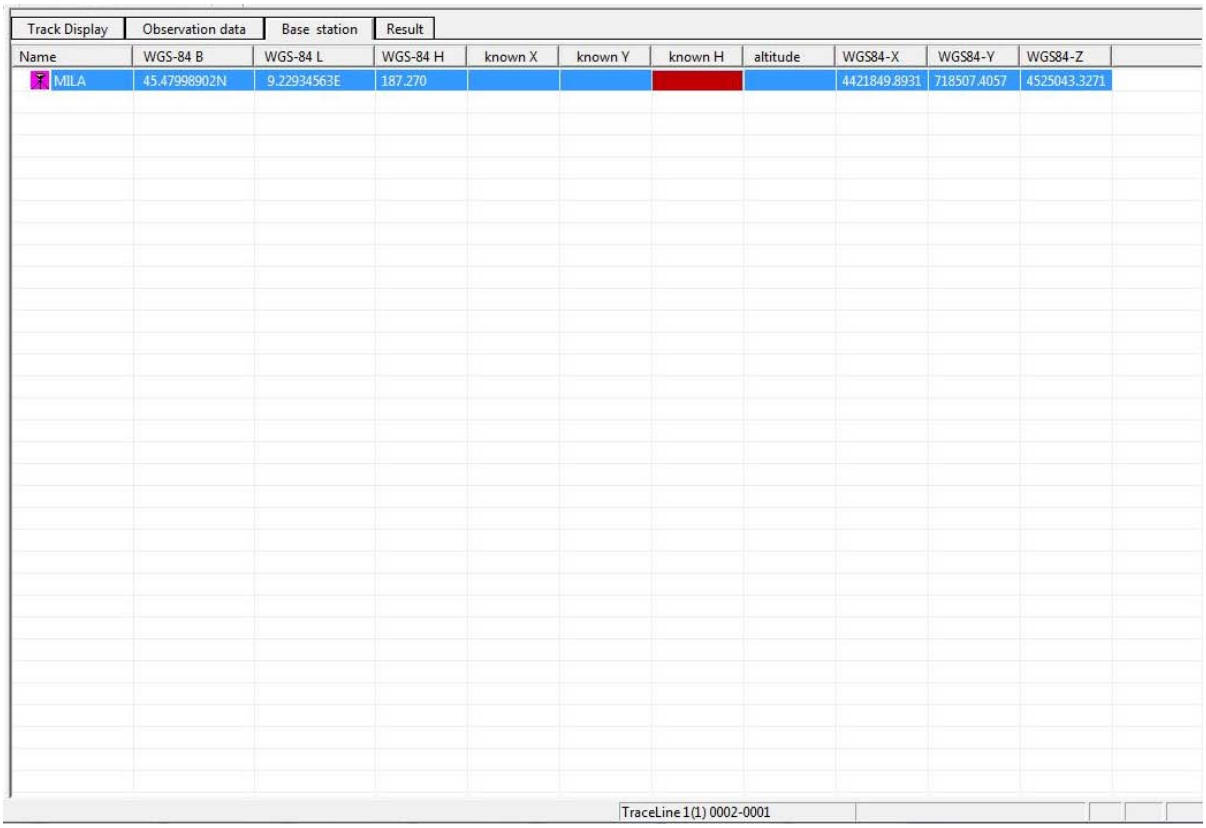

Fig. 3.3 – Example of Base station page

Observation data: It shows detailed information of every raw data file, including the path, name of raw data, name of the site, height of antenna, date, starting and ending time of collecting. In this page you can delete data file and edit antenna height (see as example fig. 3.4). See chapter IV for a complete description of antenna height set.

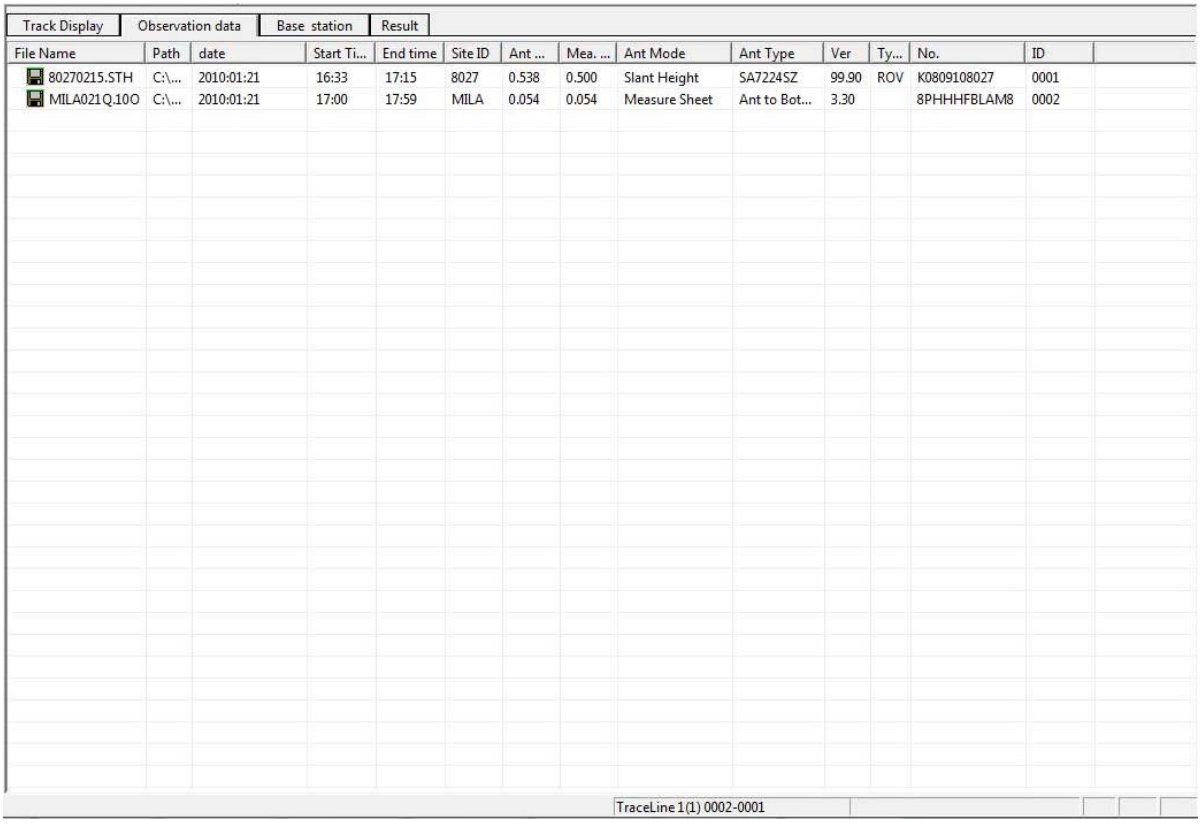

Fig. 3.4 – Example of observation data page

Moreover double clicking on a single raw file you can see a report of the tracked satellites in that file (see as example fig. 3.5).

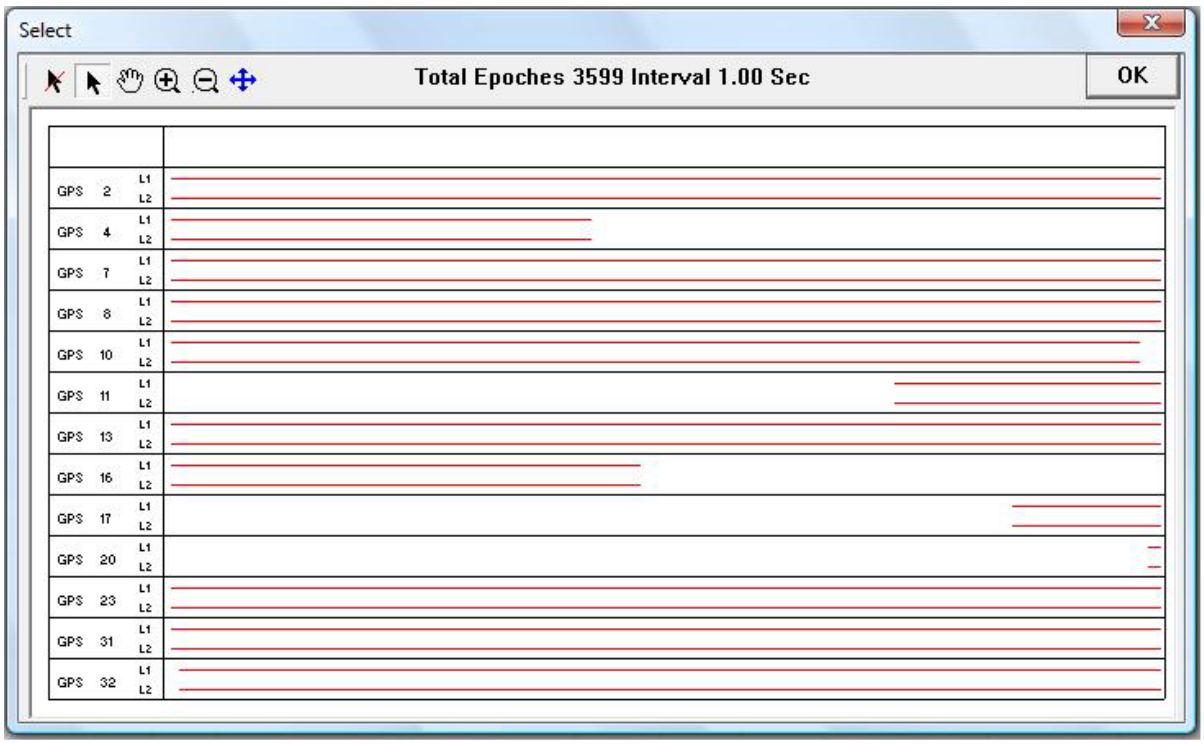

Fig. 3.5 – Example of tracking satellite report

Vector: You can see which vectors were created. Here as "vector" we don't mean a vector between two points, but the ensemble of the vectors created between the base station and the points of a kinematic survey. Double clicking opens the **Result** page**:** you can get some information about the kinematic solution, showing for every points: observation time, satellite number, antenna height, XYH coordinates, predicted rms (root mean square) and kind of observation used (see as example fig. 3.6).

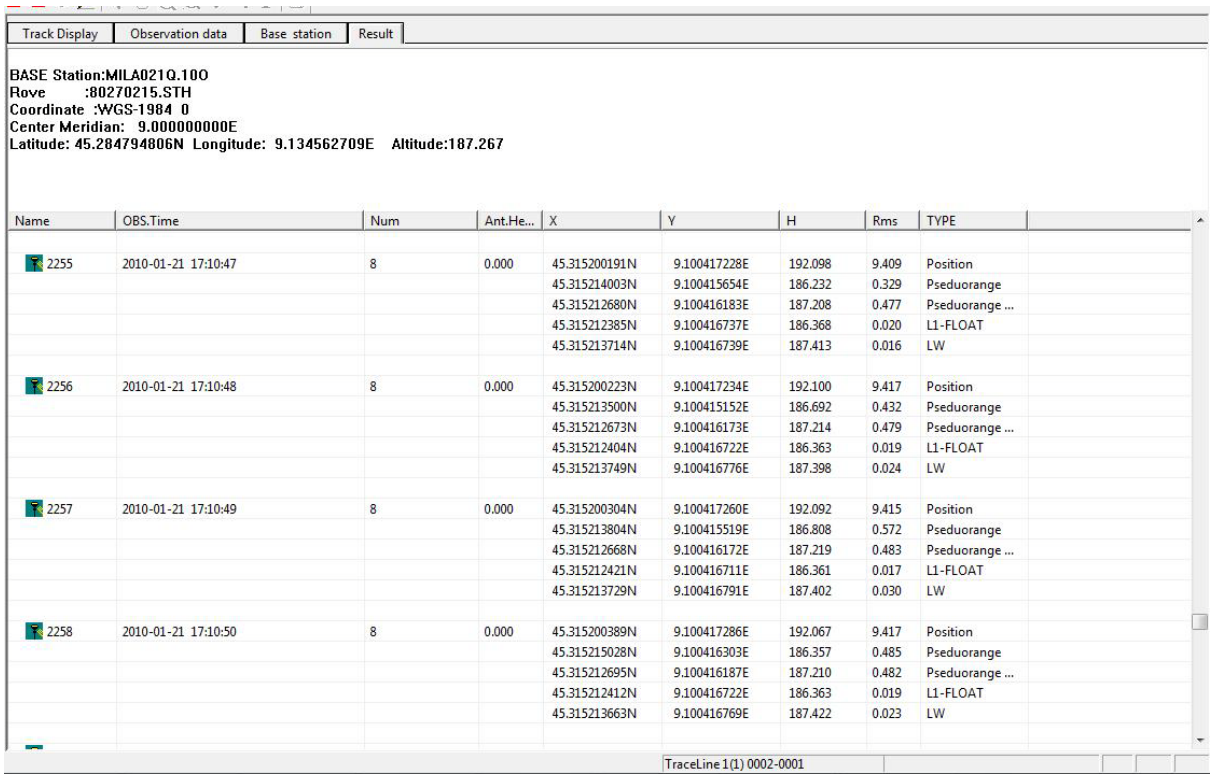

Fig. 3.6 – Example of result page

III.2 Menu bar

In this section the functions of each menu are introduced.

Project menu:

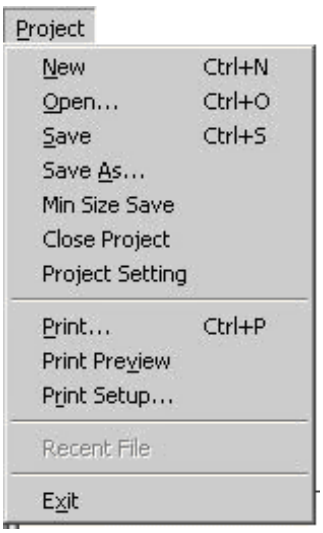

Fig. 3.7 File menu

New: you can create a new project.

Open: you can open a saved project.

Save: you can save the current project.

Save As: you can save the current project to another path.

Min Size Save: you can save the current project with the minimum size.

Close: you can close the current project.

Project setting: you can change the parameters of the project.

Print: you can print the current page.

Print preview: you can show how the current page would be printed.

Print Setup: you can set the printer.

Recent file: at the first start it is disabled, after you have saved a project, you can see the projects recently saved and open them.

Exit: you can exit the program.

Input menu:

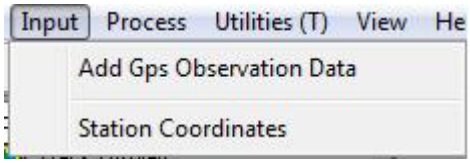

Fig. 3.8 Input menu

Add GPS observed data file: You can add new observed data to the current project. STONEX® format "*.STH" file and standard RINEX 2.0 file (*.**O) can be selected from different paths. Also IGS precise orbit file (*.sp3) can be selected (see as example fig. 3.9).

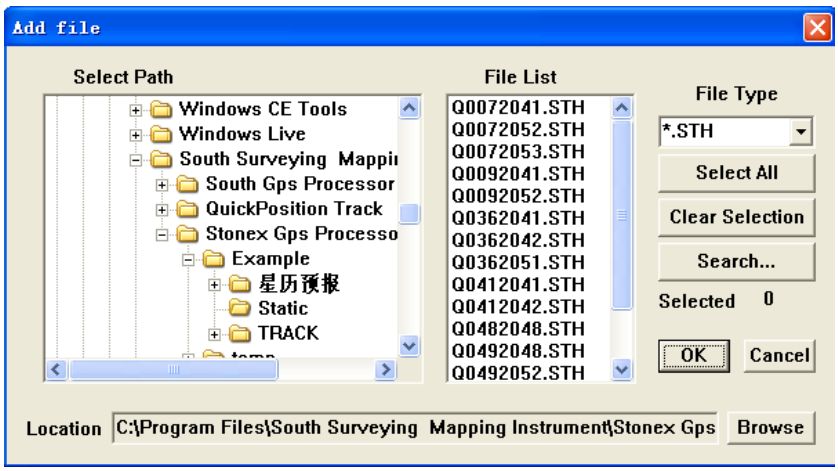

Fig. 3.9 Adding new observed data

Input station coordinates: you can input the coordinate of a reference station (see as example fig. 3.10).

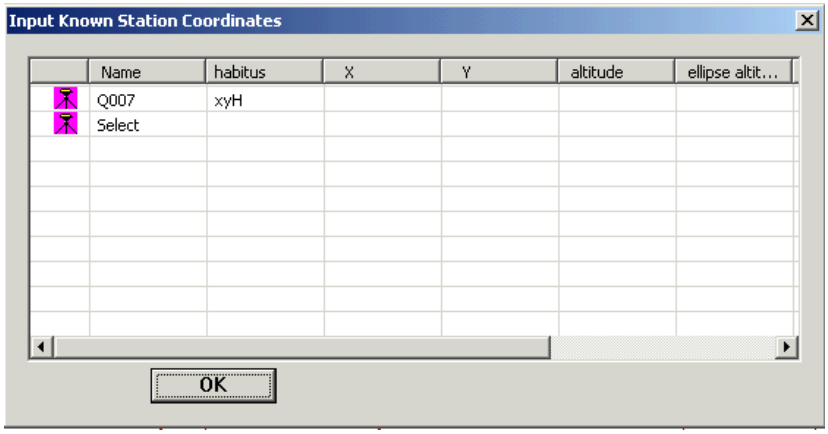

Fig. 3.10 Inserting known coordinates

Clicking under the column “habitus” (fig. 3.11) you can modify the kind of coordinates to insert: tridimensional (“N,E,H”), plane (“N,E”), only altitude (“H”), “nullity” means *?*, “delete” erases the inserted coordinates.

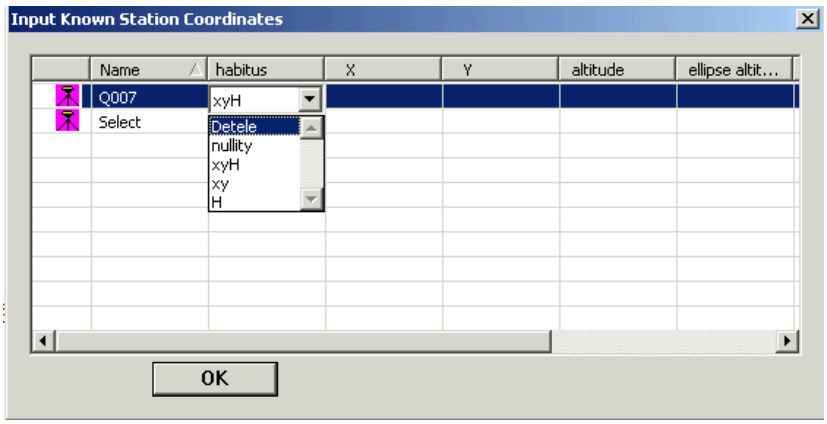

Fig 3.11 Select the status of control points

Process menu:

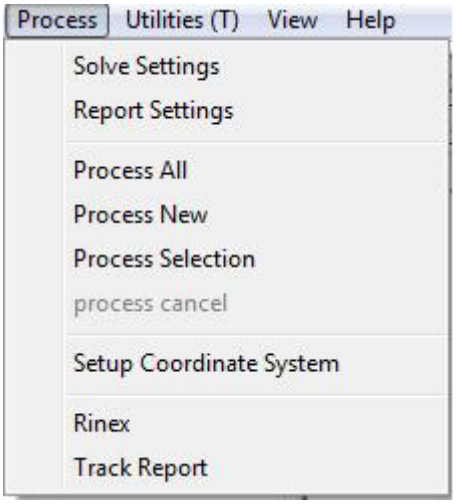

Fig 3.12 Select the status of control points

Solve Settings: you can set the parameters for the kinematic data processing. We dealt with these parameters in more details in chapter IV.

Report Settings: you can decide what data must be contained in the results report and which information are plotted on the map.

Process All: you can start the automatic processing of all vectors.

Process New: you can start the automatic processing of all new vectors.

Process Selection: you can start the processing of the vectors selected on the map.

Process cancel: you can stop a processing in progress.

Setup Coordinate System: opens the Coordinate System Setting window (like fig. 2.3)

Rinex: you can convert .STH file into RINEX 2.0 format

Track Report: you can export the processing results according to Report Settings properties.

Utilities (T):

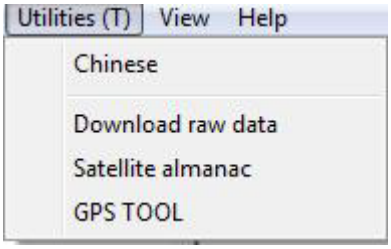

Fig. 3.13 Utilities menu

Chinese: you can choose the Chinese interface.

Download raw data: not used.

Satellite almanac: this command open a small independent program included into STONEX® GQuickPosition and called "Star Report". It has the function of showing the satellite configuration depending on time and position selected by the user. chapter V is dedicated to its description.

GPS TOOL: not used.

View menu:

Fig. 3.14 View menu

From this menu you can activate o deactivate the tool bar and the status bar.

Help menu:

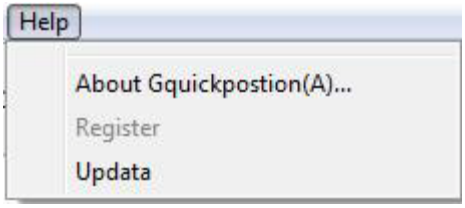

Fig. 3.15 Help menu

About: you can see some information about the software version (see as example fig. 3.16).

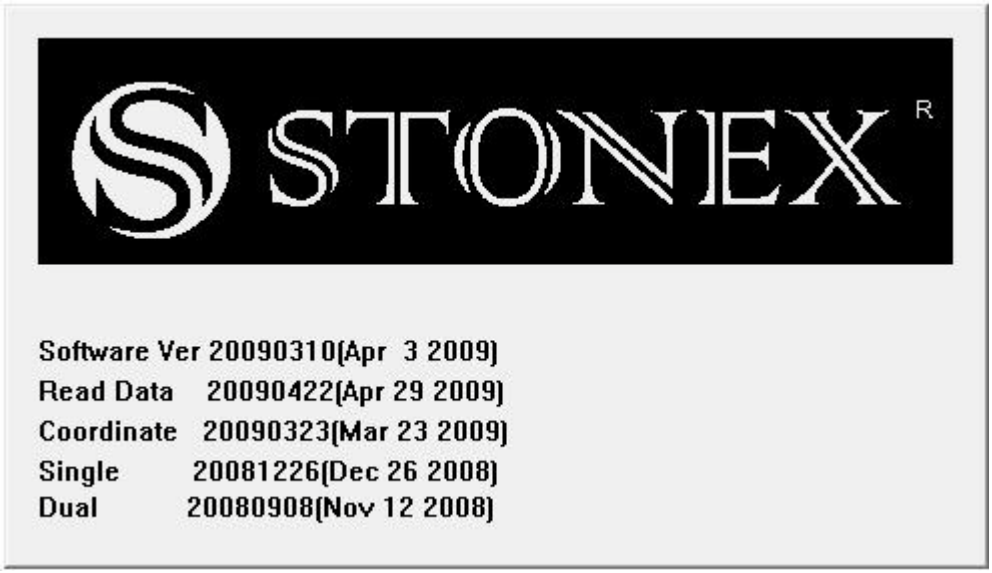

Fig. 3.16 Version number of the software

Register: not used

Updata: not used.

III.3 Tool bar

The tool bar is composed by many icons (see fig. 3.17):

Fig. 3.17 The tool bar

Some of them have the same function of some menu commands, other icons are commands which modify the map layout. A description of every icon moving from left to the right follows:

 : You can open a new project.

 : You can close the open project.

 : You can open an existing project.

 : You can save a project.

 : You can add GPS observation data.

: You can start to process all vectors.

: You can start to process new vectors.

: You can start to process selected vectors.

: You can stop processing in progress.

: Open “Input known stations coordinates” window.

: You can select a vector on the map.

: You can move the map.

: You can zoom in the map.

: You can zoom out the map.

: You can zoom out the map in order to view all features.

: You can measure the approximate distance between two points.

: You can select a point on map and find out its position and accuracy.

: You can start the printing procedure of the results.

III.4 Layer Control

If you click with mouse right button on the map a window like fig. 3.18 is opened:

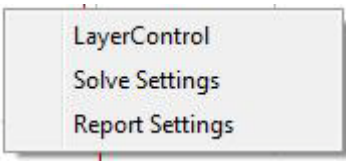

Fig. 3.18 Available commands on map

Beside of selecting again “Solve Settings” and “Report Settings” , the command “Layer Control” allows user to modify the properties of the map. A window like fig. 3.19 is opened:

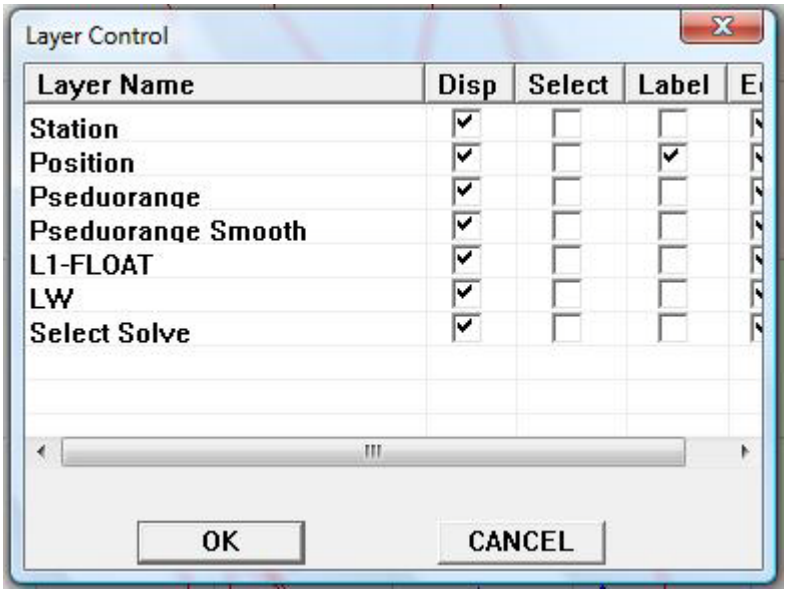

Fig. 3.19 Layer control window

From this window user can enable or disable different data layers on map, make them selectable or draw the labels. Sometimes indeed the map results too confused because of lines, points, labels, so become necessary to disable some layers for a more comprehensive plot.

Chapter IV : The processing

This chapter is dedicated to a detailed explanation of kinematic processing settings. As we said also in the introduction if you need some theoretical explanations on processing techniques we recommend to read general GPS books.

IV.1 Raw data editing

Before starting to process, there are two important matters to be discussed. The first is the problem of correctly set the antenna height. After you have loaded an observation .STH file from a survey, in the "Observation Data" page, you can see that the column "Ant High" and "Mea. Ant High" are set to 0 by default (see fig. 4.1).

Ant High	Mea. Ant High	Ant Mode	Ant Type	V
0.000	0.000	Line of Edge of antenna	SA7224SZ	9

Fig. 4.1 Detail of Observation Data page

You have to write into "Mea. Ant High" the height measured during the survey and select in "Ant Mode" the correct method of measure. There are five possible method: "Bottom of antenna phase", "Line of Edge of antenna", "Bottom of antenna mount", "Line of edge of Toll" and "Bottom of antenna". All methods cannot be applied to every receiver, each one usually allows two or three methods according to its shape. For example STONEX® S9 GNSS or the previous model STONEX® S82+ allow to take the measure of "Line of Edge of antenna", "Bottom of antenna mount" or "Bottom of antenna". You can find a description of the methods on the receiver user guide. Once you have chosen the correct method, software will automatically calculate the "Ant High", that is the real vertical antenna phase center height. Please note that a selection of a wrong measuring method could introduce a bias of several cms in your results.

If you import RINEX file, the antenna height is just defined.

The second matter deals with the opportunity to edit the raw data. In the "Observation Data" page double click on an item: a window like fig. 4.2 is opened.

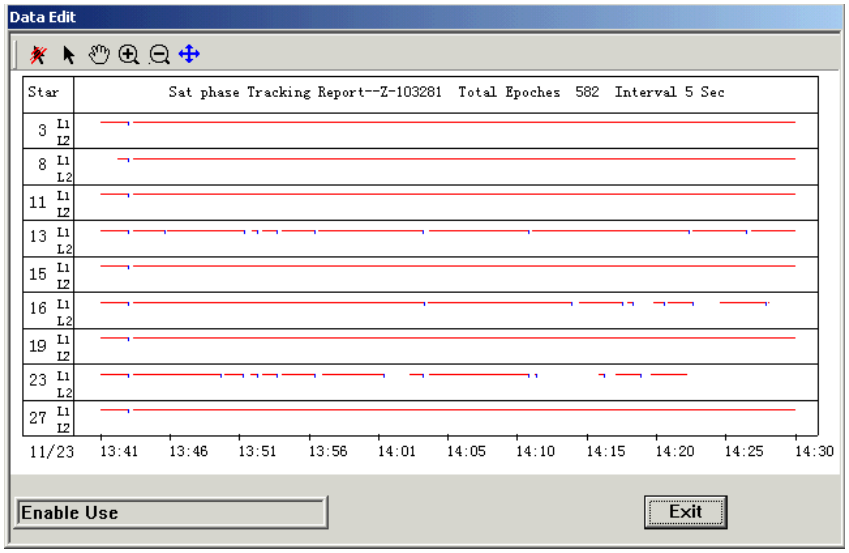

Fig. 4.2 Data Edit window

Every red line corresponds to one satellite signals. The break of red lines means signal interruption. You can delete these epochs with one or more signal interruptions using the tool  , while using  you can resume the deleted epoch. After you have completed the editing, exit the data editing box. This editing could improve your processing results.

IV.2 Kinematic processing settings

If you click on the item “Solve Settings” in the “Process” menu, a window like fig. 4.3 is opened:

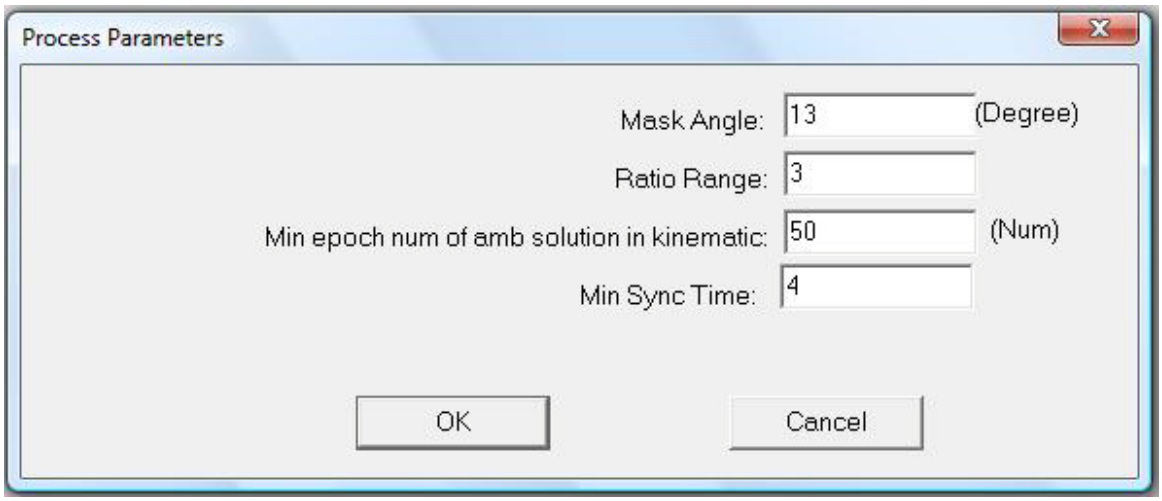

Fig. 4.3 Solve Settings window

You can modify four parameters, which take part in the processing.

Mask Angle: it is the minimum accepted satellite elevation, if an observation has a lower elevation it is rejected in the computation.

Ratio Range: it is the maximum variance ratio of ambiguity resolution accepted.

Min epoch num of amb solution in kinematic: It is the minimum epoch number accepted for processing a kinematic track.

Min Sync Time: It is the minimum synchronized time (in minutes) accepted for processing a kinematic track.

Chapter V : Star Report

This special function of Processor opens a small separate software, which can be very useful to the surveyors. It gives to users the opportunity of see the satellite positions and configuration above a specific site at a chosen time. This allows the surveyor two possibilities: to better schedule a survey in the near future, avoiding bad satellite configurations, and to select the suited data to be processed.

V.1 Satellite maps

When you click on "Satellite Almanac" function, it is showed a window like fig. 5.1:

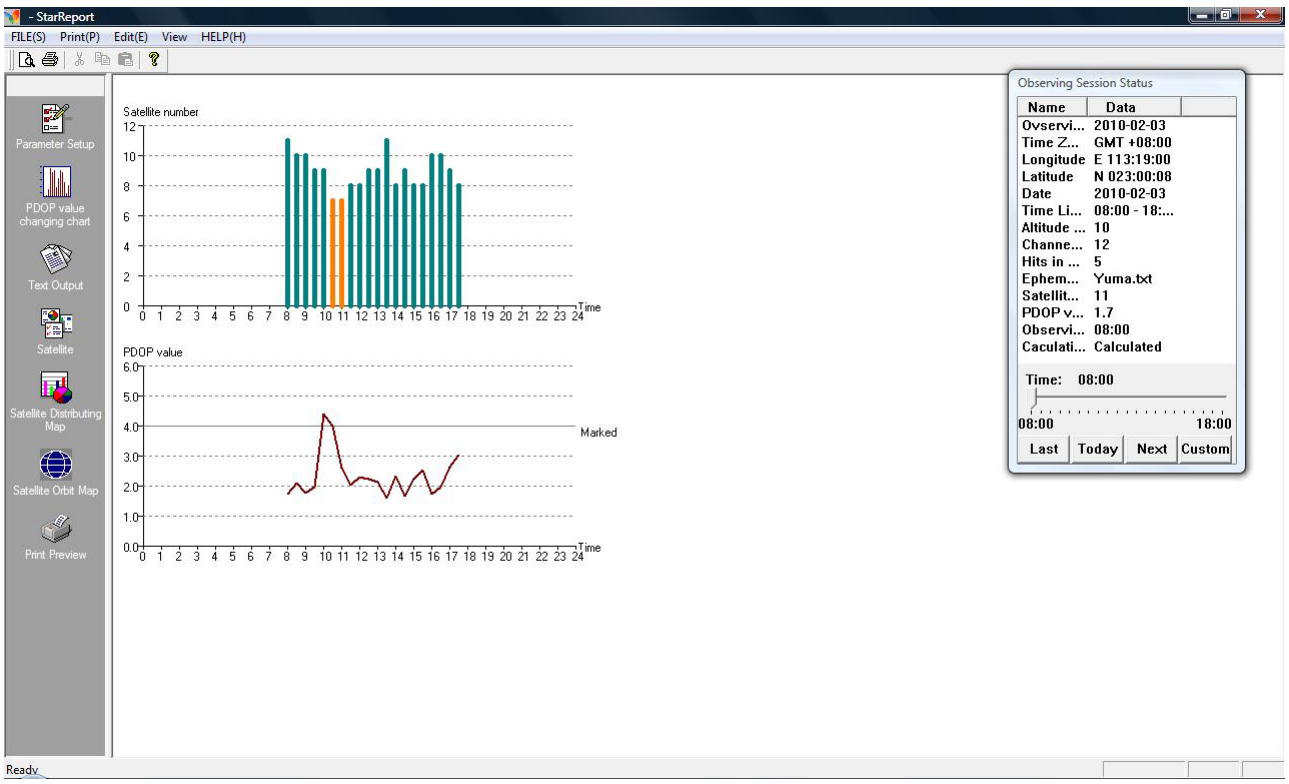

Fig. 5.1 Main interface of Star Report

For the users there are many different maps or graphs to consult. In fig. 5.1 you can already observe two interesting graphs. The graph on the top of the page shows the number of satellites which the receiver will observe or has observed in good visibility conditions

depending on the time. The less favorable conditions are showed with a different colour. In the lower graph user can observe the position dilution of precision (PDOP) values depending on time. The PDOP parameter is one of most used indexes of good quality of satellite configuration: a PDOP lower than 2 points out a very good configuration while a PDOP above 4 or 5 means a bad configuration. Combining the outputs of these two graph is just possible to determine the best time for a survey.

If user needs more precise information about single satellites, he can click on the icon above "Satellite Orbit Map" (placed on the left menu). A new map is opened like fig. 5.2.

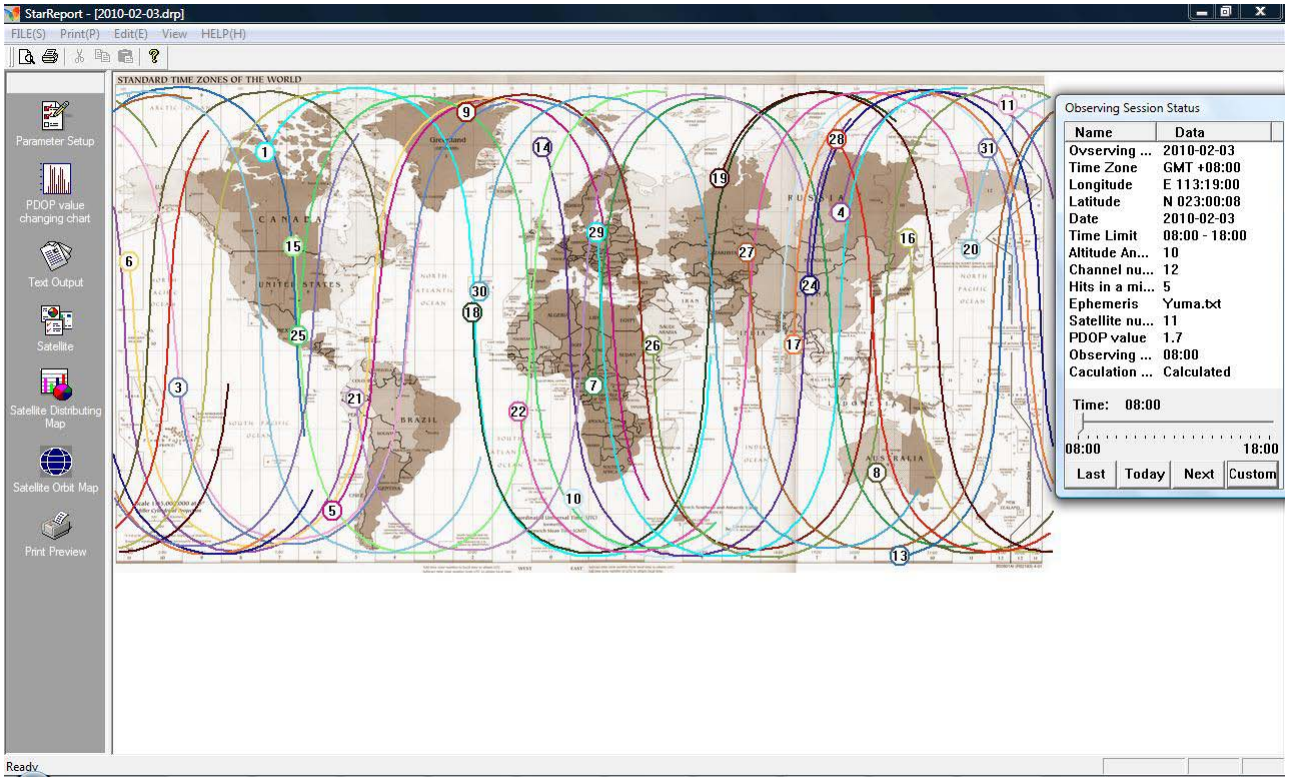

Fig. 5.2 Satellite orbit map

In this map it is possible to see the path of every satellites on the Earth surface e its position at chosen time.

If user click on the icon above "Satellite Distribution Map", a window like fig. 5.3 is opened.

Fig. 5.3 Satellite distribution map

This map shows the satellite path and position from the point of view of the receiver and allows user to observe the elevation and azimuth of every satellites. In case of an obstacle which affects the sky visibility, user can also verify, using this map, how this obstacle compromises the survey.

If user click on the icon above “Satellite Map”, a new window like fig. 5.4 is opened.

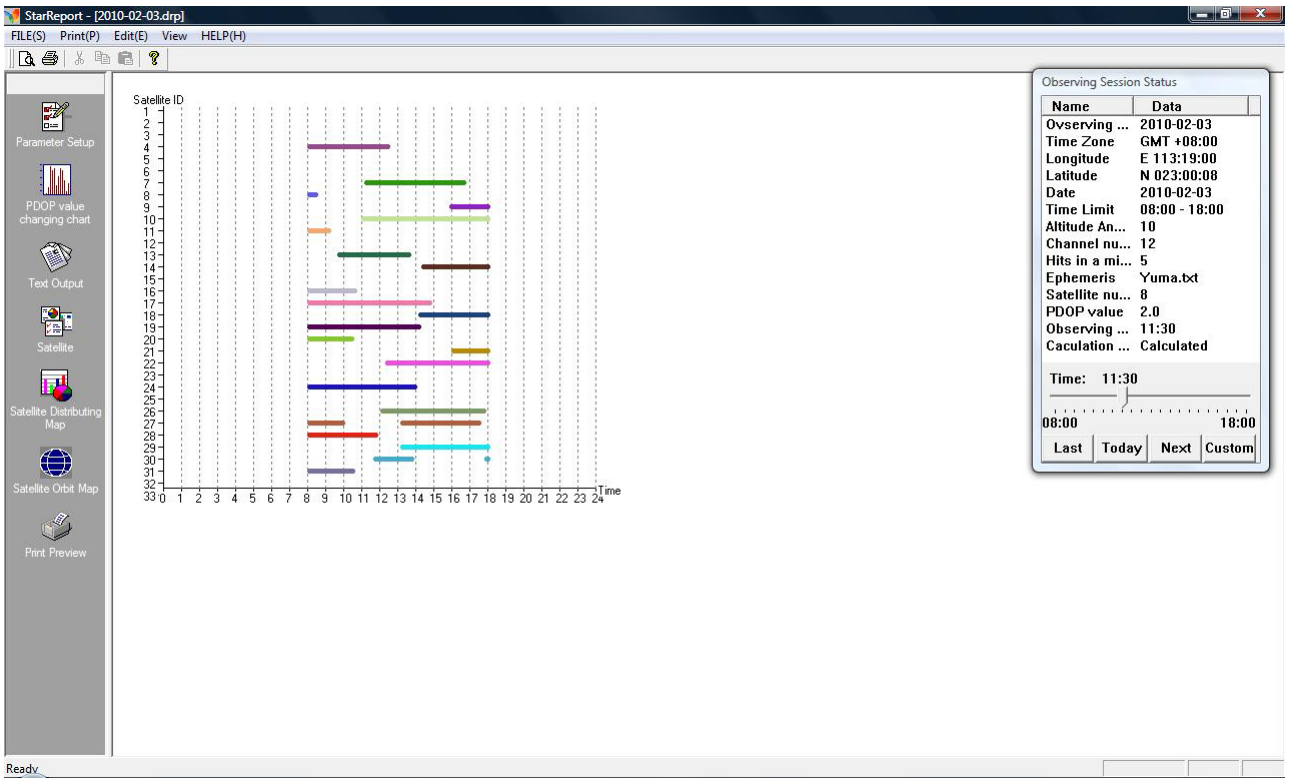

Fig. 5.4 Satellite map

In this map user can see the time intervals in which each satellite is visible.

Finally if user click on the icon above “Text output”, he can see the elevation of satellites and PDOP values summarized in a text format (see as example fig. 5.5).

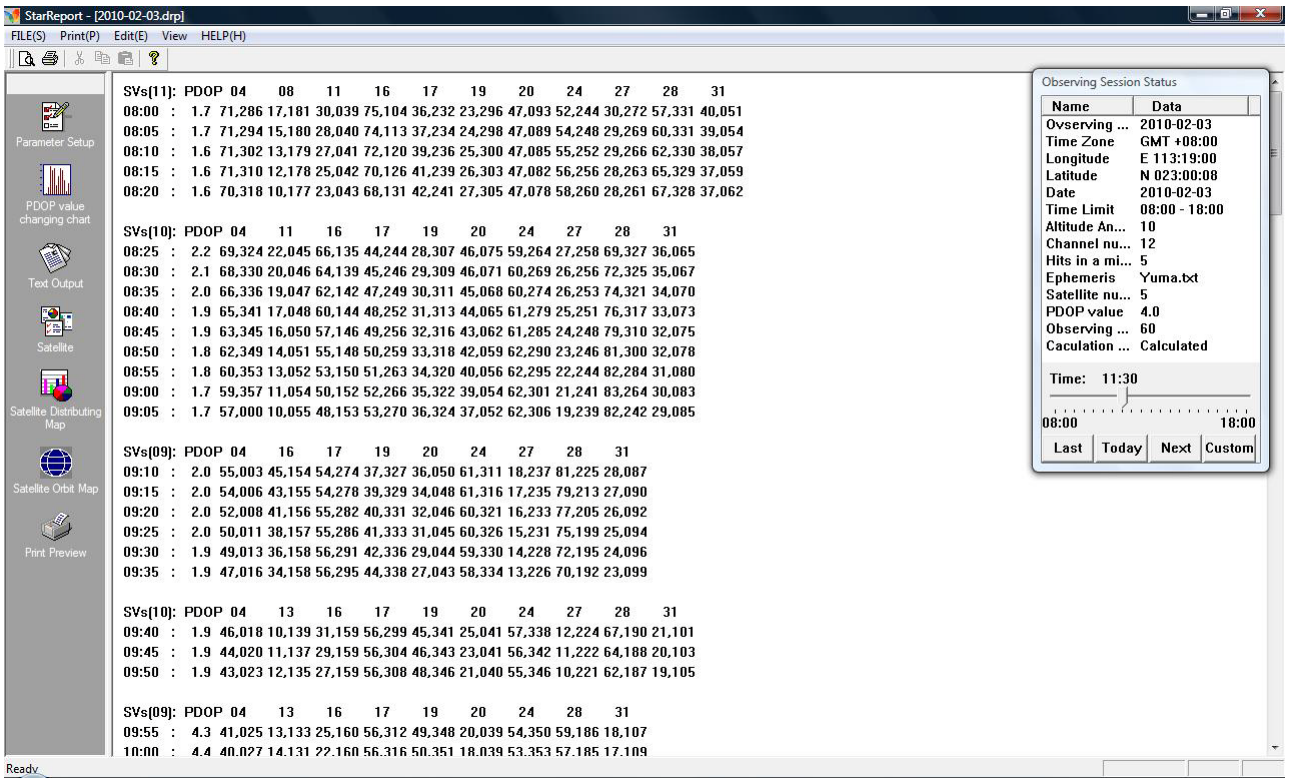

Fig. 5.5 Text output page

V.2 Site and time settings

In this section it is explained how to set all parameters of Star Report. If you click on the icon above “Parameter Setup” a window like fig. 5.6 is opened:

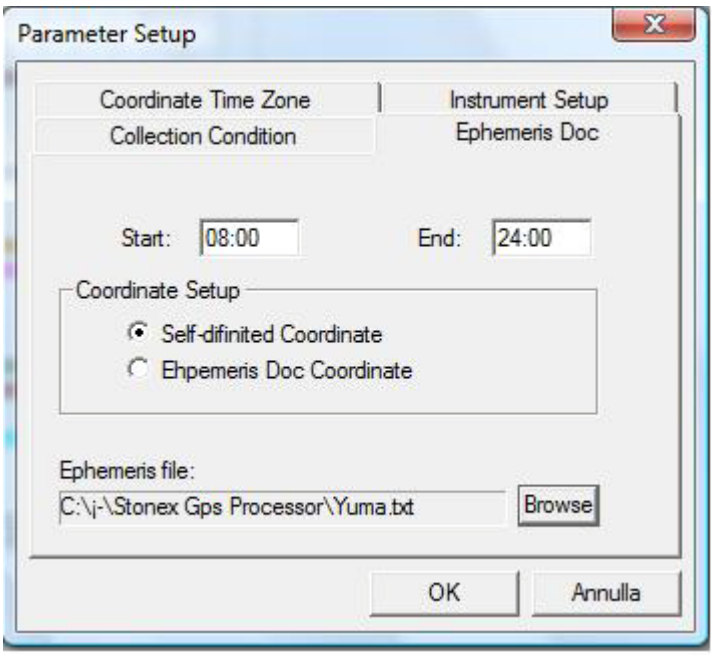

Fig. 5.6 Parameter Setup window

This window is composed of four sub-windows. The default sub-window is "Ephemeris Doc" and allows to define the interval of time considered for creating the maps and graphs. Moreover you can update the ephemeris file: this is a text file containing the orbital parameters of all GPS satellites. The satellite configurations showed in this software are based on the ephemeris file. It is necessary sometimes to update this file in order to have a more precise maps. We recommend to use the ephemeris file from website:

http://celestrak.com/GPS/almanac/Yuma/ , you can find there a week update.

Clicking on "Coordinate Time Zone" you can enter into another sub-window (see fig. 5.7).

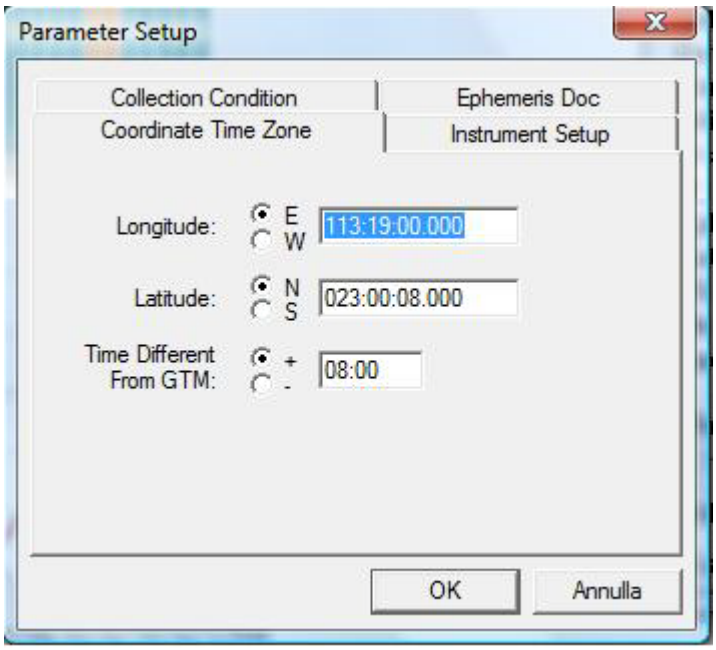

Fig. 5.7 Coordinate Time Zone sub-window

From this sub-window you can define the reference coordinates for the maps: the positioning has a precision of one thousandth of second, that is about 30 cm. It is not possible to define the altitude, so every point is considered at the sea level.

In "Instrument Setup" sub-window you can define the minimum satellite elevation below which a satellite is not considered in the maps, the sampling time interval of the maps and the number of channels, that is the maximum number of satellites collected by receiver (see fig. 5.8).

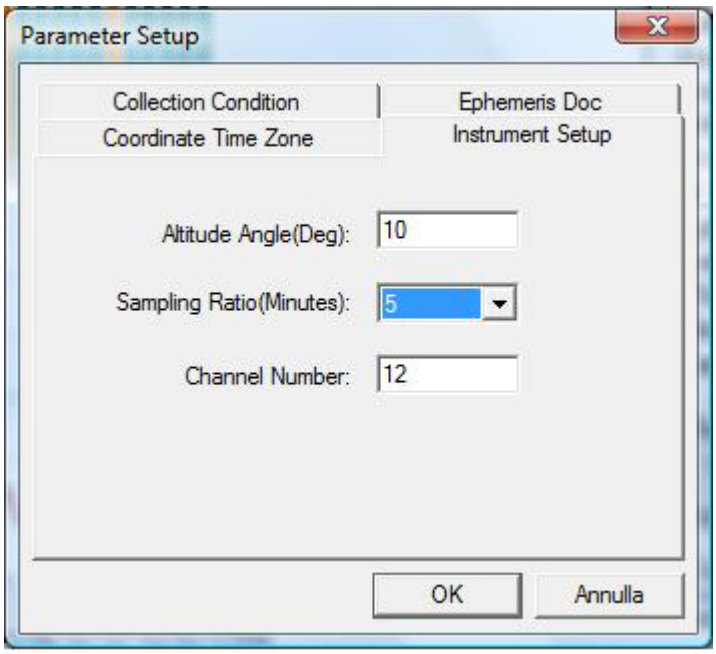

Fig. 5.8 Instrument Setup sub-window

In the "Collection Condition" sub-window user can define the minimum number of satellite and the minimum PDOP which define a limit condition which split up the considered timespan into a good and a bad situation (see fig. 5.9). This limit is showed into the PDOP graph by a line and with different colours in the graph of the number of satellites.

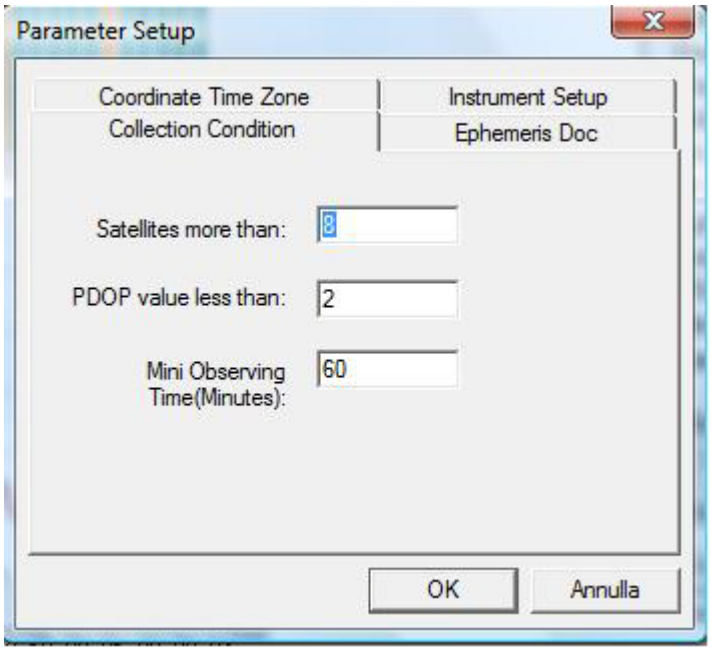

Fig. 5.9 Collection Condition sub-window

In the mainframe of Star Report on the right there is a window called “Observing Session Status” (see fig. 5.10). In this window it is possible to select an hour using the scroll bar and select a day using the commands “Last”, “Today”, “Next” and “Custom”.

Fig. 5.10 Observing Session Status window

Finally you can print every map you want clicking on the print menu in the menu bar.