

GM3D

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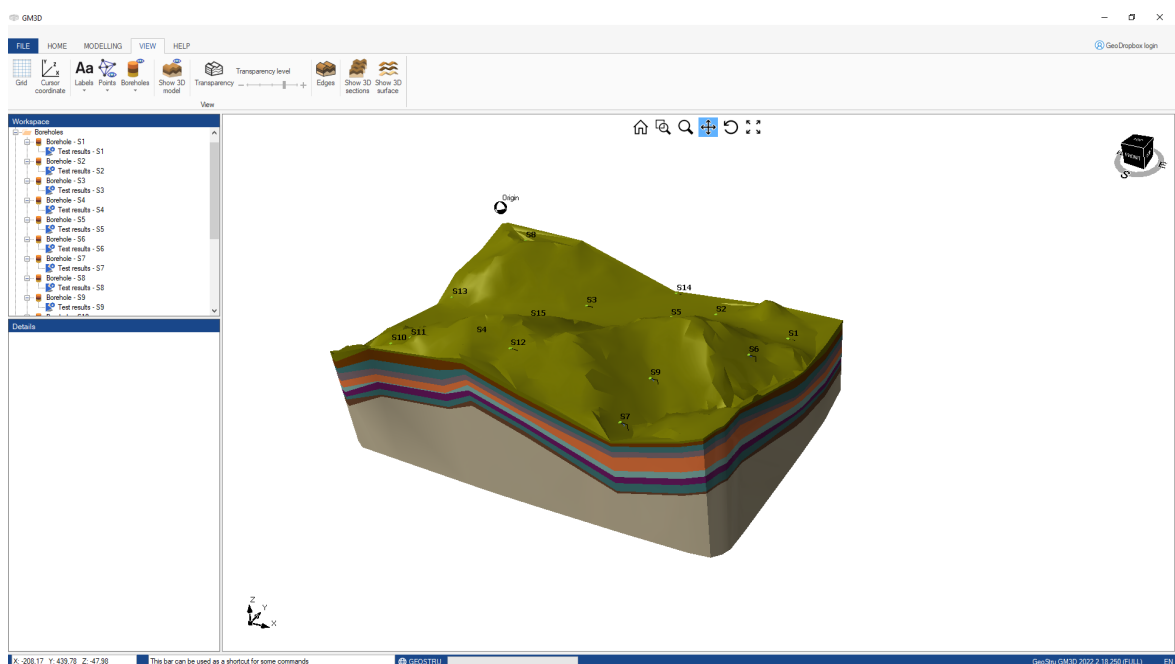
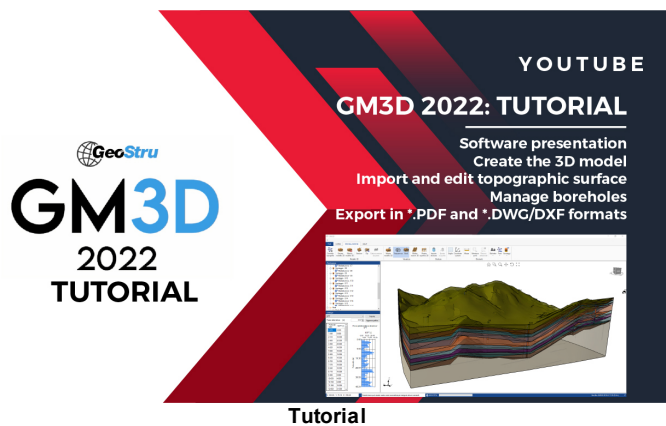
1 Introduction

[GM3D](#) is a software for **BIM geological and geotechnical modelling**, which reconstructs a layered tridimensional model of the underground through 3D modelling algorithms.

The surveys can be imported from: TXT, AGS4, EDP

After the elaboration of the 3D model you can create bidimensional sections which can be exported for successive elaborations for different case studies like: stability analysis, rock mechanics, etc.

Video Tutorial:



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2 Structure of the app

The basic commands are grouped in the following tabs:

- 1.HOME;
- 2.MODELLING;
- 3.VIEW;
- 4.HELP.

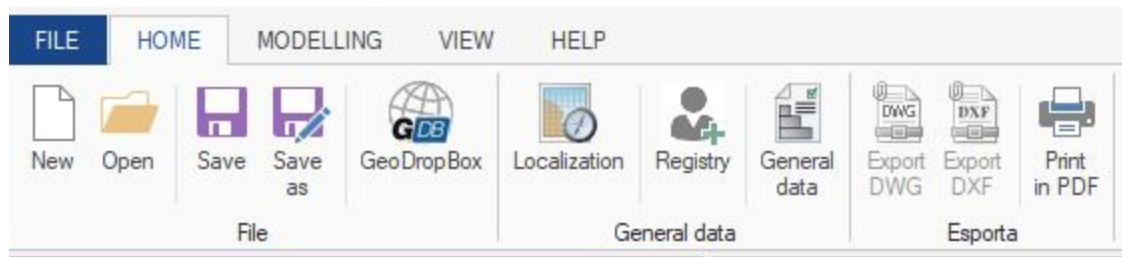
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2.1 HOME

In the **HOME** menu it is possible to handle the opening and saving of the projects, both in the traditional way and through the [GeoDropBox](#).

In the **"General Data"** section it is possible to insert the information regarding the project, like the localization of the site, the anagraphic information and a description of the project.

In the **"Export"** section you can find the commands to export the projects in file DWG 3D, dxf or in PDF.



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2.2 MODELLING

In the **MODELLING** menu it is possible to handle input data and to create the 3D model.

After uploading the topography, it is possible to do a check on the points of the surface by clicking on **"Check topography"**, with this option the

topographic surface, if necessary, will be corrected in order to optimize the 3D model.

The **"3D model"** button shows a menu through which it is possible to choose the type of modelling to use, that is geometric type of modelling, possible in the case of regularity in layers present in the surveys, or a manual type of modelling, in which the manual connection between the layers of the different surveys is requested.

Once you created the model, clicking on **"Section"**, it is possible to track down the lines along which we will be creating the sections of the model.

Another way to carry out the sectioning is by clicking on **"Clip"**, which will generate a plan through which it will be possible to see the inside of the model, after finding the spot in which we want to carry out the sectioning, it will be possible to click on **"Capture floor section"**.

Through **"Import structure"** it is possible to import DWG or DXF files of a 3D structure to place in the inside of the model.

Through **"Move to point"** you can move the imported structure, positioning it in a specific spot of the model.

In the tools section, it is possible to measure the distance between two points clicking on **"Measure"**, or selectioning and removing points from the topographic structure clicking on **"Select points"** and consequently on **"Remove selected"**.

By checking the **"Uniform surface inferior of the 3D model"** box, when the model is created, a horizontal surface even as the lowest point on the 3D model will be created as inferior surface of the model, by building the model without checking the box, the inferior surface will have a trend defined by the presence of the other surveys and by the topography.

Through the **"Survey size"** command it is possible to size the survey according to your needs, in relation to the model.



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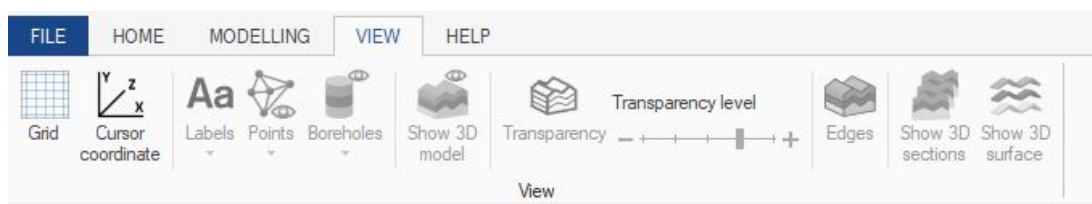
2.3 VIEW

From the **"VIEW"** menu it is possible to handle the visualization of the objects and of the 3D model, for example it is possible to view the grid, the coordinates of the cursor in the inside of the model, or turn off or on the layers of etiquettes connected to the points, the layer of the points, and of the surveys or the tests connected to the them.

Through **"Transparency"** it is possible to make the surfaces of the model transparent.

"Borders" is used to view the borders of the model.

"Show 3D sections" and **"Show 3D surfaces"** allow you to view the sections on the model, and the inferior surfaces of the different layers in the model.



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3 Structure of the input model

The input model is mainly defined through:

- 1.The topographic surface: The aforementioned surface is defined by a data structure that defines a dimensioned plane (set of points with x, y and z coordinates);
- 2.Point stratigraphic profiles, or surveys: can be imported from EDP files, known GEOSTRU data exchange format, or EDPGLOBAL

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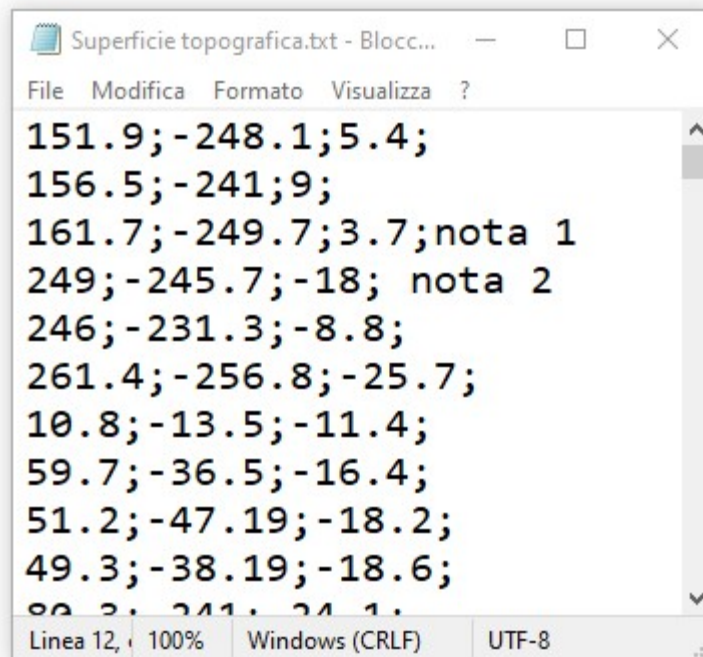
3.1 Topographic surface

It is possible to work on the topographic surface by importing it through a text file, CSV or GMT, or by manually inserting the points.

The .txt text file containing the points of the topography must have the following formatting:

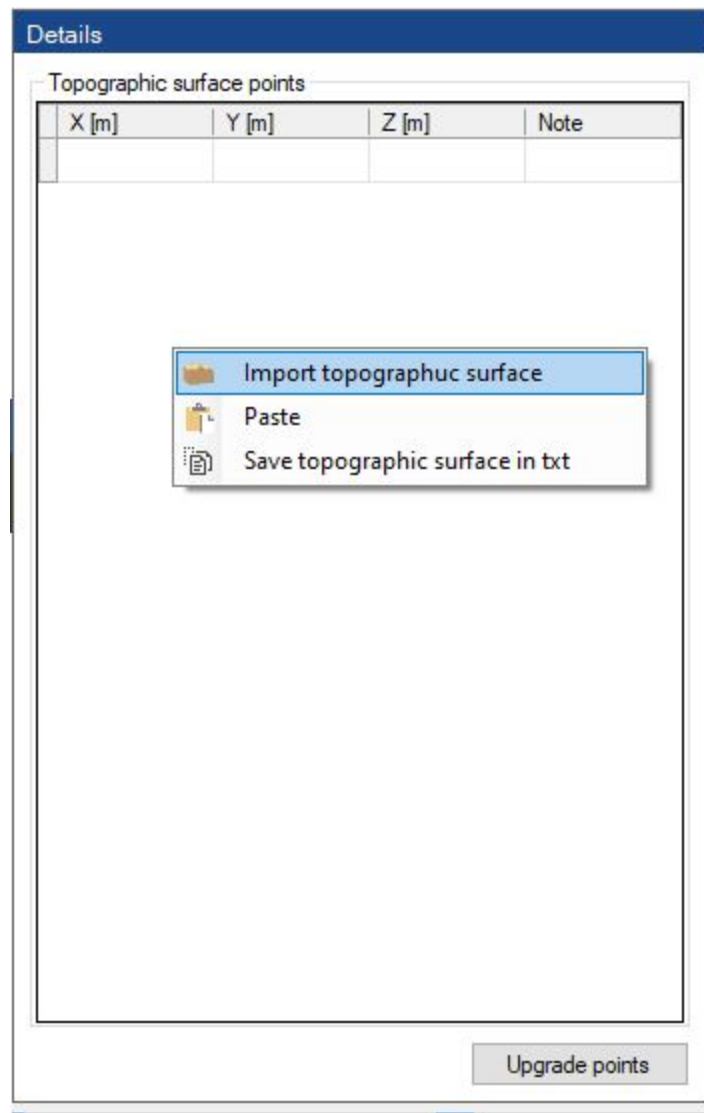
In the case of XYZ coordinates the file must have 4 columns separated by a semicolon as shown below, so:

X coordinate;Y coordinate;Z coordinate;note



The .csv files must consist of 4 columns composed as above.

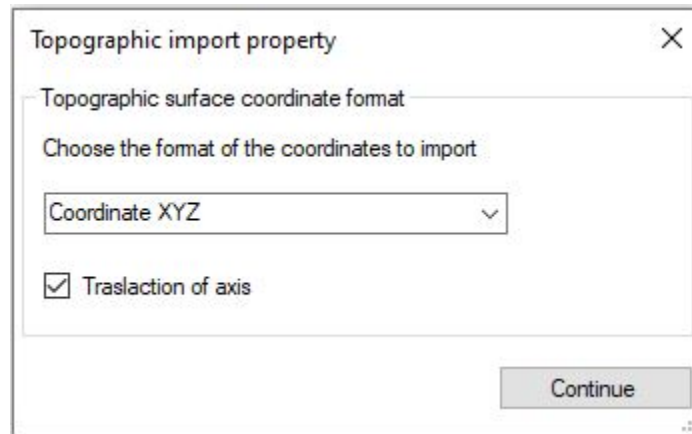
To import the topographic surface it is possible to select the file to import and by dragging it to the **"Topography"** button or by clicking with the right button of your mouse on the point table and therefore on the **"Import topographic surface"**.



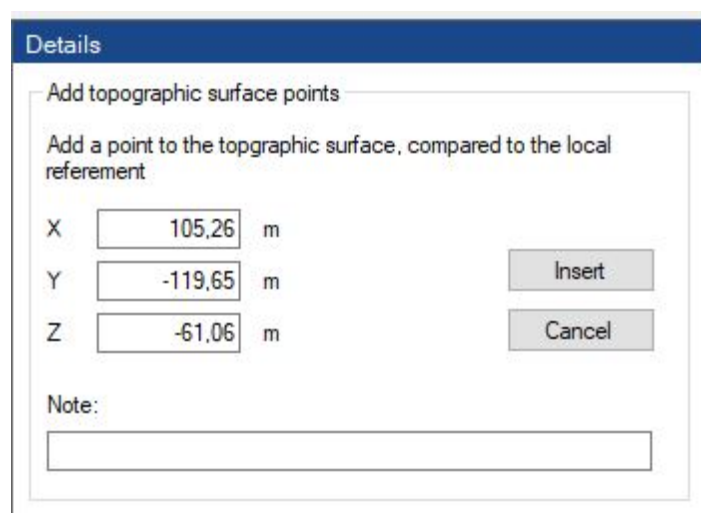
After uploading the file, you will be asked to specify the format of the coordinates.

For a fluidity purpose it is advised to leave the **"Translation of the axis"** box checked, this setting allows the imported surface to get nearer to the original location of the system.

By clicking on **"Continue"** the chosen surface will be drawn.



The manual insertion of the points can be done by clicking with the right button of your mouse on **"Add point"**, and consequently inserting the XYZ coordinates of the point.



Every point inserted can be deleted or modified, by clicking with the right button of your mouse on the point, therefore on remove or modify.

The same operation can be done through the table that can be viewed by clicking on **"Topography"**, and after on **"Upgrade points"**.

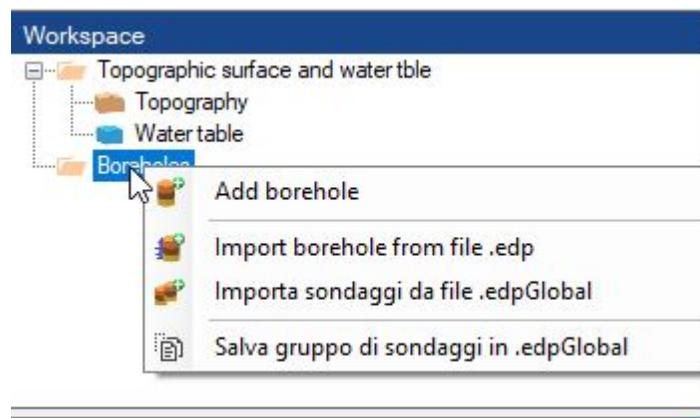
After clicking on "Topography", it is possible to do a check on the points of the surface by clicking on **"Check topography"**, with this option the topographic surface, if necessary, will correct itself in order to optimize the 3D model.

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3.2 Survey elaboration

Creating surveys

To create a survey it is possible to choose **"Add survey"** by clicking on the topographic surface, or on the **"Surveys"** button.



In the **"Details"** menu you will have to insert the survey code, that is the name that will be viewed, a description, the coordinates of the survey and in the **"Stratigraphy"** table the different layers of the soil, by inserting the depth of the layers, and by choosing the type of soil for every layer.

Details

General borehole data

Borehole code

S1

Borehole description

Rifacimento del 2021

Borehole placement

☐
Traslaction of axis

xs

365,42

m

North

0,00

[m]

ys

-59,14

m

East

0,00

[m]

zs

-54,10

m

Altitude

0,00

[m.s.l.m.]

* The georeferencing data must be entered in the WGS84 system

Stratigraphy

Depth (m)	Ground	Texture
8,00	riporto	
15,00	ghiaia limosa	
20,00	sabbia e limo	
28,00	ghiaia con sabbia	
35,00	sabbia limosa	
40,00	sabbia	

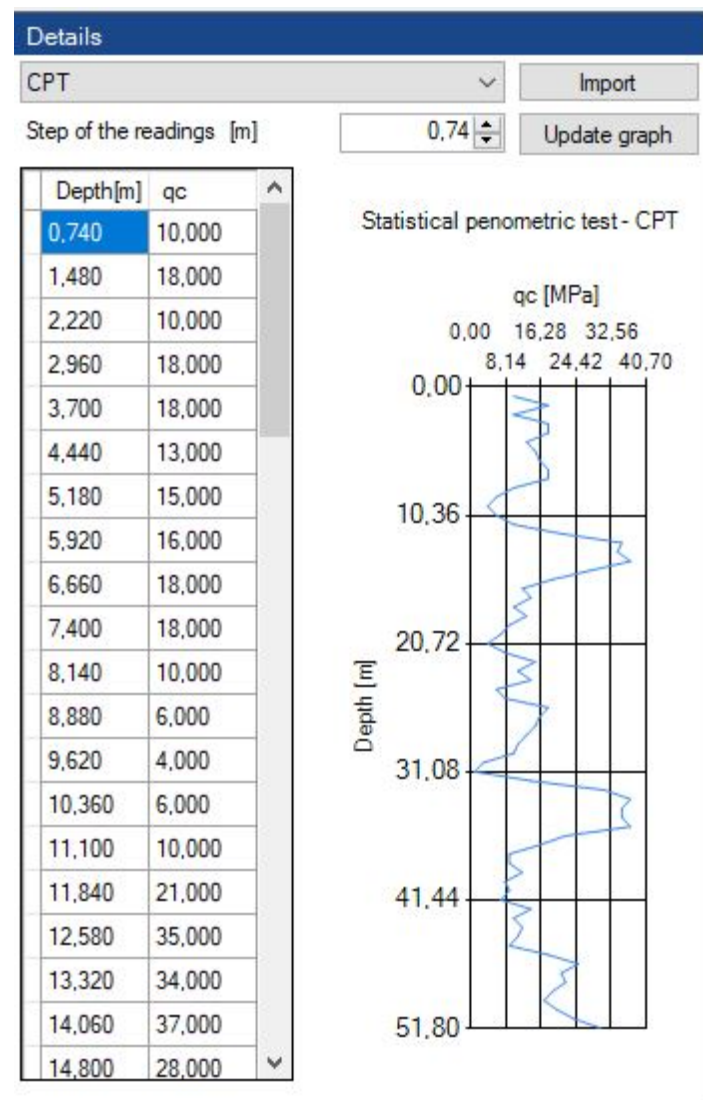
Add soil layer

Remove soil layer

Apply

By clicking on **"Apply"** the 3d model of the survey will be created.

For every survey the results of on site testing can be attributed to it, to do so you have to click on the survey, choose **"Add trial results"**, and after **"Import"**, at this point the graph of the trial will be viewed in the **"Details"** menu, and near the survey.



Import of surveys form .edp and .edpglobal files

(Surveys can be imported from: TXT text file, AGS4 (Standard BIM), EDP known GEOSTRU data interchange format)

To import one or more surveys it is sufficient to click on the **"Surveys"** button and choose **"Import survey from file EDP"**, therefore select the surveys to import, and click on "Open", or it is also possible to drag one or more EDP files on the **"Surveys"** button.

The same operations can be carried out for EDPGlobal, that is the files that contain information in groups of surveys.

Export of surveys in .edp and .edpGlobal files

To export a survey in a EDP file it is sufficient to click with the right button of your mouse on the selected survey and choose **"Save survey as .EDP file"**, meanwhile to save an entire group of sueys, it is possible to click on the **"Surveys"** button and choose **"Save survey group in .EDPGlobal"**

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4 Modelling

After having correctly entered all the required inputs, it is possible to proceed to the creation of the 3D model of the terrain.

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4.1 Construction 3D Model

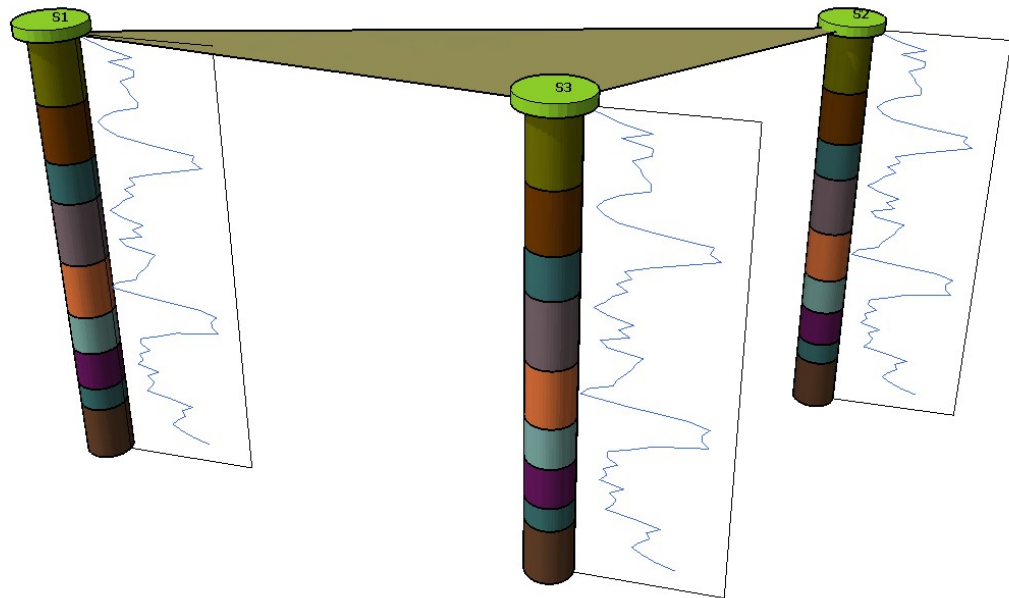
The construction of the model can be carried out through two different modalities, a geometric modeling or a manual modeling.

Geometric Model

The creation of the geometric model presupposes that the layers present in the surveys are regular, that is in every survey the pattern in which the soil layers appear is always the same, which means that the different layers will be connected based on their position in the surveys.

The creation of a geometric model is fast and precise, and it is possible to carry out having at least three of the following elements: points and

surveys, It is possible to create a geometric model having at least 2 topographic points and 1 survey, 2 surveys and 1 point, or 3 surveys.



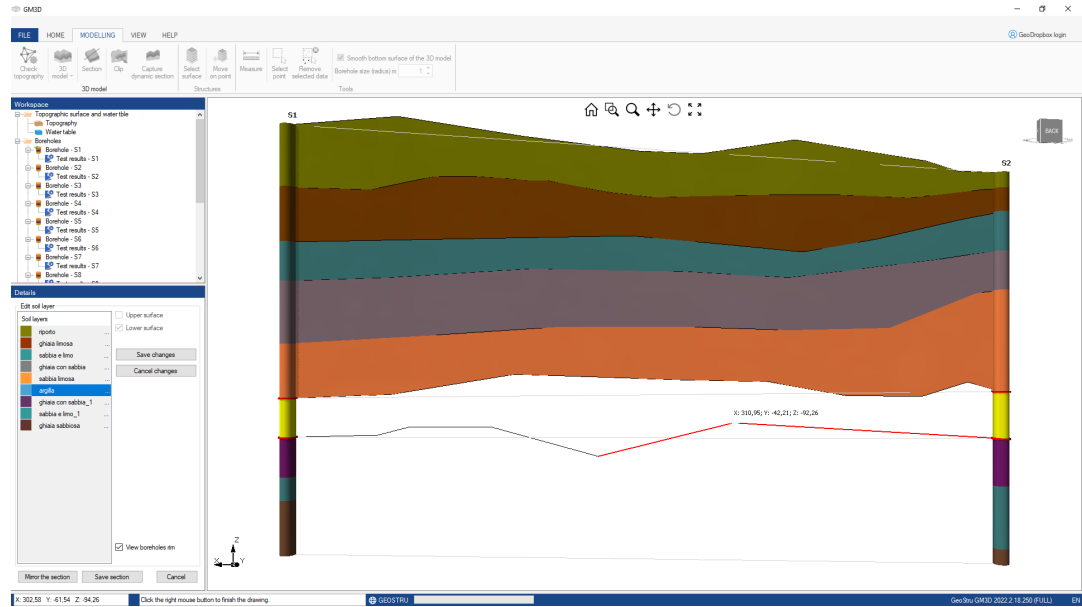
Manual modelling

The manual modeling allows to recreate a 3D model of the underground for more complex stratigraphies, it is possible to recreate whichever 3d model.

The creation of the model requires the manual connection of the different layers from one survey to another, and in this case the accuracy of the model is dependent by the accuracy in the connecting of the surveys.

To create the connections it is sufficient selecting two surveys, and drawing the section between these two, therefore connecting the layers of one survey to another.

Once all the surveys are connected it will be possible to create the model

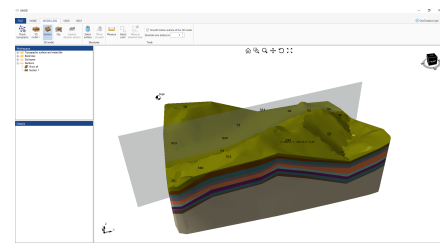
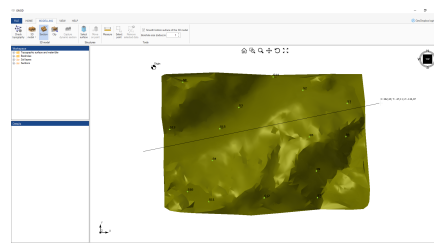


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4.2 Sections

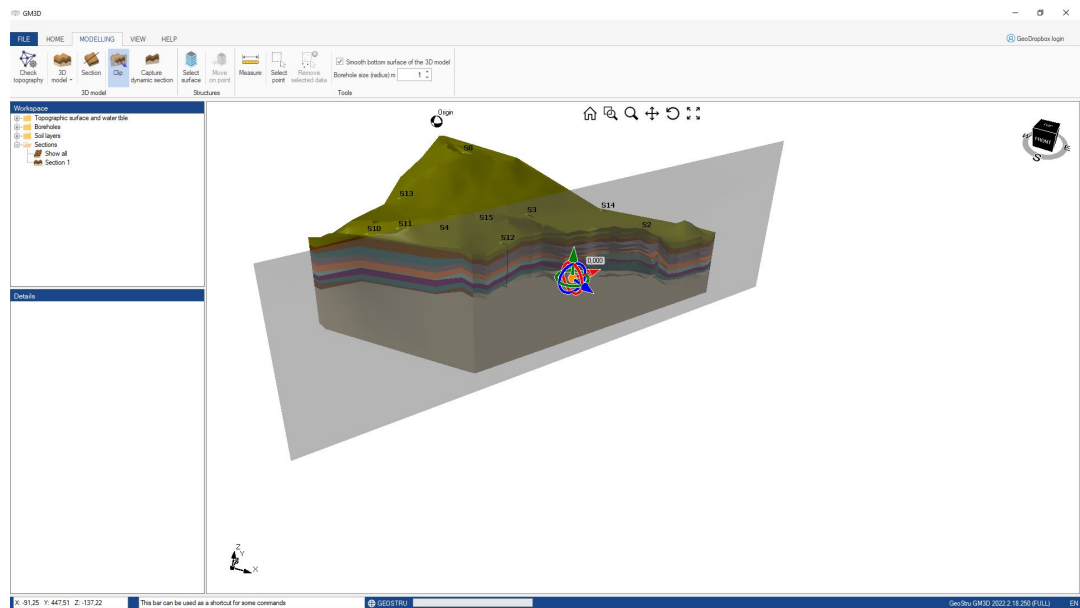
To draw the plane of the section just click on two points in order to draw a line, at this point the plane will be generated automatically.

Once you created the model, clicking on **"Section"**, it is possible to draw some lines along the model which will be the sections of it.



another way create sections is by clicking on **"Clip"**, which will generate a plan through which we will be able to see the inside of the model, and find the point in which to create a section, it is necessary to click on

“Capture floor sectioning”, which will create a section of the specific plan.

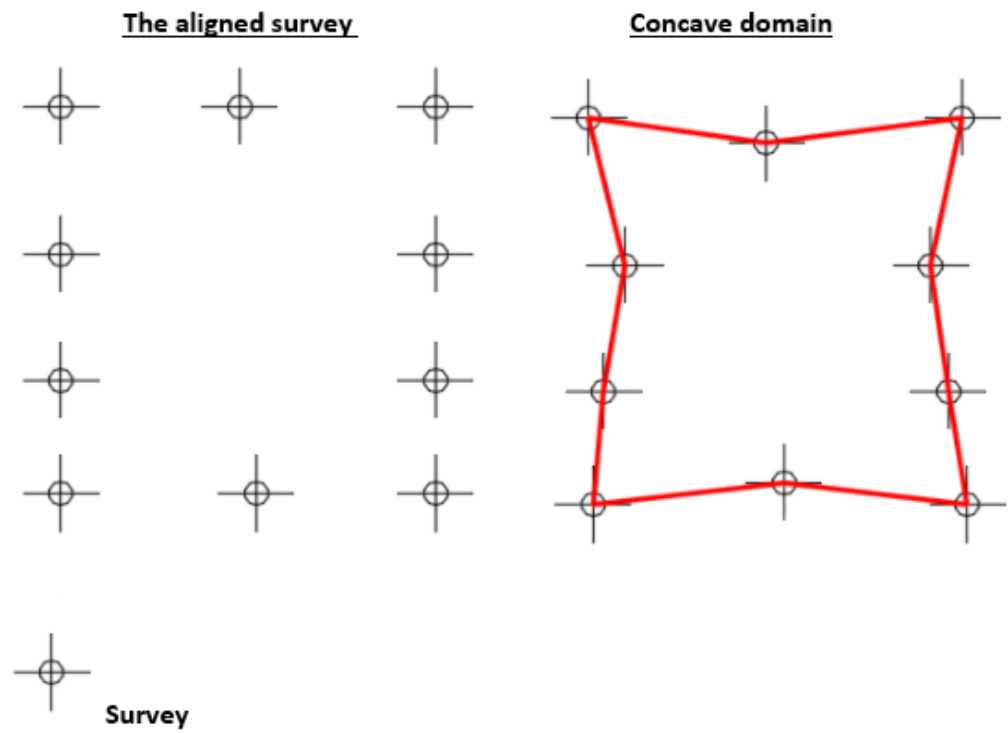


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5 Conventions

When entering the surveys, the conventions must be respected.

- 1) Surveys must not be aligned and must not define a concave domain



2) It is correct to arrange the surveys as shown in the figure, in order to define a convex domain.

