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Black Sea CROSS BORDER COOPERATION

Common borders. Common solutions.

Just ....

How to create Cross Sections ready for importing into HEC-RAS for Hydraulic Analysis

Konstantinos Papatheodorou, May 2015

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Or ....

How to create Cross Sections ready for importing into HEC-RAS for Hydraulic Analysis

.....in less than 5 minutes !

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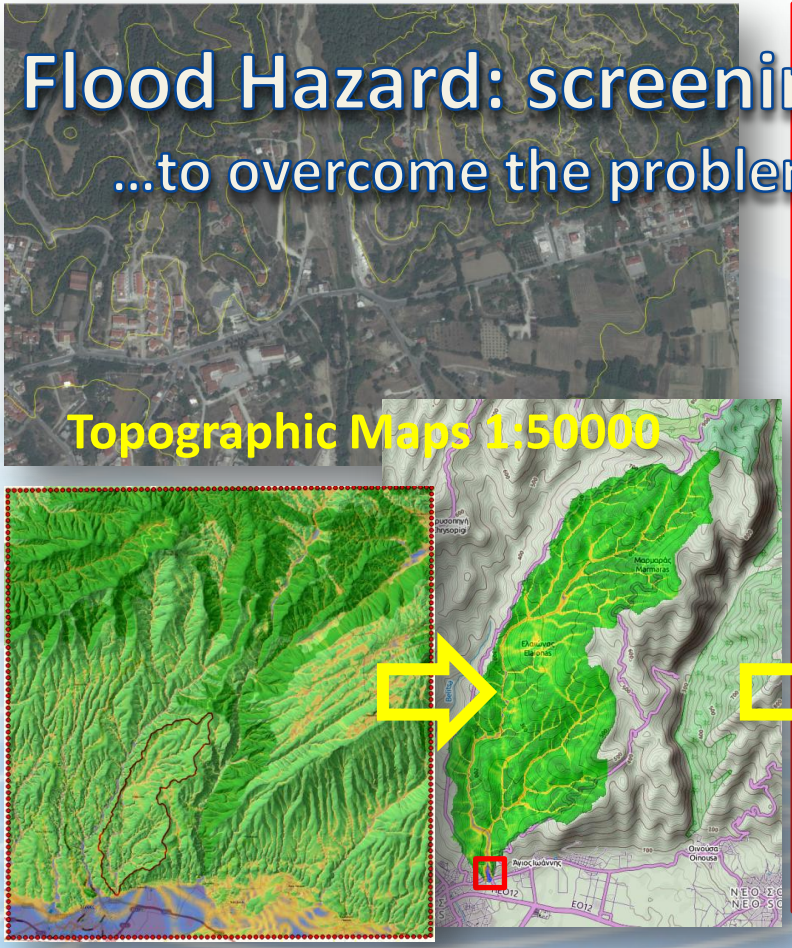
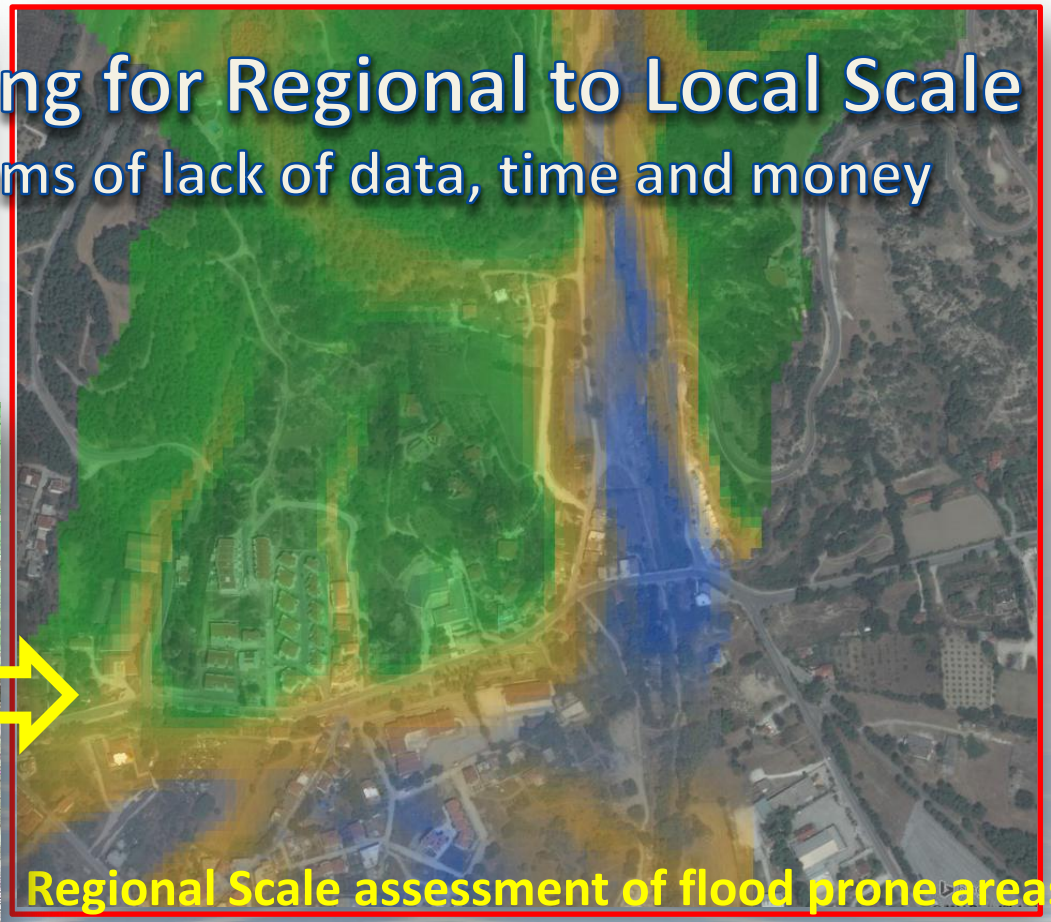
Flood Hazard Assessment: The …SciNetNatHaz project approach

Flood Hazard: screening for Regional to Local Scale

…to overcome the problems of lack of data, time and money





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Local scale implementation – topographic data (RTK)

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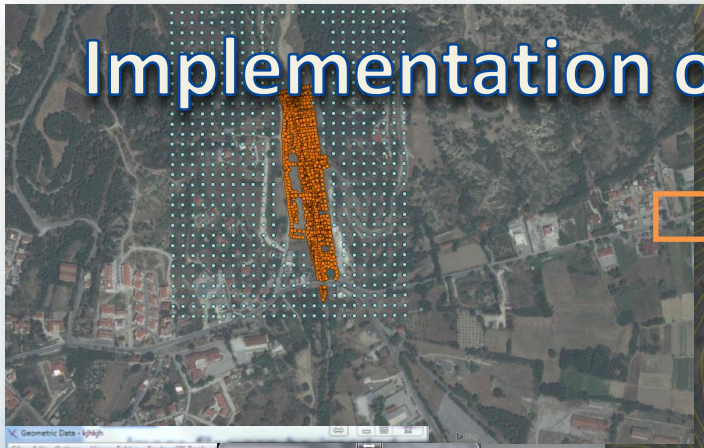
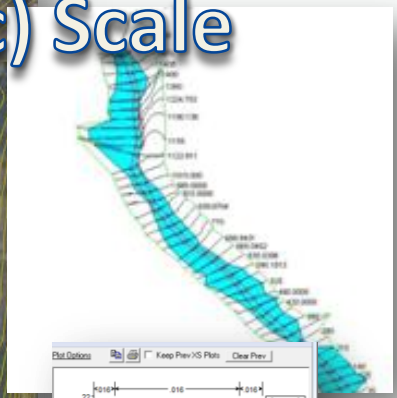
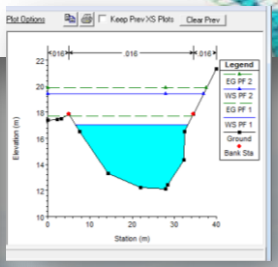
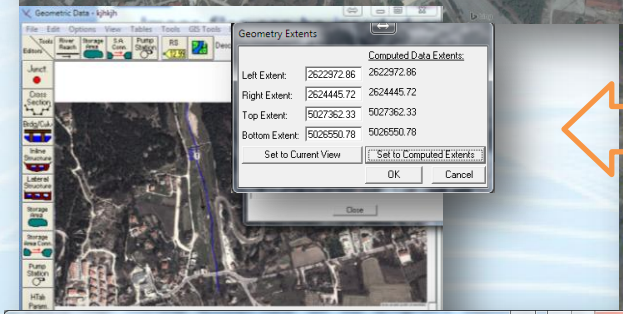
Flood Hazard… on Local scales

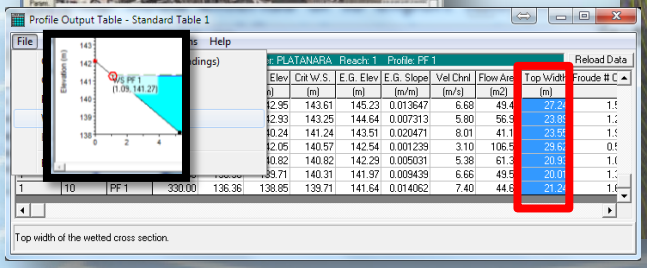
Implementation on a Local (site-specific) Scale











Software used

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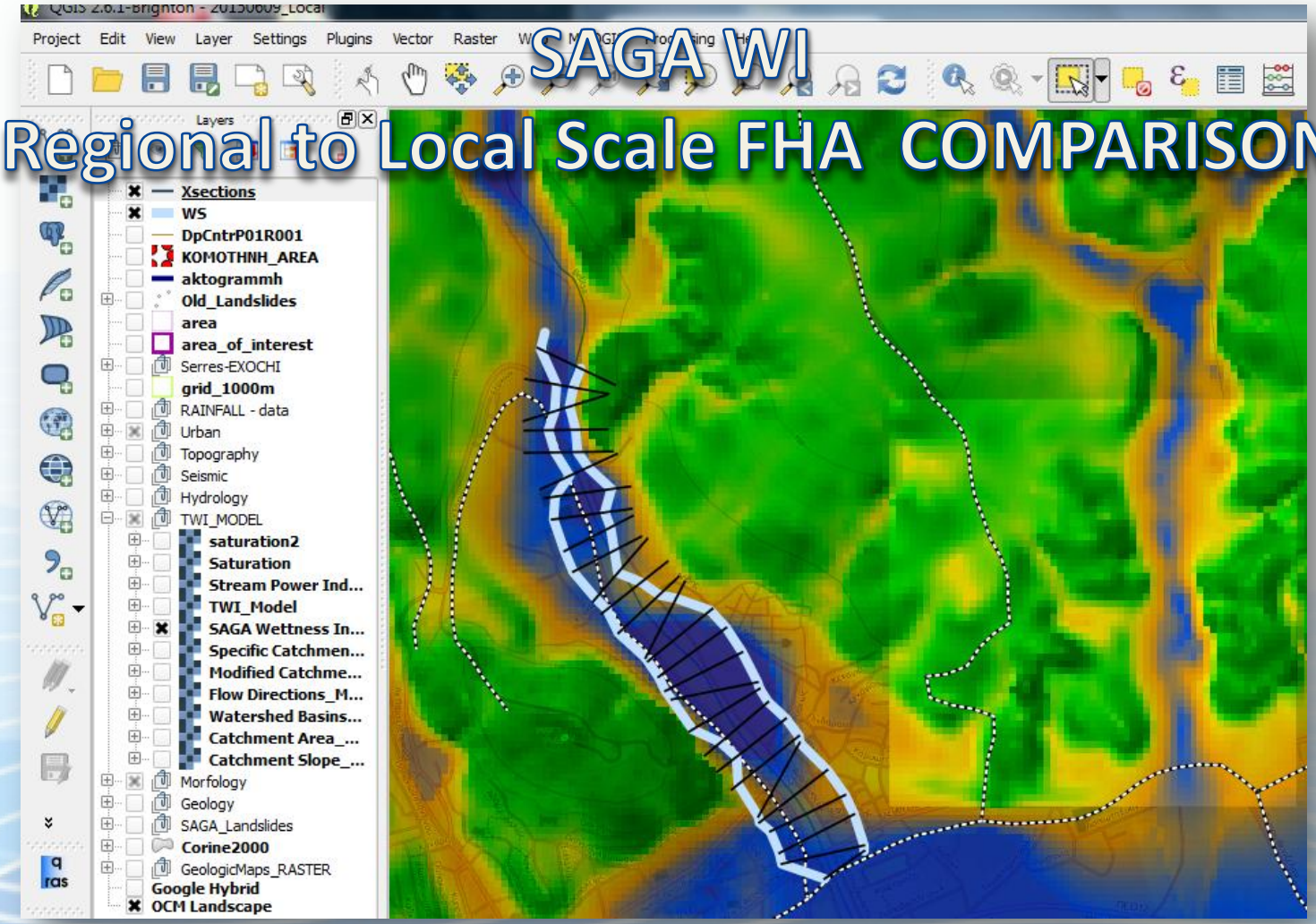
SAGA WI Regional to Local Scale FHA COMPARISON



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Local scale implementation topographic data (RTK)

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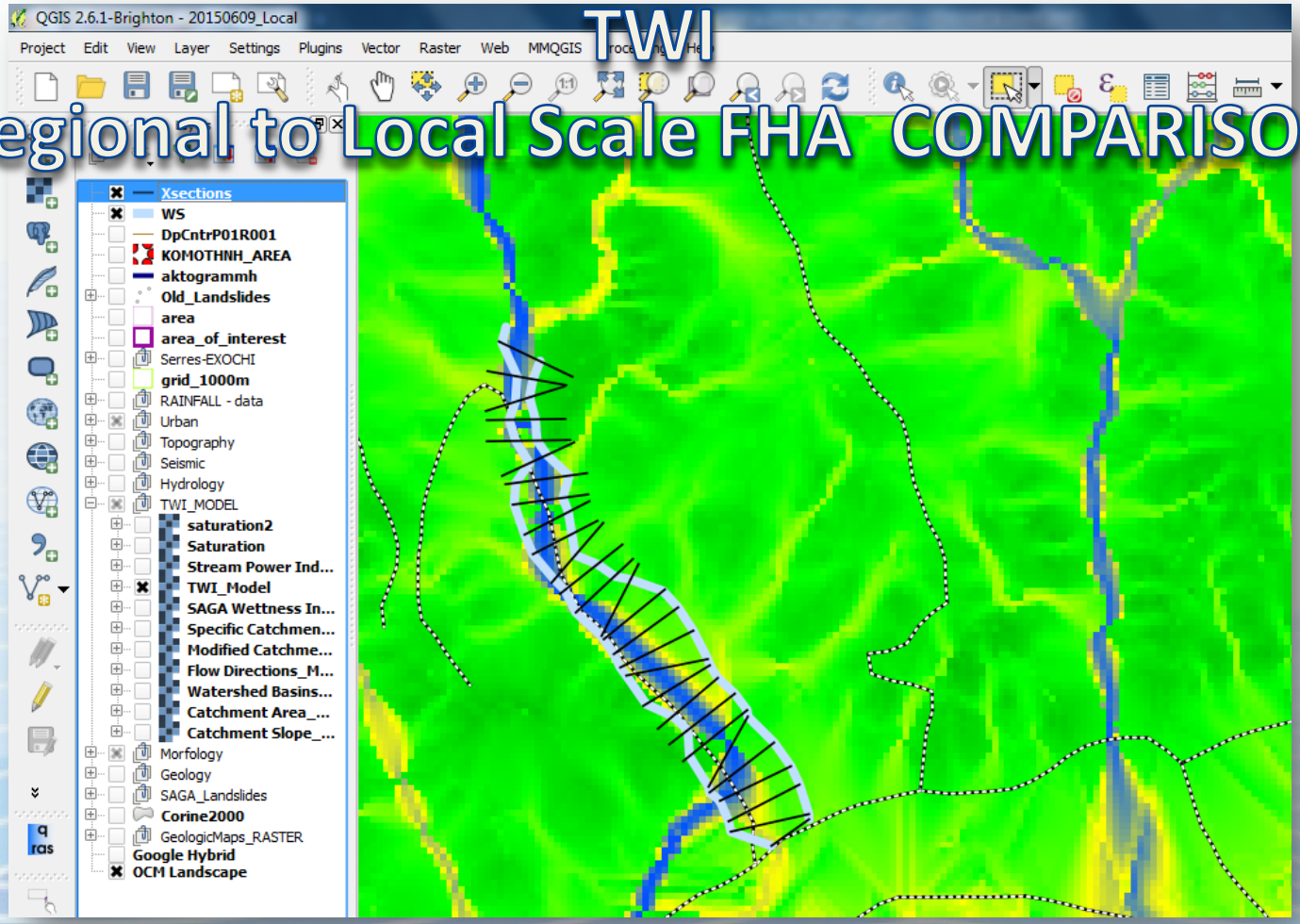
TWI
Regional to Local Scale FHA COMPARISON



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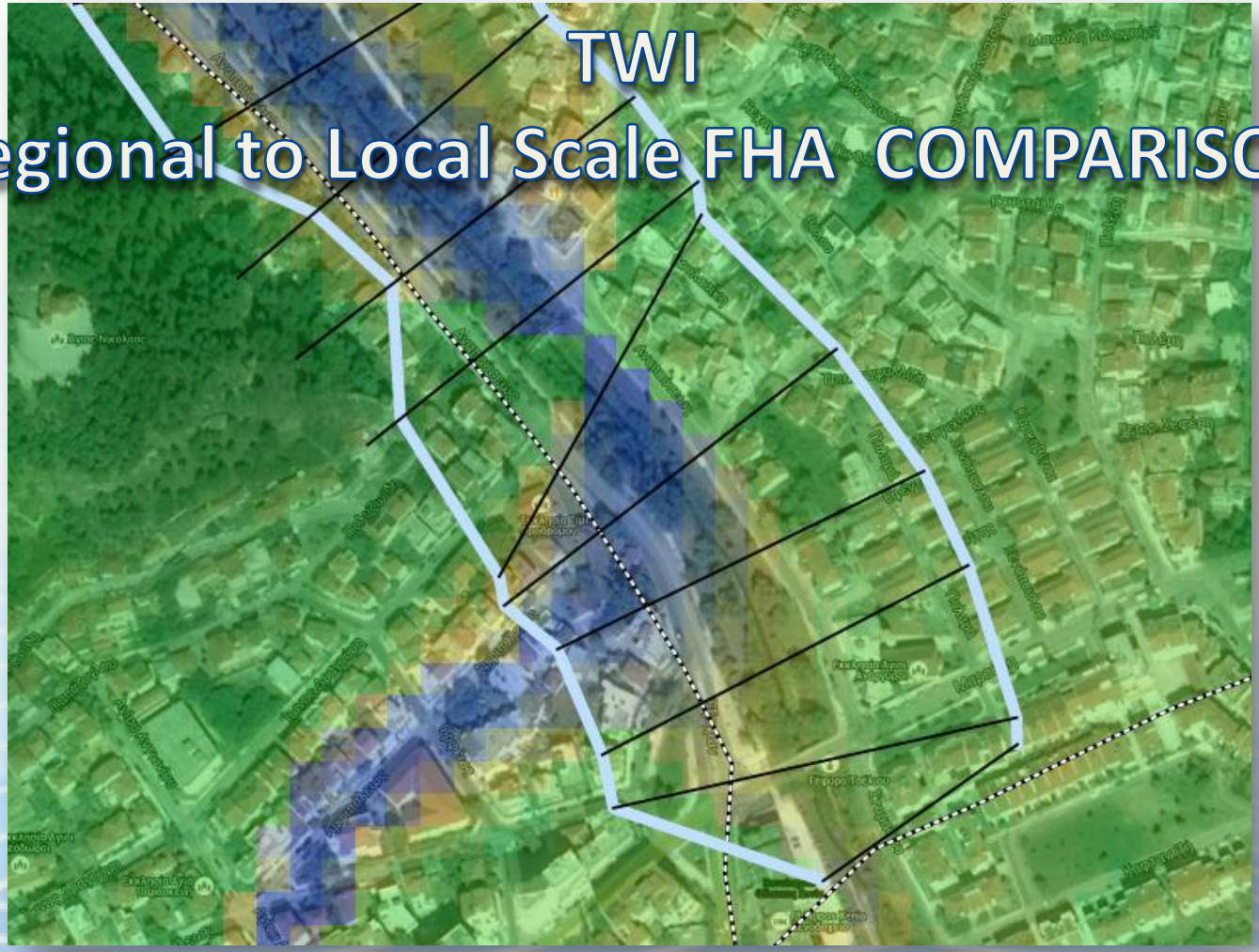
TWI
Regional to Local Scale FHA COMPARISON



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DATA REQUIREMENTS

Compulsory

- Contour lines (DIGITIZED) every 20m (topographic map at 1:50.000 scale of the **WATERSHED** (REGIONAL scale assessment)
- Contour lines (digitized) every 1m the most! (around 0.50m is OK) from a topographic map of a scale 1:1000 or higher (1:500 etc) (LOCAL scale assessment)

Optional

- Elevation points
- Ancillary data (road network, etc)

Data Created in the process

- DEMs, Stream line, Cross Sections (CR), CR elevation points

Other REQUIREMENTS

Compulsory

- Basic GIS concepts (types of data, Geographic and Projection systems …)
- A minimum competency with GIS software

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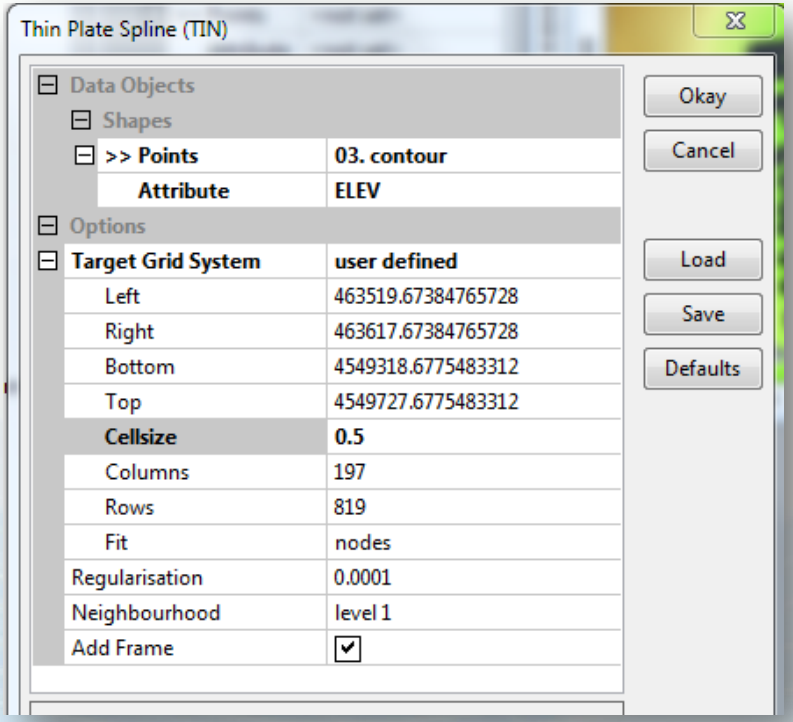
- Run SAGA
- **LOAD** the contour lines (just "**open**" the respective shapefile)
- RUN **Menu > Grid > Spline Interpolation> Thin Plate Spline**
- Insert the contour file name
- Insert the proper PIXEL size
  - for data from 1:50000 scale a pix.size of 15m is OK.
  - 1:1000, pix.size 0.5m



SAGA www.saga-gis.org System for Automated Geoscientific Analyses

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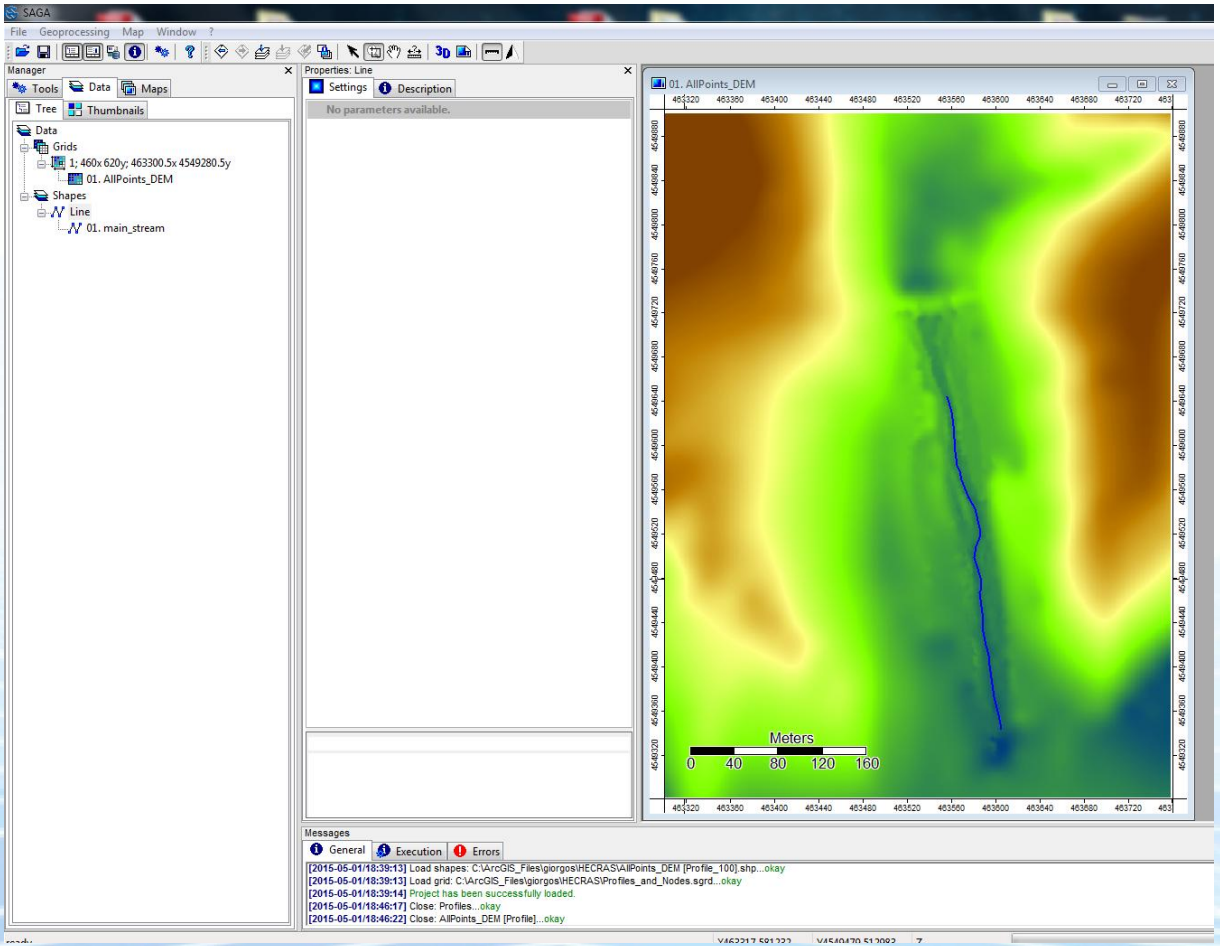
- LOAD DEM (just "**open**" the geotiff)
- LOAD the stream (just "**open**" the shapefile)



SAGA www.saga-gis.org System for Automated Geoscientific Analyses

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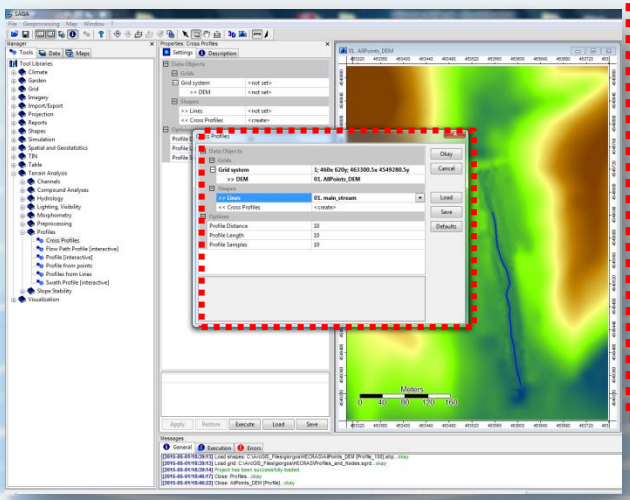
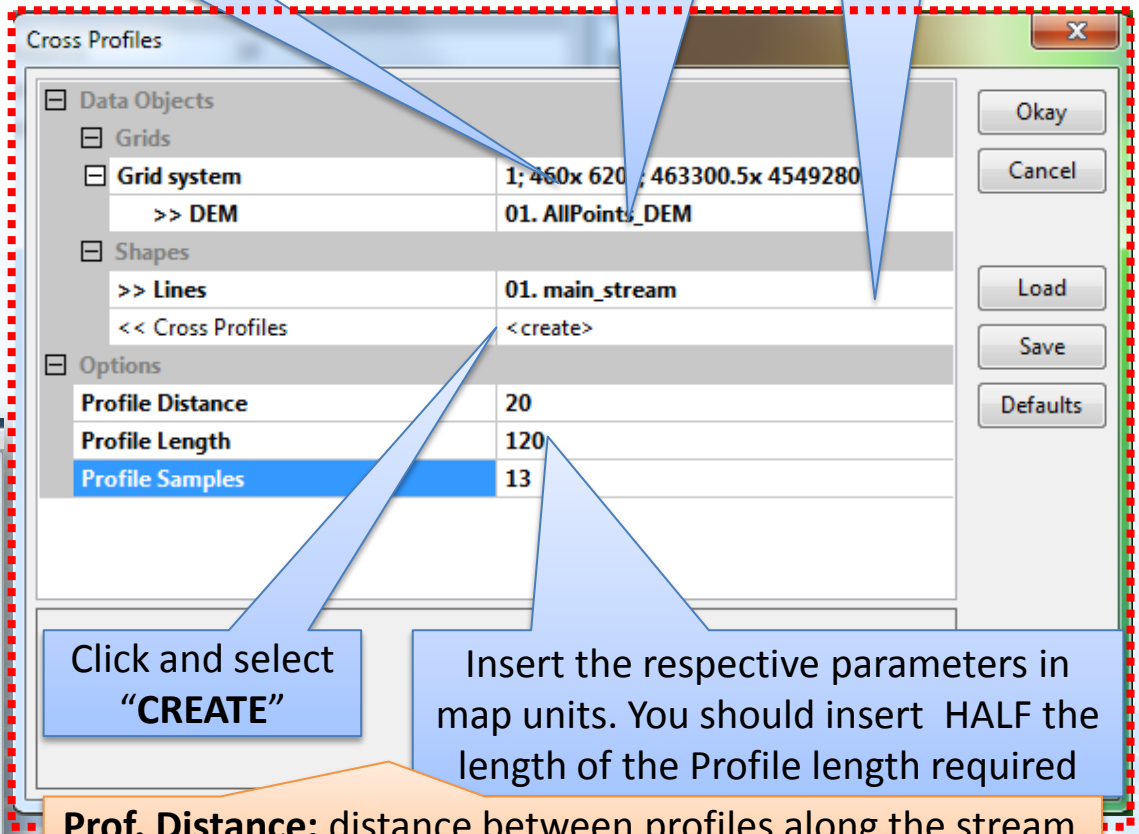
- GO to ….**Tools > Terrain Analysis > Profiles** and run (double click) **CROSS PROFILES**



Click and select the only option

Click and select the **DEM**

Click and select the **STREAM** line



Click and select "**CREATE**"

Insert the respective parameters in map units. You should insert HALF the length of the Profile length required

Prof. Distance: distance between profiles along the stream
Profile Samples: the number of points along the profile

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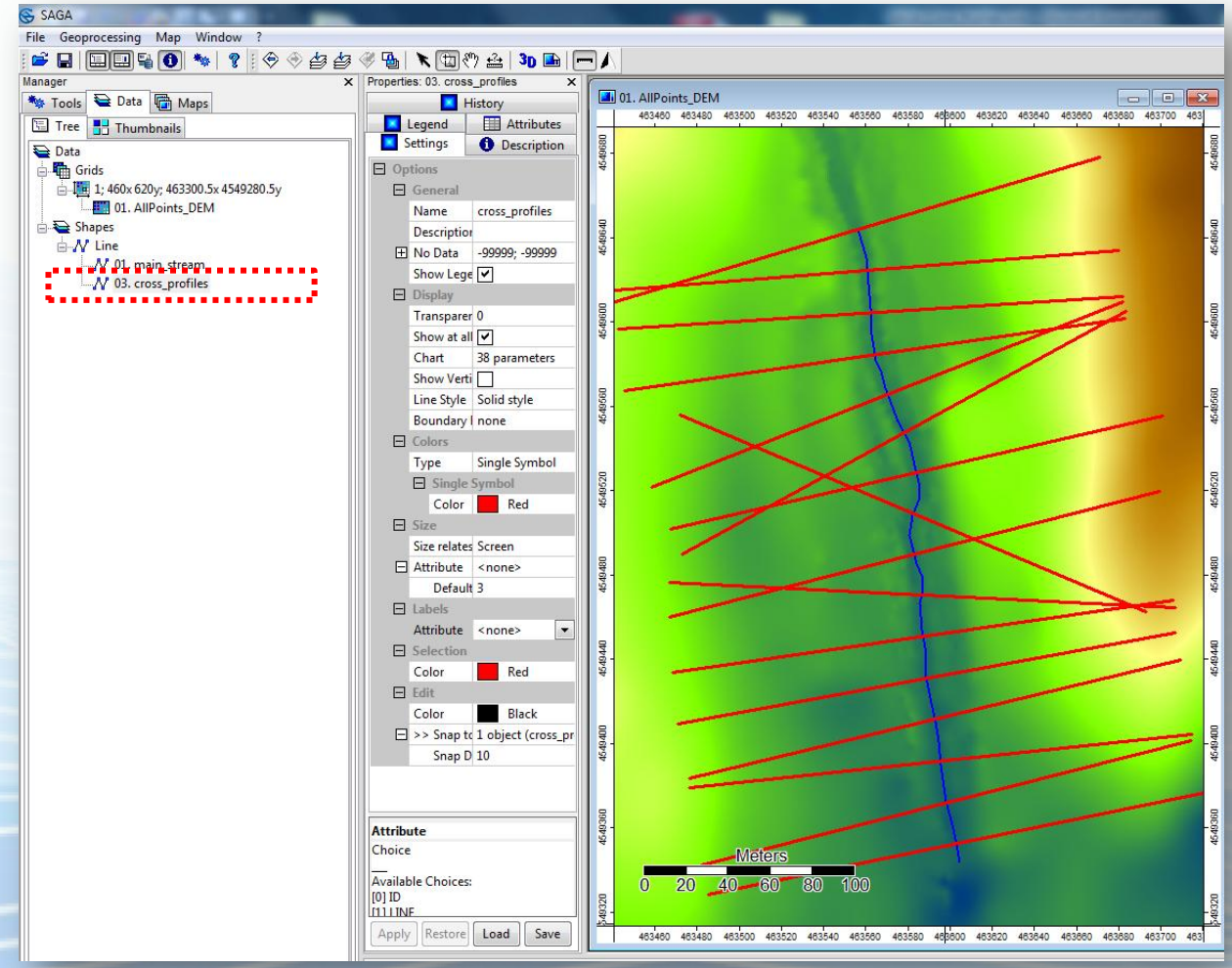
- **RUN** and ….

- Cross sections file appears under the Data click tab



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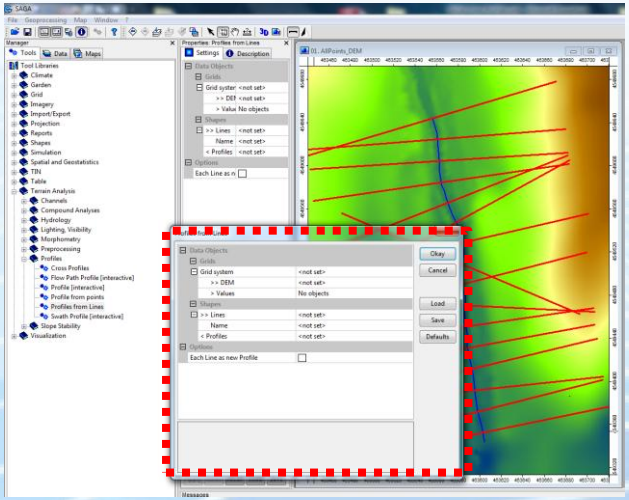
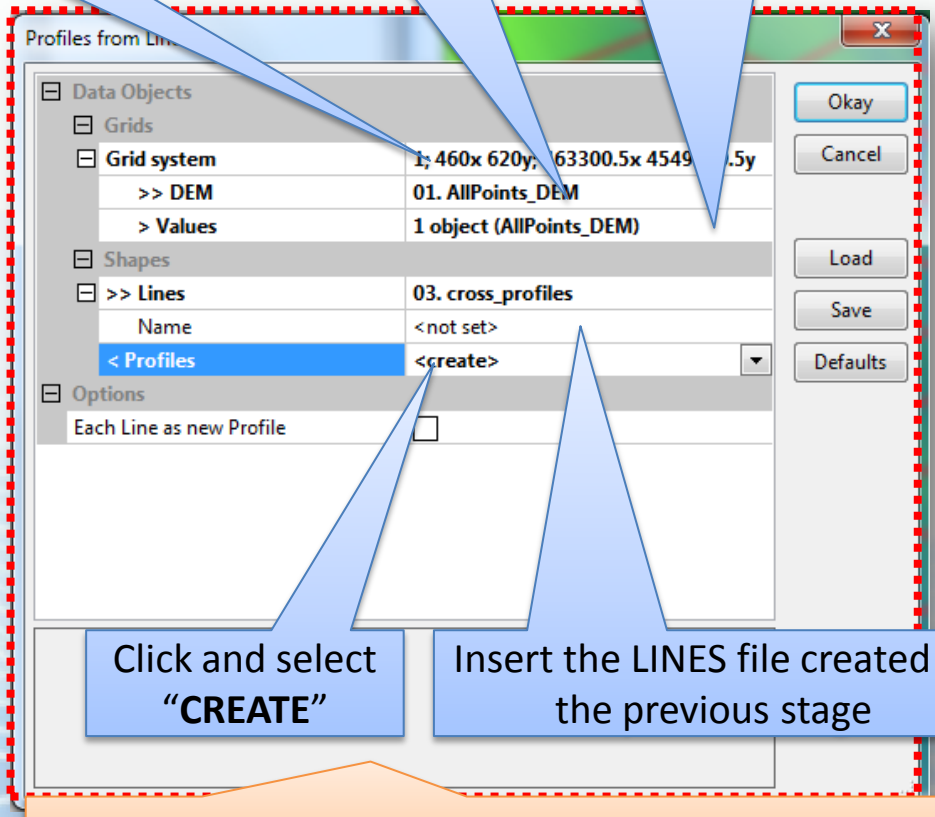
- Now….RUN…
  PROFILES from LINES



Click and select the only option

Click and select the **DEM**

Click and insert in the requested the **DEM**



Click and select "**CREATE**"

Insert the LINES file created in the previous stage

Click Okay and …..

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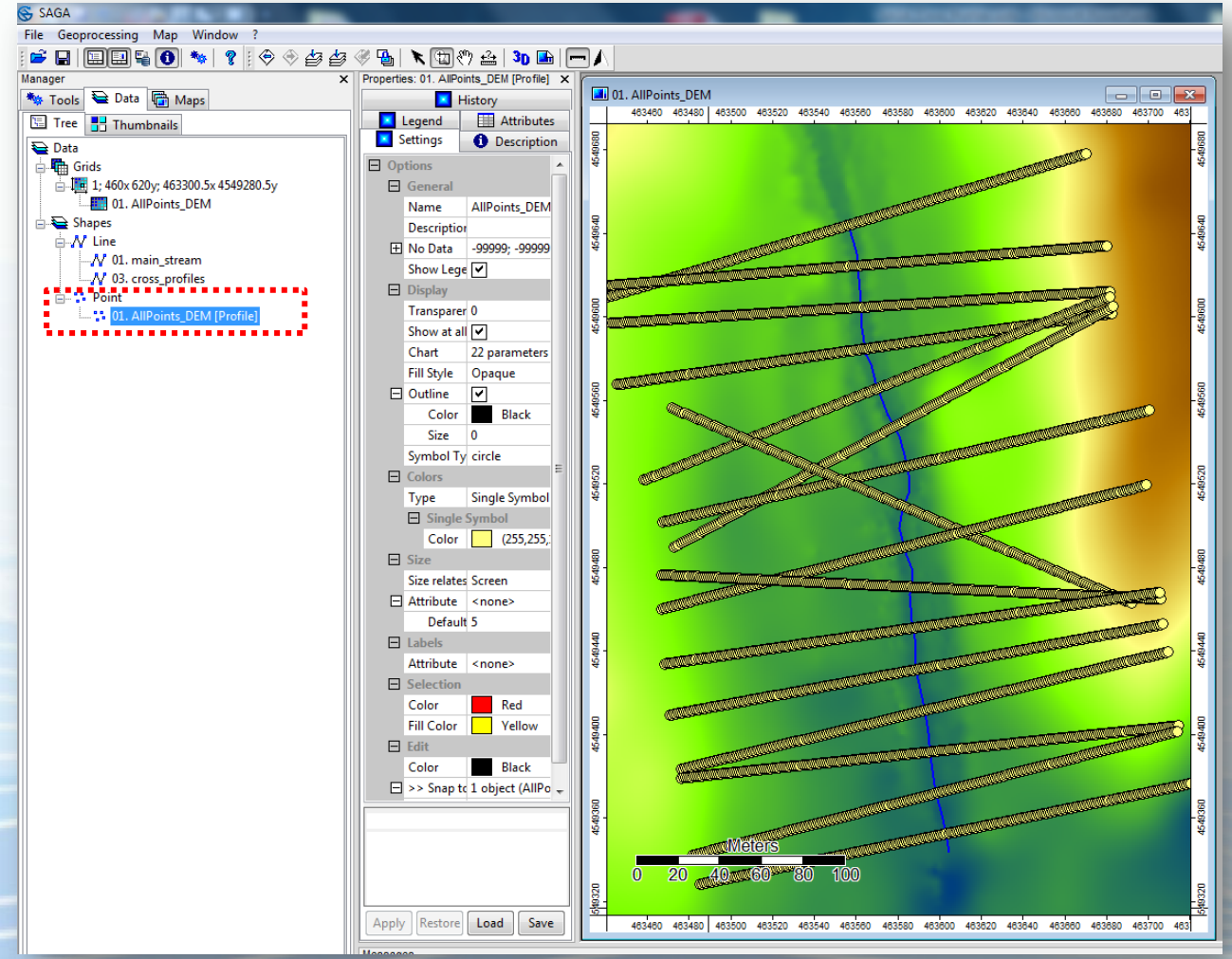
- **RUN** and ….
- Cross sections POINTS file appears under the Data click tab
- Now, for every cross section, there are points spaced 1.4m from each other
- Right Click on the point data file and select…ATTRIBUTES ”Save as”….



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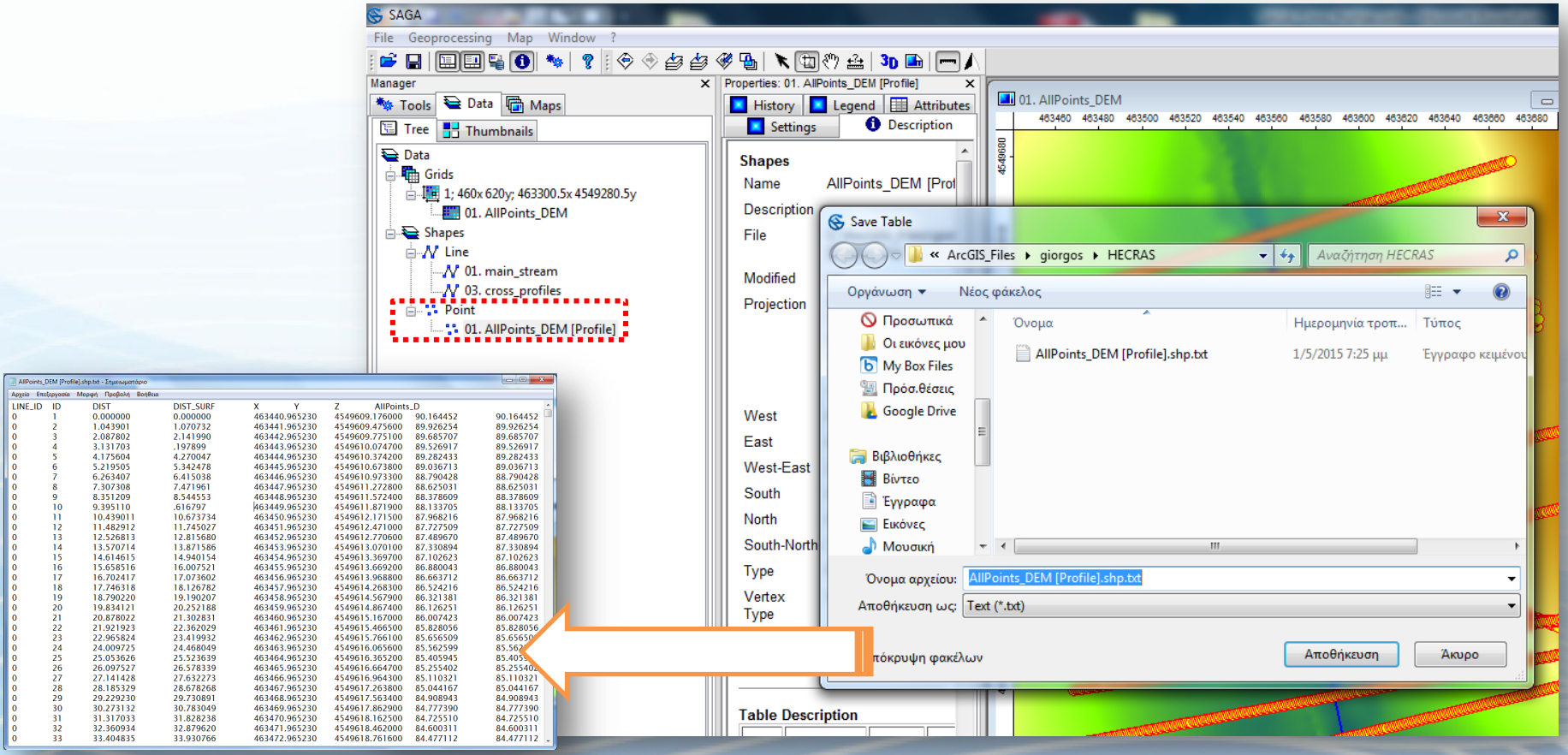
- Right Click on the point data file and select ATTRIBUTES …"Save as" and **Save as TEXT**.



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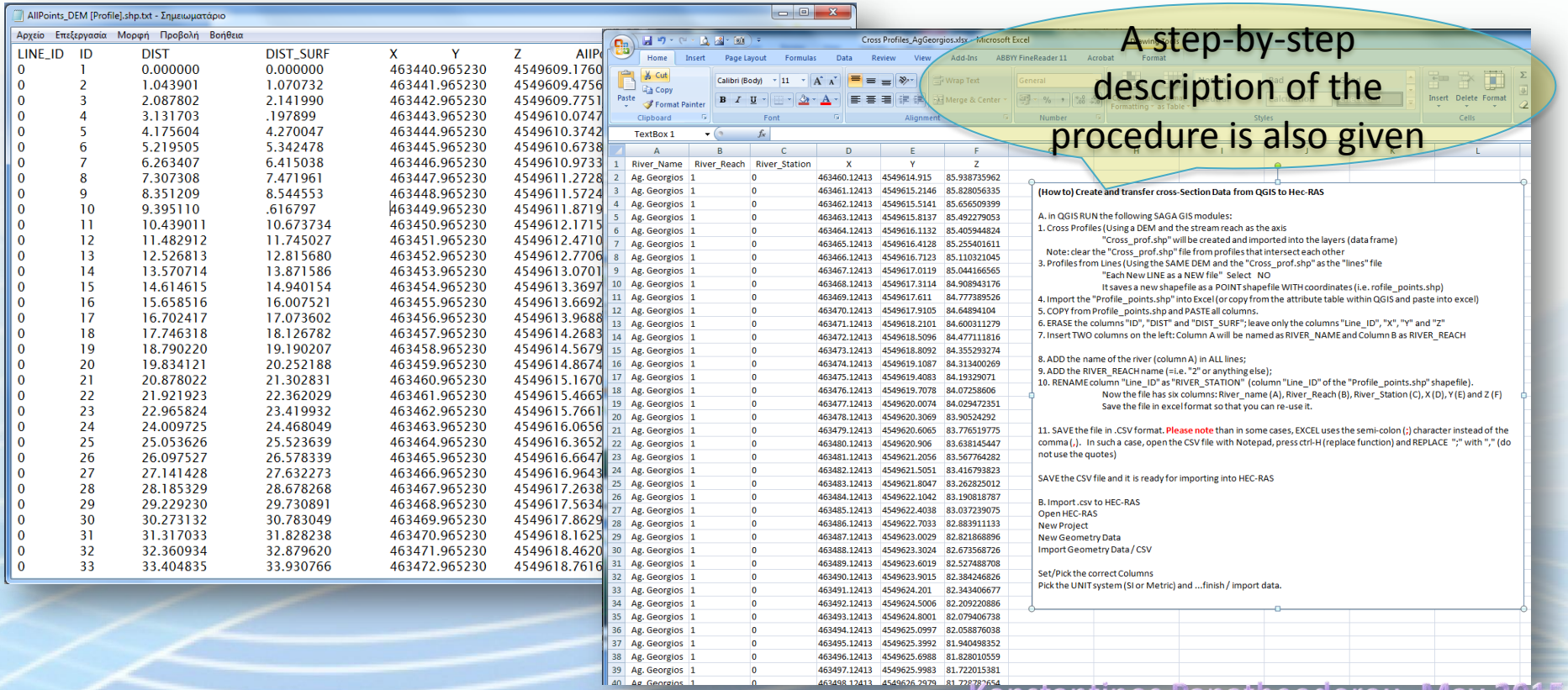
- This file can be imported into EXCEL for the next few steps before being imported into HEC-RAS for applying the Hydraulic Model



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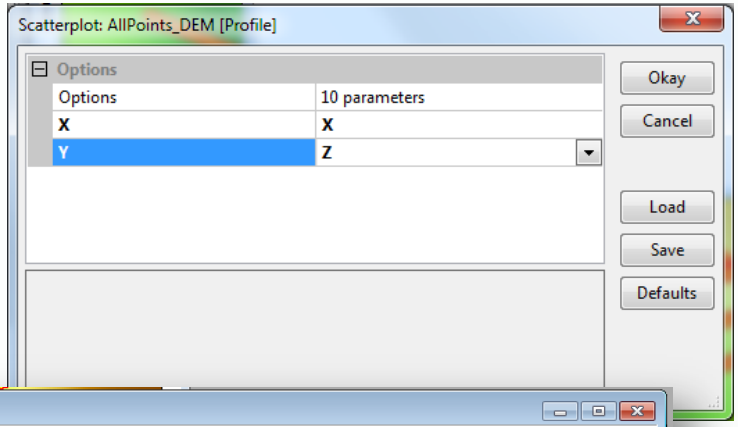
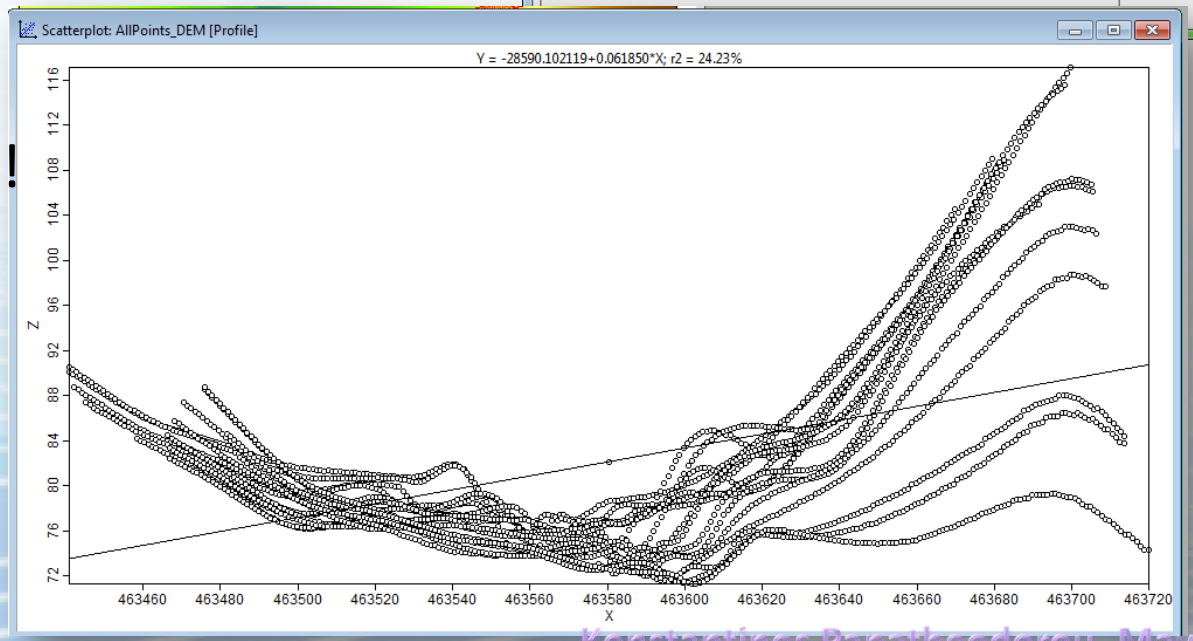
- Right Click on the point data file and select…ATTRIBUTES ”Scatterplot”….
- Provide the parameters for the cross sections… X & Z



- ..and you get…this!



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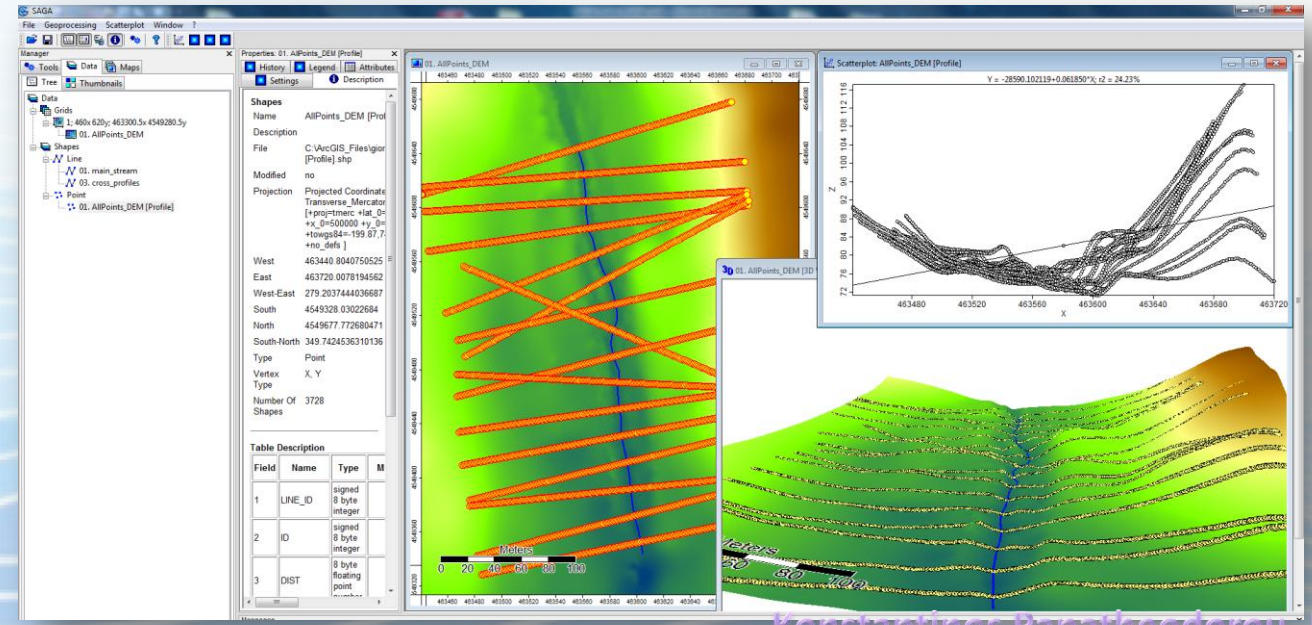
- Double Click on the DEM file on the DATA tab, and display the respective map
- Click on the map and select from the TOP MENU > Map > Show 3D View
- Input the parameters (DEM etc)
- Okay and ….. PLAY!



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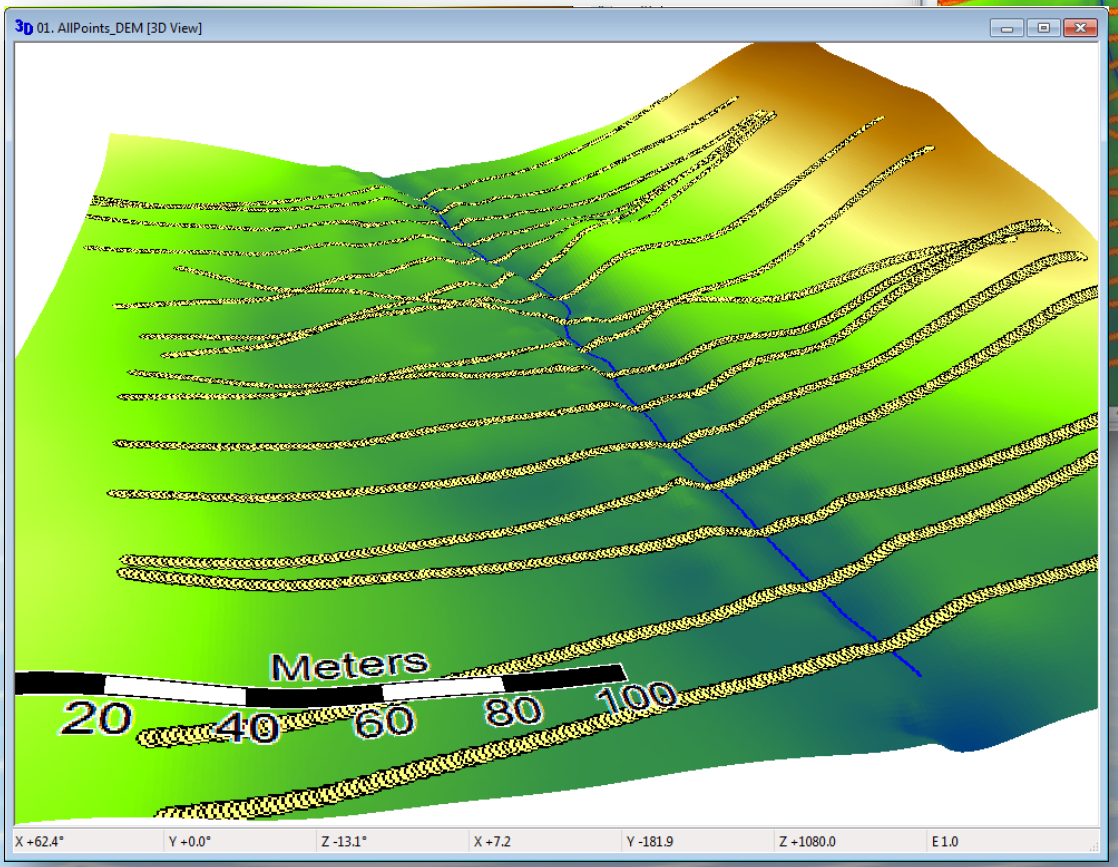
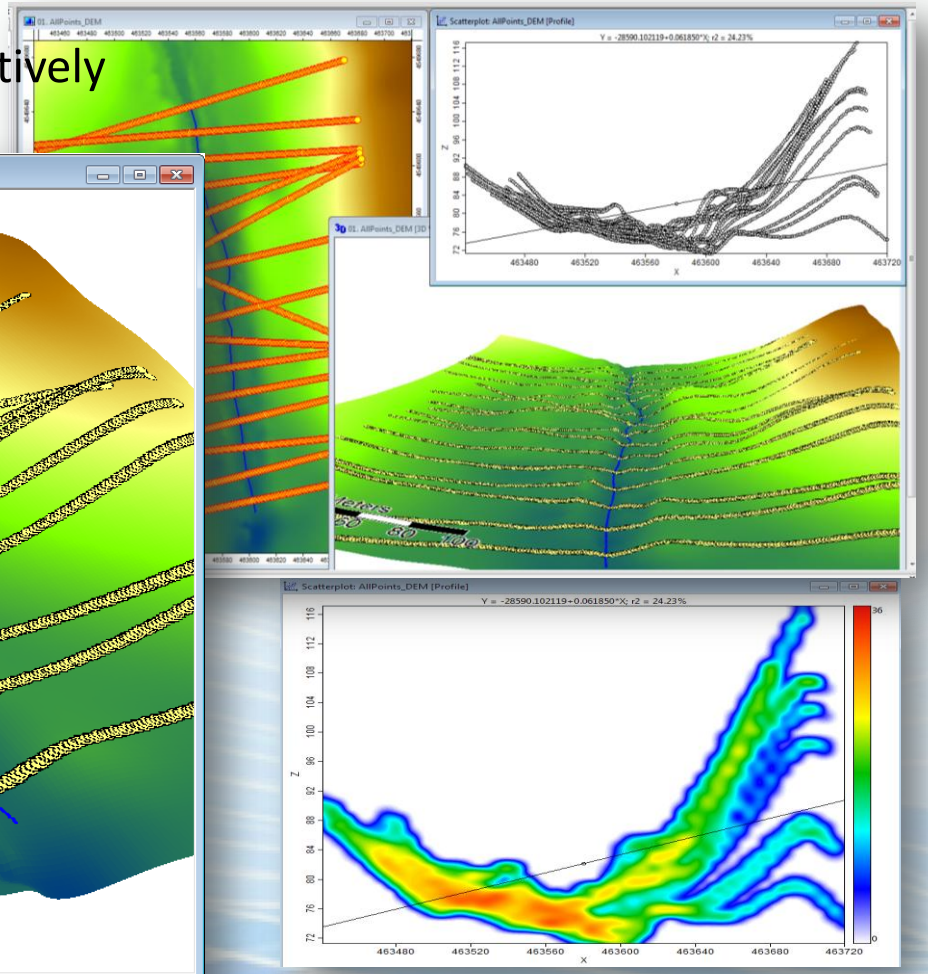
- Mouse Scroll Wheel: zoom in and out
- Mouse LEFT: change perspective interactively
- Mouse RIGHT: Move the Map





Konstantinos Papatheodorou, May 2015

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Steps to create Cross Sections for HEC-RAS

- **RUN** SAGA
- Either open the contours and make a DEM within SAGA or open a DEM created with other software
- Open the Stream shapefile
- Run **Tools > Terrain Analysis > Profiles > CROSS PROFILES**
- RUN… **PROFILES from LINES** (same menu)
- Right Click on the point data file and select ATTRIBUTES …"Save as" and **Save as TEXT**

…. import the file into EXCEL for making a few changes

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The ....version

A Step-by-Step Tutorial (click to read)

How to create Cross Sections ready for importing into HEC-RAS for Hydraulic Analysis

...IN LESS THAN 5' !

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(How to) Create and transfer cross-Section Data from QGIS to Hec-RAS

- In QGIS load/create the DEM of the area and the stream line
- RUN the following SAGA GIS modules:
  1. Cross Profiles (Using a DEM and the stream reach as the axis. A shapefile (named by you) will be created and imported into the layers (data frame).
  2. Profiles from Lines (Using the SAME DEM and the "Cross_prof.shp" as the "lines" file. "Each New LINE as a NEW file" Select NO (It saves a new shapefile as a POINT shapefile WITH coordinates (i.e. profile_points.shp))
  3. **C**opy from the attribute table within QGIS the list of numbers (all columns) and paste it PASTE into Excel

- *…some work is needed in Excel which is common for both the SAGA and the QGIS based procedure*

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Last fixes with

4. ERASE the columns "ID", "DIST" and "DIST_SURF"; leave only the columns "Line_ID", "X", "Y" and "Z“
5. Insert TWO columns on the left: Column A will be named as RIVER_NAME and Column B as RIVER_REACH
6. ADD the name of the river (column A) in ALL lines; (e.g. Agios_Georgios)
7. ADD the RIVER_REACH name (=i.e. "2" or anything else);
8. RENAME column "Line_ID“ header as "RIVER_STATION" (column "Line_ID" of the "Profile_points.shp" shapefile).

- **Now the file has six columns: River_name (A), River_Reach (B), River_Station (C), X (D), Y (E) and Z (F)**
- **Save the file in excel format so that you can re-use it.**

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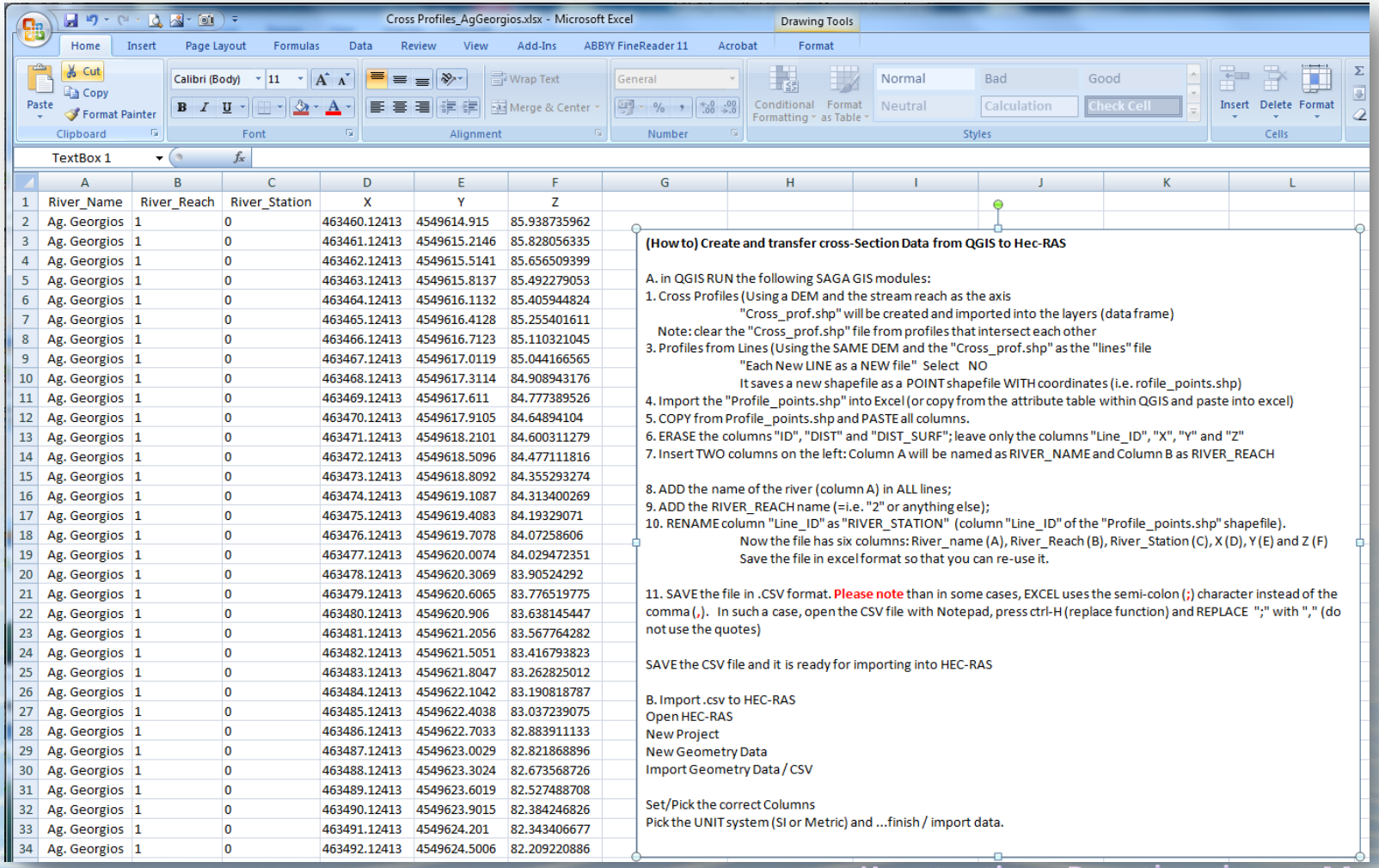

	A	B	C	D	E	F
1	River_Name	River_Reach	River_Station	X	Y	Z
2	Ag. Georgios	1	0	463460.12413	4549614.915	85.938735962
3	Ag. Georgios	1	0	463461.12413	4549615.2146	85.828056335
4	Ag. Georgios	1	0	463462.12413	4549615.5141	85.656509399
5	Ag. Georgios	1	0	463463.12413	4549615.8137	85.492279053
6	Ag. Georgios	1	0	463464.12413	4549616.1132	85.405944824
7	Ag. Georgios	1	0	463465.12413	4549616.4128	85.255401611
8	Ag. Georgios	1	0	463466.12413	4549616.7123	85.110321045
9	Ag. Georgios	1	0	463467.12413	4549617.0119	85.044166565
10	Ag. Georgios	1	0	463468.12413	4549617.3114	84.908943176
11	Ag. Georgios	1	0	463469.12413	4549617.611	84.777389526
12	Ag. Georgios	1	0	463470.12413	4549617.9105	84.64894104
13	Ag. Georgios	1	0	463471.12413	4549618.2101	84.600311279
14	Ag. Georgios	1	0	463472.12413	4549618.5096	84.477111816
15	Ag. Georgios	1	0	463473.12413	4549618.8092	84.355293274
16	Ag. Georgios	1	0	463474.12413	4549619.1087	84.313400269
17	Ag. Georgios	1	0	463475.12413	4549619.4083	84.19329071
18	Ag. Georgios	1	0	463476.12413	4549619.7078	84.07258606
19	Ag. Georgios	1	0	463477.12413	4549620.0074	84.029472351
20	Ag. Georgios	1	0	463478.12413	4549620.3069	83.90524292
21	Ag. Georgios	1	0	463479.12413	4549620.6065	83.776519775
22	Ag. Georgios	1	0	463480.12413	4549620.906	83.638145447
23	Ag. Georgios	1	0	463481.12413	4549621.2056	83.567764282
24	Ag. Georgios	1	0	463482.12413	4549621.5051	83.416793823
25	Ag. Georgios	1	0	463483.12413	4549621.8047	83.262825012
26	Ag. Georgios	1	0	463484.12413	4549622.1042	83.190818787
27	Ag. Georgios	1	0	463485.12413	4549622.4038	83.037239075
28	Ag. Georgios	1	0	463486.12413	4549622.7033	82.883911133
29	Ag. Georgios	1	0	463487.12413	4549623.0029	82.821868896
30	Ag. Georgios	1	0	463488.12413	4549623.3024	82.673568726
31	Ag. Georgios	1	0	463489.12413	4549623.6019	82.527488708
32	Ag. Georgios	1	0	463490.12413	4549623.9015	82.384246826
33	Ag. Georgios	1	0	463491.12413	4549624.201	82.343406677
34	Ag. Georgios	1	0	463492.12413	4549624.5006	82.209220886

(How to) Create and transfer cross-Section Data from QGIS to Hec-RAS

A. in QGIS RUN the following SAGA GIS modules:
1. Cross Profiles (Using a DEM and the stream reach as the axis
"Cross_prof.shp" will be created and imported into the layers (data frame)
Note: clear the "Cross_prof.shp" file from profiles that intersect each other
3. Profiles from Lines (Using the SAME DEM and the "Cross_prof.shp" as the "lines" file
"Each New LINE as a NEW file" Select NO
It saves a new shapefile as a POINT shapefile WITH coordinates (i.e. rofile_points.shp)
4. Import the "Profile_points.shp" into Excel (or copy from the attribute table within QGIS and paste into excel)
5. COPY from Profile_points.shp and PASTE all columns.
6. ERASE the columns "ID", "DIST" and "DIST_SURF"; leave only the columns "Line_ID", "X", "Y" and "Z"
7. Insert TWO columns on the left: Column A will be named as RIVER_NAME and Column B as RIVER_REACH

8. ADD the name of the river (column A) in ALL lines;
9. ADD the RIVER_REACH name (=i.e. "2" or anything else);
10. RENAME column "Line_ID" as "RIVER_STATION" (column "Line_ID" of the "Profile_points.shp" shapefile).
Now the file has six columns: River_name (A), River_Reach (B), River_Station (C), X (D), Y (E) and Z (F)
Save the file in excel format so that you can re-use it.

11. SAVE the file in .CSV format. **Please note** than in some cases, EXCEL uses the semi-colon (;) character instead of the comma (,). In such a case, open the CSV file with Notepad, press ctrl-H (replace function) and REPLACE ";" with "," (do not use the quotes)

SAVE the CSV file and it is ready for importing into HEC-RAS

B. Import .csv to HEC-RAS
Open HEC-RAS
New Project
New Geometry Data
Import Geometry Data / CSV

Set/Pick the correct Columns
Pick the UNIT system (SI or Metric) and ...finish / import data.

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Common borders. Common solutions.

(How to) Create and transfer cross-Section Data from QGIS to Hec-RAS

- 11. SAVE the file in .CSV format.
- **Please note** than in some cases, EXCEL uses the semi-colon (**;**) character instead of the comma (**,**). In such a case, open the CSV file with Notepad, press ctrl-H (replace function) and REPLACE ";" with "," (do not use the quotes)

- The CSV file and it is ready for importing into HEC-RAS

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(How to) Create and transfer cross-Section Data from QGIS to Hec-RAS

- A. in QGIS RUN the following SAGA GIS modules

A Step-by-Step Tutorial (click to read)

B. Import .csv to HEC-RAS

- Open HEC-RAS

1. **Menu FILE > New Project** (create a project)
2. Menu **EDIT > Geometric data**
3. Menu **Geometric data > New Geometry Data**
4. Menu **Import Geometry Data** / Import CSV
5. Set/Pick the correct Columns
6. Pick the UNIT system (SI or Metric) and ...**finish** to import data.

Konstantinos Papatheodorou, May 2015

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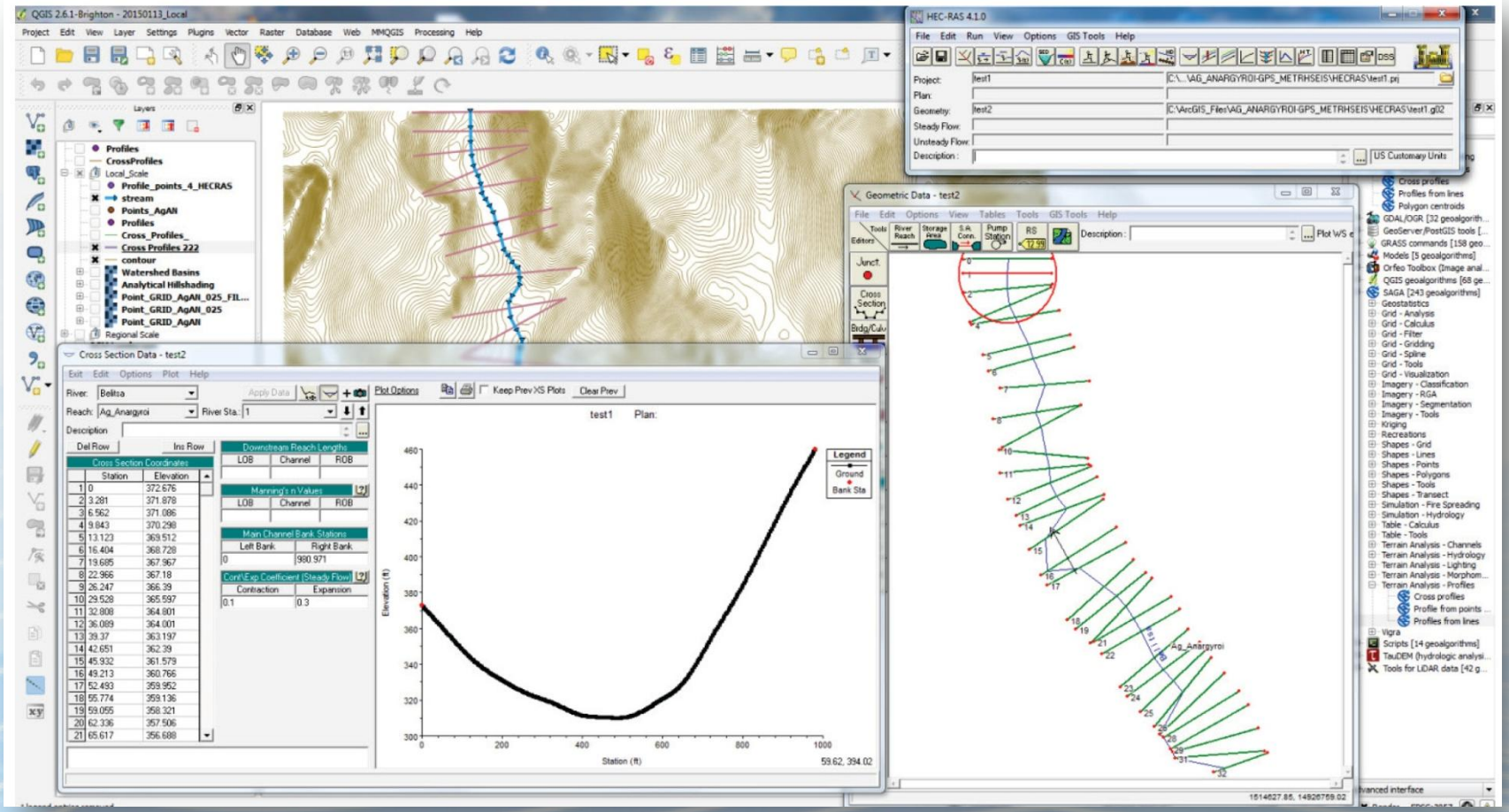
Common borders. Common solutions.

Got it! Create in QGIS Cross Sections and import them into HEC-RAS in less than 5’



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SciNet NatHaz Prevention

Black Sea CROSS BORDER COOPERATION

Common borders. Common solutions.

Just .... SAGA www.saga-gis.org System for Automated Geoscientific Analyses Or ....

Thank you !

How to create Cross Sections ready for importing into HEC-RAS for Hydraulic Analysis

Konstantinos Papatheodorou, May 2015