1. USER MANUAL

1.1 TOOL INSTALATION

To install the tool, open the ArcMap software, and display the ArcToolbox window as shown in Figure 1.

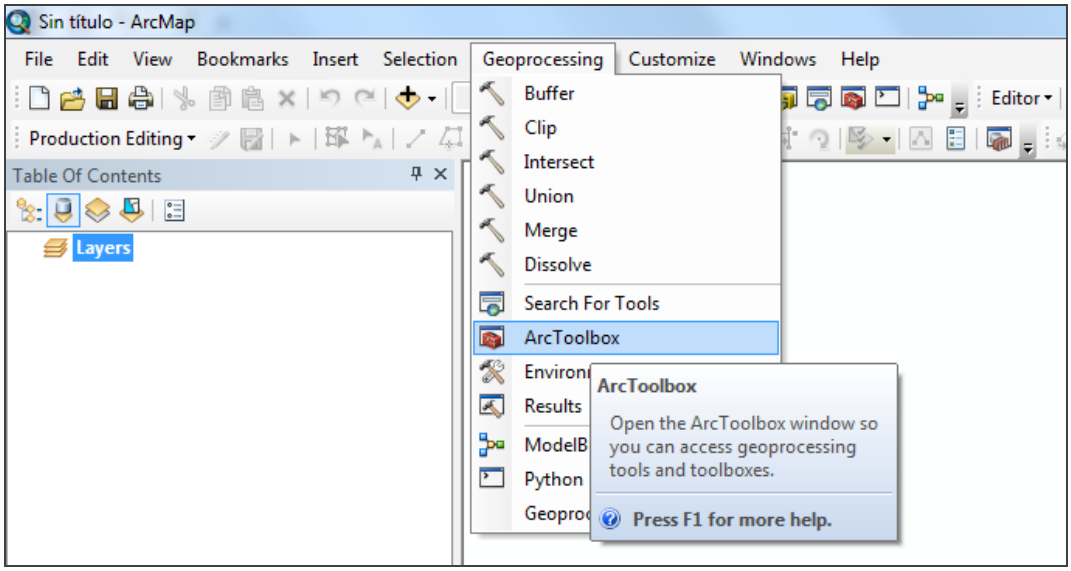

Figure 1. Toolbox window.

When displaying the window, place the cursor over the parent Toolbox called ArcToolbox, right click and select the Add Toolbox option as shown in Figure 2.

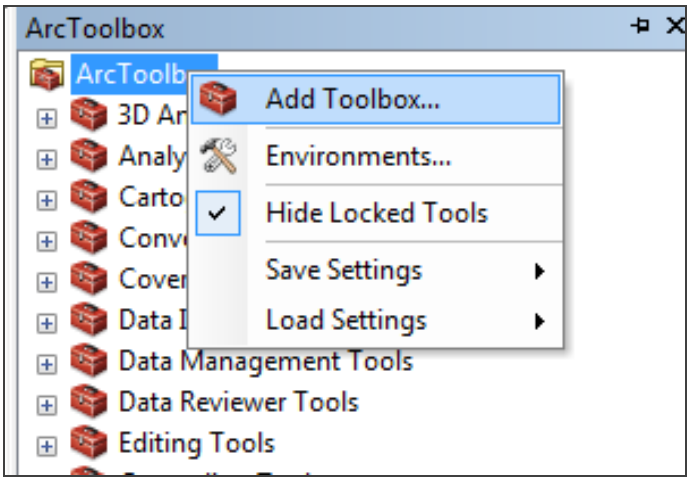

Figure 2. Adding the Toolbox to ArcToolbox.

Locate the path that you defined during the file download or in the decompression process, being inside the folder, select the file "Geologic Profile Tool.tbx" and click on 'Open' as seen in Figure 3.

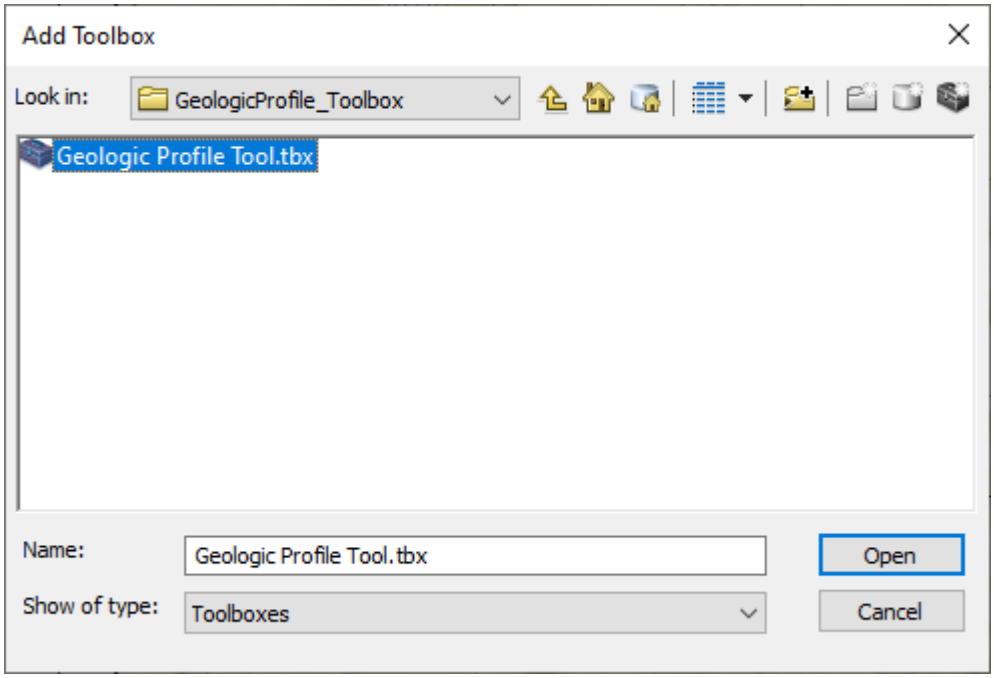

Figure 3. Selection of Toolbox to add.

Once the Toolbox has been added, it should appear in the ArcToolbox window as seen in the following figure.

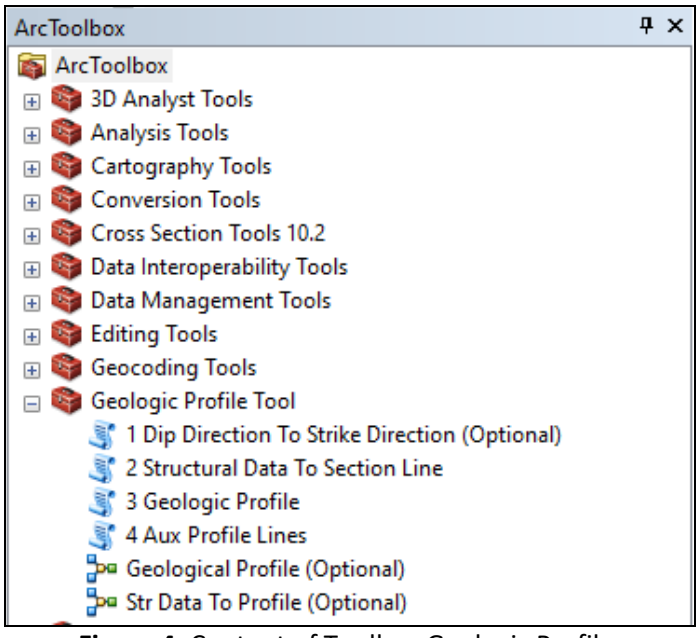

Figure 4. Content of Toolbox Geologic Profile.

For the tool to be permanently saved in your ArcToolbox, right click on ArcToolbox, select “Save Settings” and then select “To Default” as shown in the following figure:

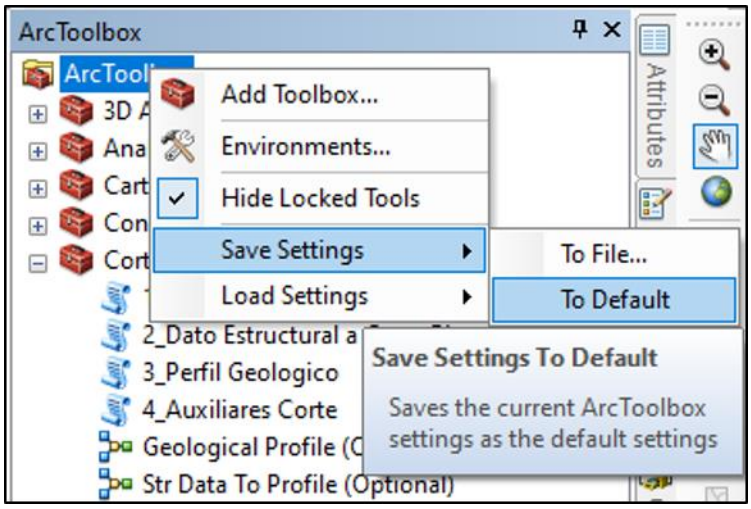

Figure 5. save settings.

At this point you have the tool installed and everything is ready to start its implementation.

1.2 TOOL IMPLEMENTATION

Before starting, you must have the necessary information loaded in the ArcMap table of contents (TOC), you need a digital elevation model (DEM) preferably with 12.5m spatial resolution, a layer of geological units, a layer of faults geological (optional), a layer of folds (optional), a layer with the geological cut line in plan and a layer with the structural data. It is important to verify that all the layers are in the same projected coordinate system, note that the tool does not work with data in geographic coordinate system.

To start the implementation of the tool, a thematic selection of the structural data that are useful for making the cross section must be made, for this, select the structural data that are considered convenient, and then export the selection to a new layer as shown in Figures 6 and 7 respectively.

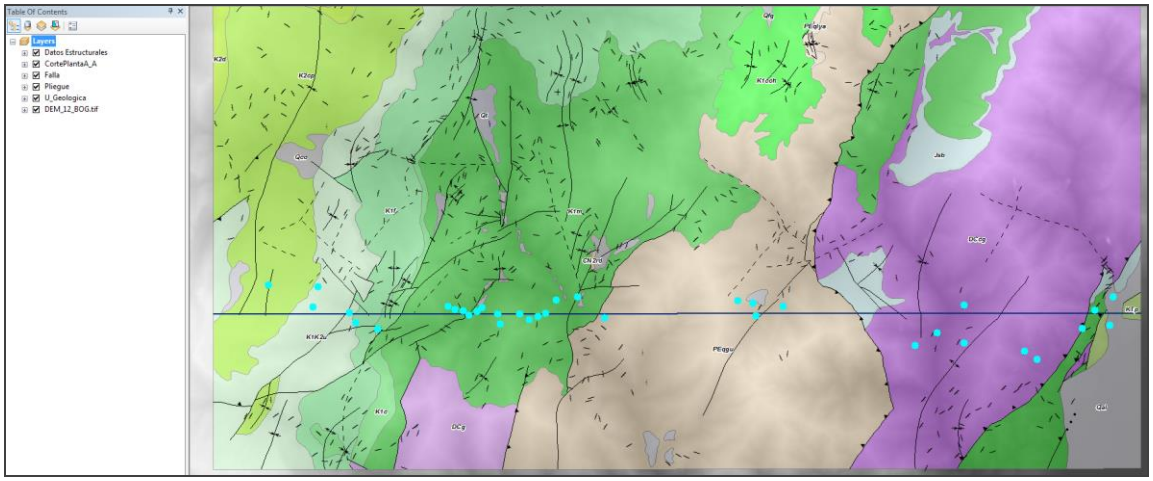

Figure 6. Select structural data.

Once you have the selection ready, right click on the structural data layer and select “Data” and “Export Data…”, assign an output path for the new layer. The software will ask you if you want to load the resulting layer, click on “Yes” and remove from the TOC the previous layer of structural data (the one with all the data).

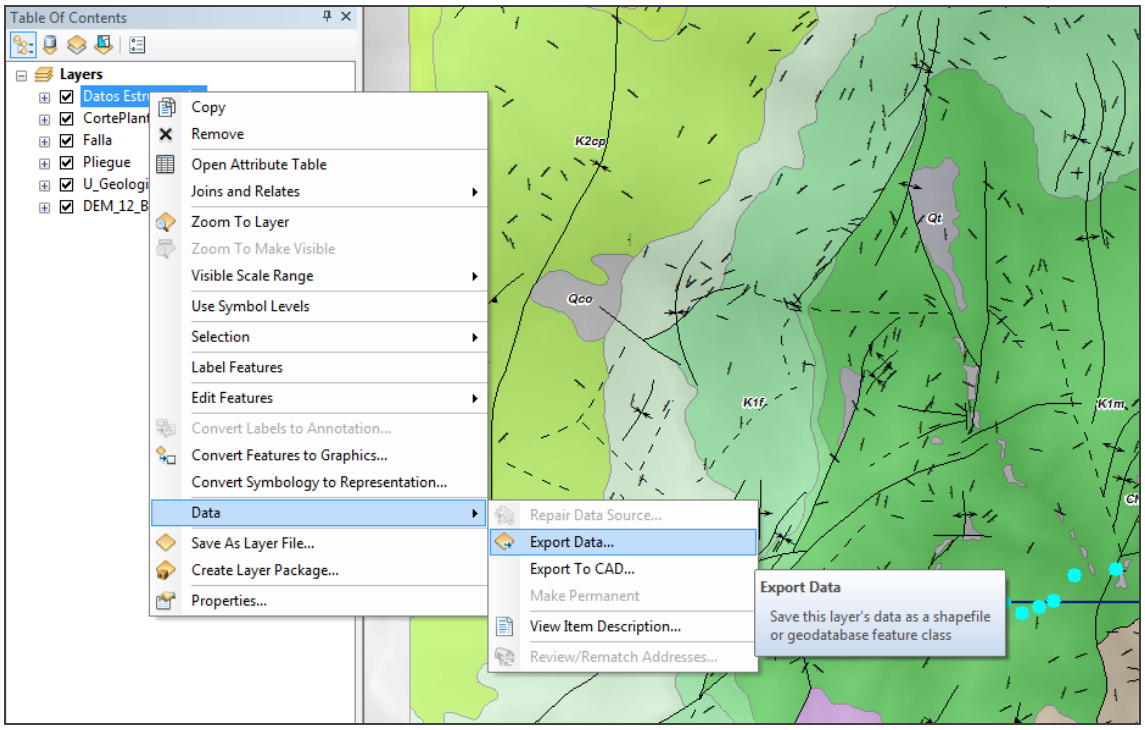

Figure 7. Export selected data to a new layer.

When finishing this selection, ArcMap should only show the structural data that was selected, as seen in Figure 8.

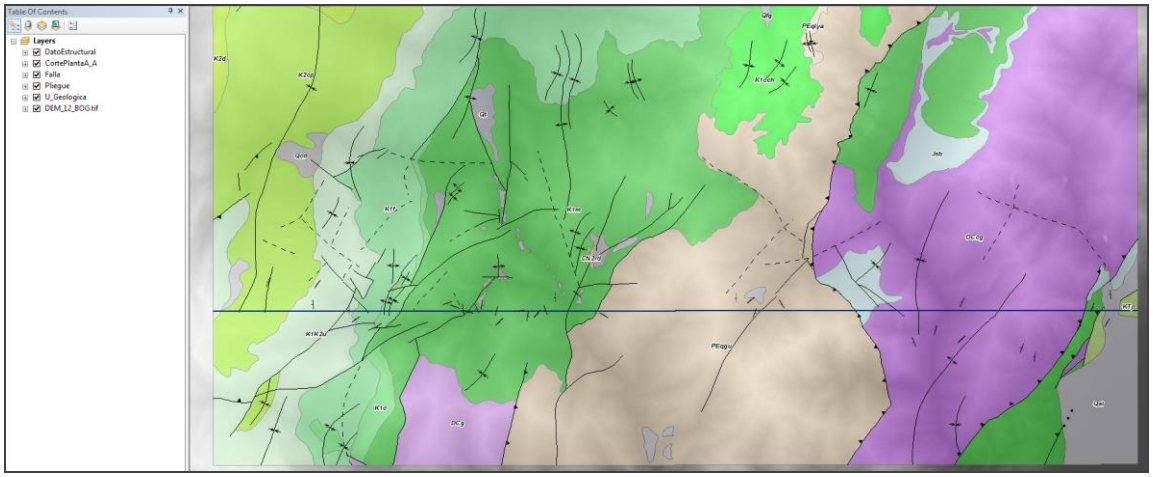

Figure 8. Layers to start tool implementation.

Display the ArcToolbox again and display the Toolbox called "Geological Cut", double click on the Script 1 Dip Direction To Strike Direction (Optional).

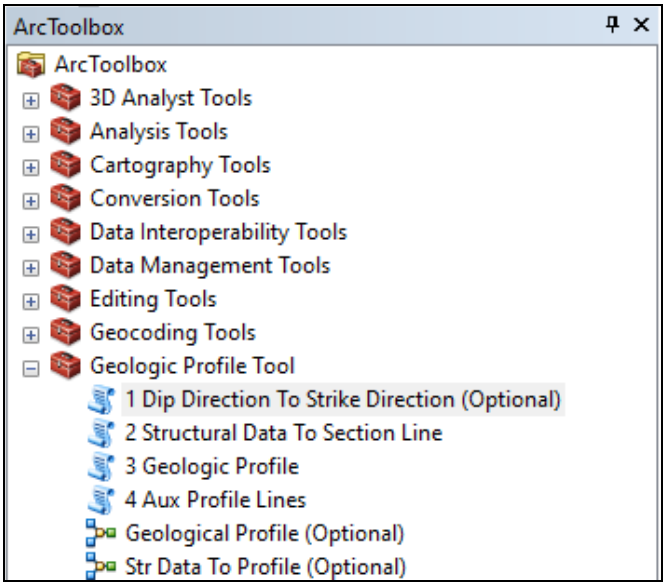

Figure 9. Script 1 Dip Direction To Strike Direction (Optional).

When double clicking on Script 1, a window will be displayed in which the structural data layer must be loaded and the field that stores the dip azimuth must be indicated as shown in Figure 10, remember that, if the azimuth calculated in the taking of the structural data was the bearing, this Script does not have to be executed and can be started in Script 2.

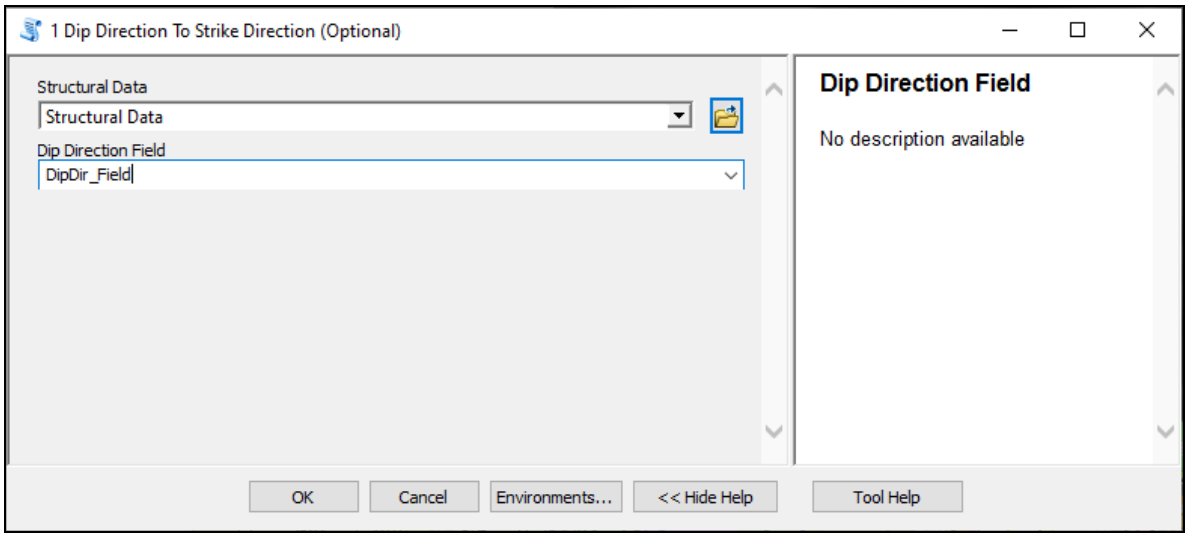

Figure 10. Load parameters in Script 1.

Click on "OK", when Script 1 finishes executing, click on "Close" and verify that the "BearingAz" field has been created and calculated in the attribute table of your structural data layer as shown in the Figure 11 (Selected field in Cyan color).

Structural Data Select

OBJECTID *	Shape *	ESTACION	Dip Azimuth	Dip	BearingAz
1	Point ZM	TGN-46	160	46	70
2	Point ZM	TGN-47	130	90	40
3	Point ZM	TGN-51	115	50	25
4	Point ZM	GMS-0533	120	52	30
5	Point ZM	GMS-0541	310	75	220
6	Point ZM	TGN-72	300	29	210
7	Point ZM	TGN-69	295	25	205
8	Point ZM	MLC 926	320	45	230
9	Point ZM	MLC 533	310	66	220
10	Point ZM	MLC 516	155	50	65
11	Point ZM	MLC 498	310	34	220
12	Point ZM	MLC 473	335	80	245
13	Point ZM	MLC 420	300	40	210
14	Point ZM	MLC 85	310	32	220
15	Point ZM	MLC 66	320	32	230
16	Point ZM	MLC 43	305	22	215
17	Point ZM	MLC 255	280	8	190
18	Point ZM	ETJ 148	102	19	12
19	Point ZM	ETJ 125	307	39	217
20	Point ZM	ETJ 048	308	44	218
21	Point ZM	ETJ 044	336	55	246
22	Point ZM	ETJ 036	332	50	242
23	Point ZM	ETJ 099	332	14	242
24	Point ZM	TGN-123	306	65	216

Figure 11. Field "BearingAz".

Once the bearing azimuth data has been obtained for each structural data, Script 2 is executed. For this, go back to the Toolbox "Geological Profile Tool" and double click on Script 2 Structural Data To Section Line.

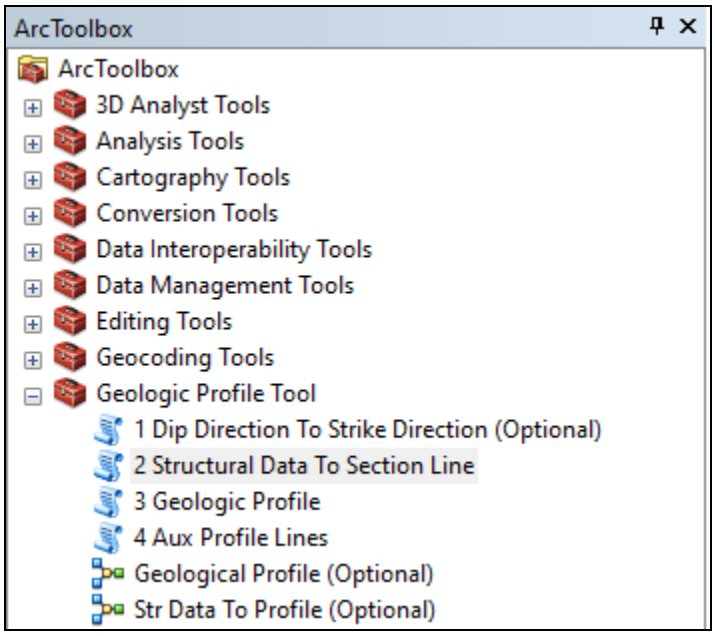

Figure 12. Script 2 Structural Data To Section Line

When executing Script 2, a window will be displayed in which the requested parameters must be loaded, the first parameter is the structural data layer, then the layer containing the cut line, the bearing azimuth field, the dip field, the fault layer (in case of having faults that cross the cut), the pleat layer (in case of having folds that cross the cut) and finally the exit path to store the structural data, faults and folds projected to the cut line, Figure 13 shows how to load the parameters in Script 2..

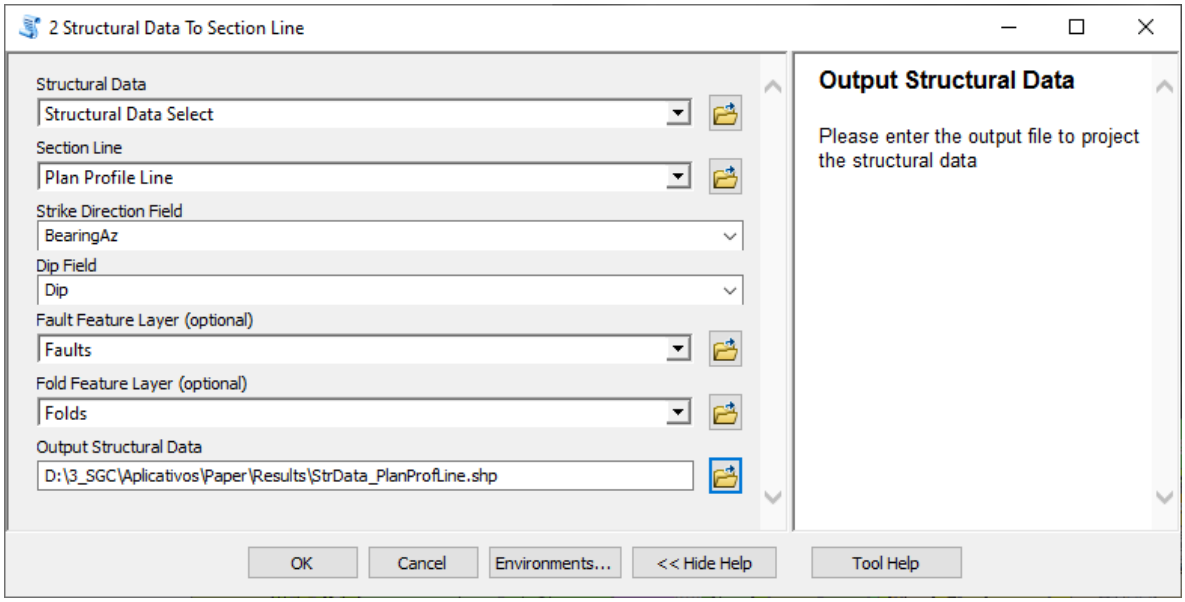

Figure 13. Load parameters in Script 2.

Once the parameters have been loaded, click on “Ok” and Script 2 will be executed. At the end of its execution close the process window by clicking on “Close”, now in the TOC and the ArcMap display the new layer should appear as seen in Figure 14.

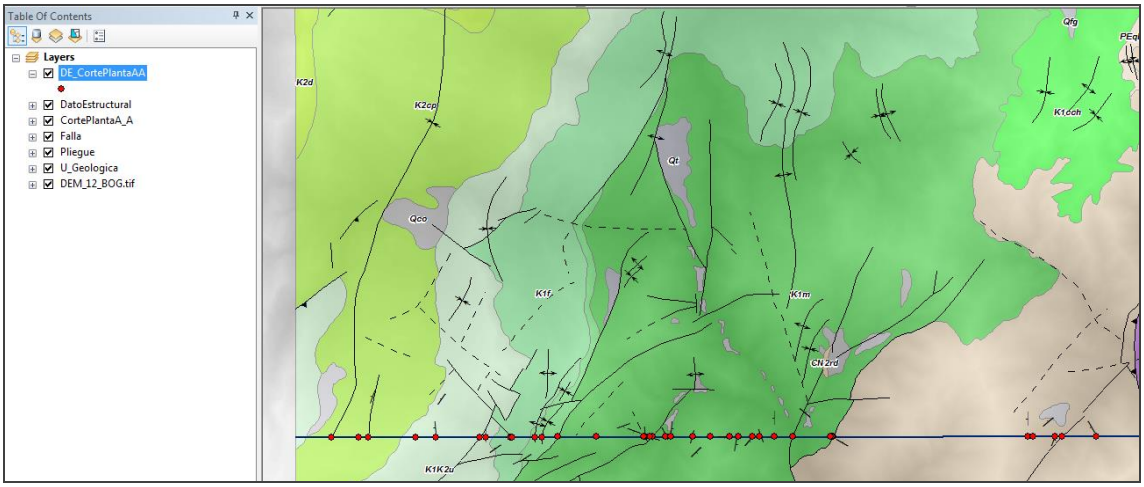

Figure 14. Structural data points and structures projected to the section line.

Remember that the structural data projected to the section line already has the apparent dip calculation.

Once Script 2 has been executed, we proceed to execute Script 3_Geological Profile, in which the parameters must be loaded as they have been loaded in the previous Scripts, to do this, go to the Toolbox "Geological Profile Tool" again, double click on the script 3 and load the information with the requested parameters in the following order, first the layer containing the cut line is loaded, then the structural data that was projected to the section line as a result of the execution of Script 2, then the layer of geological units, then the digital elevation model DEM is loaded, the exaggeration factor of the relief is requested, which by default is 1 but can be modified by entering a positive integer number, the field that stores the code of the units is selected geological (for the example it is the "COD" field), finally the exit routes for the geological profile and the structural data in profile are defined as shown in Figure 15.

By running Script 3_Geological Profile, you get the geological profile line and the structural data points and projected structures on this geological profile line as seen in Figure 16.

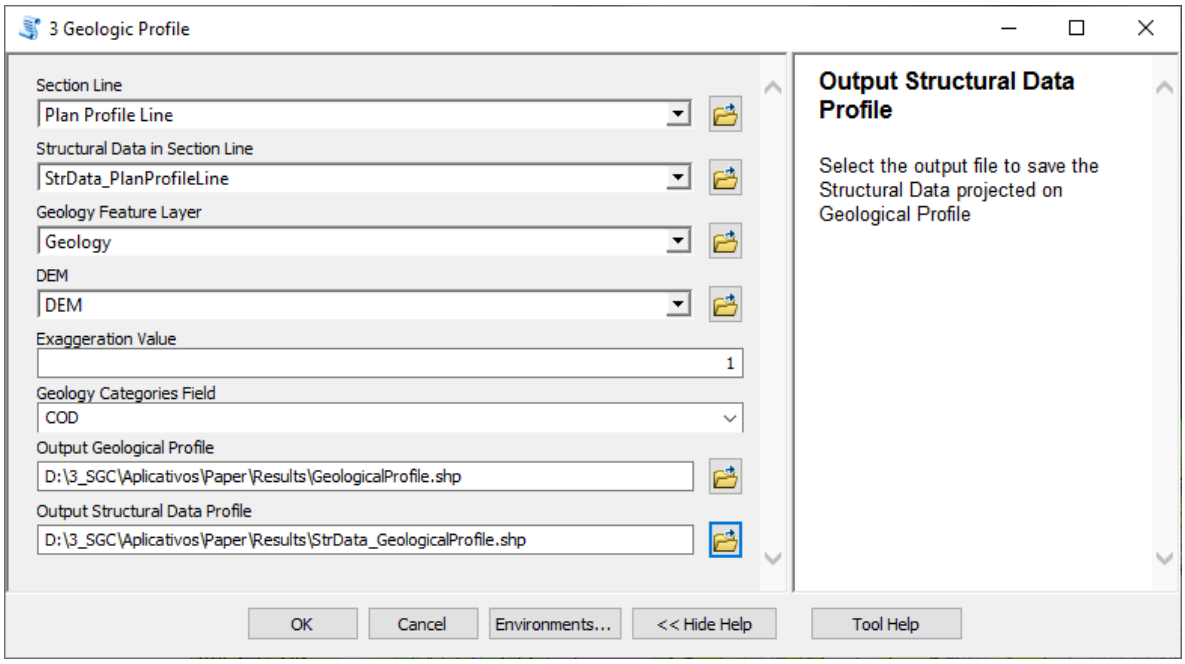

Figure 15. Load parameters in Script 3.

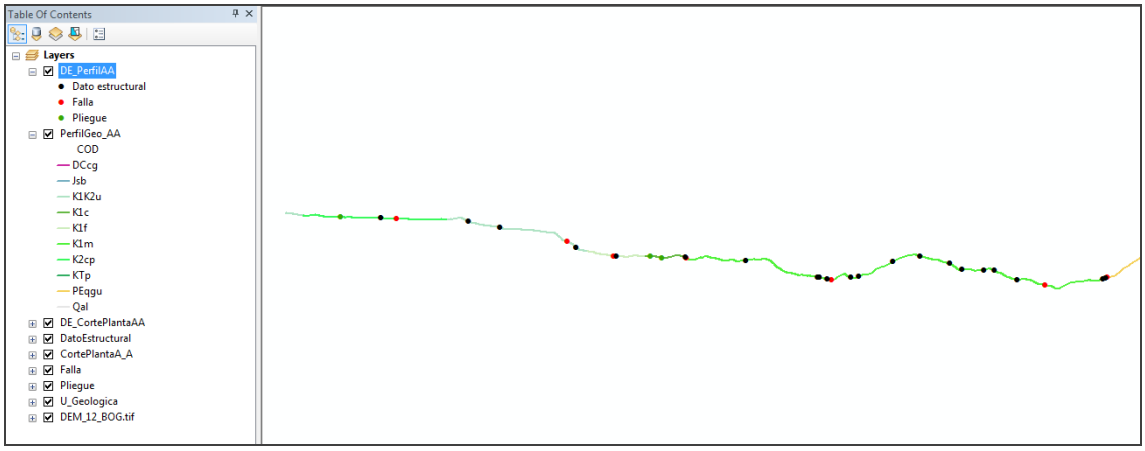

Figure 16. Results of the Script 3 execution.

Once Script 3 has been successfully executed, Script 4 is executed, for this, again go to the Toolbox and double click on Script 4 Aux Profile Lines, the window to load the parameters will be displayed, in this case you only have to enter the points of structural data and structures in profile, that is, those resulting from the execution of the Script 3 Geologic Profile, and the exit routes for the dip lines and auxiliary lines must be defined as seen in Figure 17.

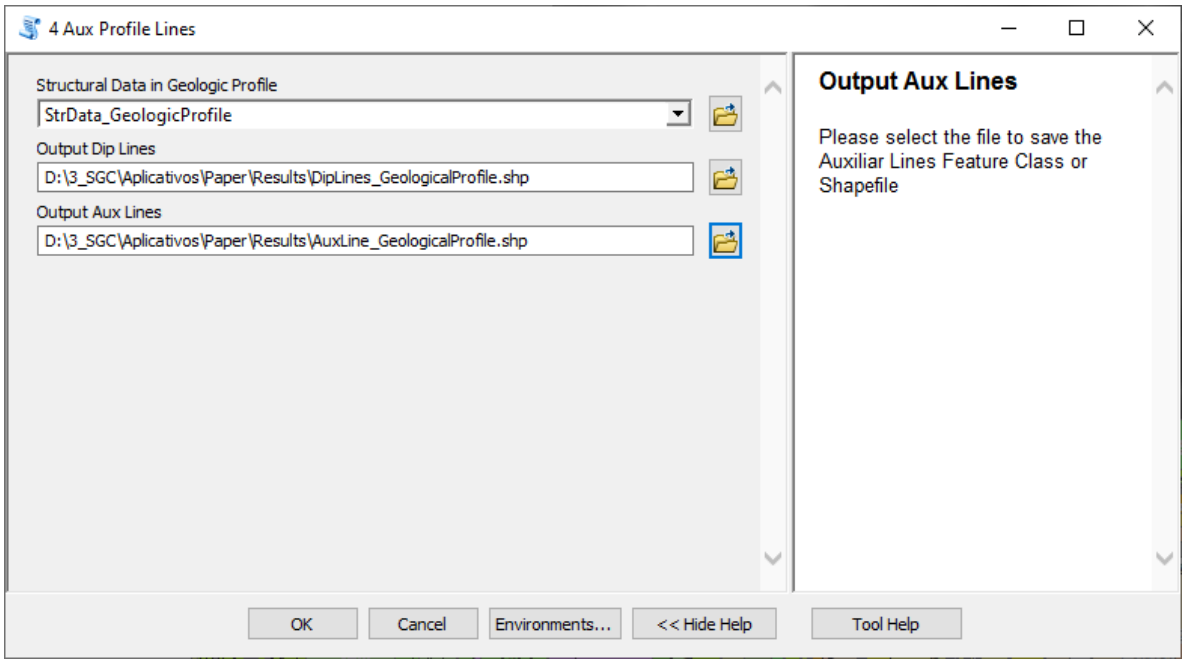

Figure 17. Load parameters in Script 3.

Once you have loaded the Script 4 parameters, click on "OK", and at the end of the execution click on "Close", the result generates a layer of auxiliary lines and a layer of dip lines that are loaded in ArcMap as It is shown in Figure 18 (dip lines in blue and auxiliary lines in gray dotted), note that there is no auxiliary line at the points corresponding to fault or fold axis.

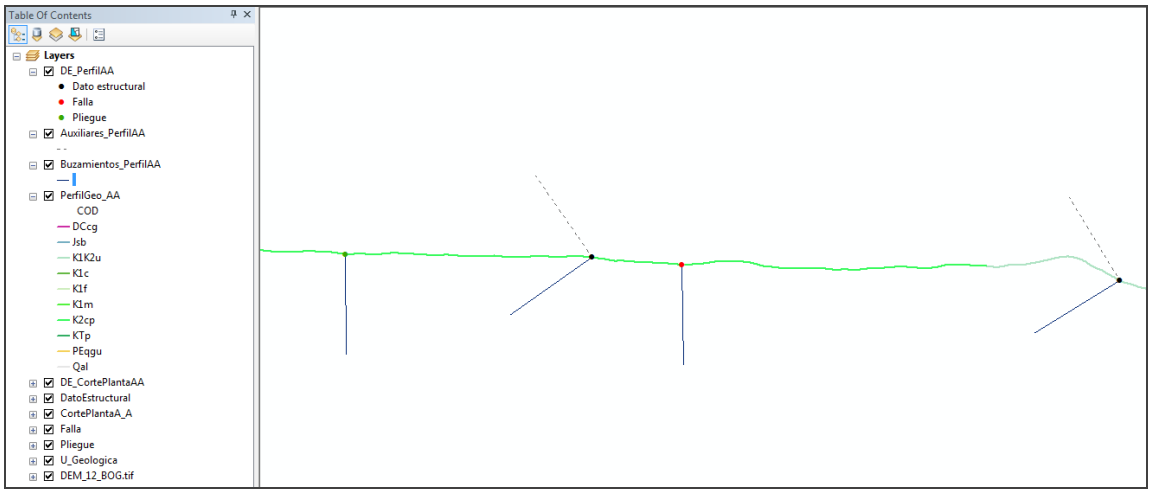

Figure 18. Apparent dip lines and auxiliary lines in geological profile.

Having the auxiliary lines and the dip lines, the execution of the automation tool has been completed, from this point on, the ArcMap editing tools must be used to interpret and elaborate the geological cross section, since this interpretation depends on the criteria the geologist or professional in charge of making the cut, it must be done manually.

Additionally, in case of having another source of geological units or another source of structural data, the models Geological Profile (Optional) and Str Data To Profile (Optional) have been arranged to project the geological units and structural data to the topographic profile line, is important to clarify that the execution of these models is optional.