Figures Tutoriel Chapter X

Representation of the drainage network in urban and periurban areas using a 2D polygonal mesh composed of pseudo-convex elements

The various steps presented in this document are part of a series of exercices the objective of which is to reproduce most of the figures included in this chapter. Two steps can be distinguished: the first one that only uses the TriangleQGIS plugin for the triangulation of bad-shaped elements, and the second one that also allows the second step, called dissolution and that uses the Geo-PUMMA toolbox, based on Python and Grass scripts and functions.

Part A: (QGIS-Windows)
Installation of the TriangleQGIS plugin in Windows
Getting the following figures included in the chapter under numbers:
x2;x28;x30;x31;x34;x35;x36

Part B: (QGIS-GRASS-Virtual box)

Dissolution of the triangulation and application to the Mercier catchment Getting the following figures included in the chapter under numbers: X34;x35;x36;x37

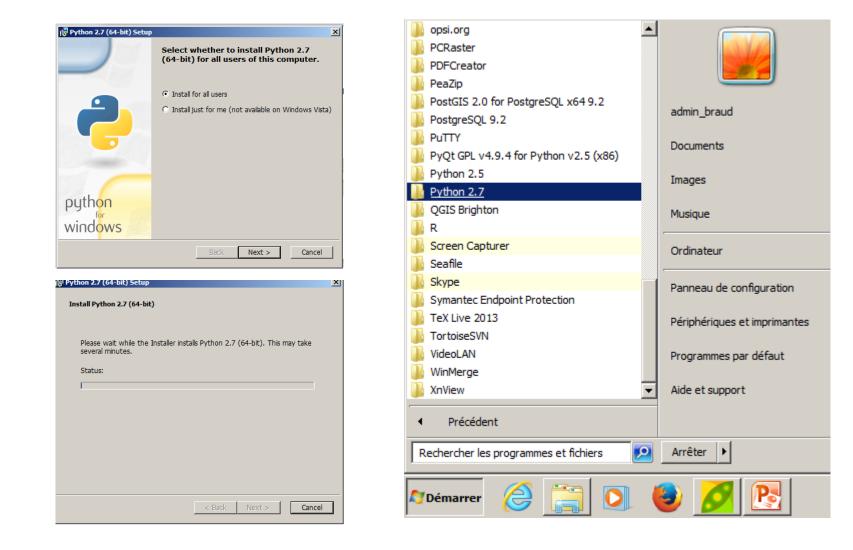
Part A: (QGIS-Windows) Installation of the TriangleQGIS plugin in Windows

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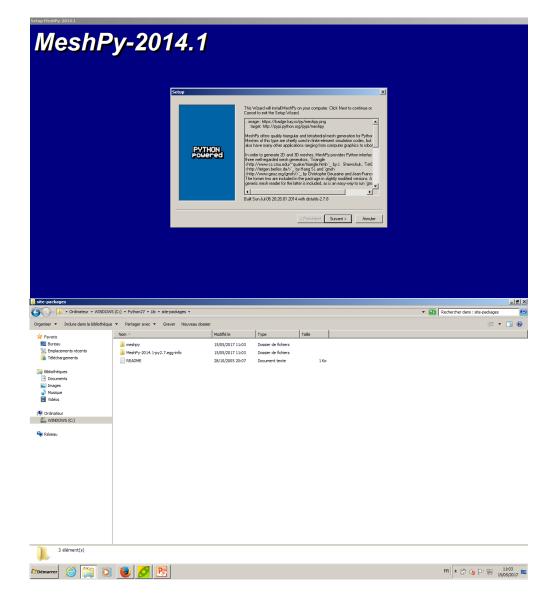
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Folder containing the installation archive of QGIS, Python, MeshPy et QGISTriangle: Install QGIS 2.4 or higher Install Python 2.7 Install MeshPy

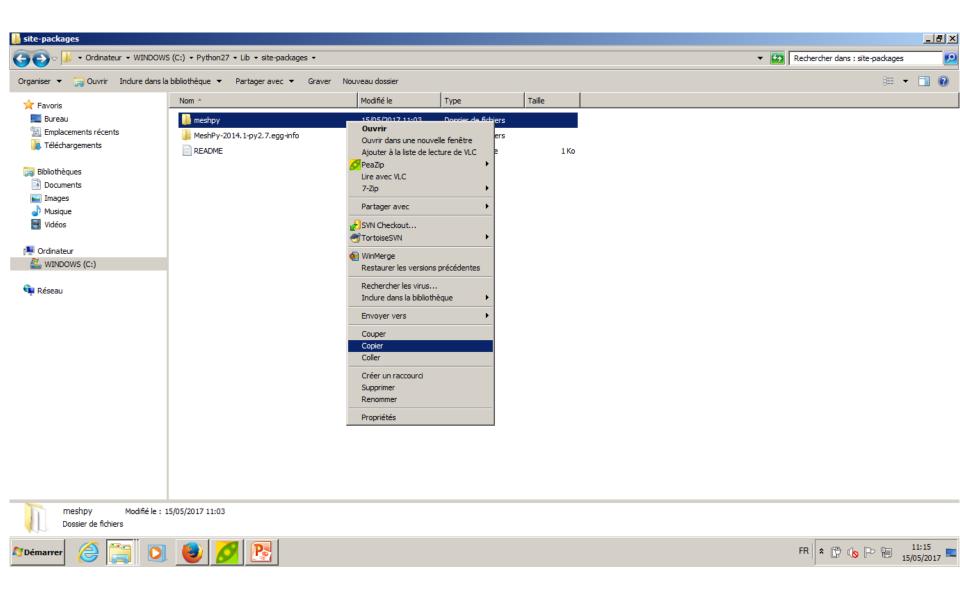


Step: Installation of Python 2.7

Verify that Python is correctly installed in the starting bar menu



Step: Installation of MeshPy If everything is OK, the MeshPy library should be in the folder: C:\Python27\Lib\site-packages



Step: Installation of MeshPy in QGIS Copy the MeshPy folder from the folder: C:\Python27\Lib\site-packages

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Step: Installation of MeshPy in QGIS Copy the MeshPy folder in the folder:

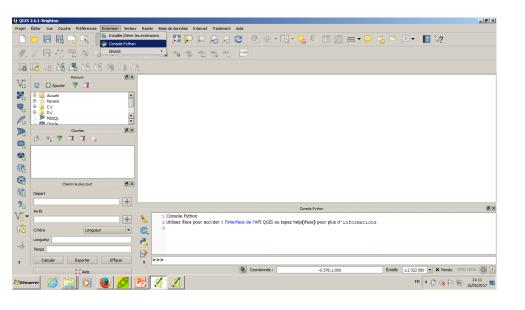
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Step: Verify that the library is well installed in the Python from QGIS:

-Open QGIS

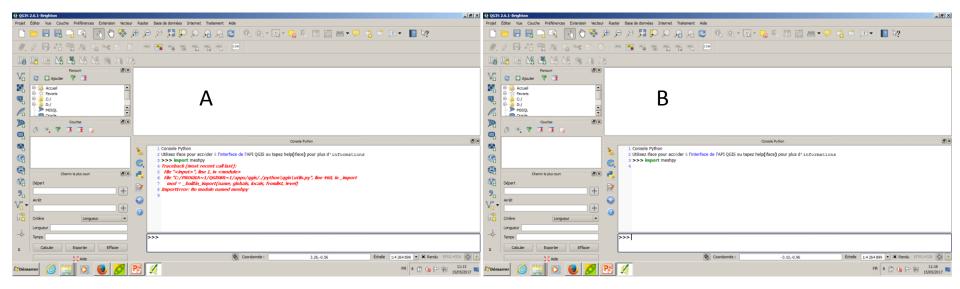
-Open the Python console

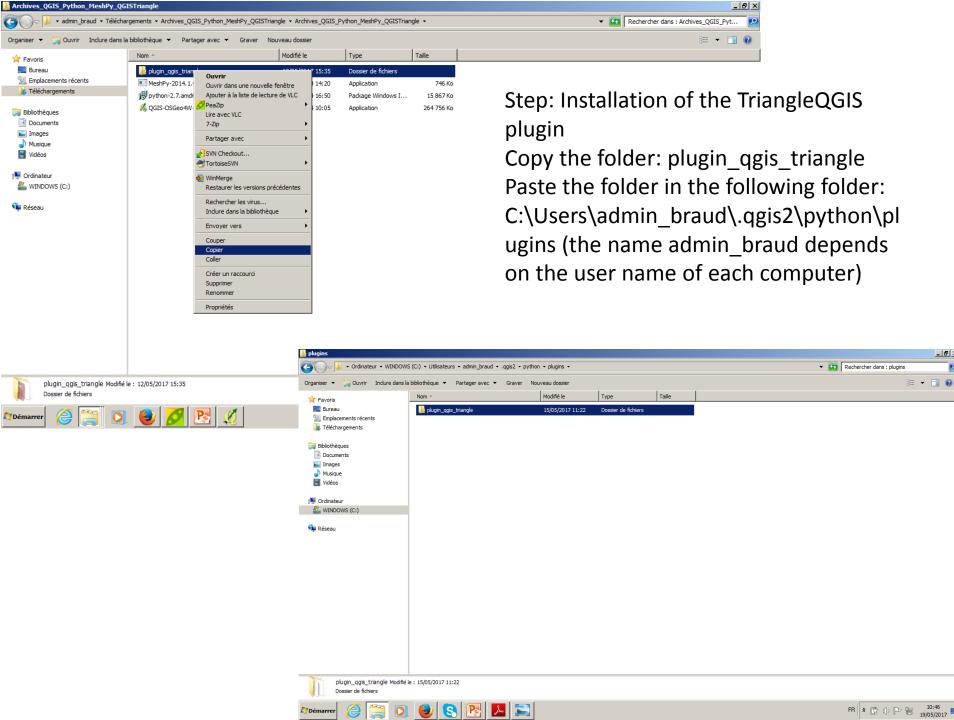
-Type: import meshpy

If the library is not well copied, the user gets Figure A;

If the library is well installed, the user gets Figure B

Once this step is finalized, QGIS must be closed to proceed with the installation of TriangleQGIS





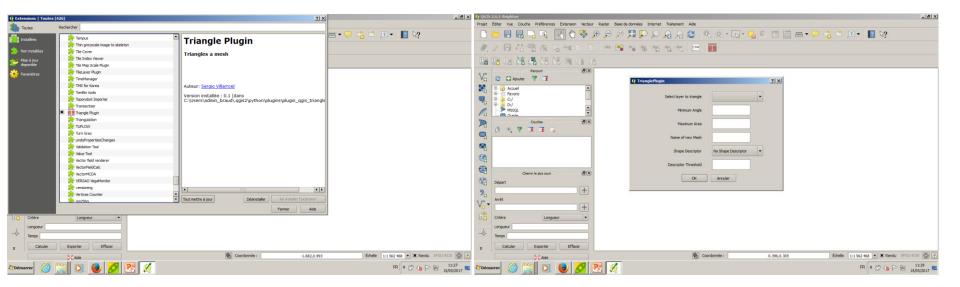
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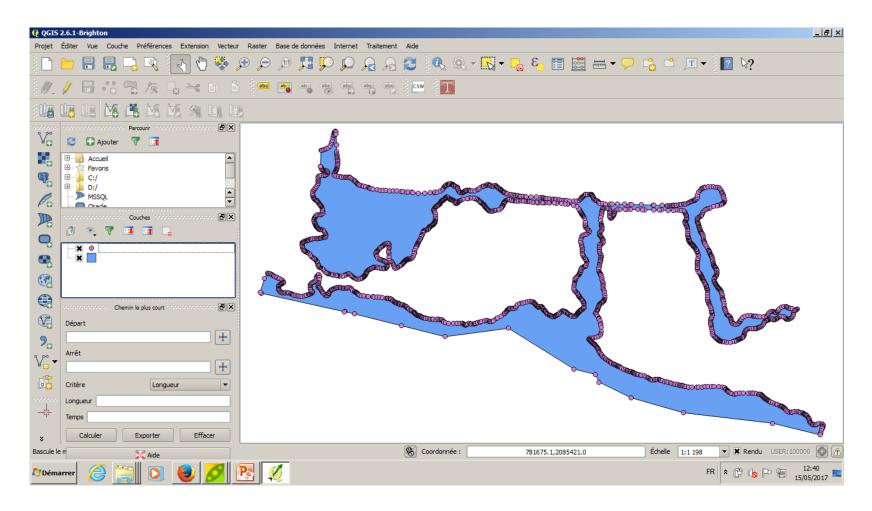
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Step: Activation of the TriangleQGIS plugin -Select Extension-> Install/Manage extensions -Select Triangle with a click

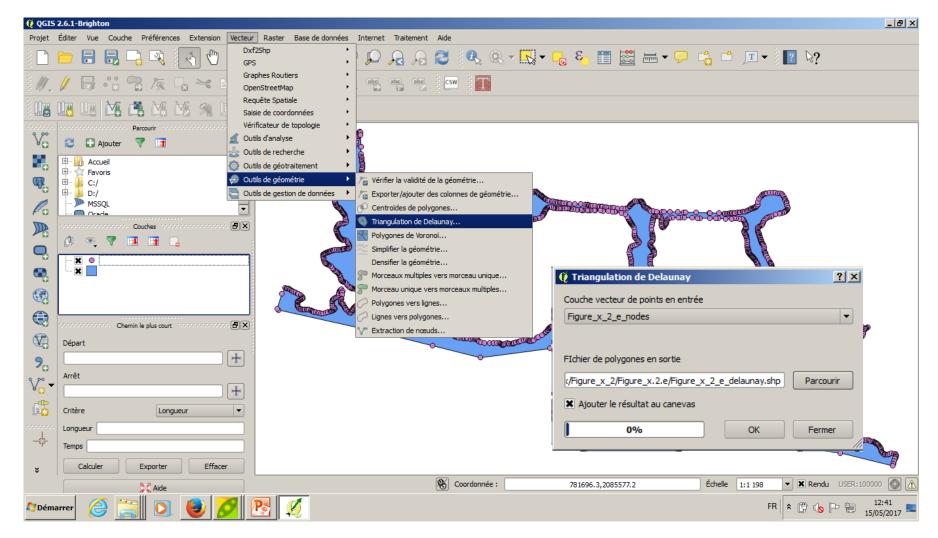
Once installed, the Triangle icone appears as well as the interface to manage the the triangulation



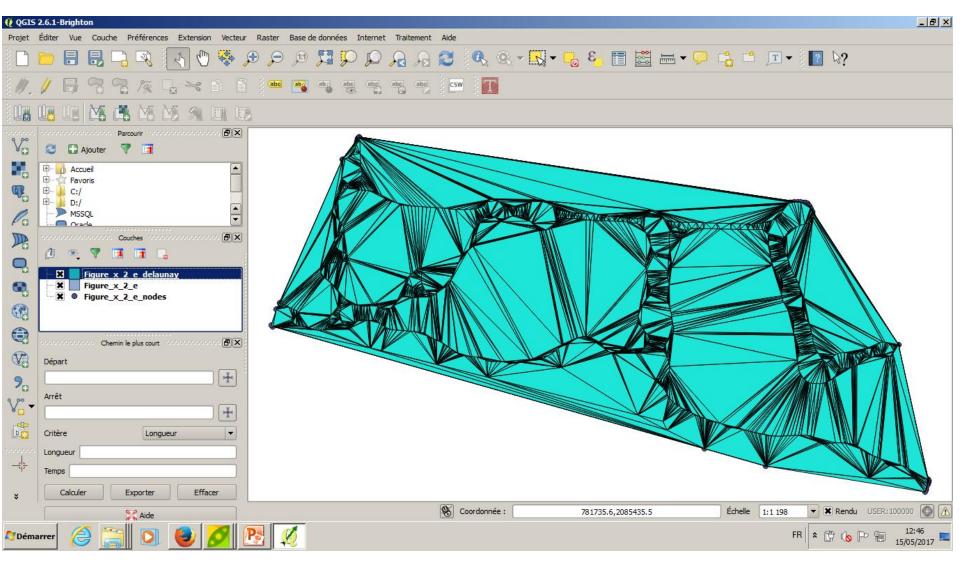


Step: Triangulation of a green area

-Load the shape Figure_x_2_e and Figure_x_2_e_nodes that is located in the folder: C:\Users\admin_braud\Downloads\Couches Vectorielles Chapitre x\Figure_x_2\Figure_x.2.e



Step: Triangulation of a green area with the option Delaunay triangulation in QGIS -Select the vectorial tool Vector-> Delaunay Triangulation; the input layer is Figure_x_2_e_nodes

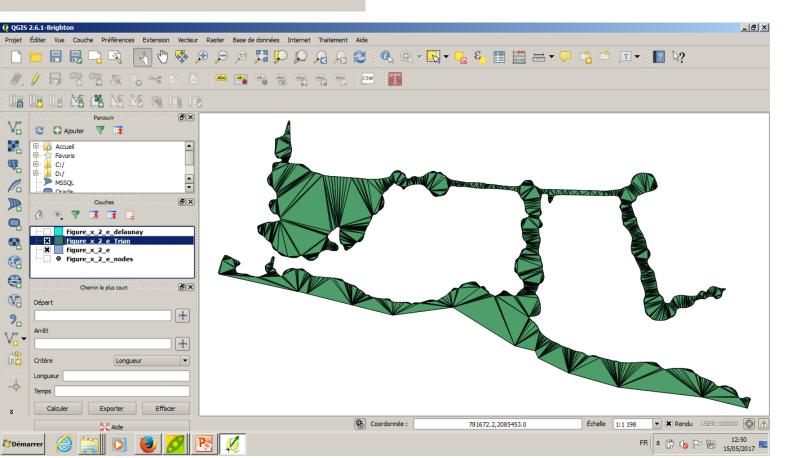


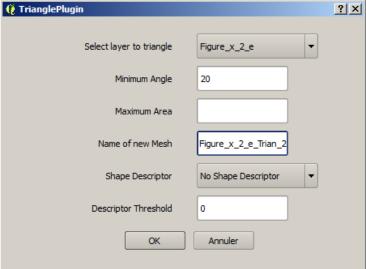
Step: Triangulation of a green area with the option Delaunay triangulation in QGIS (getting Figure x.5.b)The result of the Triangulation Delaunay option in figure (4667 triangles)

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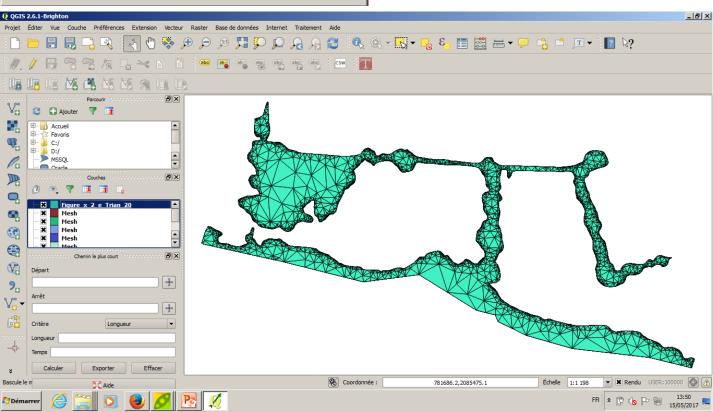
Step: Triangulation of a green area in Triangle (getting Figure x.5.c)

Option Delaunay Triangulation with constraints -The triangulation of the green area generates triangles inside the polygon (2340 triangles) respecting the initial boundary of the initial polygon





Step: Triangulation of a green area in Triangle (getting Figure x.5.d) with option conformal Triangulation (Maximum angle30°)
The triangulation of the green area generates triangles inside the polygon (5247 triangles) with a restriction on the interior angle of 20° maximum



Step: Triangulation of a periurban catchment: the Mercier catchment
The corresponding .shape, Figure_x_4_mercier.shp, is located int he folder
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It shows a periurban sub-catchment composed of 23 elements

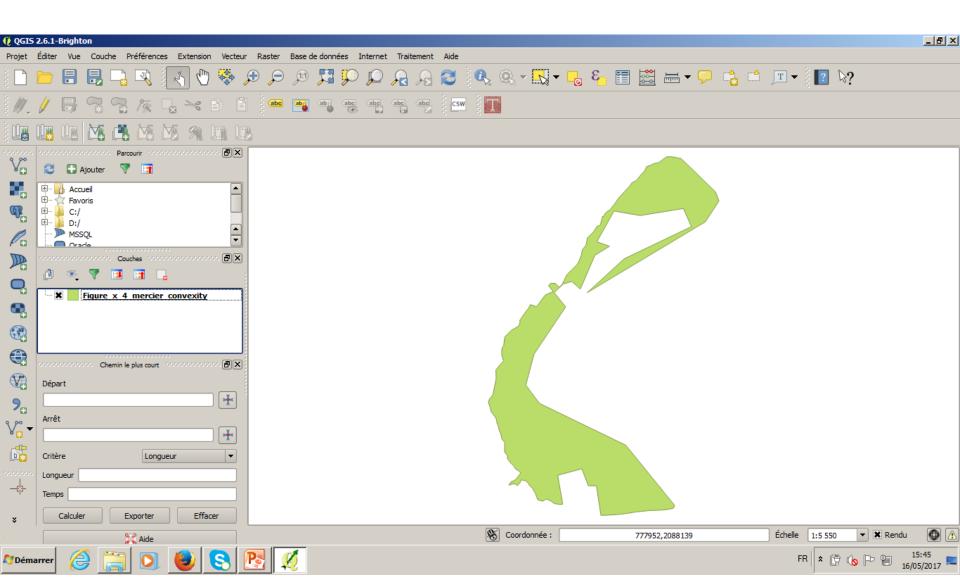
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Step: Selection of bad-shaped irregular polygons without shape format (cf Figure x.4) Polygons of the Mercier are divided into four groups:

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Step: Triangulation of non-convex elements (Getting figure x.30.a) -Load the .shp: Figure_x_4_mercier_convexity.shp



Step: Triangulation of non-convex elements (Getting figure x.30.b) -load the .shp: Figure_x_4_mercier_convexity.shp -to get a triangulation that preserve the initial non-convex boundary, the following 🧭 TrianglePlugin ? × options are used:

Select layer to triangle

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Step: Triangulation of non-convex elements (Getting figure x.30.c)

-Load the .shp: Figure_x_4_mercier_convexity.shp

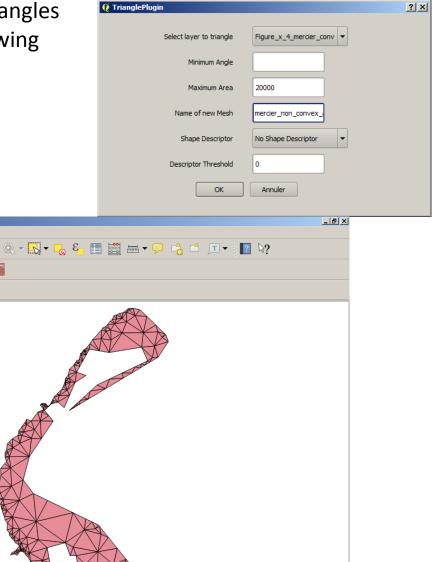
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 To get a triangulation that only generates triangles with an area larger than 20000 m2 the following options are used:

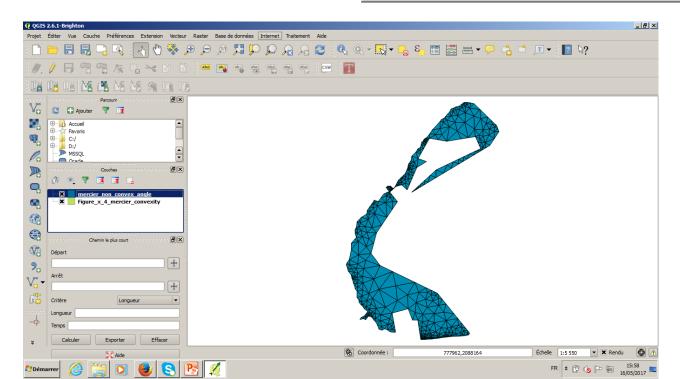
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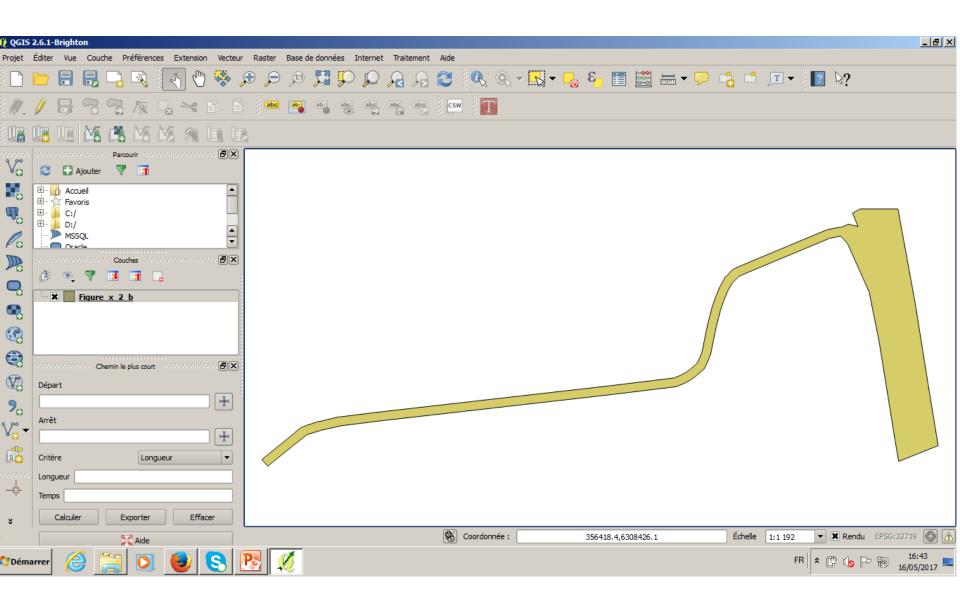
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-Load the .shp: Figure_x_4_mercier_convexity.shp
-to get the triangulation that only contains triangles with angles lower than 30°, the following options are used:

Select layer to triangle	Figure_x_4_mercier_conv -
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Maximum Area	
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Shape Descriptor	No Shape Descriptor
Descriptor Threshold	0
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Step: Triangulation of a long and thin element (Getting Figure x.31.a) -Load the .shp: Figure_x_2_b.shp



Step: Triangulation of a long and thin element (Getting Figure x.31.b)

-Load the .shp: Figure_x_2_b.shp

- to get a triangulation that preserve the initial polygon boundary, the following options are used :

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	Select layer to triangle	Figure_x_2_b
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Step: Triangulation of a long and thin element (Getting Figure x.31.c)

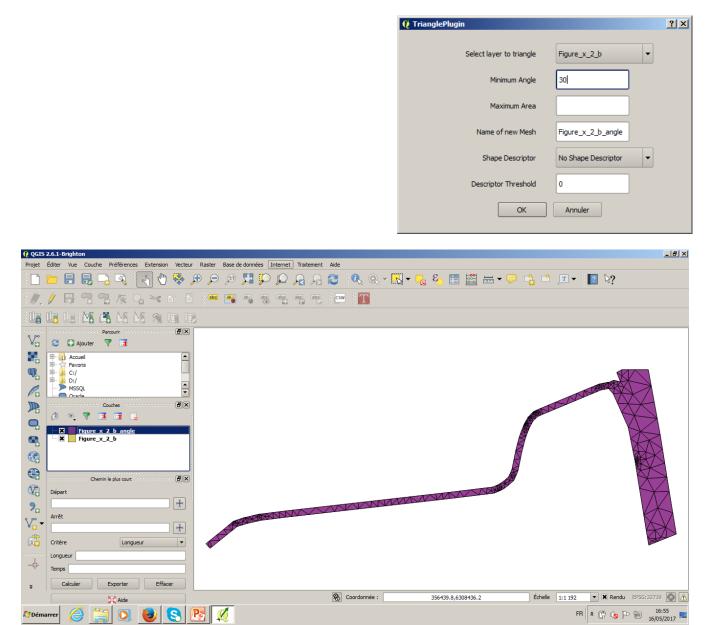
-Load the .shp: Figure_x_2_b.shp

-To get a triangulation that only generates triangles with an area larger than 200 m2 the following options are used:

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Step: Triangulation of a long and thin element (Getting Figure x.31.d) -Load the .shp: Figure_x_2_b.shp

- to get the triangulation with angles restriction of 30°, the following options are used:



- Step: Triangulation of a long and thin element with nodes separated by a maximum distance of 5 m (Getting Figure x.31.e)
- -Load the .shp: Figure_x_2_b_split_5m.shp (The .shp where additional points are already inserted is given. To do that, the user will have to use the v.split function from Grass (see p.32 of the Geo-PUMMA Users' Manual)
- -to get the triangulation with angles restriction of 30°, the following options are used:

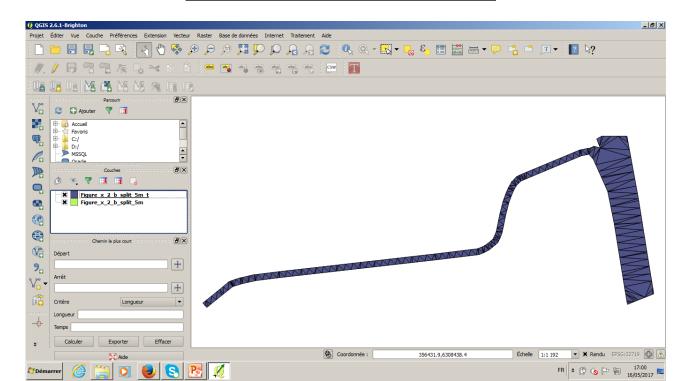
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Step: Triangulation of a long and thin element (Getting Figure x.31.f)

-Load the .shp: Figure_x_2_b_split_5m.shp

-to get a triangulation without restriction on surface and angle, use the following options:

🤃 TrianglePlugin	<u>? ×</u>
Select layer to triangle	Figure_x_2_b_split_5m
Minimum Angle	0
Maximum Area	
Name of new Mesh	Figure_x_2_b_split_5n
Shape Descriptor	No Shape Descriptor
Descriptor Threshold	0
ОК	Annuler



Step: Triangulation of a long and thin element from the Mercier
-Load the layer Figure_x_4_form_factor_split_5m.shp that is located in the folder:
C:\Users\admin_braud\Downloads\Couches Vectorielles Chapitre x\Figure_x_4

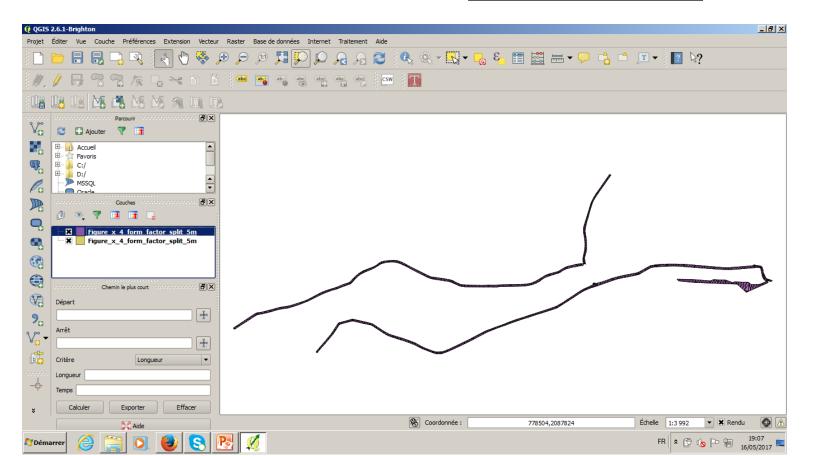
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Step: Triangulation of a long and thin element from the Mercier

-to get a triangulation without restriction on area and angle, use the following options: This figure is part of

Figure x.33 Long and thin element

TrianglePlugin	<u>? ×</u>
Select layer to triangle	Figure_x_4_form_factor_;
Minimum Angle	0
Maximum Area	
Name of new Mesh	Figure_x_4_form_fact
Shape Descriptor	No Shape Descriptor
Descriptor Threshold	0
ОК	Annuler



Step: Triangulation of a polygon with a too large area -Load the .shp: Figure_x_4_mercier_big_area.shp

🧕 TrianglePlugin

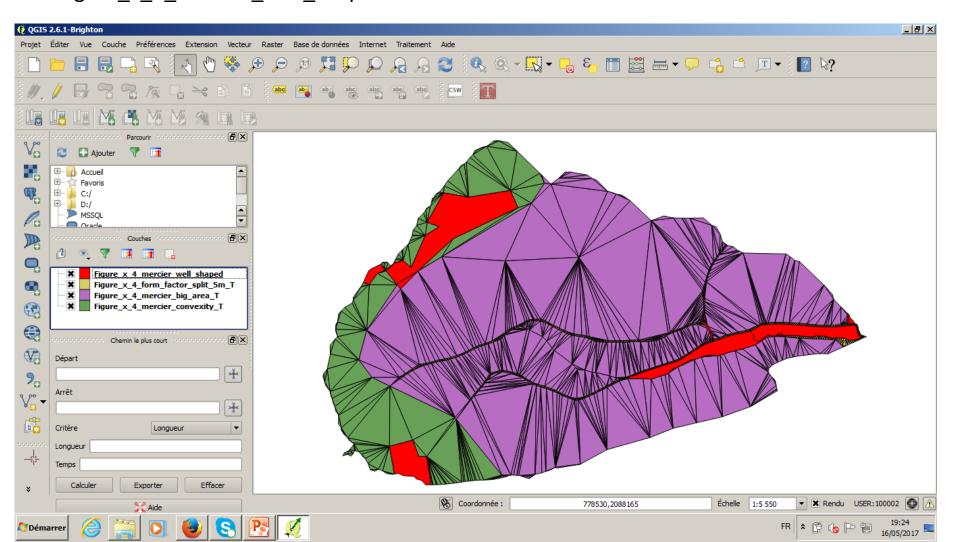
-to get a triangulation with area restriction of 2ha, use the following options:

This figure is part of Figure x.33 Too large element Restriction on the ar

33	Select layer to triangle	Figure_x_4_mercier_big_a ▼			
element	Minimum Angle	0			
on on the area	Maximum Area	20000			
in on the area	Name of new Mesh	4_mercier_big_area_T			
	Shape Descriptor	No Shape Descriptor			
	Descriptor Threshold	0			
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Step: Triangulation of the Mercier mesh The following GIS layers are available: (Figure x.33) -Figure_x_4_mercier_big_area_T -Figure_x_4_form_factor_split_5m_T -Figure_x_4_mercier_convexity_T -Figure_x_4_mercier_well_shaped



Part B: (QGIS-GRASS-Virtual box) Dissolution of the triangulation and application to the Mercier catchment

Step: download the GeoPUMMA Virtual box -This downloading can be performed on the following web site: <u>http://DOI.org/10.5281/zenodo.821563</u> And for the source codes <u>https://forge.irstea.fr/projects/geopumma</u>

If more information is required, the user can download the detailed tutorial Geo-PUMMA v1.1.pdf:

https://forge.irstea.fr/projects/geopumma/files

Step: Download the GeoPUMMA virtual box

-If the download was successful, the following file should be available in the download folder

-Then the virtual box, available in the .7zip archive must be decompressed

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Step: Installation of the Virtual box Select Downloads

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About Screenshots Downloads Documentation End-user docs Technical docs Contribute Community	 Here, you will find links to VirtualBox binaries VirtualBox binaries By downloading, you agree to the terms and VirtualBox 5.1.22 platform package ⇔ Windows hosts ⇔ OS X hosts ⇔ Solaris hosts VirtualBox 5.1.22 Oracle VM Virtual Support for USB 2.0 and USB 3.0 devintroduction to this Extension Pack. The Extension Pack binaries are relead Please install the extension pack with If you are using VirtualBox 5.0.40, for the content of the extension pack with See the changelog for what has changed. 	nd conditions of the respect ges. The binaries are release alBox Extension Pack \Rightarrow A vices, VirtualBox RDP, disk en ased under the VirtualBox Pe h the same version as your please download the extens oper Kit (SDK) \Rightarrow All platfor	ed under the terms of the GPL Il supported platforms ncryption, NVMe and PXE boot ersonal Use and Evaluation Lice installed version of VirtualBox: ion pack 🖙 here.	t for Intel cards. See this cl	napter from th	ne User N	lanual	for an		
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	Hote. After upgrading virtualbox it is recon	mmended to upgrade the gu								•



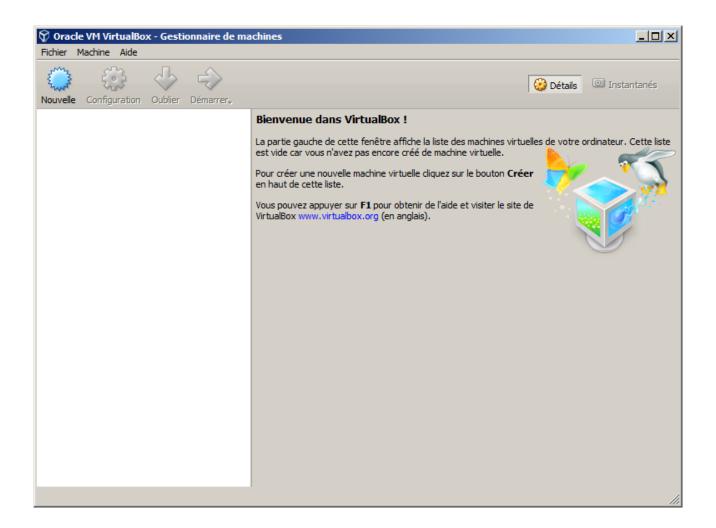
Step: Installation of the Virtual box

-Select « Save » and accept all the default installation options in all the windows that wil open later:

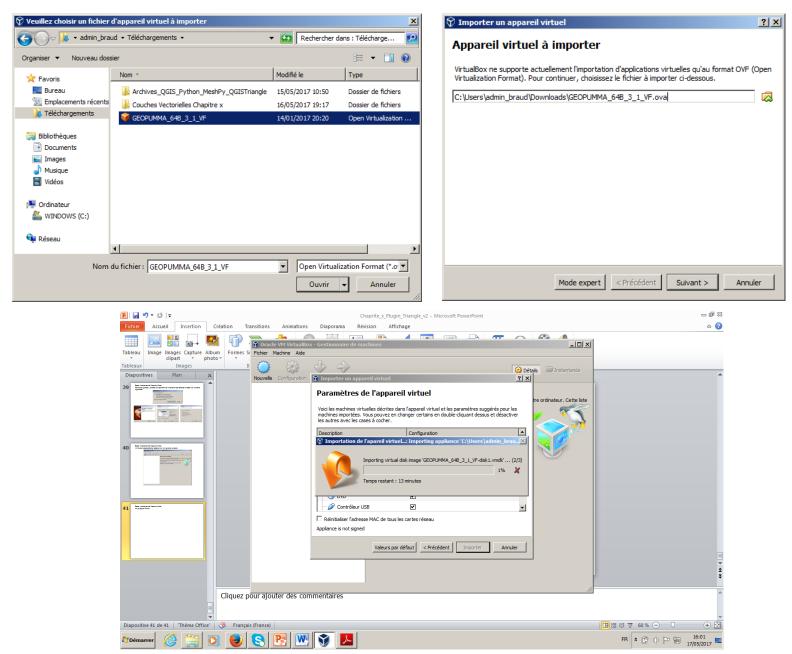


📴 Oracle VM VirtualBox 5.1.22 Setup	🕞 Oracle VM VirtualBox 5.1.22 Setup	🖞 Oracle VM VirtualBox 5.1.22 Setup
Welcome to the Oracle VM VirtualBox 5.1.22 Setup	Custom Setup Select the way you want features to be installed.	Custom Setup Select the way you want features to be installed.
Wizard The Setup Wizard will install Oracle VM VirtualBox 5.1.22 on your computer. Click Next to continue or Cancel to exit the Setup Wizard.	Click on the icons in the tree below to change the way features will be installed.	Please choose from the options below: Create start menu entries Create a shortcut on the desktop Create a shortcut in the Quick Launch Bar Register file associations
Version 5.1.22 Next > Cancel	Version 5.1.22 Disk Usage < Back Next > Cancel	Version 5.1.22 < Back Next > Cancel

Step: Installation of the Virtual box -If the installation ran correctly, the following window should appear:

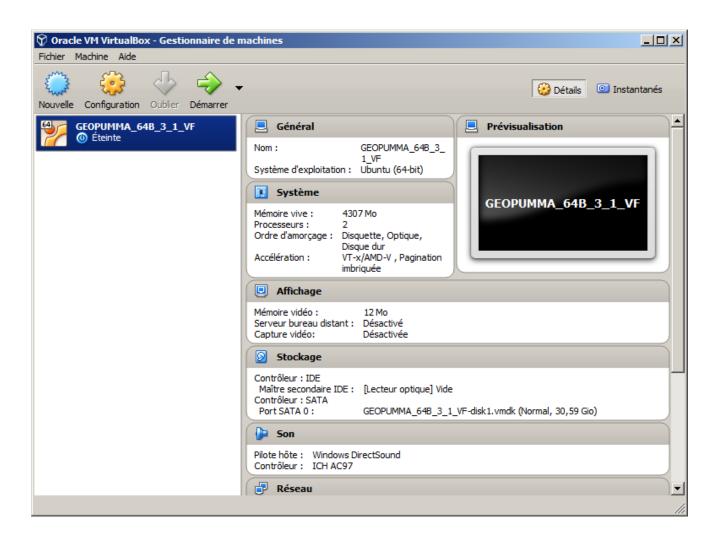


Step: Installation of the Virtual box -In the « File » option



Step: Installation of the Virtual box

-Select « Initialize the Virtual box ». In case of problem in this step, it is possible to find solutions on this web page https://forge.irstea.fr/projects/geopumma/files and to download the tutorial Tutorial Geo-PUMMA v1.1.pdf

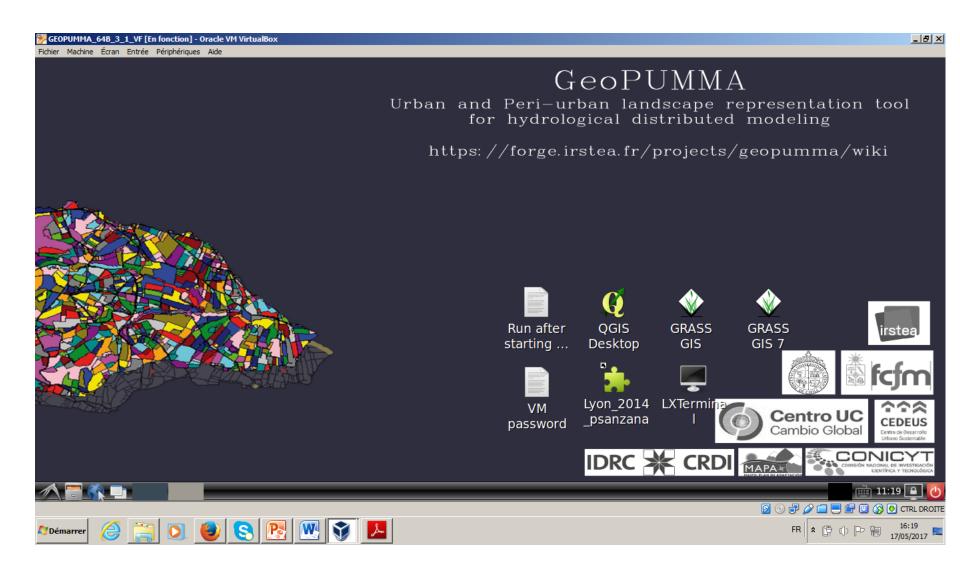


Define a shared folder that can be accessed from the Virtual Box and the main system. To achieve that:

- Go to "Shared folders" (Step 1)
- Select the wished folder (Step 2) and click the icon "add a folder"
- Create a folder named "Lyon_2014_psanzana" in the example(Step 3)
- Select also options "Auto-mount" and "Make permanent" (Step 4).
- -Then click "Ok" to close the window (Step 5)
- Then click "Ok" again to add the folder (Step 6).

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Storage	Folder Path: C:\Lyon_2014_psanzana	Yes	Full	
Audio	Folder Name: Lyon_2014_psanzana			
Network	Read-only Step 4 Auto-mount			
Serial Ports	Make Permanent			
Step 1	Step 5			
Shared Folders	OK Cancel			
User Interface				
		Step 6		

Step: Installation of the Virtual box -Once the virtual box is launched, the following screen should appear:



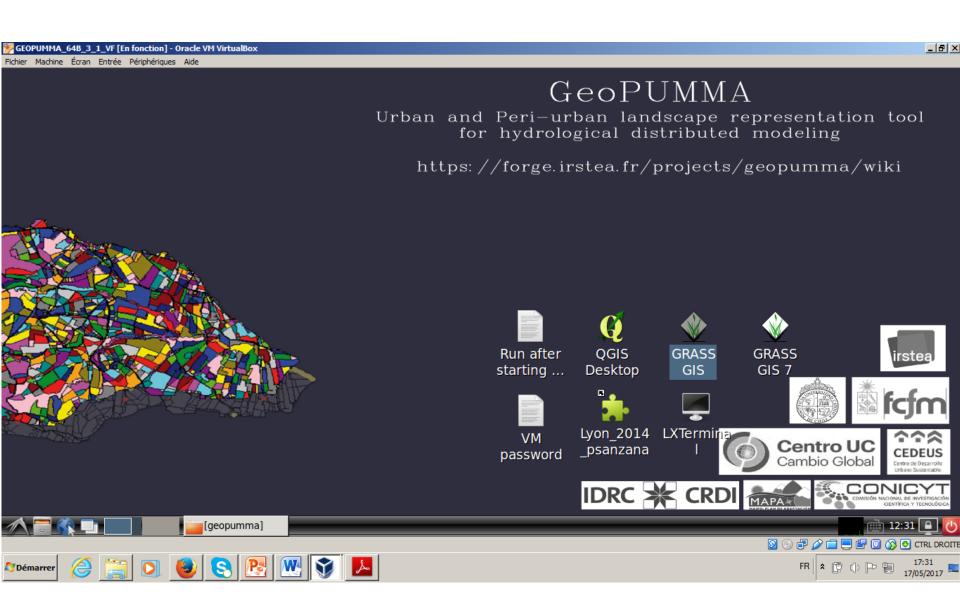
Step: Dissolution of triangulated elements
-Copy the archive Couches_Vectorielles_Chapitre_x in the folder
/home/geopumma as shown in the figure below

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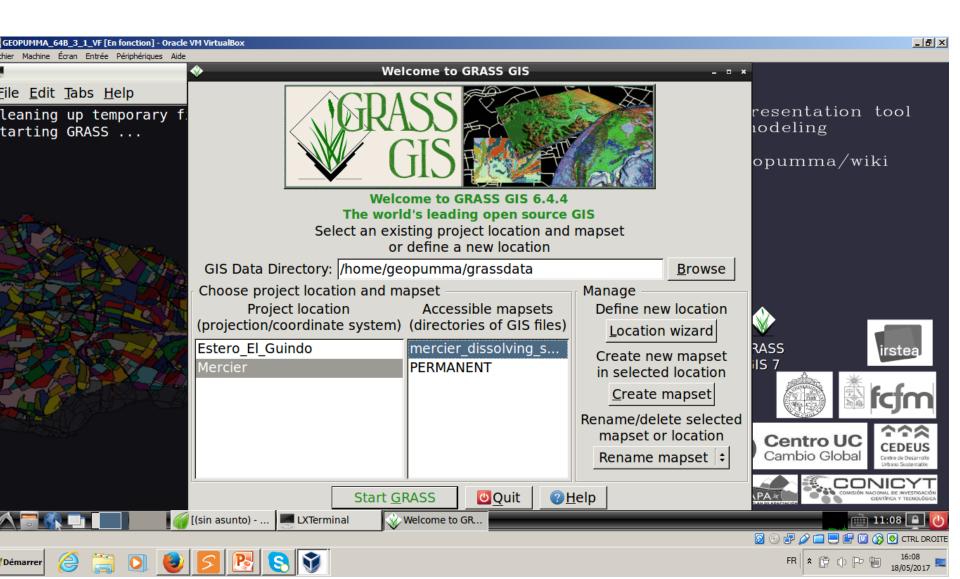
Step: Dissolution of triangulated elements-Select the folder archive and copy it in the folder/grasssdata/Mercier as shown in the figure below

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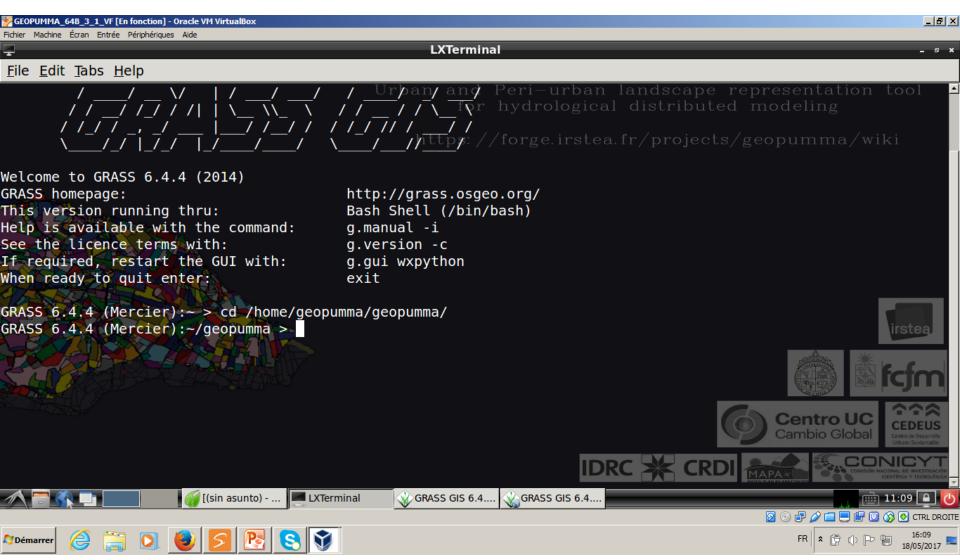
Step: Dissolution of triangulated elements -Select the GRASS GIS icon that corresponds to the 6.4 version:



Step: Dissolution of triangulated elements -Select the Mercier and the mercier_dissolving_step folder

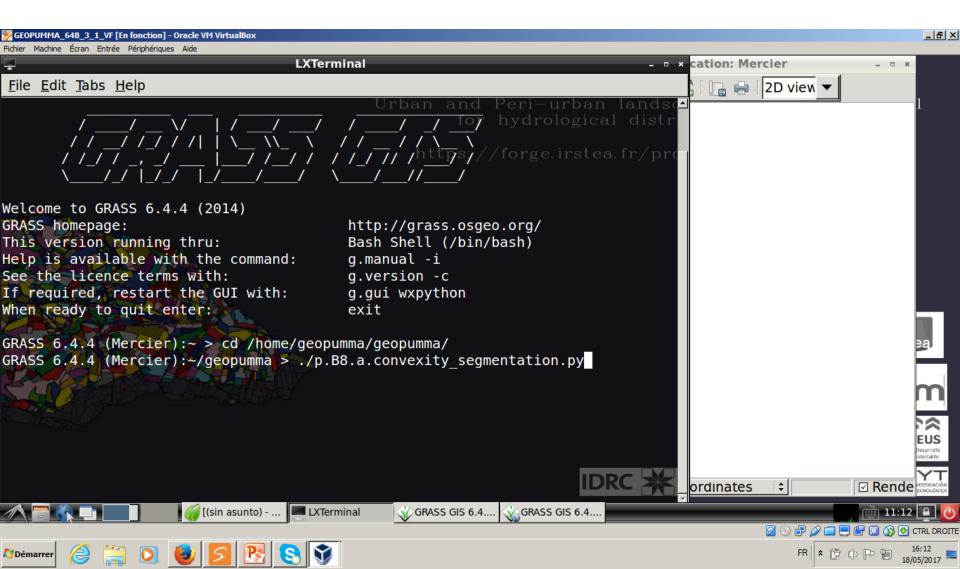


Step: Dissolution of triangulated elements -Once GRASS is open, run the following commands



-Type cd /home/geopumma/geopumma/ in the command line

-Type ./p.B8.a.convexity_segmentation.py in the command line

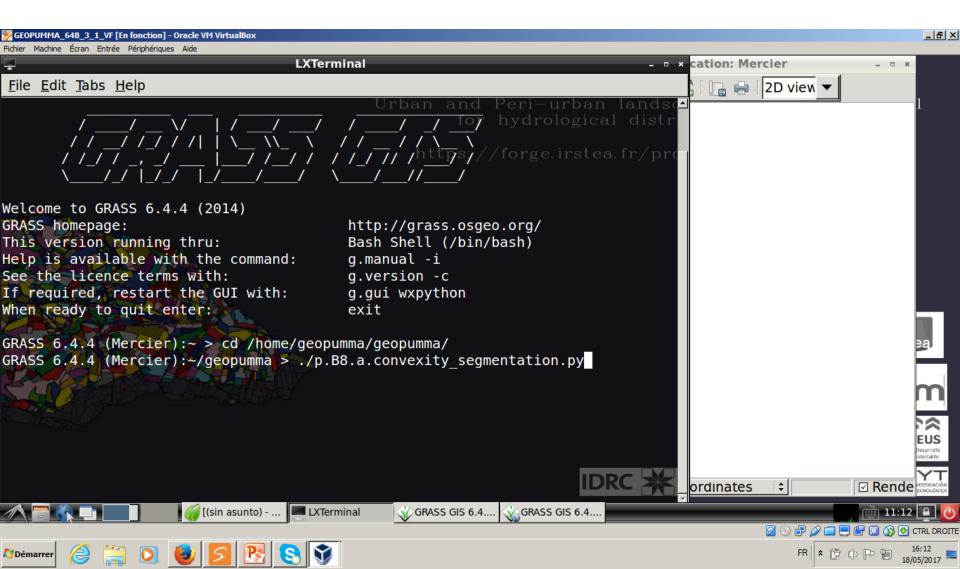


-Select the following options for the polygons selected according to the convexity criterion

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Help is available with the command: See the licence terms with: If required, restart the GUI with: When ready to quit enter:	g.manualani and Peri-urban landscape representation g.version -c for hydrological distributed modeling g.gui wxpython exit https://forge.irstea.fr/projects/geopumma/	
GRASS 6.4.4 (Mercier):~ > cd /home/geopu GRASS 6.4.4 (Mercier):~/geopumma > ./p.B /home/geopumma/geopumma	B8.a.convexity_segmentation.py	
<pre>'Marser': 'PERMANENT', GISDBASE : /No 'Mercier', 'MONITOR': 'x0', 'GRASS_GUI' vector files available in mapset <perman< pre=""></perman<></pre>		
Figure x_4_form_factor_split_5m_T_clean		irstea
Please enter the name of the output poly	<pre>dissolve : Figure_x_4_mercier_convexity_T_clean ygon : Figure x 4 mercier convexity T clean diss</pre>	fcfm
Please enter the Convexity Index Thresho Please enter the Maximum Area (Amin rec	= 20000 m2) : 20000	Centro de Desarrollo Urbano Sustantable
Please enter the Form Factor Threshold (IDRC CRDI MAPAKA	
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-Type cd /home/geopumma/geopumma/ in the command line

-Type ./p.B8.a.convexity_segmentation.py in the command line

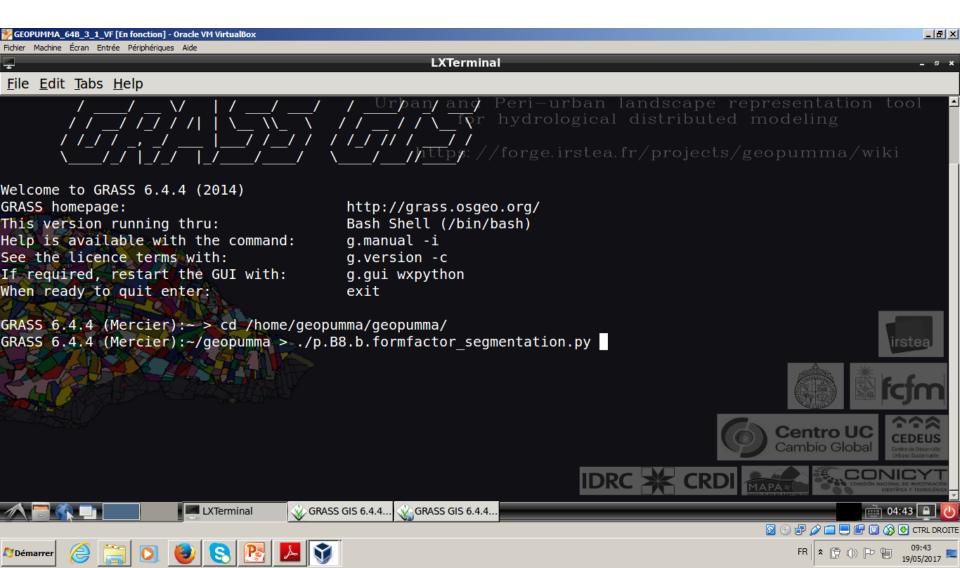


-Select the following options for the polygons selected according to the area criterion

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<pre>vector files available in mapset <permanent>: Figure x 4 form_factor_split_5m_T_clean Figure x 4 form_factor_split_5m_T_clean_diss Figure x 4 mercier_big_area_T_clean Figure x 4 mercier_big_area_T_clean_diss Figure x 4 mercier_convexity_T_clean Figure x 4 mercier_convexity_T_clean Figure x 4 mercier_convexity_T_clean_diss</permanent></pre>	
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Please enter the name of the polygon to dissolve : Figure x 4 mercier big area T clean Please enter the name of the output polygon : Figure x 4 mercier big area T clean diss Please enter the name of polygon pre Triangle to get columns: initial mesh shape factors alt Please enter the Convexity Index Threshold (CIT 0.75-0.85) : 0.75 Please enter the Maximum Area (Amin rec = 20000 m2) : 20000 Please enter the Form Factor Threshold (FFT 0.20-0.40) : 0.20	
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-Type cd /home/geopumma/geopumma/ in the command line

-Type ./p.B8.b.formfactor_segmentation.py in the command line



Etape: Dissolution d'éléments triangulés

-Select the following options for the polygons selected according to the form factor criterion

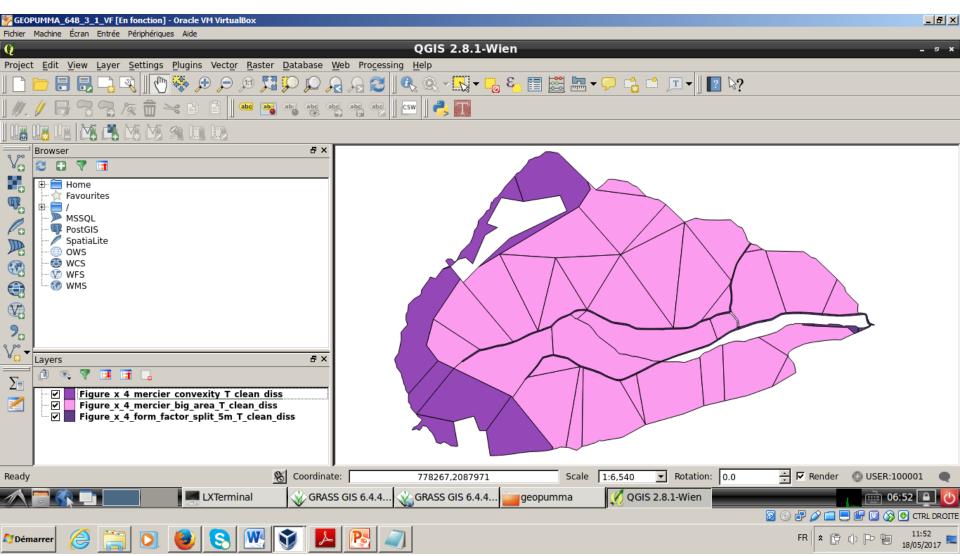
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Repeted Value 23 <^Z		n landscape representation tool – cal distributed modeling
[4]+ Stopped GRASS 6.4.4 (Mercier):~/geop	./p.B8.b.formfactor_segmentation.py pumma > ./p.B8.b.formfactor_segmentation.py	ea.fr/projects/geopumma/wiki
/home/geopumma/geopumma	SDBASE': '/home/geopumma/grassdata', 'LOCAT]	
vector files available in ma Figure_x_4_form_factor_split Figure_x_4_form_factor_split Figure_x_4_mercier_big_area	_5m_T_clean _5m_T_clean_diss _T_clean	
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Please enter the name of the Please enter the Form Factor	e polygon to dissolve : Figure_x_4_form_fact e output polygon : Figure_x_4_form_factor_sp r Threshold (0.20-0.40) : 0.20 ea (Amax rec = 20000 m2) : 20000	
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Step: Dissolution of triangulated elements -The result leads to the following folders

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Desktop	Figure_x_4_mercier_convexity_T_clean_diss	p.B8.a.convexity_segmentation.py	
📆 Trash Can	p.A1.clean_topology.py	p.B8.b.formfactor_segmentation.py	,
	p.A2.clean_polyline.py	p.B9.raster_segmentation.py	
	📄 p.area_temp	p.B10.all_interfaces.py	
	p.B1.sidewalk_street.py	p.B11.river_segm.py	
	📓 p.B2.uhe.py	p.B12.wtri.py	
	p.B3.a.average_altitude.py	p.B13.wti.py	
	p.B3.b.mnt.py	p.B14.olaf.py	
	p.B3.c.wood_surface.py	p.B15.geo_descriptors.py	
	p.B3.d.fill_polygons_nulls.py	p.C1.river_direction.py	
	p.B4.length.py] p.C2.rebuild_ditch_segments.py	
	📄 p.B5.built.py	p.C3.river_h_s.py	



Step: Dissolution of triangulated elements -Each folder contains the following .shp layers (Figures x.34 x.35 y x.36)



With these .shape files, it is possible to get the mesh of Figure x.37:

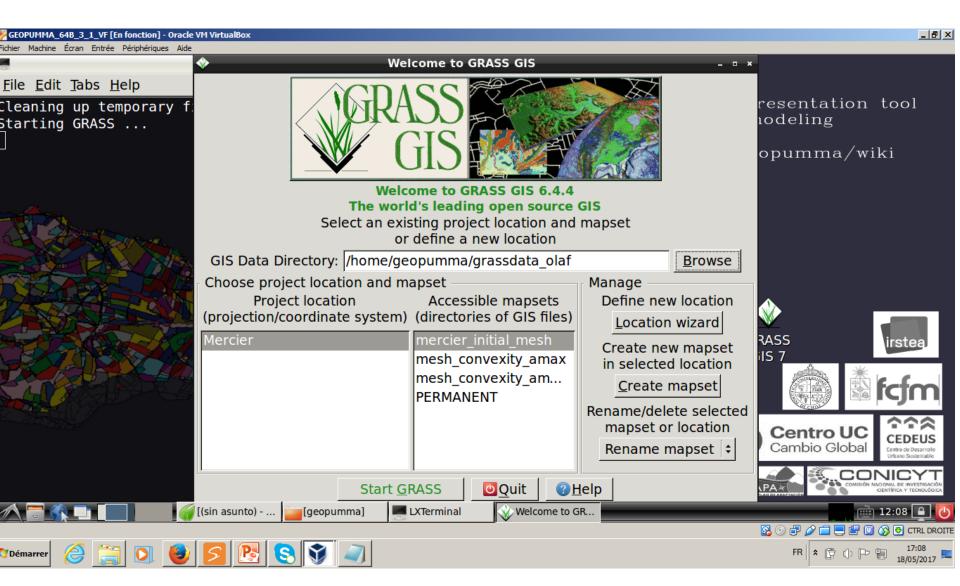
- Improved mesh on convexity and area criteria
- Improved mesh on form factor criterion

Step: Détermination of flow directions between elements (routing)

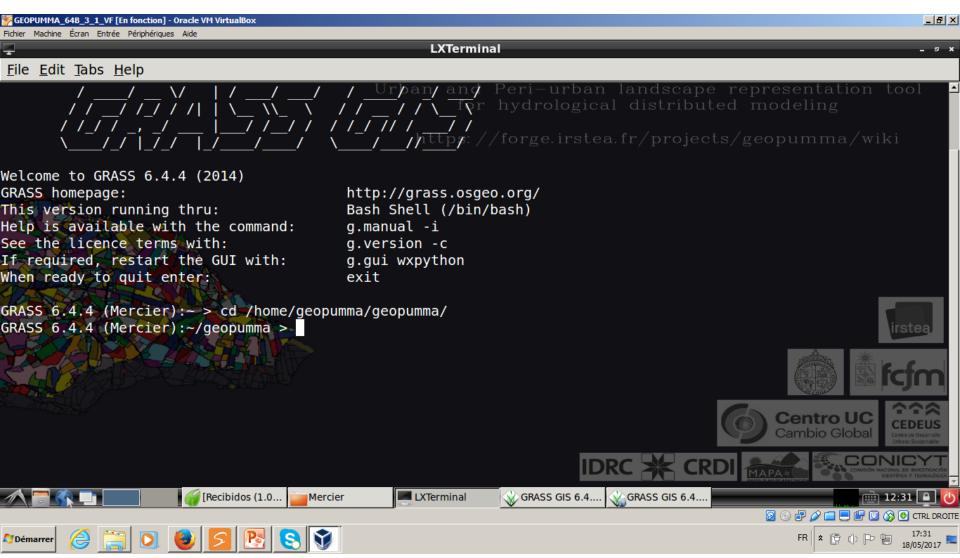
A folder with the three mesh model mesh has been prepared. The following steps only aim at illustrating how to perform the flow routing. We do not show how to get all the layers (other commands from Geo-PUMMA should be used for that), but we provide the resulting layers which are outputs of these scripts For more details about intermediary steps, the user can read the GeoPUMMA V1,1 users' manual -Copy the folder grassdata_olaf in the folder: /home/geopumma

GEOPUMMA_64B_3_1_VF [En fonction Fichier Machine Écran Entrée Périphériq		
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ಶ Démarrer 🖉 📋 💽	🕑 💈 🔁 😂 💓 🥥	FR A P D P 17:08 18/05/2017

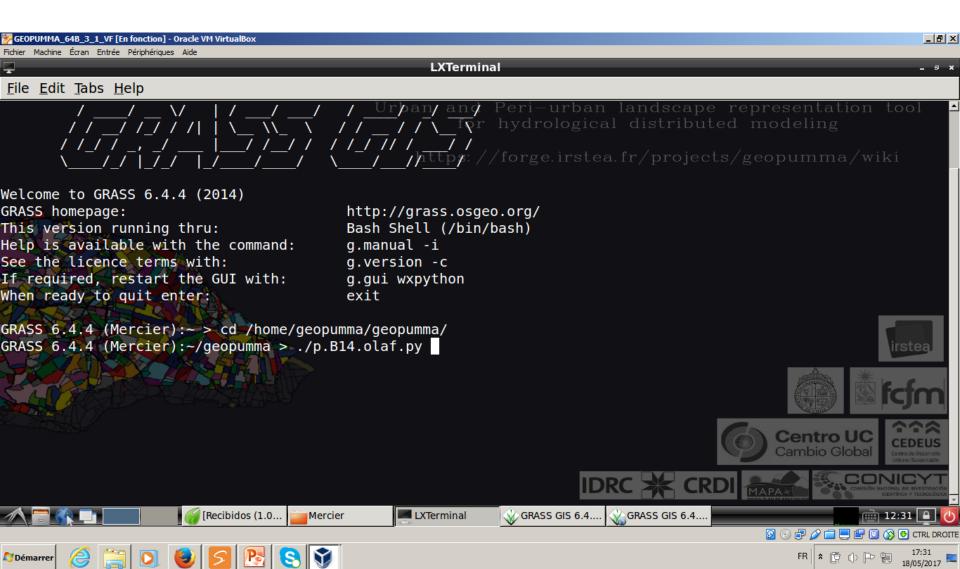
Step: Flow routing of the initial mesh Select LOCATION: Mercier and MAPSET: mercier_initial_mesh



Step: Flow routing of the initial mesh Change directory



Step: Flow routing of the initial mesh Run the olaf command



Step: Flow routing of the initial mesh Enter the following options

GEOPUMMA_648_3_1_VF [En fonction] - Oracle VM VirtualBox		_ 5 ×
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Help is available with the command: See the licence terms with: If required, restart the GUI with: When ready to quit enter:	g.manualani and Peri-urban lands g.version -c for hydrological distr g.gui wxpython exit https://forge.irstea.fr/pr	ributed modeling
GRASS 6.4.4 (Mercier):~ > cd /home/geog GRASS 6.4.4 (Mercier):~/geopumma > ./p {'MAPSET': 'mercier_initial_mesh', 'GIS ITOR': 'x0', 'GRASS_GUI': 'wxpython'} /home/geopumma/geopumma		'LOCATION_NAME': 'Mercier', 'MON
<pre>vector files available in mapset <merc: Initial Ditch Initial Ditch_river_segm initial mesh_shape_factors_alt_ initial_mesh_shape_factors_alt_all_inte initial_mesh_shape_factors_alt_wti initial_mesh_shape_factors_alt_wtri</merc: </pre>		irstea k fcfm
		Centro UC Cambio Global
Please enter the name of the map with p	oolygon mesh : initial_mesh_shape_factors_	
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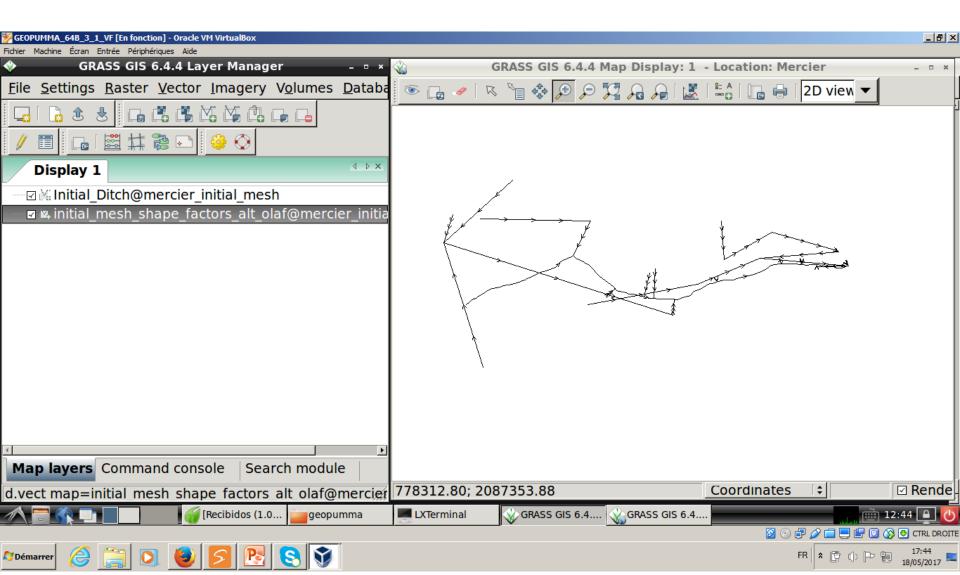
Step: Flow routing of the initial mesh Enter the following options

GEOPUMMA_64B_3_1_VF [En fonction] - Oracle VM VirtualBox
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LXTerminal - ®
ile <u>E</u> dit <u>T</u> abs <u>H</u> elp
OUBLE PRECISION geol_id 4 Urban and Peri-urban landscape representation tool
HARACTER module for hydrological distributed modeling
OUBLE PRECISION dem_ave
OUBLE PRECISION slp_stdd https://forge.irstea.fr/projects/geopumma/wiki
OUBLE PRECISION area
OUBLE PRECISION perimeter
OUBLE PRECISION/solidity
OUBLE PRECISION convexity OUBLE PRECISION compact
OUBLE PRECISION formfactor
OUBLE PRECISION centr dist
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OUBLE PRECISION n centre
OUBLE PRECISION d average
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lease enter the name of the column with altitude value : dem_ave
lease enter the name of the wtri : initial_mesh_shape_factors_alt_wtri
tease enter the name of the will : initiat_mesn_snape_ractors_att_will Cambio Global Cambio Global Cambio Global
lease enter the name of the segmented river : Initial_Ditch_river_segm
lease enter the name of the olaf output vector : initial_mesh_shape_factors_alt_olaf
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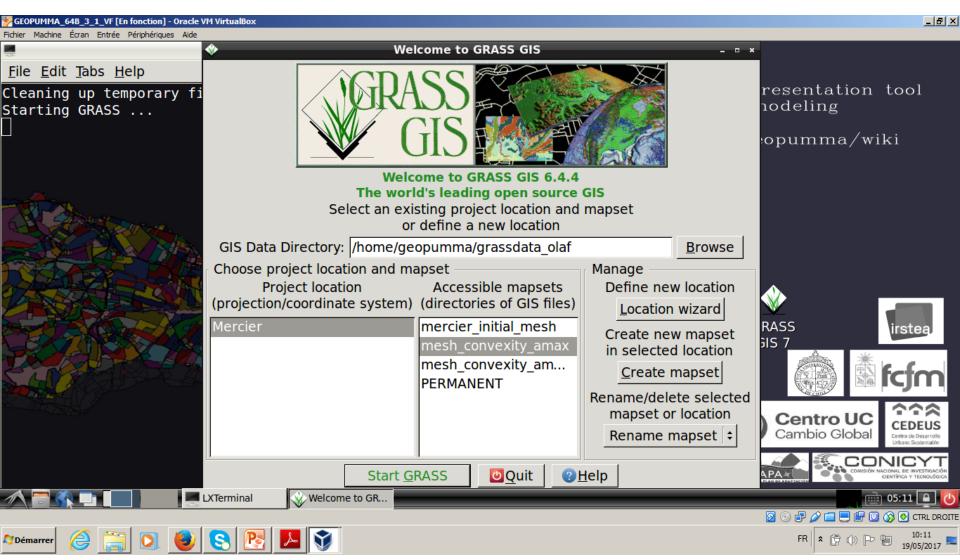
Step: Flow routing of the initial mesh

Visualize the vectorial layers corresponding to the surface drainage network in GRASS

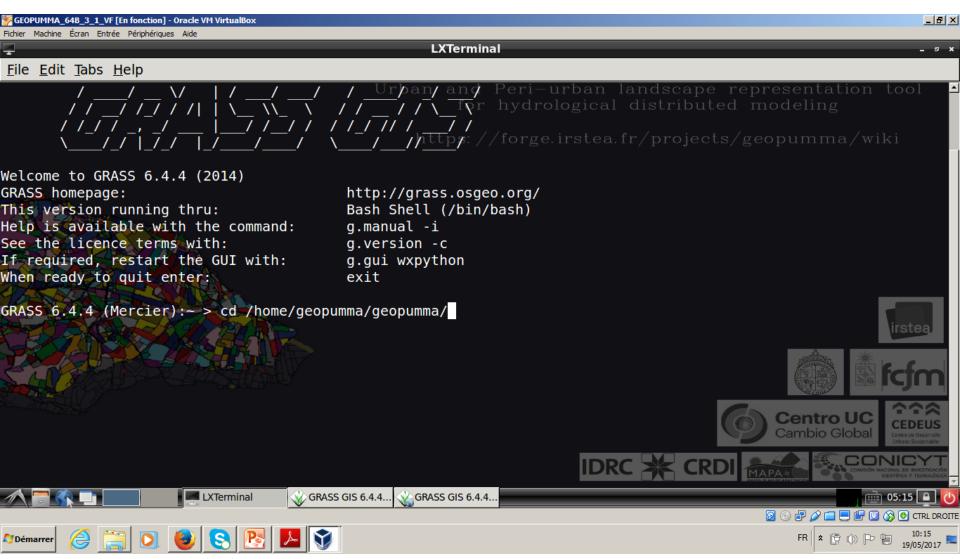
These elements belong to the drainage network shown in Figure x.37.b



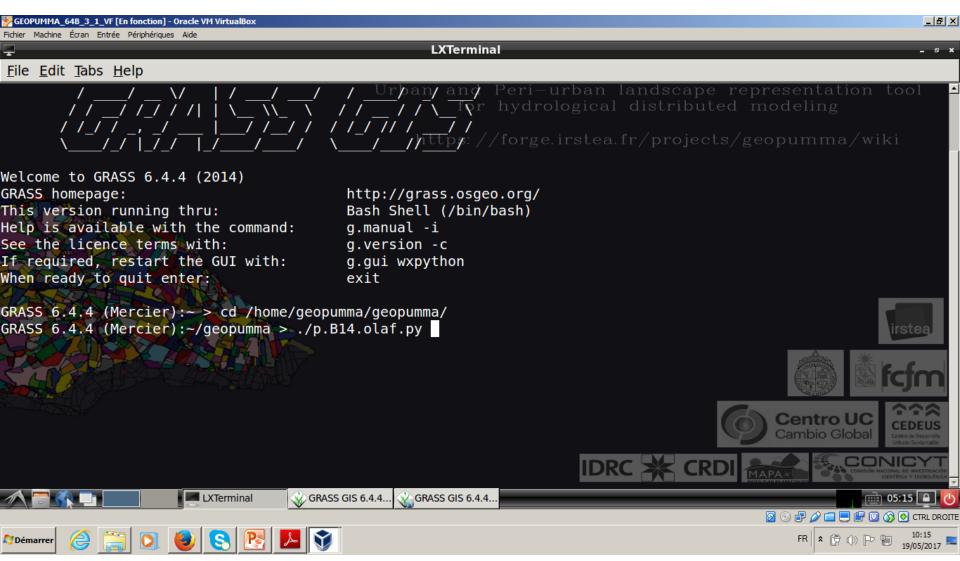
Step: Flow routing of the initial mesh Select LOCATION: Mercier and MAPSET: mercier_convexity_amax



Step: Flow routing of the initial mesh Change directory



Step: Flow routing of the initial mesh Execute the olaf command



Step: Flow routing of the initial mesh Enter the following commands

GEOPUMMA_64B_3_1_VF [En fonction] - Oracle VM VirtualBox		_ 8 ×
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File Edit Tabs Help		
Help is available with the command: See the licence terms with: If required, restart the GUI with: When ready to quit enter:	g.manualani and Peri-urban landscape represen g.version -c for hydrological distributed modeli g.gui wxpython exit https://forge.irstea.fr/projects/geopum	ng
GRASS 6.4.4 (Mercier):~ > cd /home/geopur GRASS 6.4.4 (Mercier):~/geopumma > ./p.B {'MAPSET': 'mesh_convexity_amax', 'GISDB, TOR': 'x0', 'GRASS_GUI': 'wxpython'} /home/geopumma/geopumma		Mercier', 'MONI
vector files available in mapset <mesh_co Initial Ditch Initial_Ditch_segm_riv mesh_convexity_0750_amax_2ha_alt_clean mesh_convexity_0750_amax_2ha_alt_clean_a</mesh_co 		irstea
mesh_convexity_0750_amax_2ha_alt_clean_w mesh_convexity_0750_amax_2ha_alt_clean_w mesh_convexity_0750_amax_2ha_alt_clean_w	rti ⁻	fcfm
		tro UC io Global
Please enter the name of the map with po	lygon mesh : mesh_convexity_0750_amax_2ha_alt_clean	
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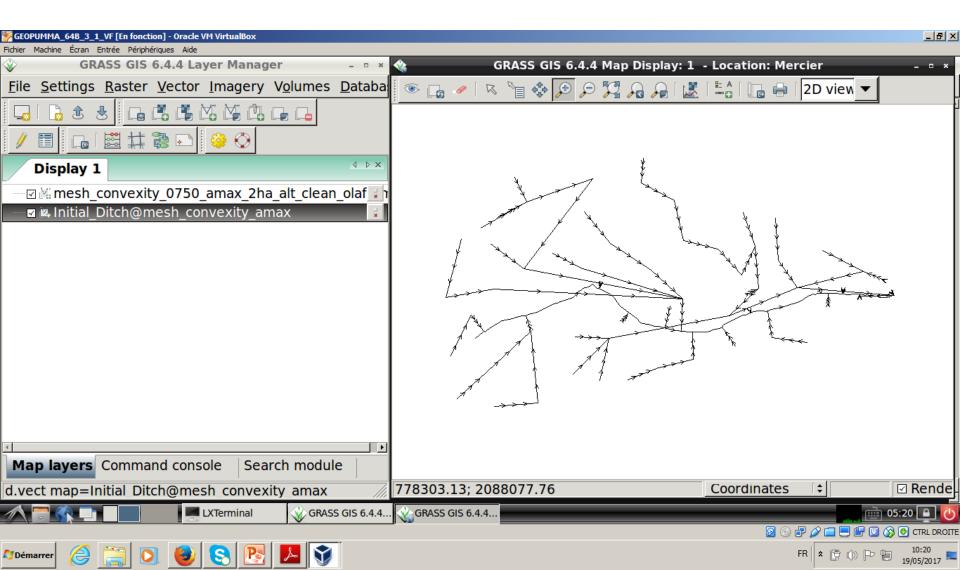
Step: Flow routing of the initial mesh Enter the following commands

GEOPUMMA_648_3_1_VF [En fonction] - Oracle VM VirtualBox Fichier Machine Écran Entrée Périphériques Aide	
Ţ	LXTerminal _ @ *
<u>F</u> ile <u>E</u> dit <u>T</u> abs <u>H</u> elp	
DOUBLE PRECISION perimeter	Urban and Peri-urban landscape representation tool
DOUBLE PRECISION solidity	for hydrological distributed modeling
DOUBLE PRECISION convexity	
DOUBLE PRECISION compact	https://forge.irstea.fr/projects/geopumma/wiki
DOUBLE PRECISION formfactor	
DOUBLE PRECISION centr_dist	
DOUBLE PRECISION e_centr	
DOUBLE PRECISION n_centr	
DOUBLE PRECISION d_number	
DOUBLE PRECISION d_minimum	
DOUBLE PRECISION d_maximum DOUBLE PRECISION d range	
DOUBLE PRECISION d average	
DOUBLE PRECISION d stddev	
DOUBLE PRECISION d variance	irsteal
DOUBLE PRECISION d sum	inded,
INTEGER id mesh	
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Please enter the name of the olaf output	vector : mesh_convexity_0750 amax_2ha_alt_clean_olaf
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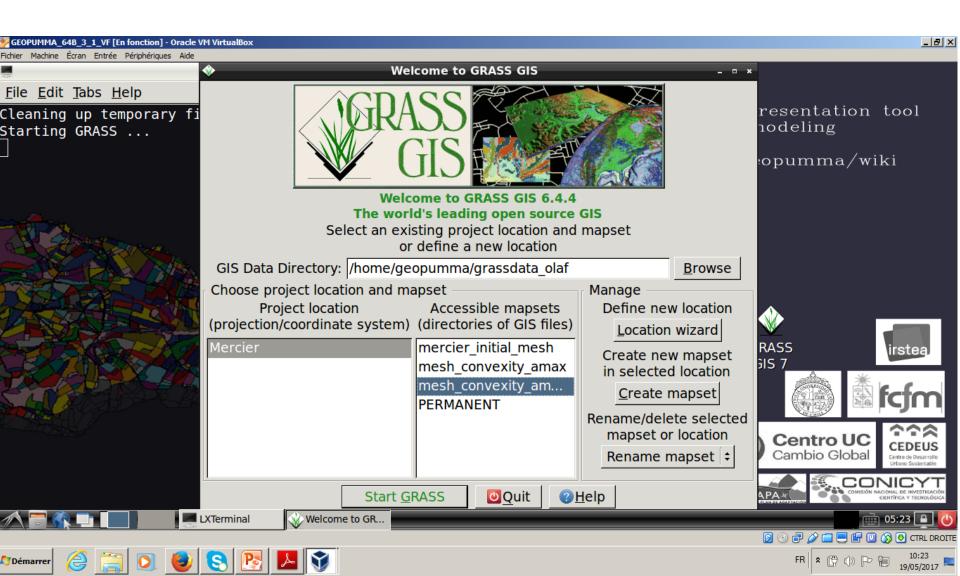
Step: Flow routing of the initial mesh

Visualize the vectorial layers corresponding to the surface drainage network in GRASS

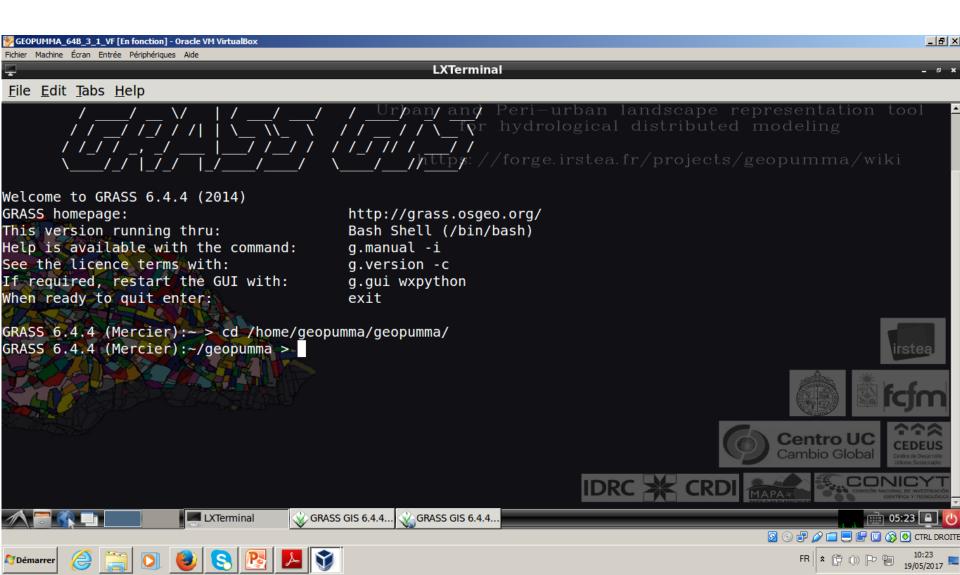
These elements belong to the drainage network shown in Figure x.37.c



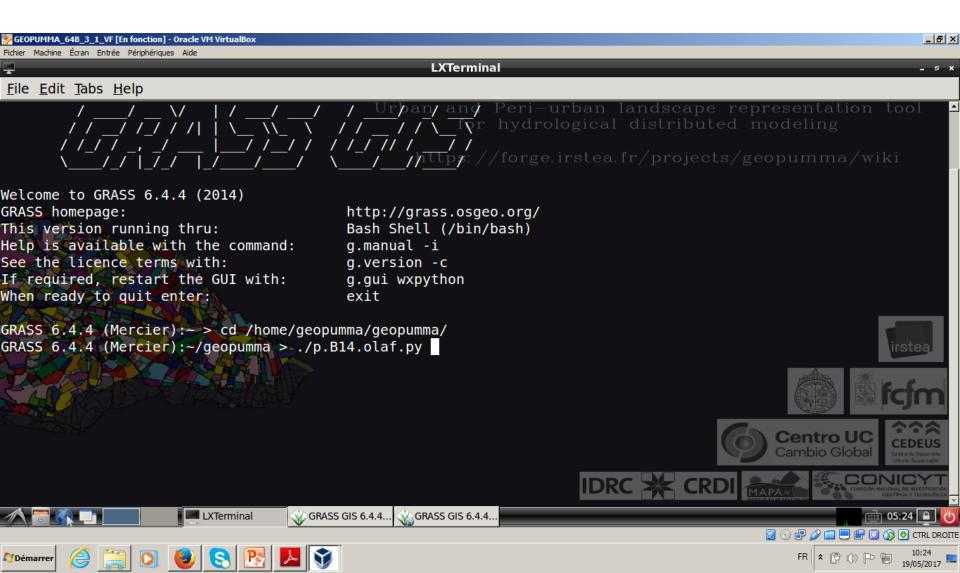
Step: Flow routing of the initial mesh Select LOCATION: Mercier and MAPSET: mercier_convexity_amax_ff



Step: Flow routing of the initial mesh Change directory



Step: Flow routing of the initial mesh Execute the olaf command



Step: Flow routing of the initial mesh Enter the following commands

FEOPUMMA_64B_3_1_VF [En fonction] - Oracle VM VirtualBox		
Fichier Machine Écran Entrée Périphériques Aide	LXTerminal	
File Edit Tabs Help		_ ~ ~ ~
Help is available with the command: See the licence terms with: If required, restart the GUI with: When ready to quit enter:	g.manualani and Peri-urban landscap g.version -c for hydrological distribu g.gui wxpython exit https://forge.irstea.fr/projec	ited modeling
<pre>GRASS 6.4.4 (Mercier):~ > cd /home/geo GRASS 6.4.4 (Mercier):~/geopumma > ./p {'MAPSET': 'mesh_convexity_amax_ff', '(ONITOR': 'x0', 'GRASS_GUI': 'wxpython') /home/geopumma/geopumma</pre>	.B14.olaf.py GISDBASE': '/home/geopumma/grassdata_olaf', 'l	_OCATION_NAME': 'Mercier', 'M
vector files available in mapset <mesh Initial Ditch Initial Ditch_segm_riv mesh_ci_075_amax_2ha_ff_020_clean_alt mesh_ci_075_amax_2ha_ff_020_clean_alt_a mesh_ci_075_amax_2ha_ff_020_clean_alt_v</mesh 	all_interf wti	
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Please enter the name of the map with p	oolygon mesh : mesh_ci_075_amax_2ha_ff_020_cle	
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Step: Flow routing of the initial mesh Enter the following commands

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DOUBLE PRECISION geol_id_4 for hydrological distri	ibuted modeling
CHARACTER module	aiaata (aaanumma (wilsi
DOUBLE PRECISION dem_ave https://forge.irstea.fr/pro	ojects/geopumma/wiki
DOUBLE PRECISION slp_stdd	
DOUBLE PRECISION area CHARACTER ID	
DOUBLE PRECISION perimeter	
DOUBLE PRECISION solidity	
DOUBLE PRECISION convexity	
DOUBLE PRECISION compact	
DOUBLE PRECISION formfactor	
DOUBLE PRECISION centr_dist	
DOUBLE PRECISION e_centr	
DOUBLE PRECISION n_centr	irsteal
DOUBLE PRECISION d_average	and the second sec
INTEGER id_mesh	
Please enter the name of the column with altitude value : d average	
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Please enter the name of the wti : mesh ci 075 amax 2ha ff 020 clean alt wti	Centro UC Cambio Global
Please enter the name of the segmented river : Initial Ditch segm riv	Carribio Giobar Lente de Desarrole Urbano Sustentable
Please enter the name of the olaf output vector : mesh_ci_075_amax_2ha_ff_020_cl	eangalt olaf
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Step: Flow routing of the initial mesh

- Visualize the vectorial layers corresponding to the surface drainage network in GRASS
- These elements belong to the drainage network shown in Figure x.37.d

