



Deuxième atelier des contributeurs

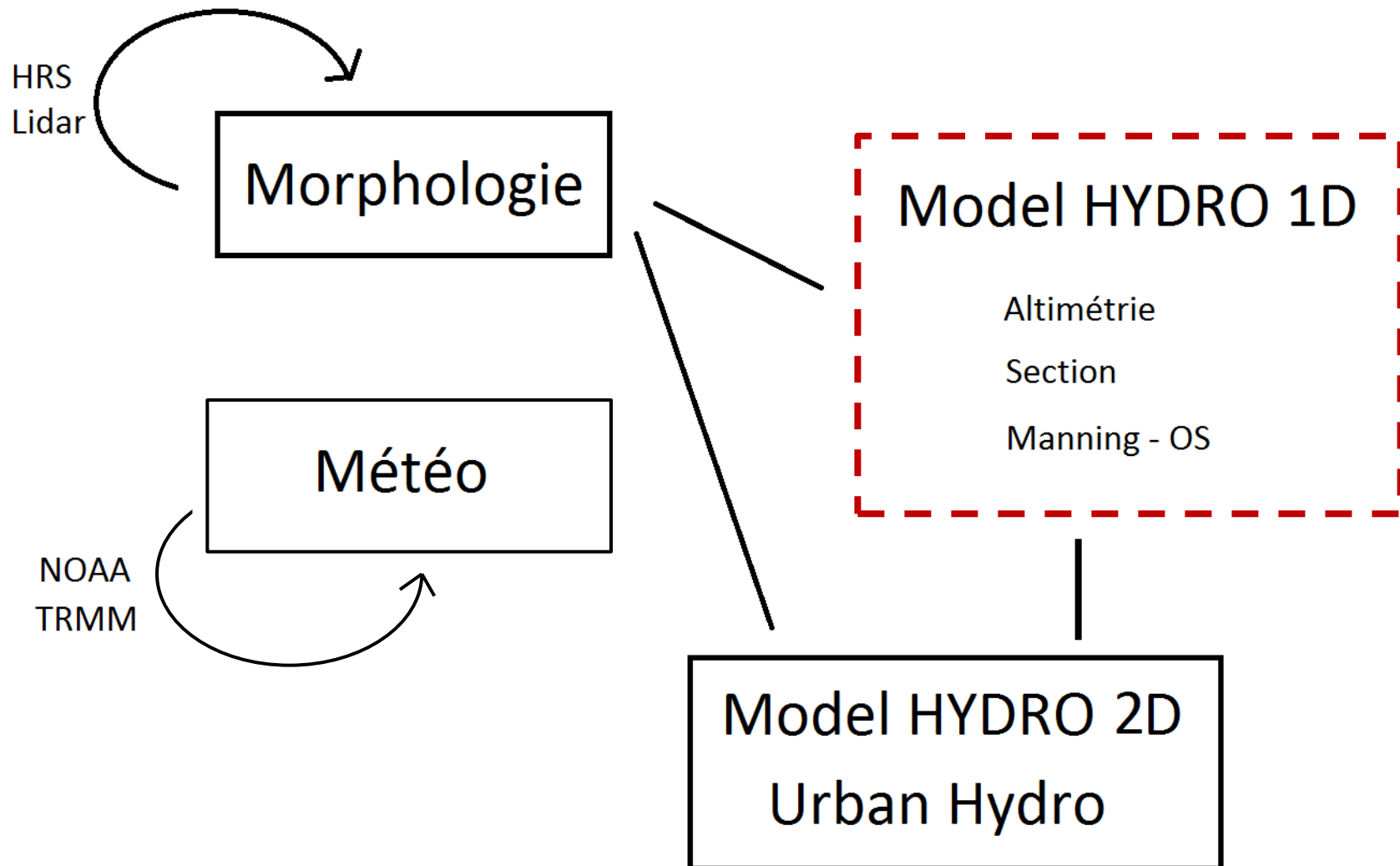
6-7 juin 2012 – CNES (Paris)

Modélisation du risque de ruissellement et
inondation à Port-au Prince




Andrea Bozza (SERTIT, Politecnico de Milan, Sigma)

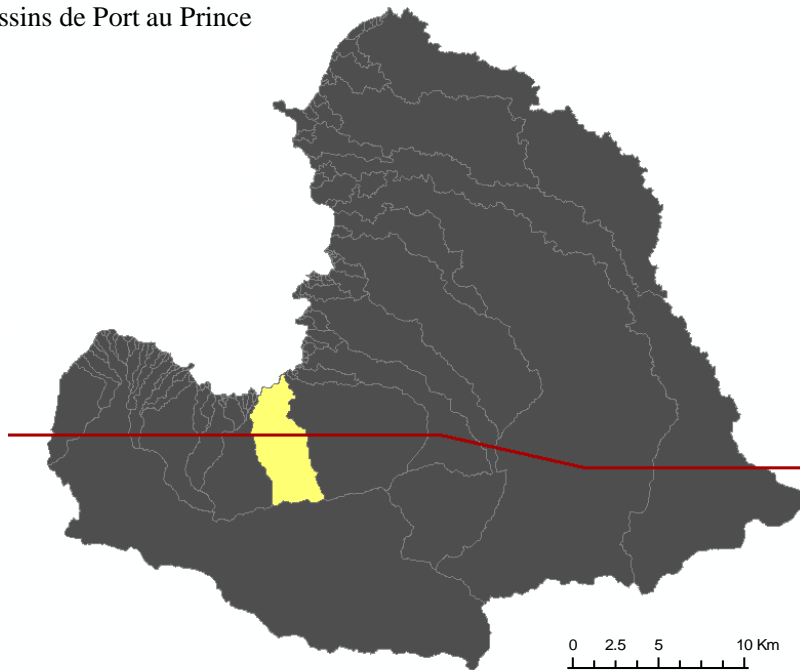
Plan de la présentation

1. Introduction
2. Analyse Hydro-morphologique
3. Base de données météo
4. Modélisation hydrologique
5. Conclusions / problèmes / perspectives





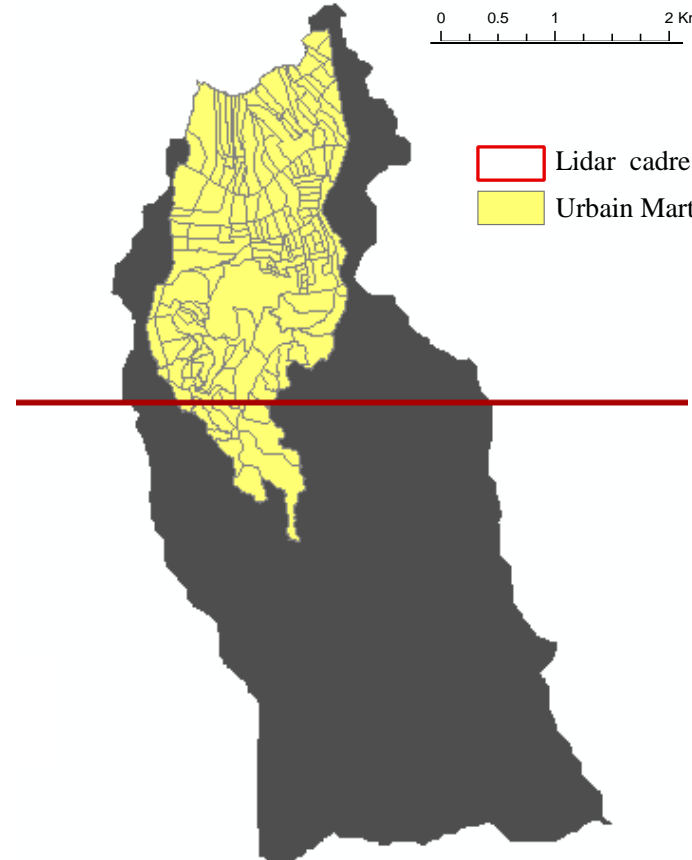
Analyse morphologique

-  Lidar cadre
-  Bassin de Martissant
-  Bassins de Port au Prince

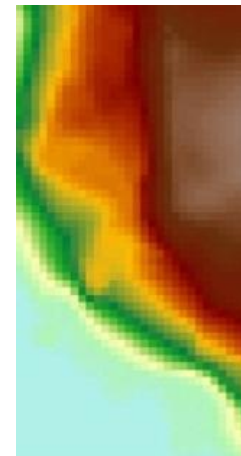
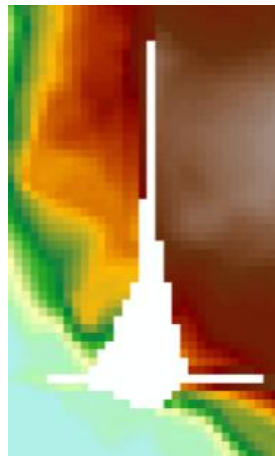
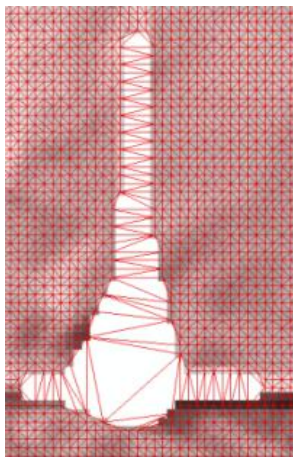
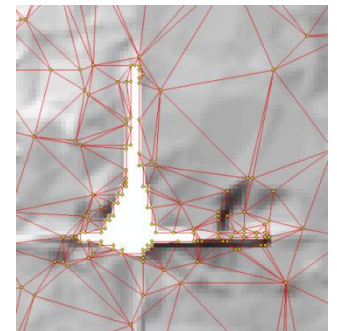
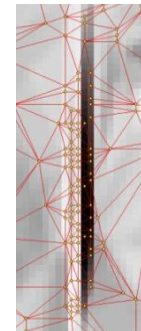
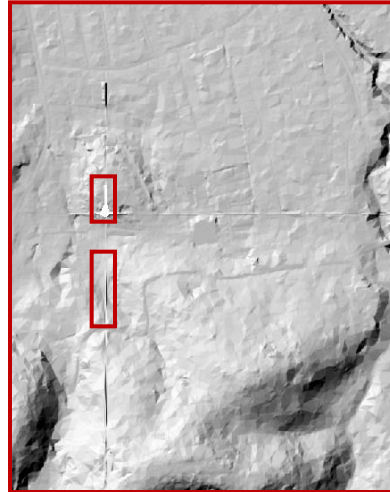
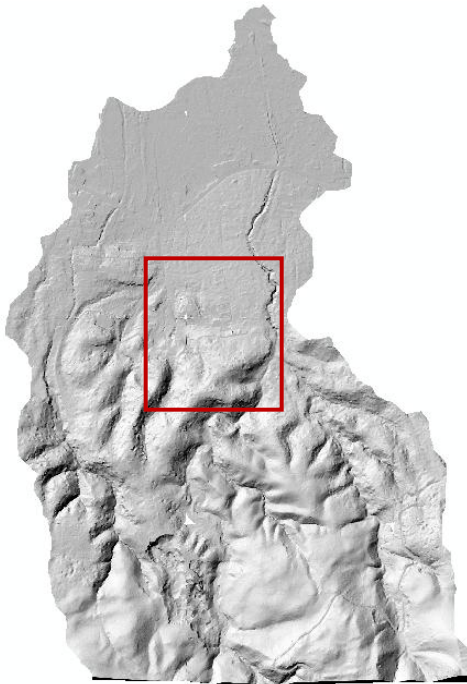


0 0.5 1 2 Km

-  Lidar cadre
-  Urbain Martissant

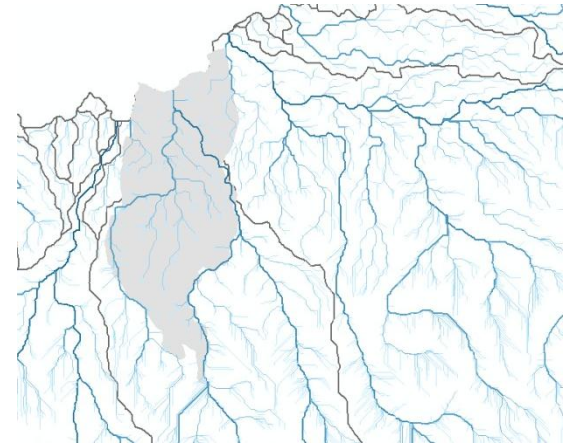


Correction des MNT

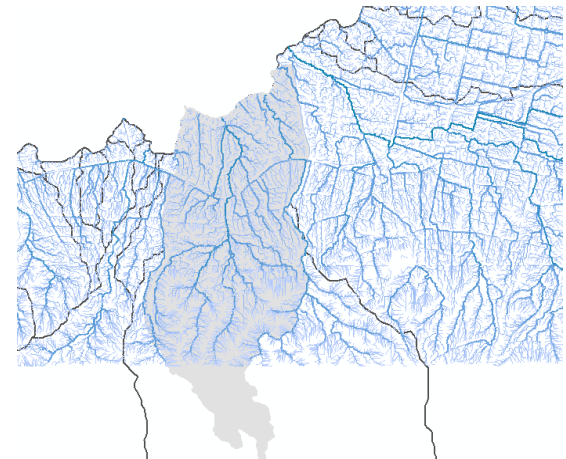


Exploitation du MNT

Flow accumulation \longrightarrow Vision Globale = écoulement théorique



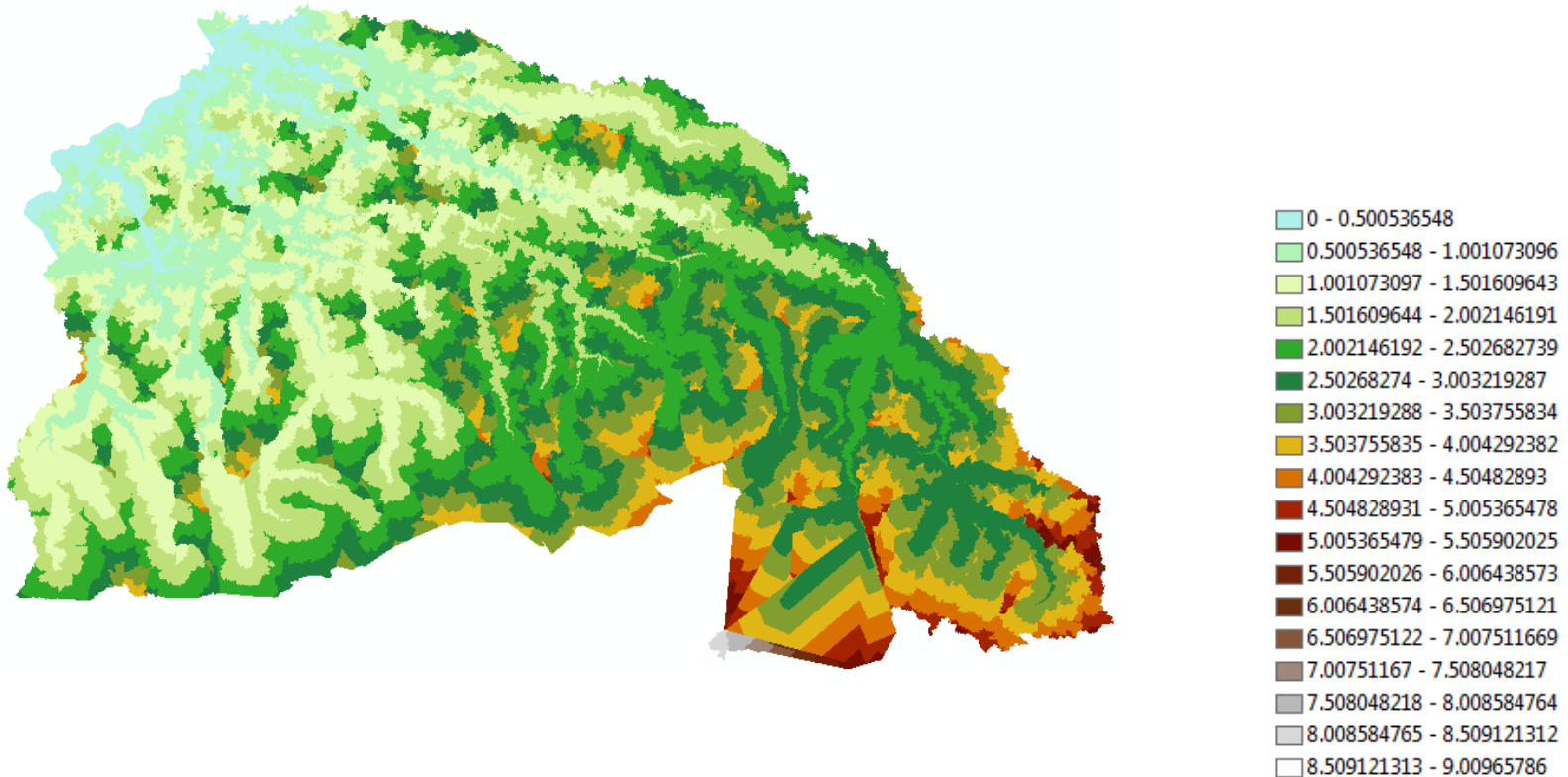
HRS



Lidar

Exploitation du MNT

Temps d'écoulement théorique → sous bassin

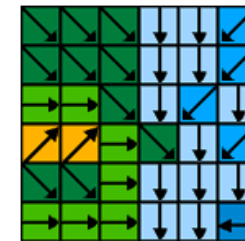


Exploitation du MNT

Flow direction → zone urbaine



FAC. 0 - 10
100,0000001



Flow direction

0	0	0	0	0	0
0	1	1	2	2	0
0	3	7	5	4	0
0	0	0	20	0	1
0	0	0	1	24	0
0	2	4	7	35	2

Flow accumulation



Direction coding



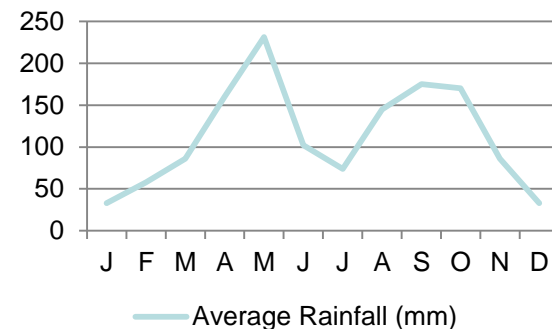
Lidar

Base de données Météo : les précipitations

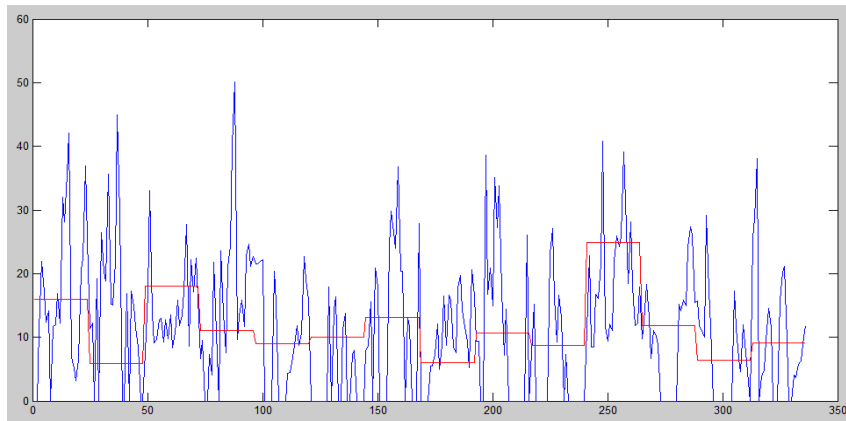
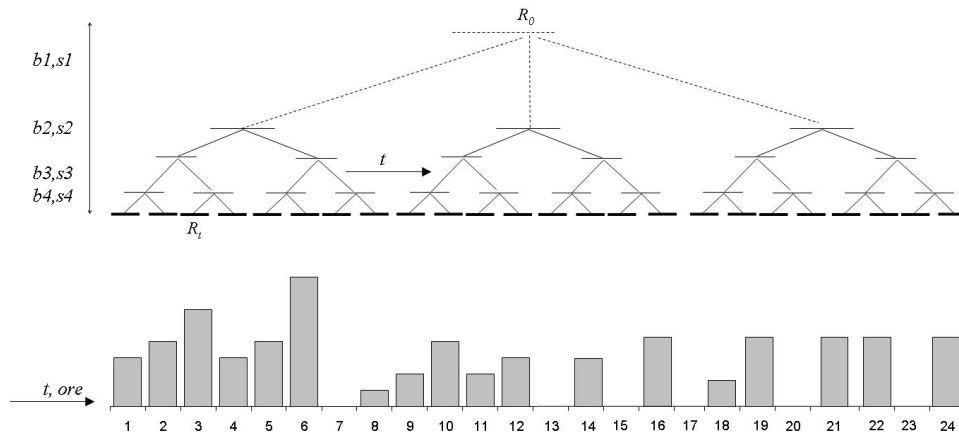
	Data	No Data	Almost
Port Au Prince	1943-2006	1949-1973	1945
		1975-1983	1947-1948
		1992	1974
		1995-1999	1984-1991
		2001-2004	1993-1994
			2000
			2006
Barahona	Data	No Data	Almost
	1973-2012	1997-1998	1977-1978
			1981-1982
			1988-1999
Santo Domingo	1973-2012	1948	1943
		1953-1972	1952
			1977-1978
			1992
			1994-1995
Las America	1973-2012		1977
			1992-1995
			1998
Santiago	1973-2012	1991-1992	1977-1978
			1981
			1988-1995
			1998-1999
Guantanamo	1945-2012	1964-1965	1945
		1974	1959
			1963
			1972-1980
			1987
			1999-2002
Punta Masl	1977-2012	1996-2000	1977
		2003	1979
		2006-2007	1981-1982
			1985-1987
			1991
			1994-1995
			2001-2008

NOAA - National and Oceanic Atmospheric Administration

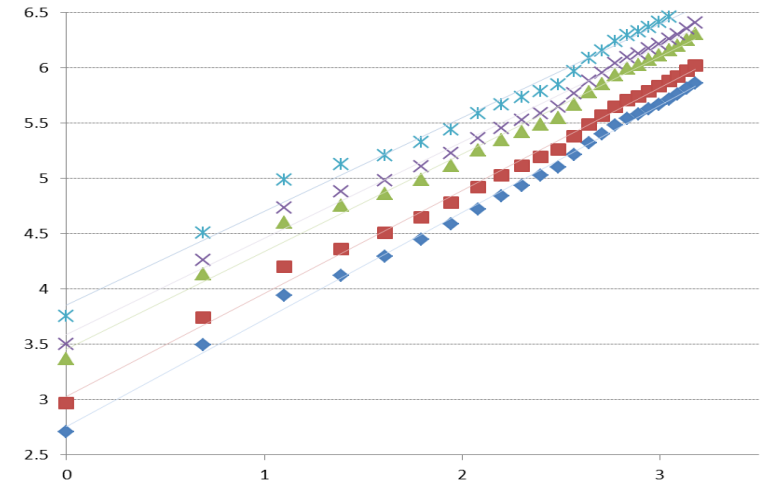
TRMM - Tropical Rainfall Measuring Mission, NASA (1998-2011)



Discrétisation Horaire des précipitations → temps de retour

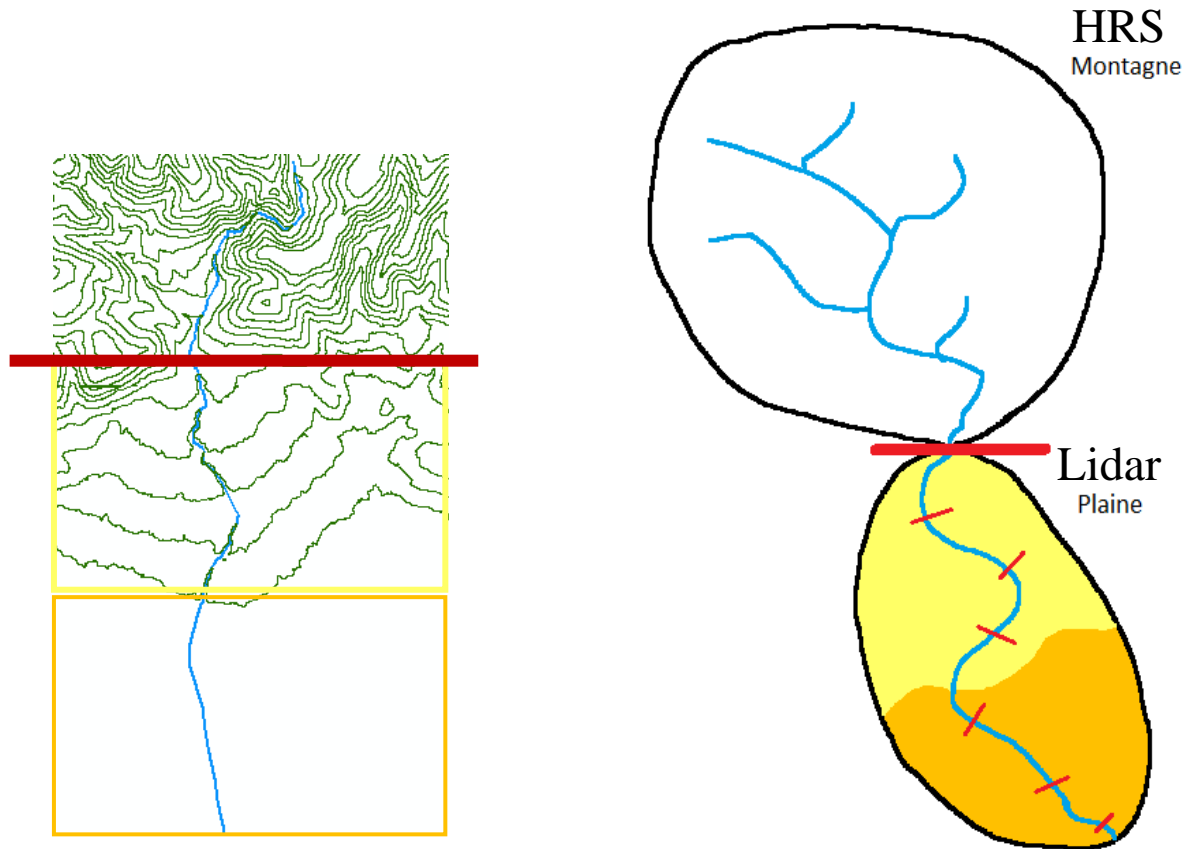


Daniele Bocchiola, Politecnico de Milan

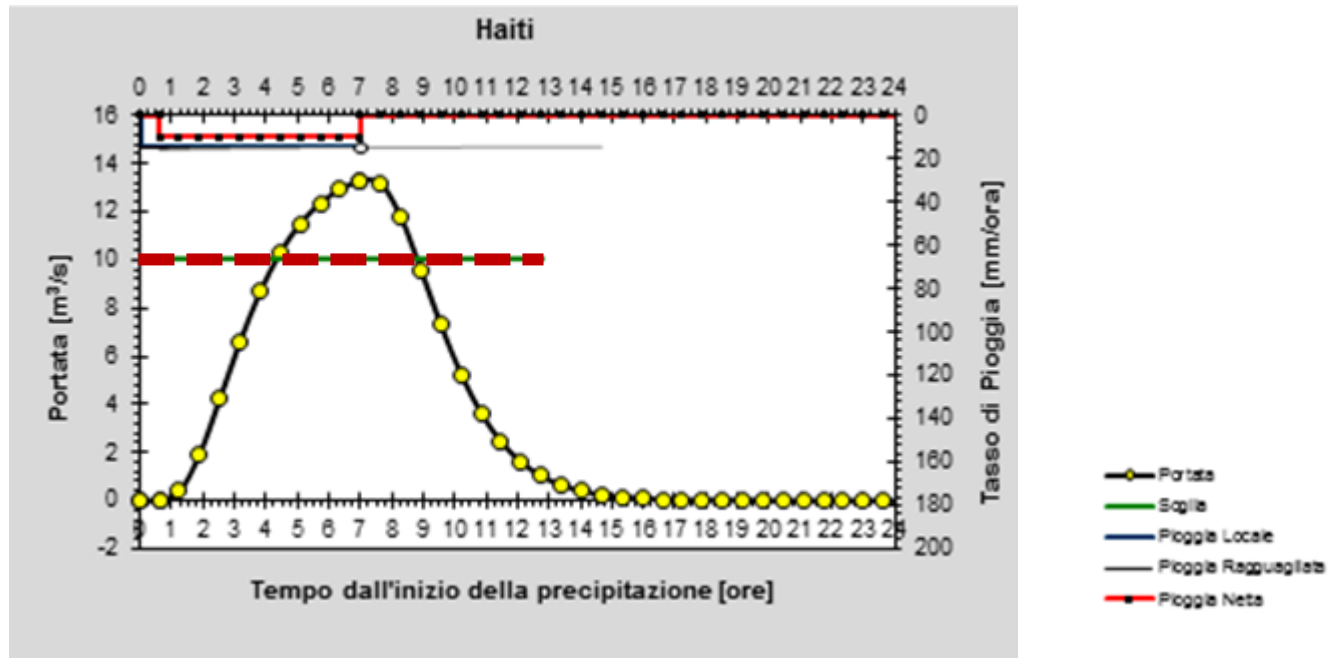


4 Temp de retour						
5	n	0.9703	50	n	0.8833	◆ 5
	a	15.68805		a	31.62661	
	Coef corr	0.9969		Coef corr	0.9927	
10	n	0.9321	100	n	0.8702	■ 10
	a	20.62284		a	36.31021	
	Coef corr	0.9954		Coef corr	0.9918	
500	n	0.8486	500	n	0.8486	▲ 50
	a	47.18136		a	47.18136	
	Coef corr	0.9901		Coef corr	0.9901	

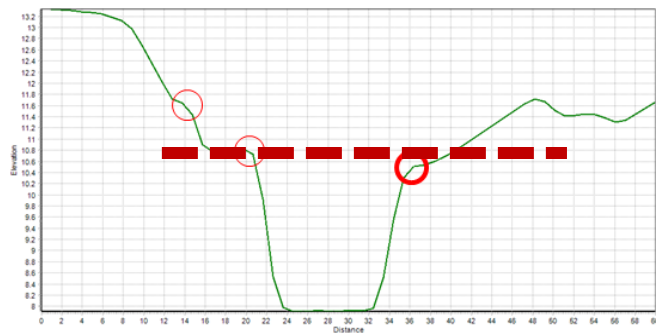
Modélisation Hydrologique



Calibrage de la section d'entrée

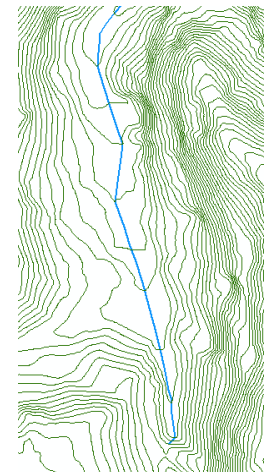
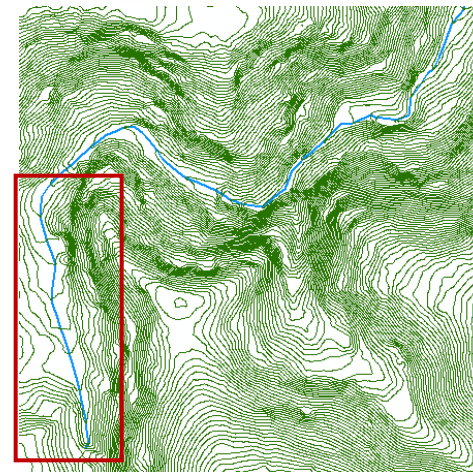
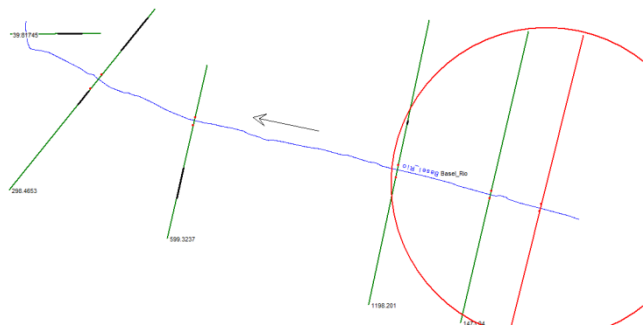
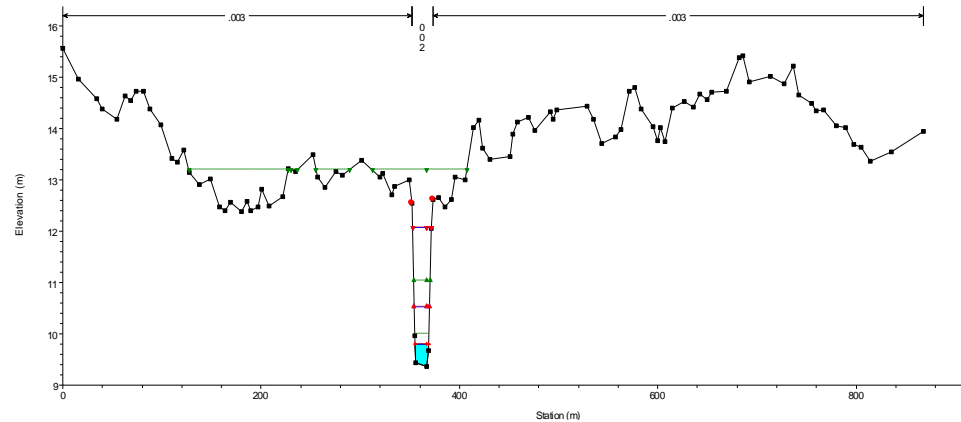


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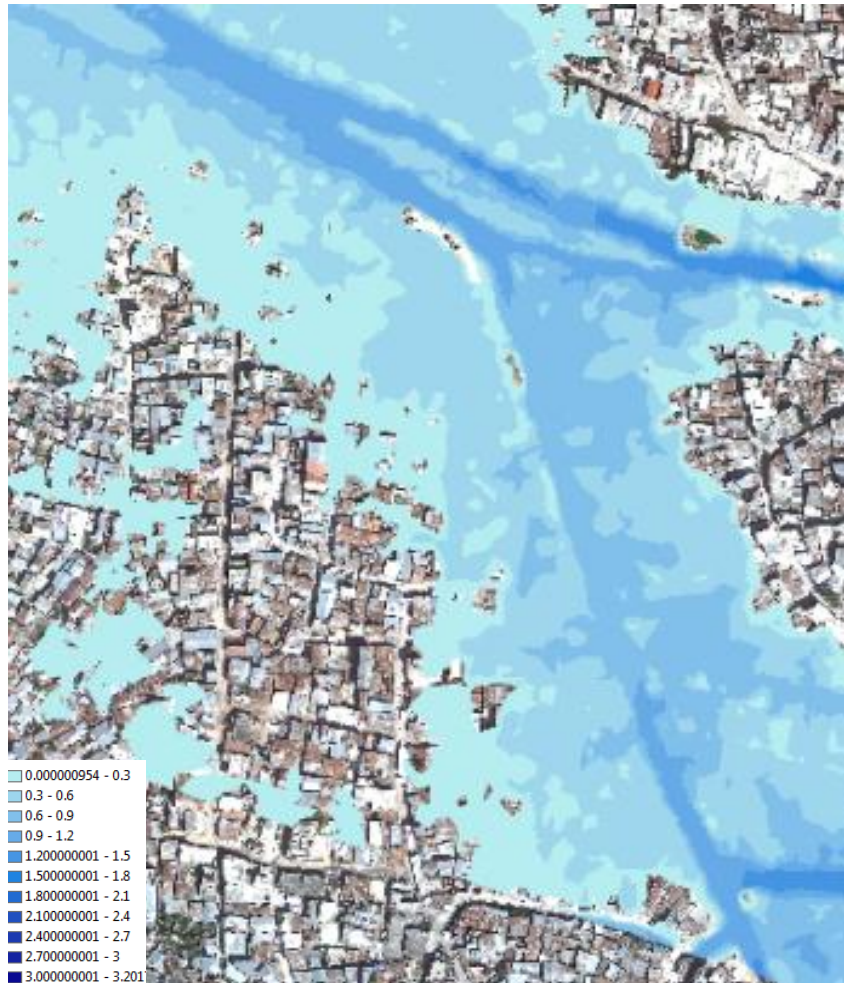


Input pour MODELISATION 1D, logiciel Hec-GeoRas

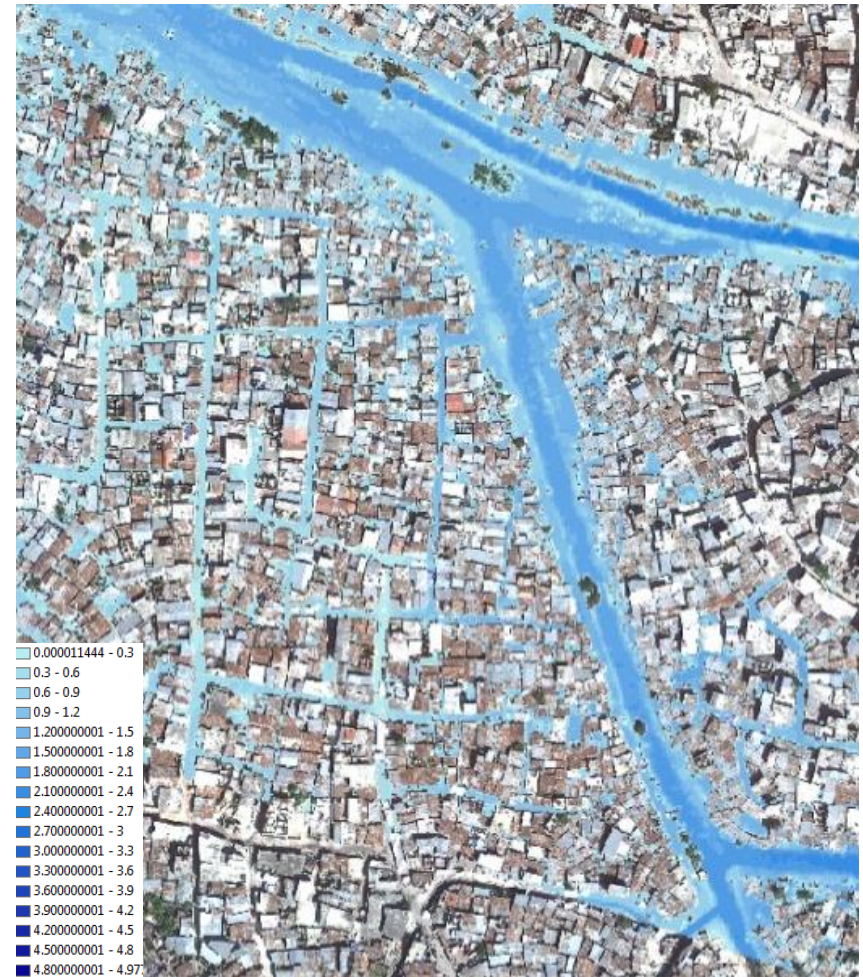
- Rivière
- Sections
- Géométrie du drain
- Obstacles
- Lit majeur i.e zone de stockage
- Occupation du sol



Premiers résultats de modélisation

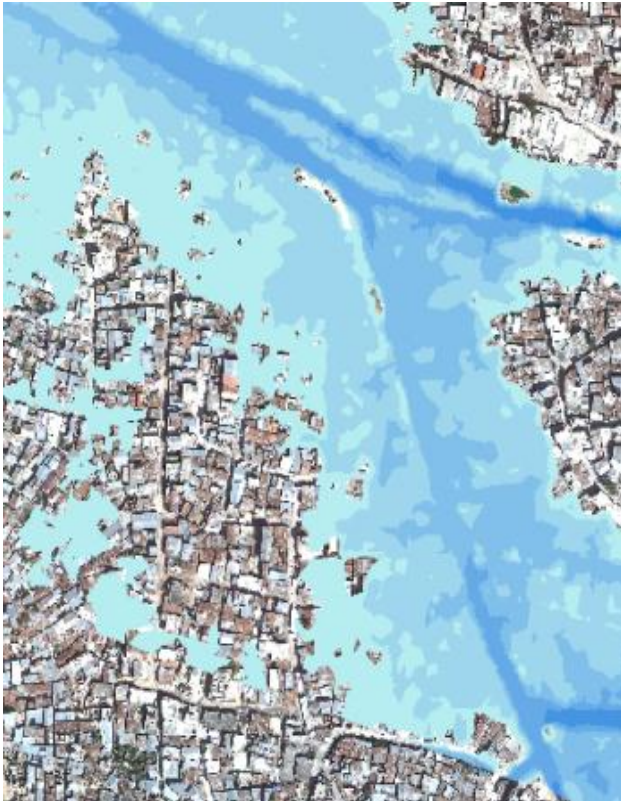


MNT – modèle Numérique de Terrain



Mns – Modèle Numérique du Surface

Premiers résultats de modélisation



MNT – modèle Numérique de Terrain

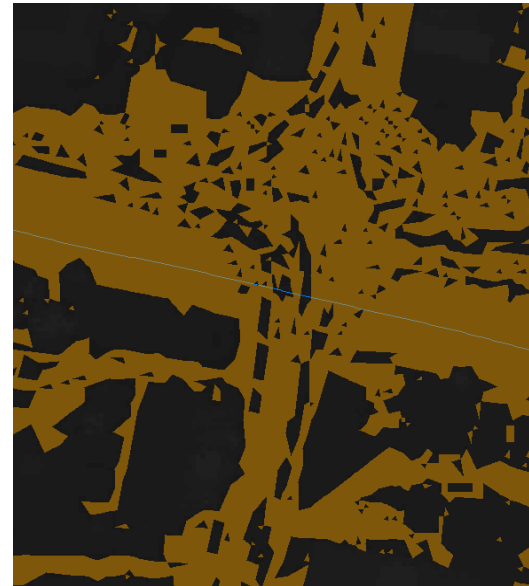
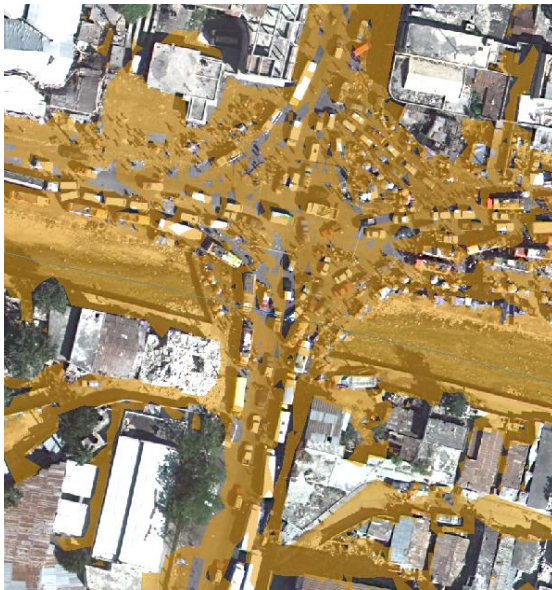


Mns – Modèle Numérique du Surface

ZOOMS

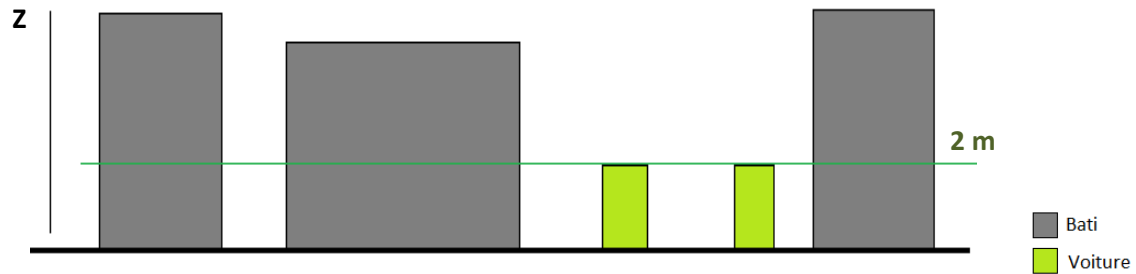


Modélisation
plausible



Problèmes

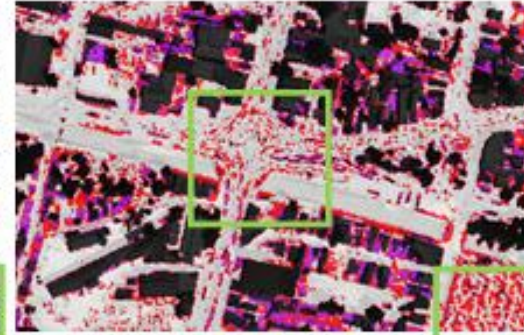
Conclusion retour à la description géométrique pour corrections



Nettoyage du MNE

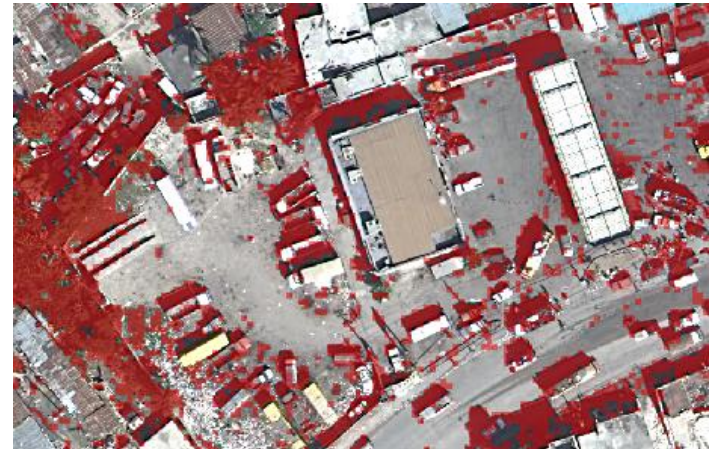
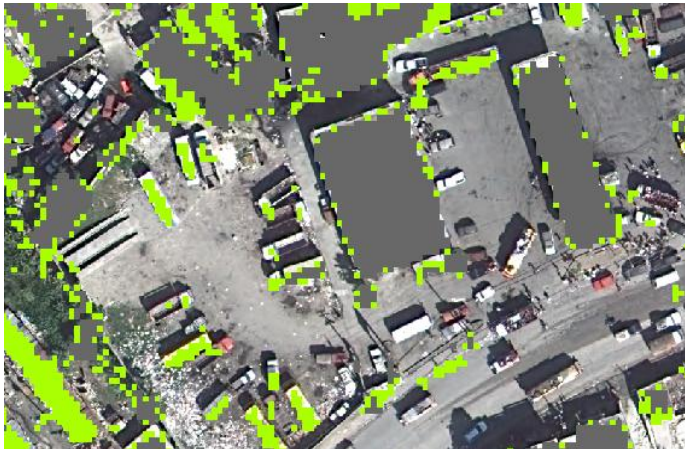
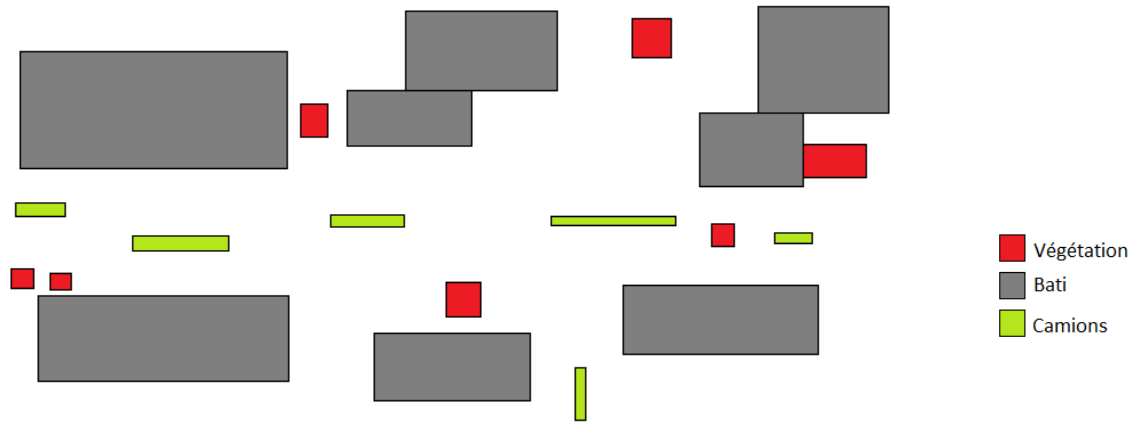


High : 15
Low : 5



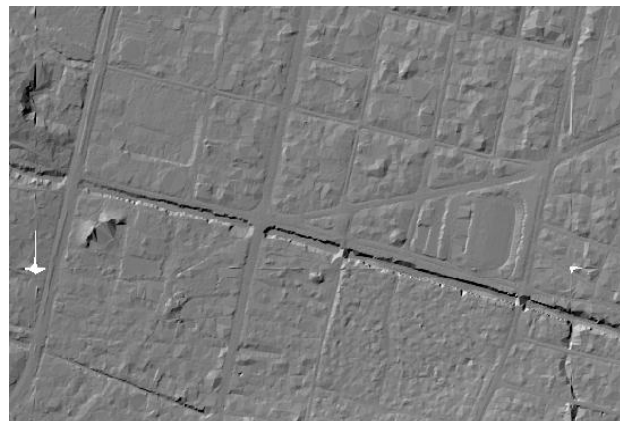
■ -1,005 - 0
■ 0 - 1
■ 1.000000001 - 2.5
■ 2.500000001 - 3
■ 3.000000001 - 1,004

Nettoyage du MNE

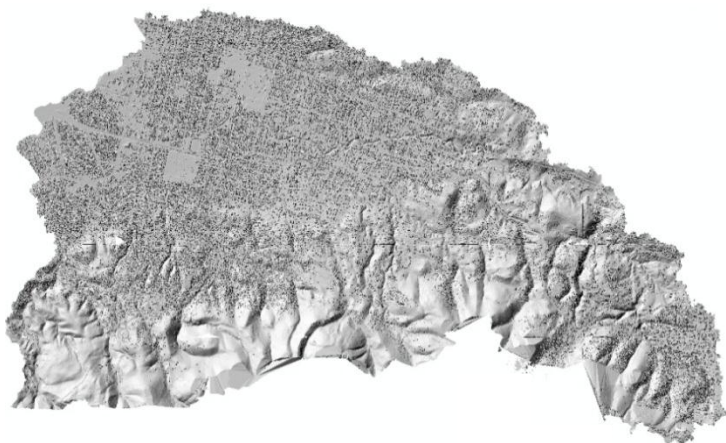




MNT stricto sensu



Hilshade mnt



MNT complété par sur sol nettoyé (bâti)

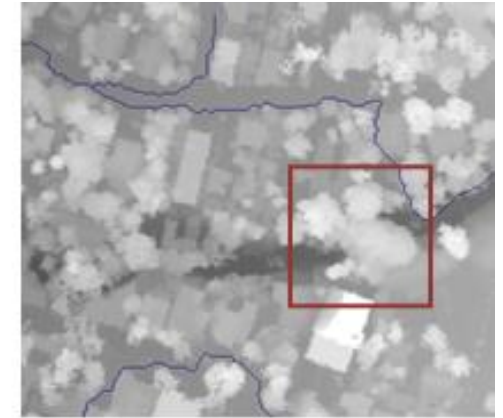
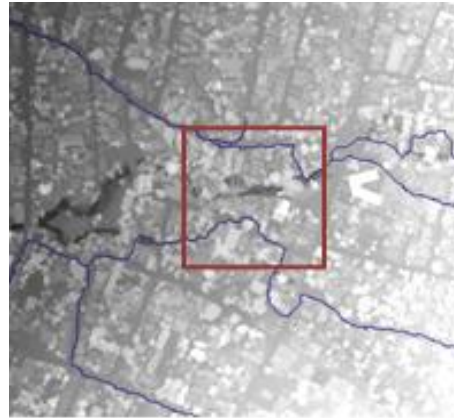


Hilshade du NEW mnt

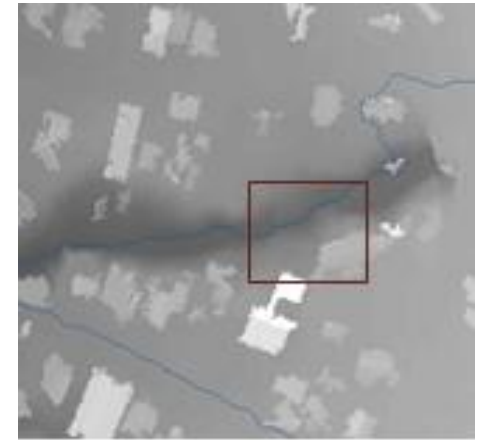
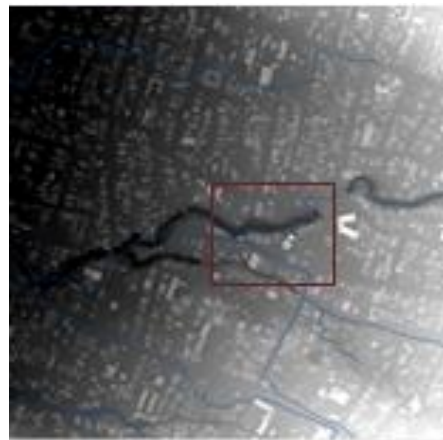
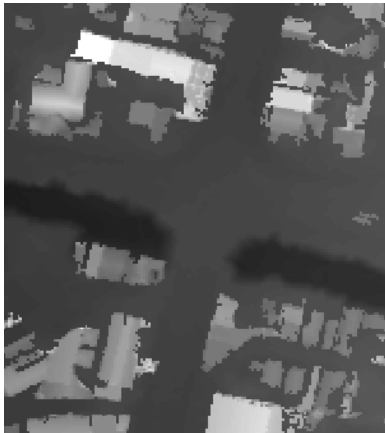
Voiture - Camion

Végétation

MNS
initial

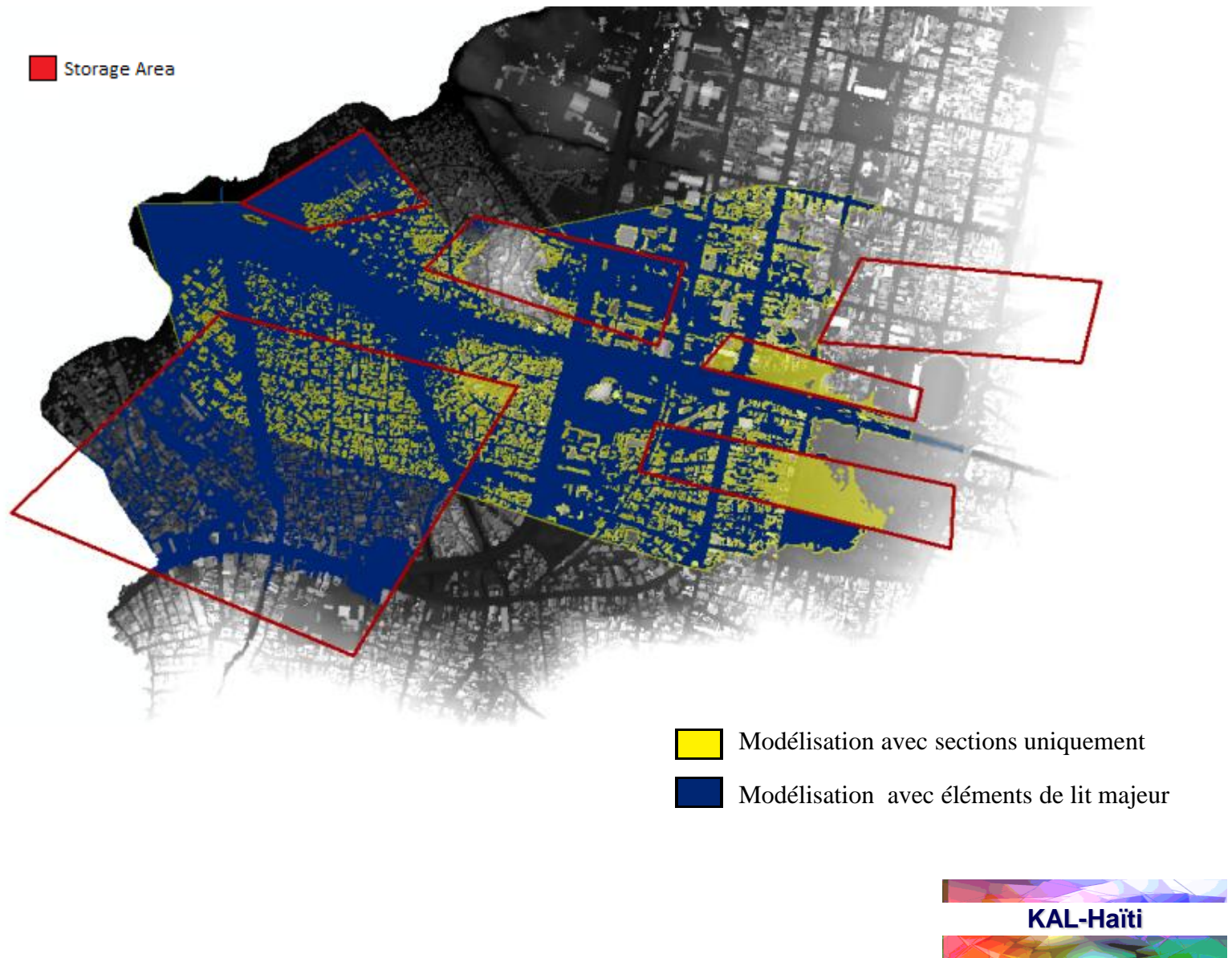


MNT
nettoyé



Importance de l'imagerie THR pour nettoyer le MNT

Nouvelle modélisation avec MNT nettoyé



Complexification = occupation du sol i.e. coefficient de Manning



0.011 - Goudron

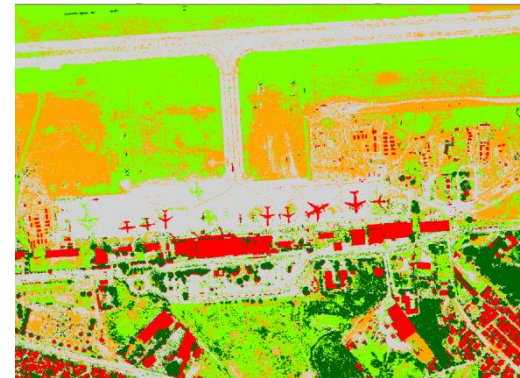
0.8 - Forêt

Spatialisation de l'occupation du sol avec THR

Vers des modèles plus réalistes



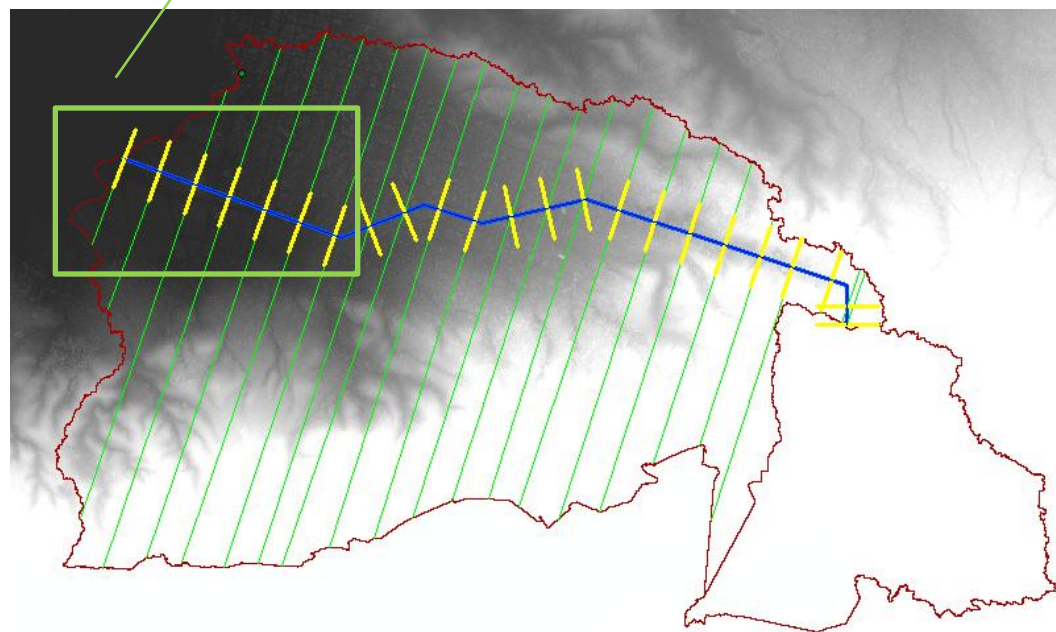
Zone de stockage



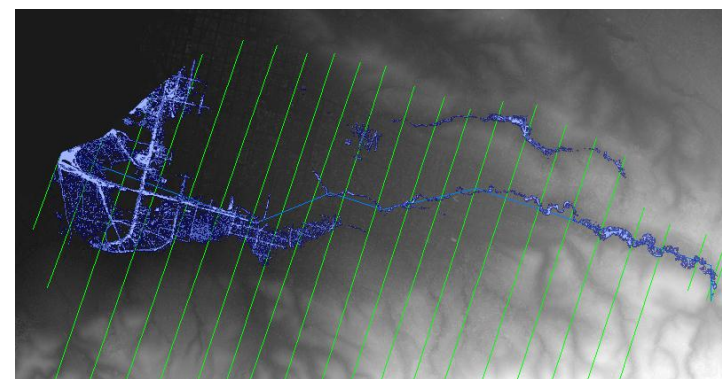
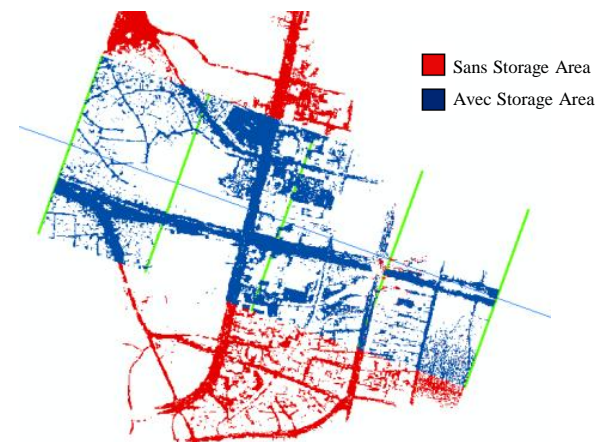
Occupation du sol

Sous Bassin

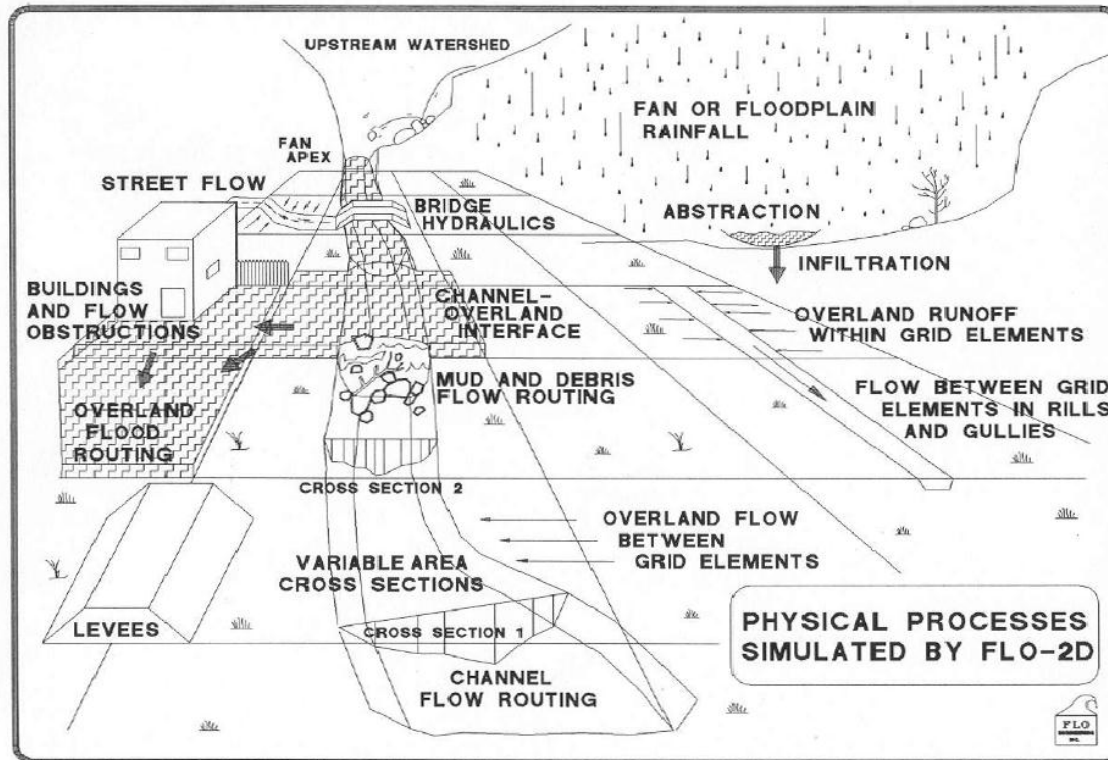
Essai Martissant



- Rivière
- Section Basin
- Section 500m

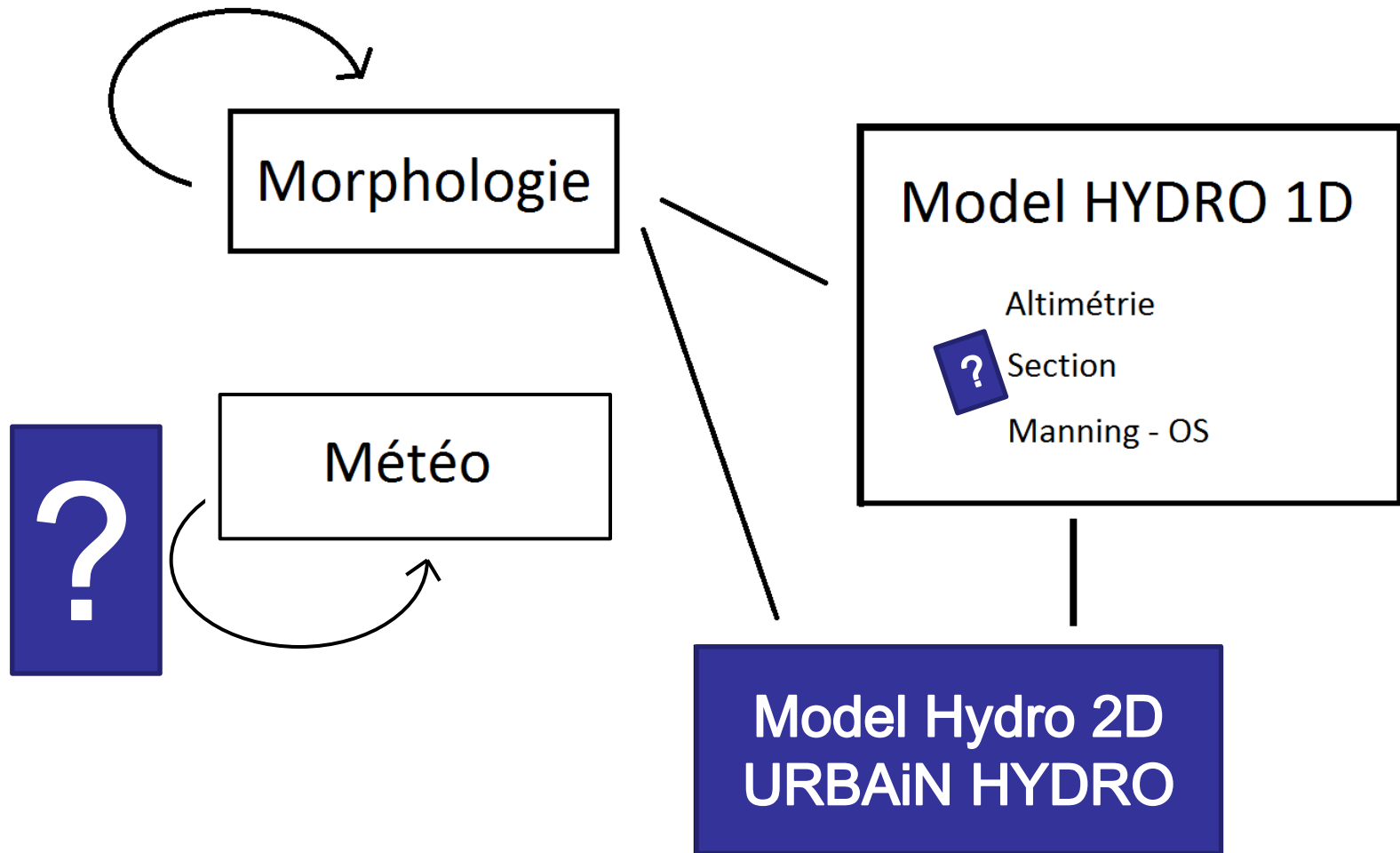


MODELISATION 2D: Urbain Hydro

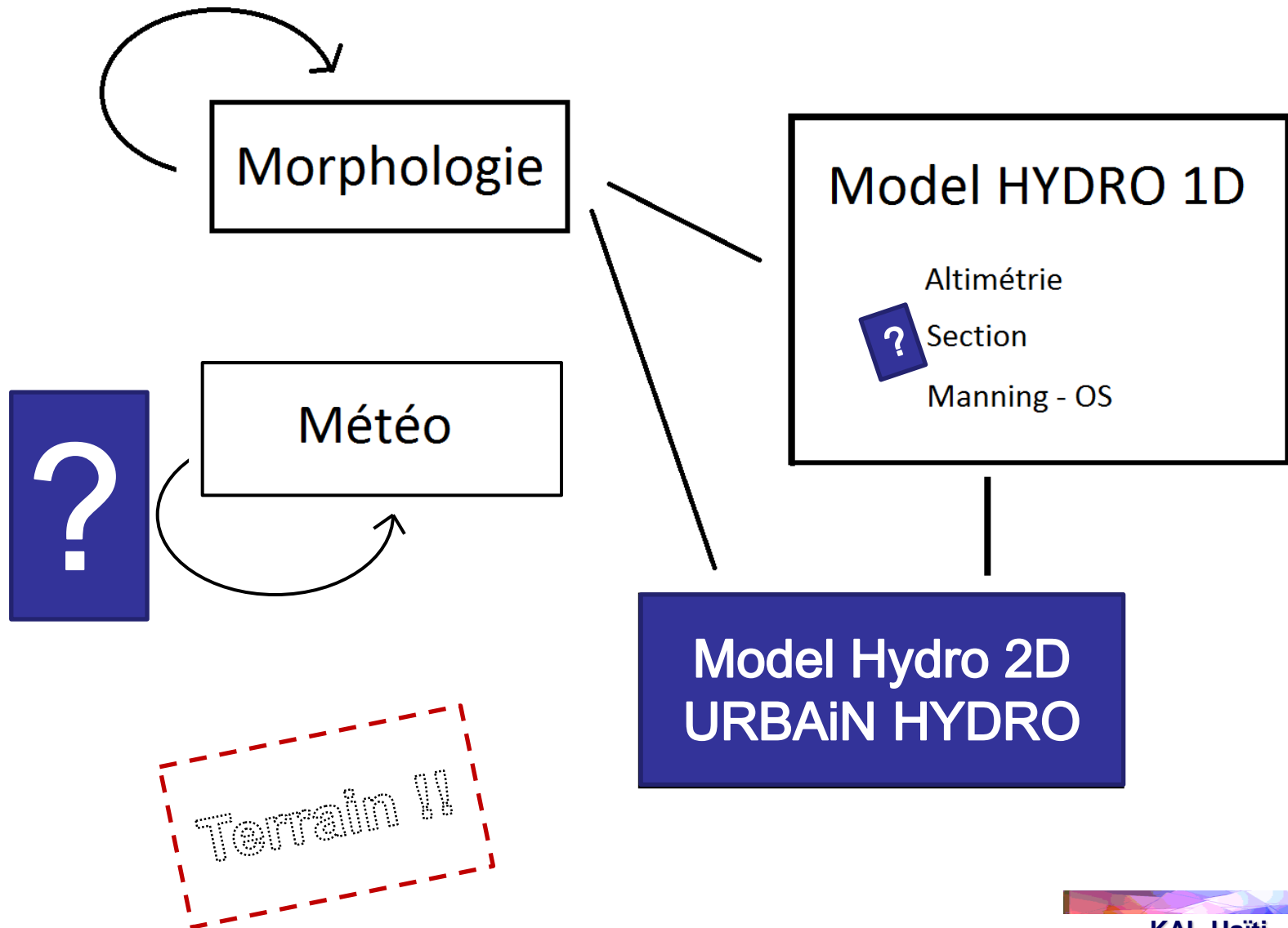


Flow 2D
Deltares
Infoworks
Delft 3D...

Conclusions / perspectives



Conclusions / perspectives

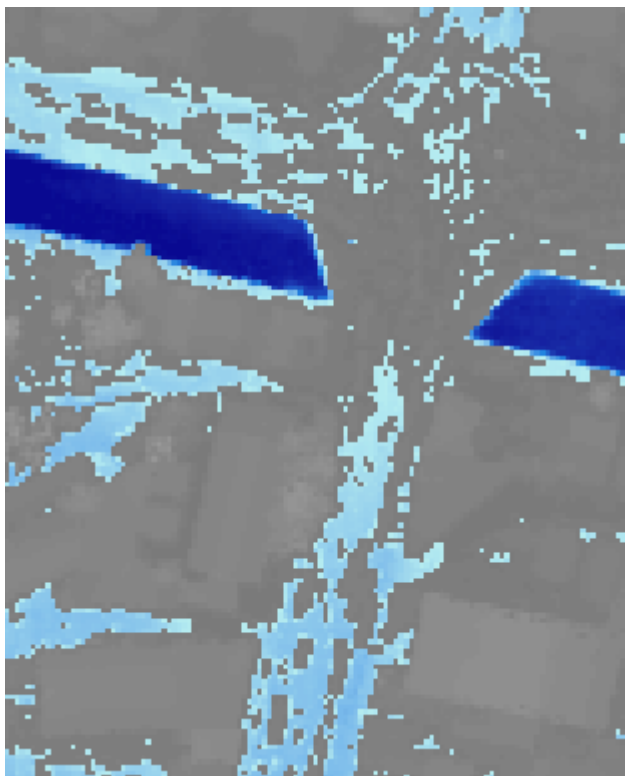


Merci

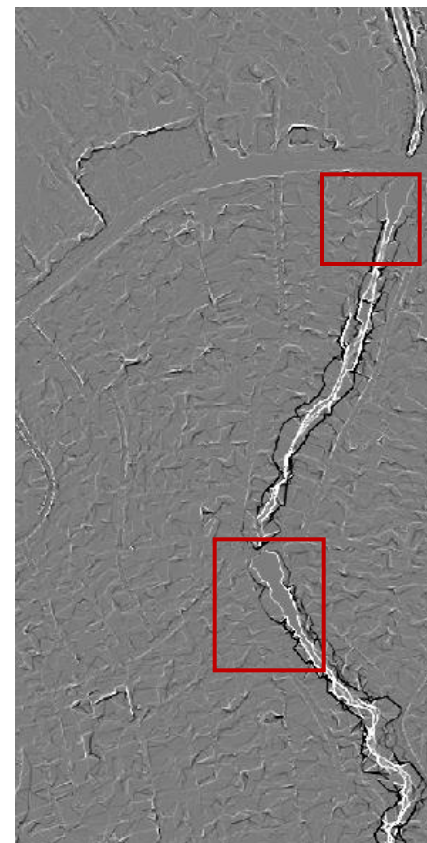
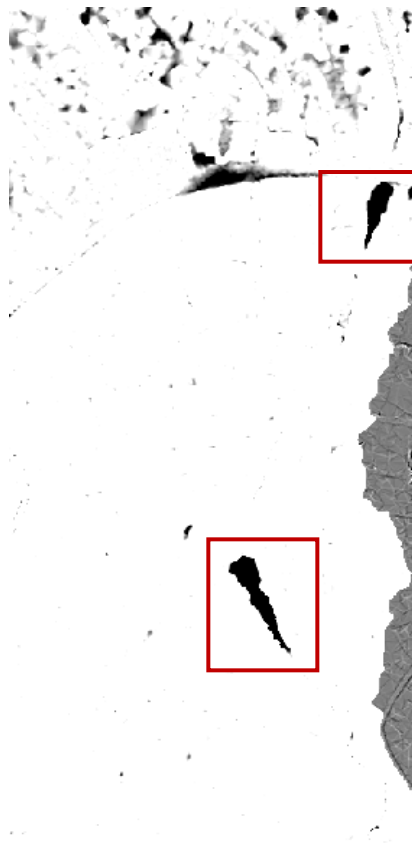
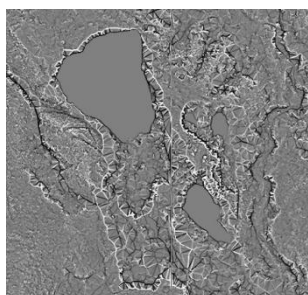
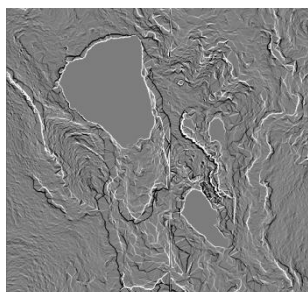
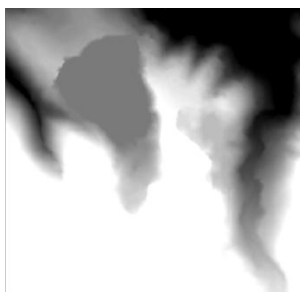
Travail réalisé en collaboration avec
l'Ecole Polytechnique de Milan.

Daniele Bocchiola, Gabriele Confortola e Andrea Soncini

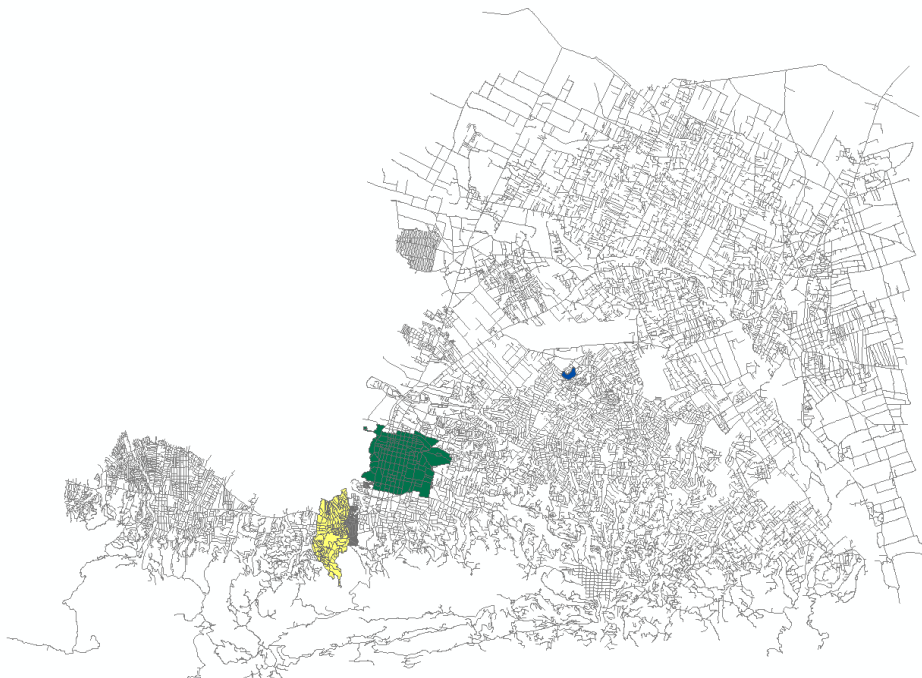
Dans le cadre du Master Sigma,
Ecole Polytechnique de Toulouse



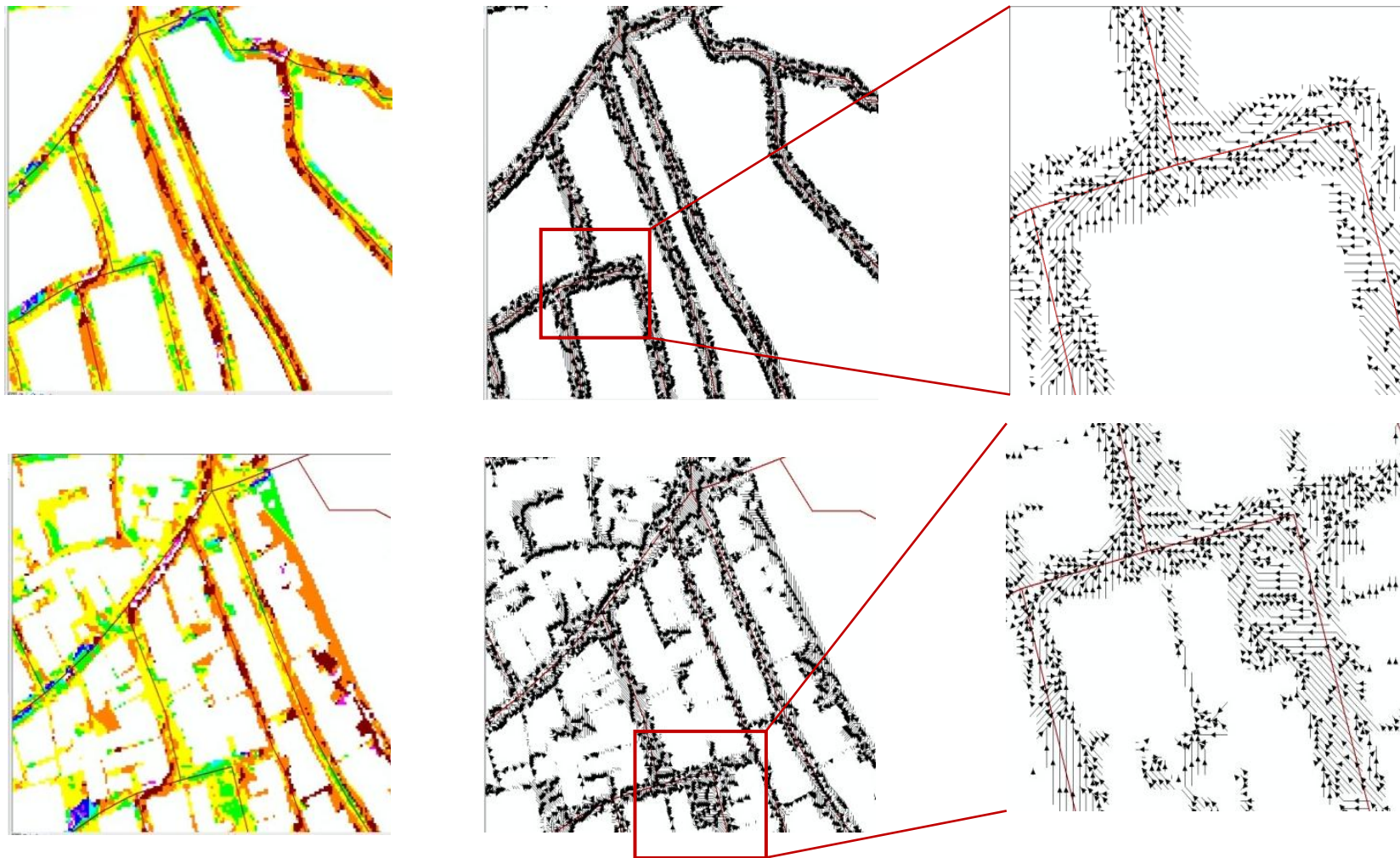
Dépressions



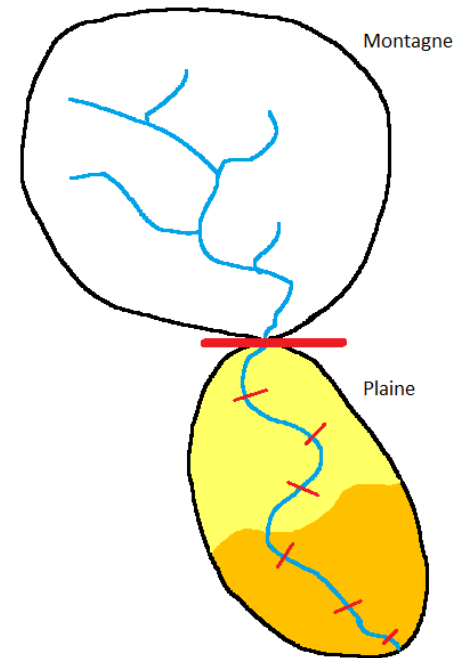
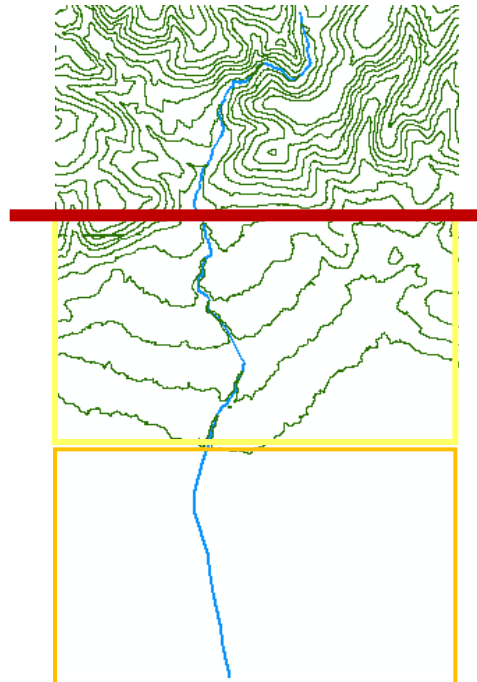
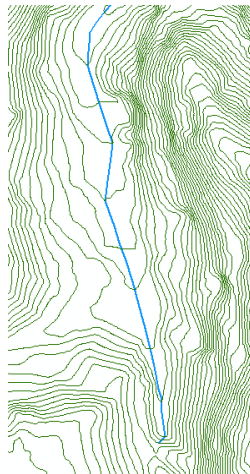
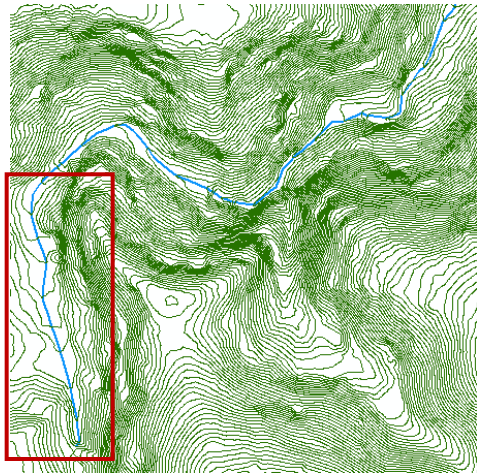
Polygone Bâti



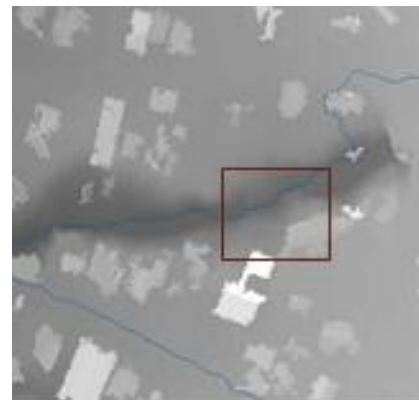
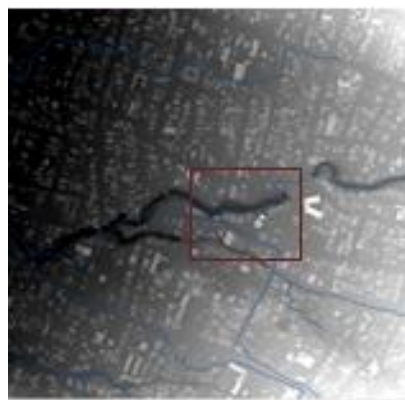
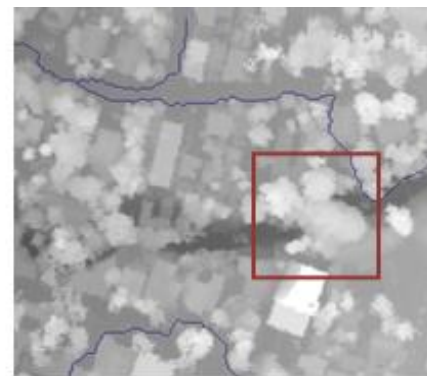
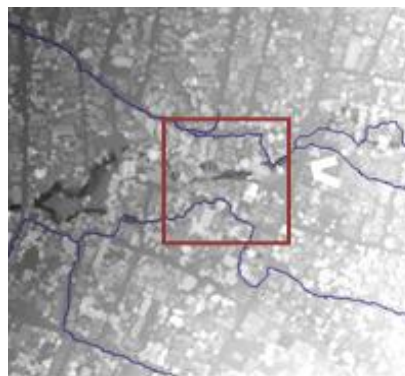
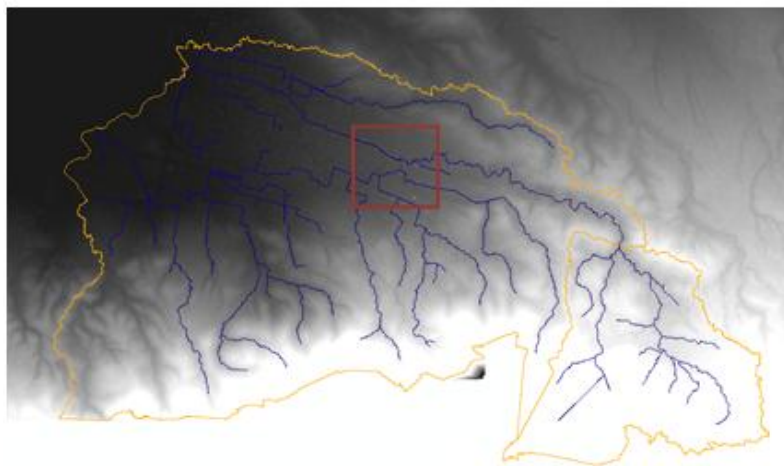
Directions de flux dans les espaces non bâtis



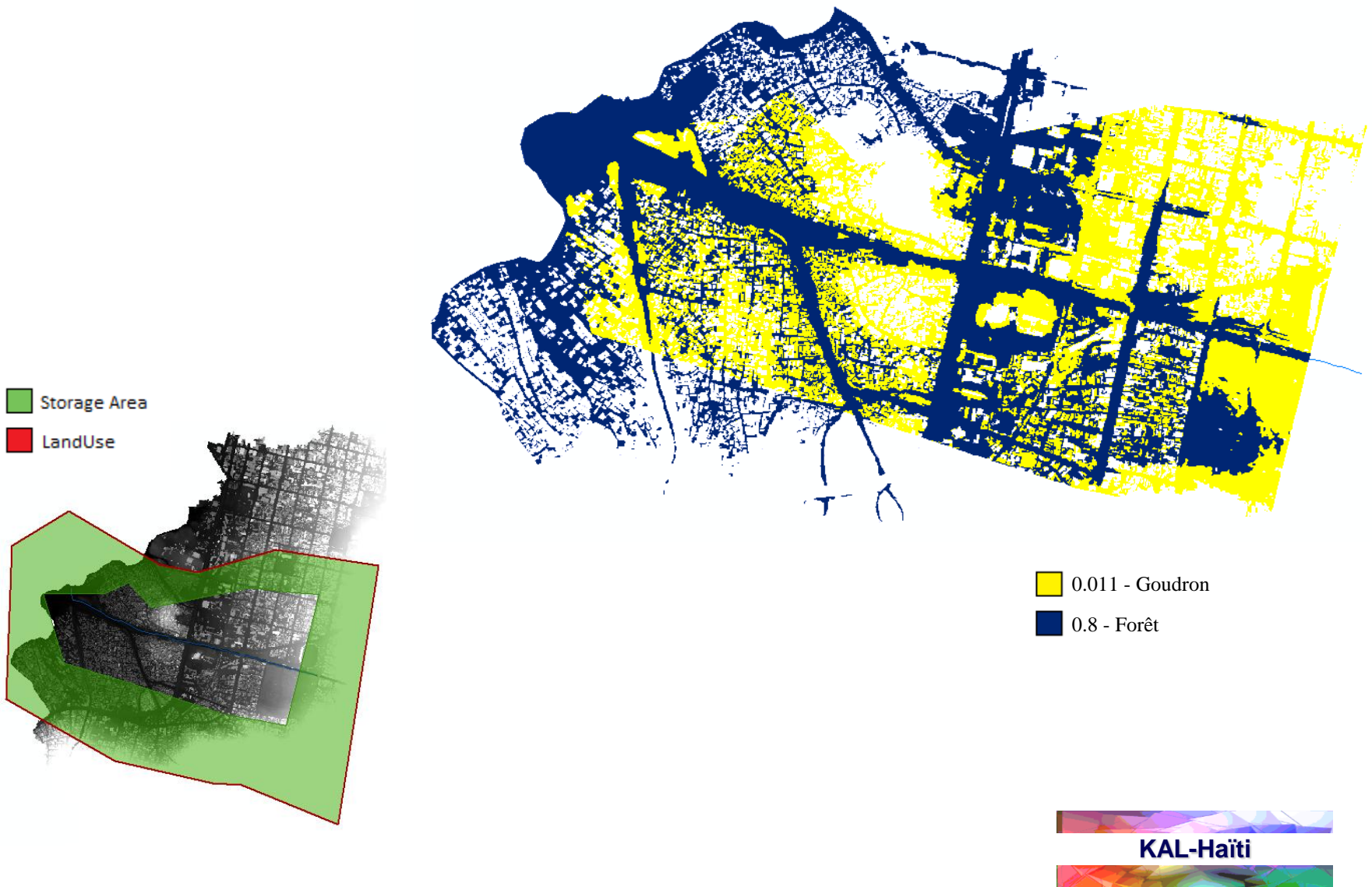
Analyse Hydro



Problématique



Land Use – Manning's value



Simplification - Basin

