Riparian characterization from remote sensing in a multiple scale perspectives. A few examples.

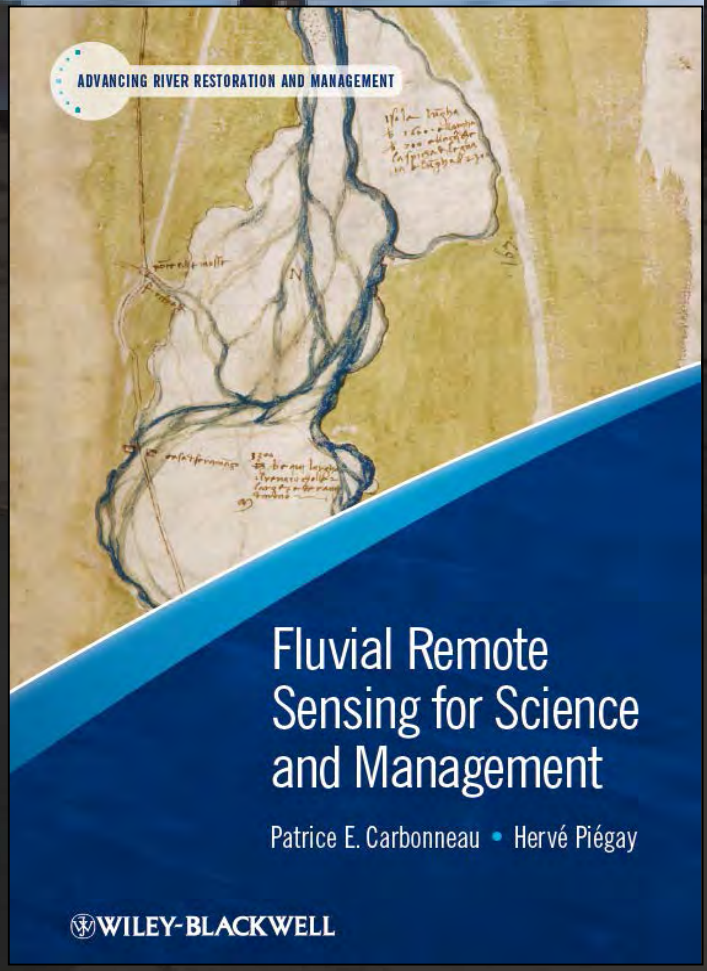
Piégay H., Michez A., Raepple B., Stella J., Wawrzyniak V.

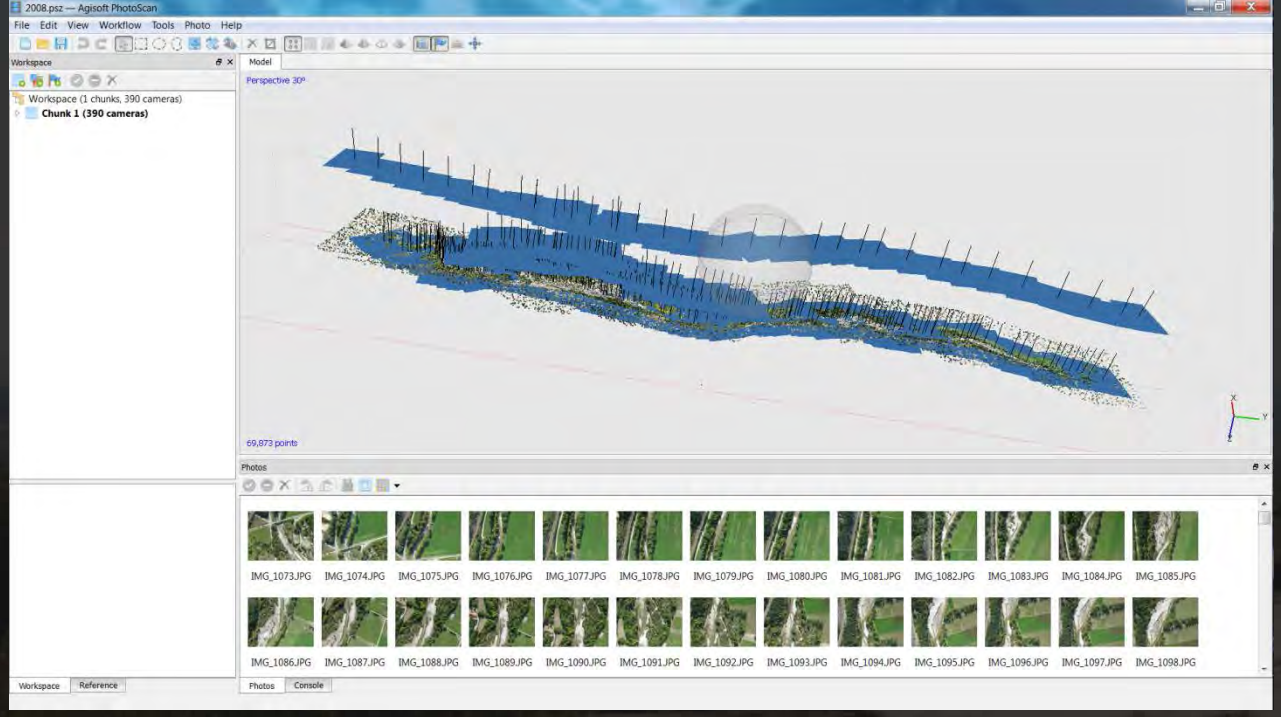
CNRS UMR 5600, Univ. of Lyon

Univ. of Liège, Univ. of Syracuse

Outline

- Combine computed/field data with archives
- Acquire and explore own airborne data acquisition (thermal, drone)

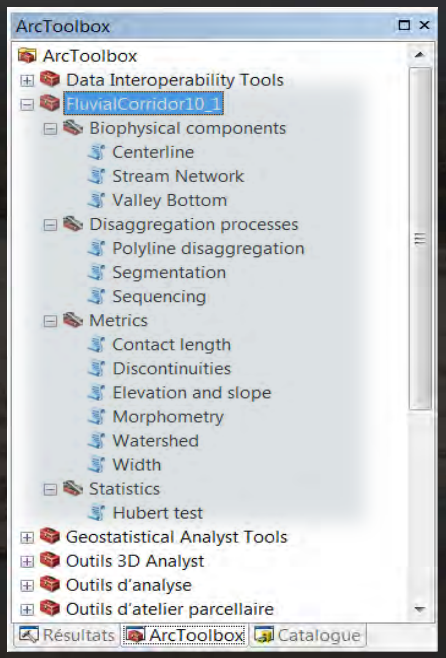


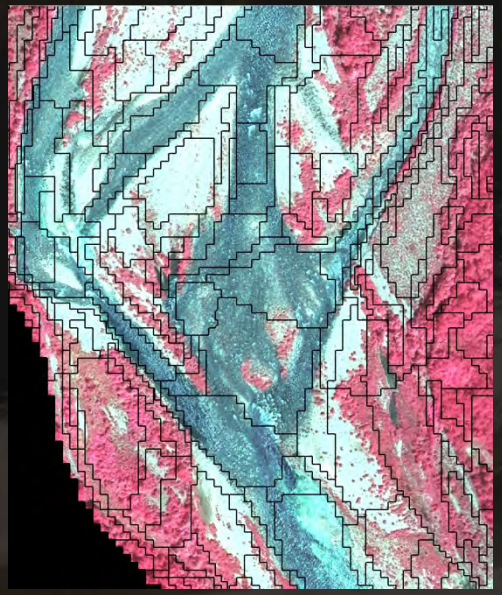


Agisoft Photoscan

SFM

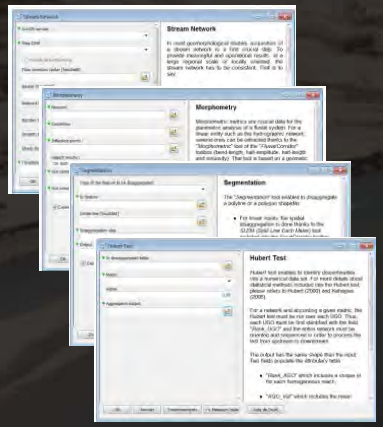
FluvialCorridor, a GIS toolbox package

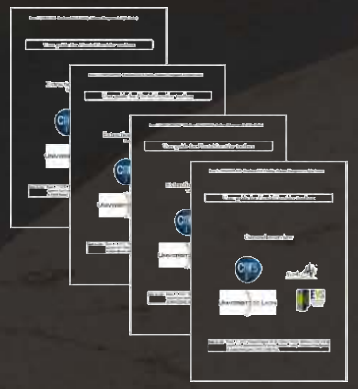




Object-Based Image Analysis

OBIAS

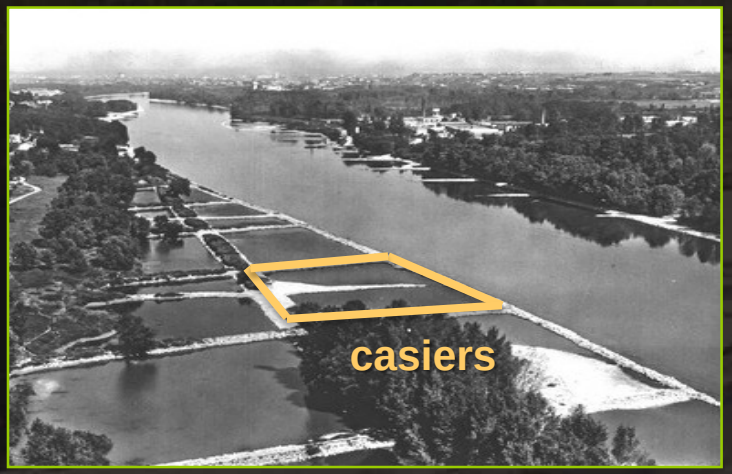


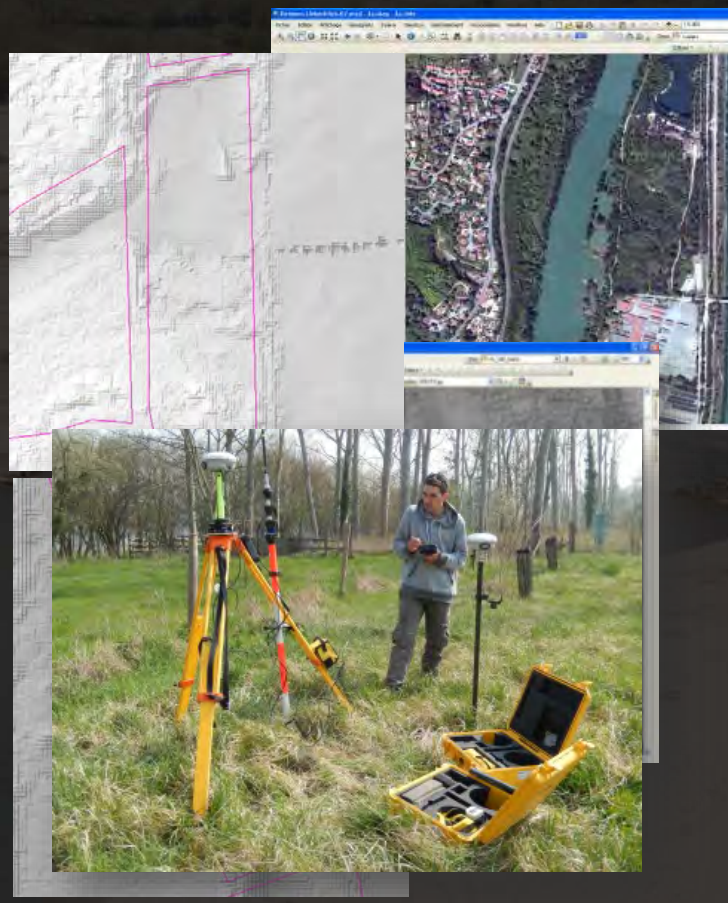


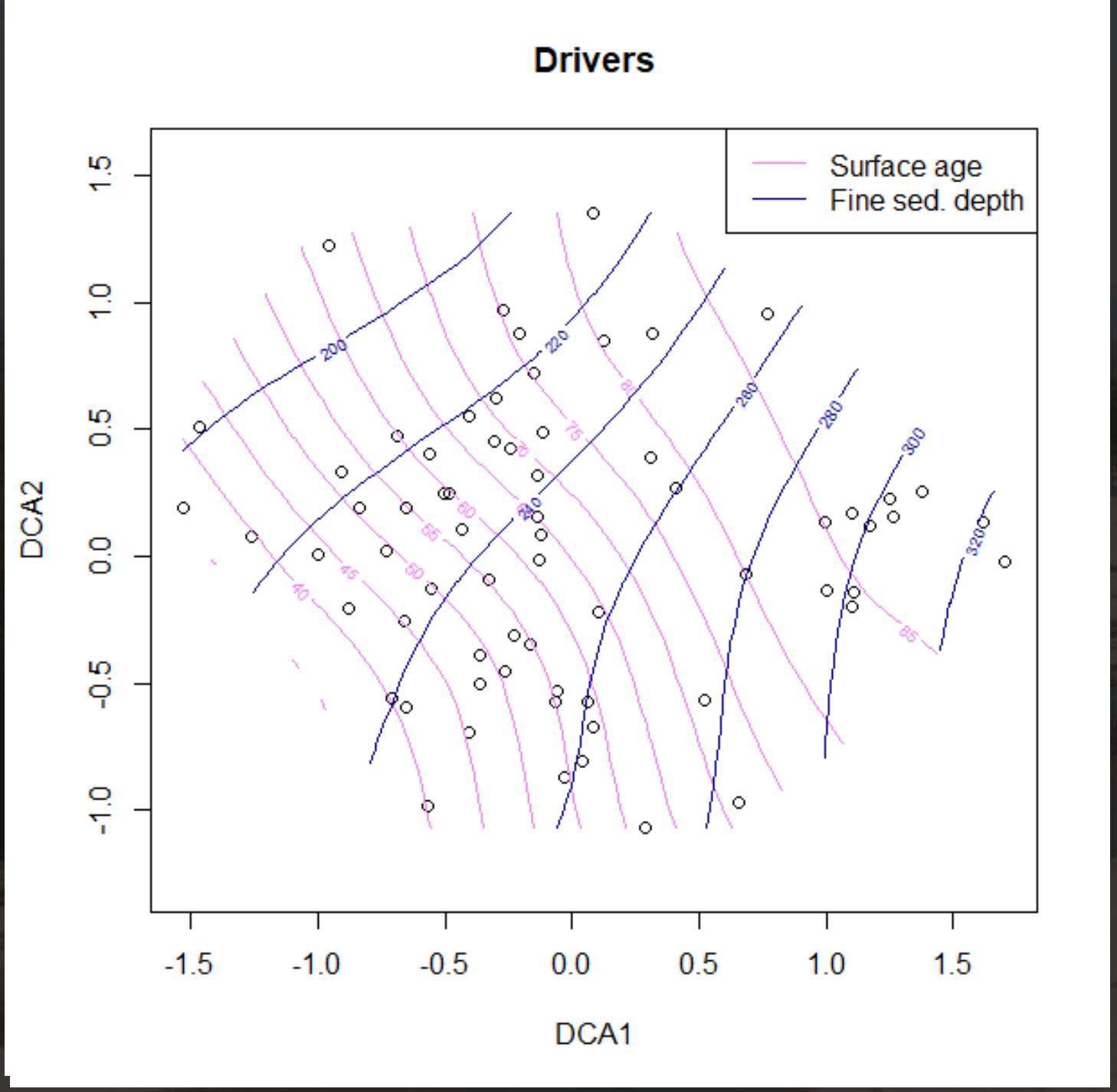
Roux et al., 2015 Geomorphology

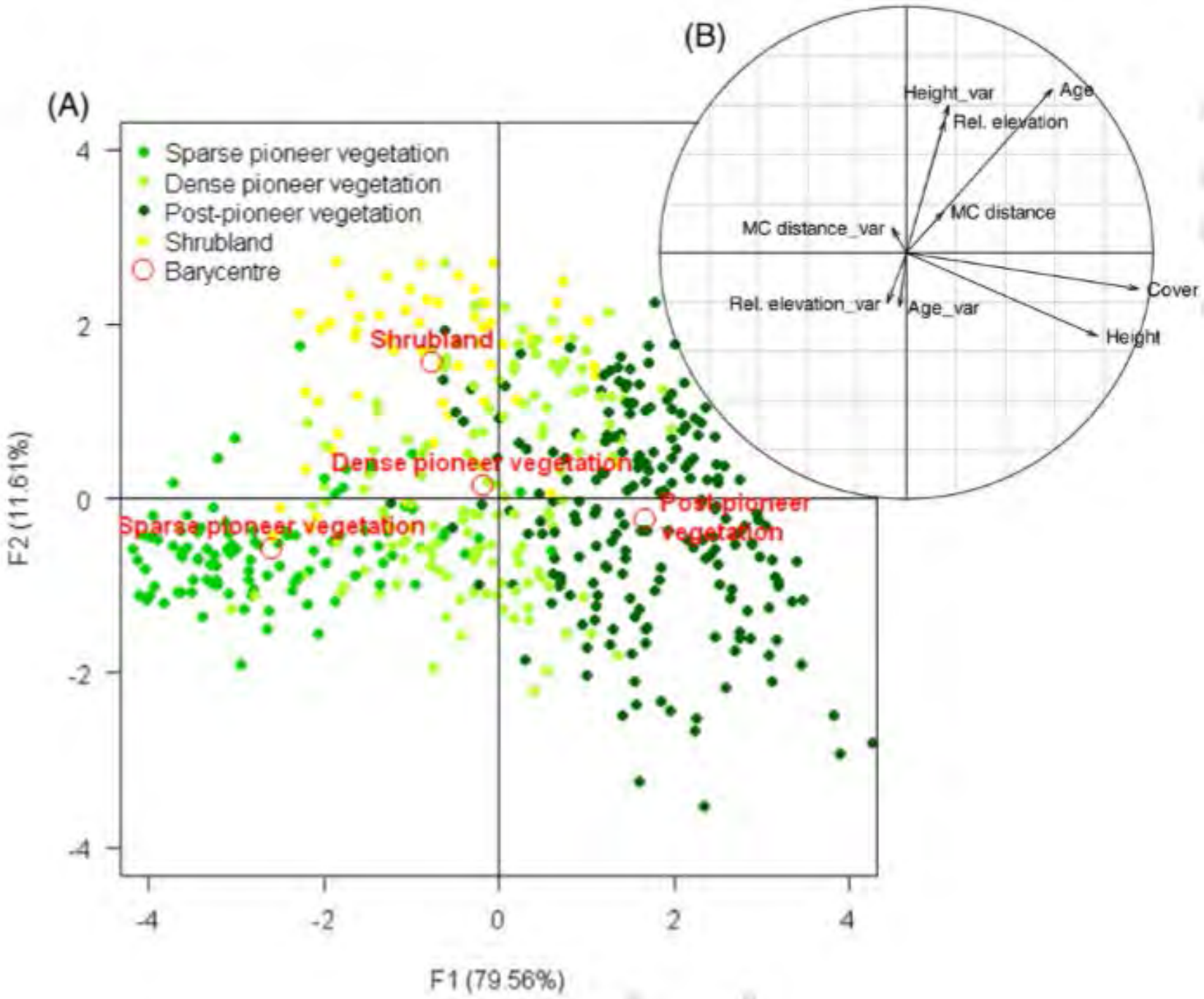
Combine computed/field data with archives

Orthophotos





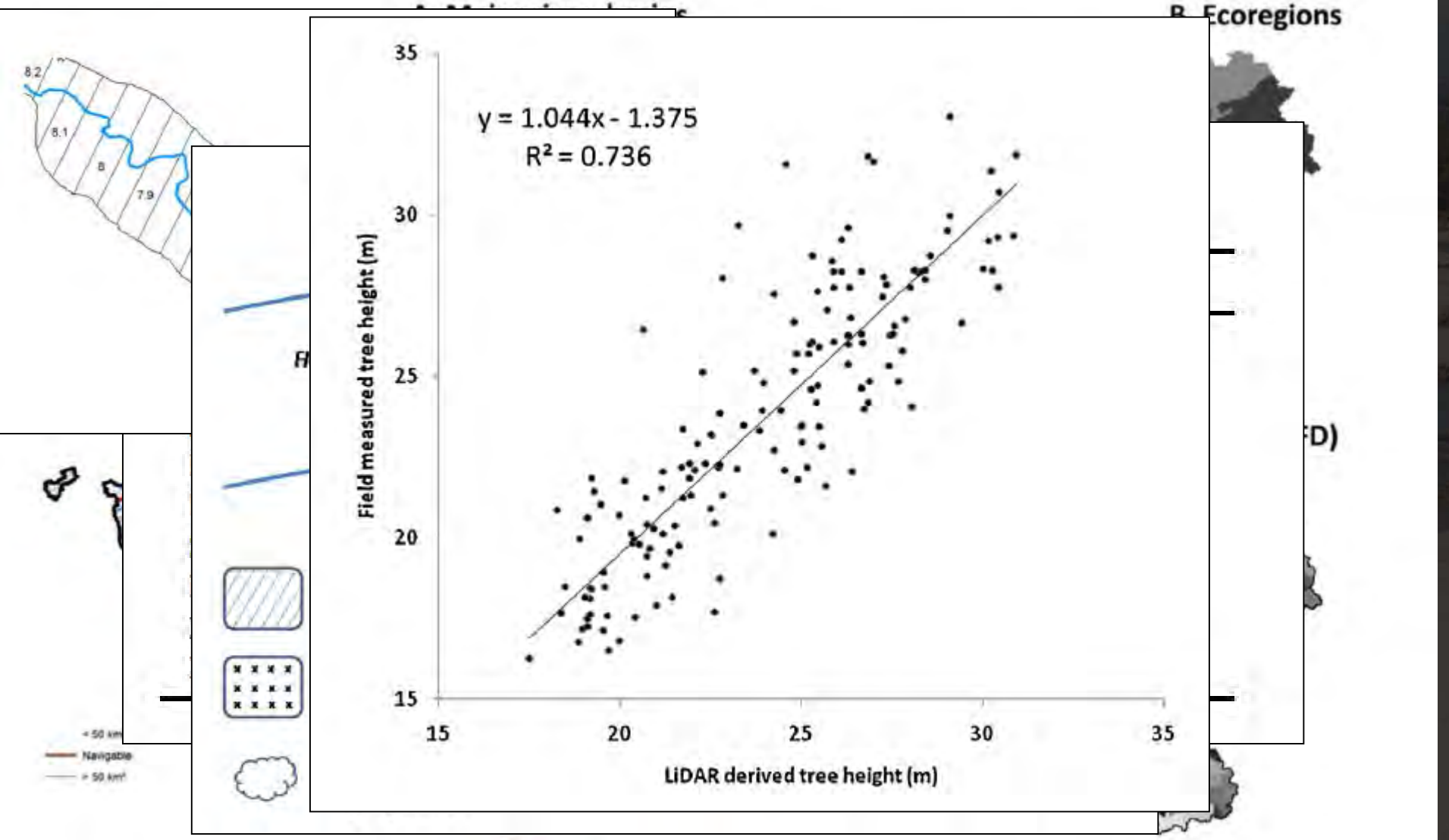

Drivers
Surface age
Fine sed. depth
DCA2
DCA1
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
200
220
280
280
300
320
40
45
50
55
60
65
70
75
80
85


(A)
Sparse pioneer vegetation
Dense pioneer vegetation
Post-pioneer vegetation
Shrubland
Barycentre
Shrubland
Dense pioneer vegetation
Sparse pioneer vegetation
Post-pioneer vegetation
F2 (11.61%)
F1 (79.56%)
4
2
0
-2
-4
-4
-2
0
2
4
(B)
Height_var
Age
Rel. elevation
MC distance
MC distance_var
Cover
Rel. elevation_var
Age_var
Height

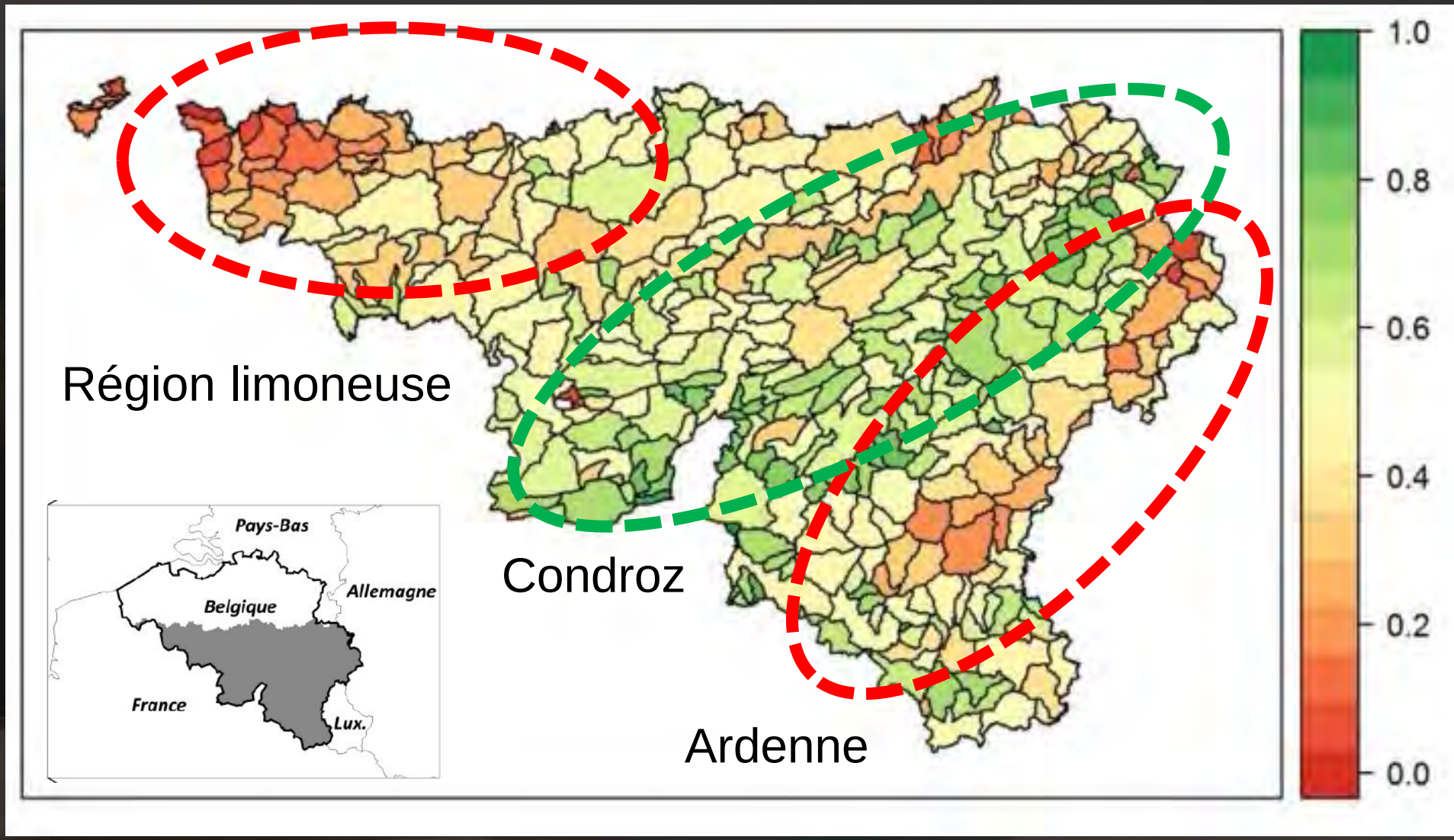
LiDAR derived ecological integrity indicators for riparian zones: Application to the Houille river in Southern Belgium/Northern France

Adrien Michez[a,*], Hervé Piégay[b], François Toromanoff[a], Delphine Brogna[c], Stéphanie Bonnet[a], Philippe Lejeune[a], Hugues Claessens[a]

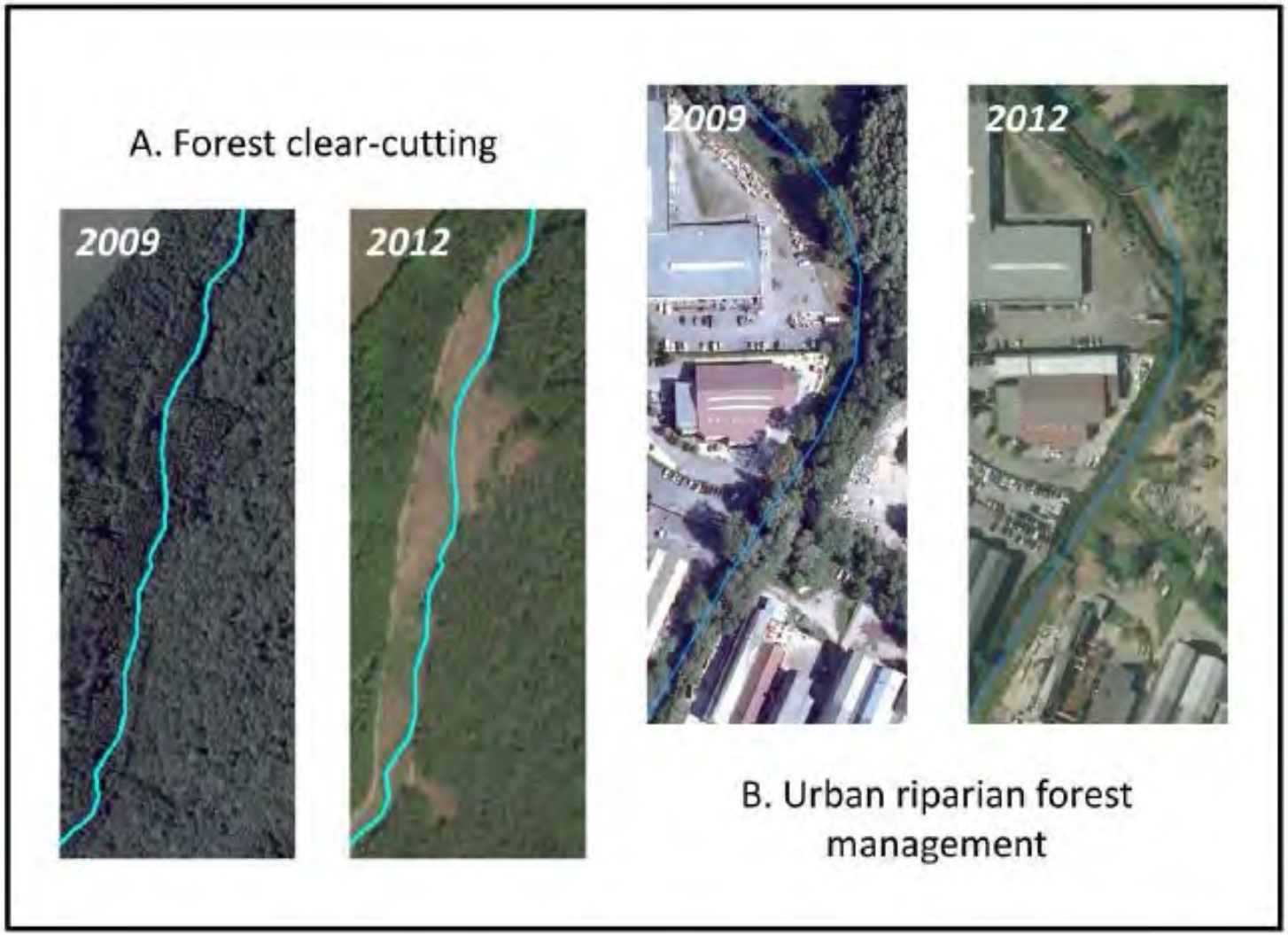
Ecological indicators, 2013



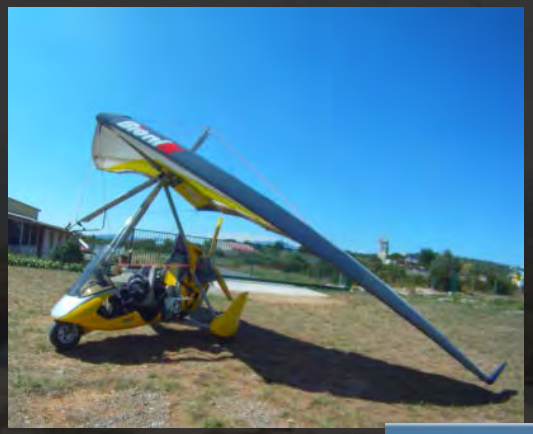
Longitudinal continuity of riparian forests at national/regional scale



Detailed scale : Management units



Lab. acquisitions



Limestone outcrops (Varambon / Ain)
(alt.: 335 m, res: 16 cm)

Sedimentary reloading (Bellegarde / Ain)
(alt.: 141 m, res: 6.7 cm)

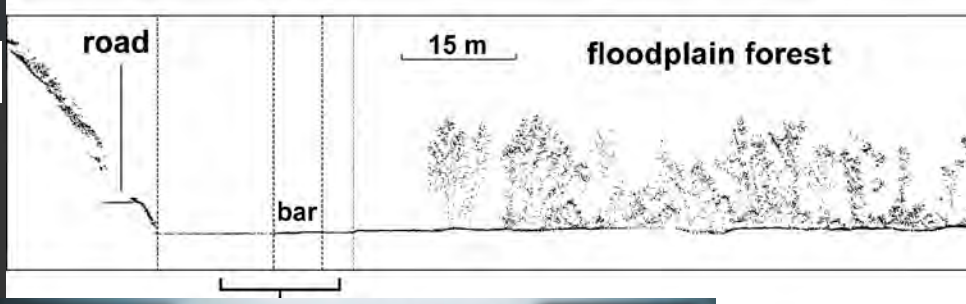
Pioneer units (Bellegarde / Ain)
(alt.: 258 m, res.: 12.3 cm)

Woody debris / grain size structure (Gévrieux / Ain)
(alt.: 36 m, res.: 1.7 cm)

Very high multi-temporal resolution

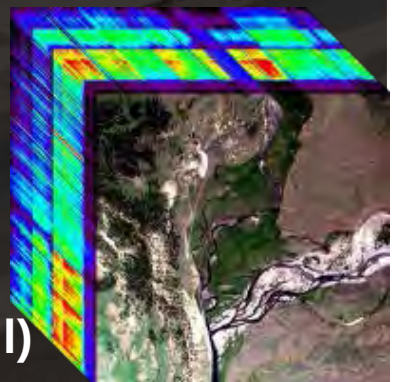
Very high spatial resolution (a few cm)

Very high spectral resolution

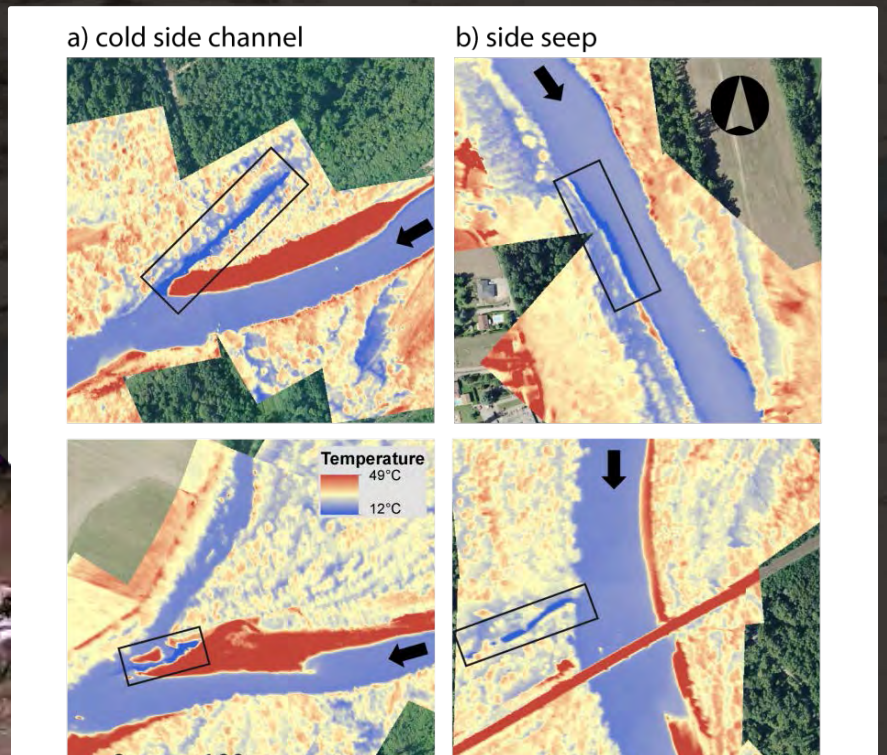


LiDAR HDL-32E

VarioCAM® Infratec



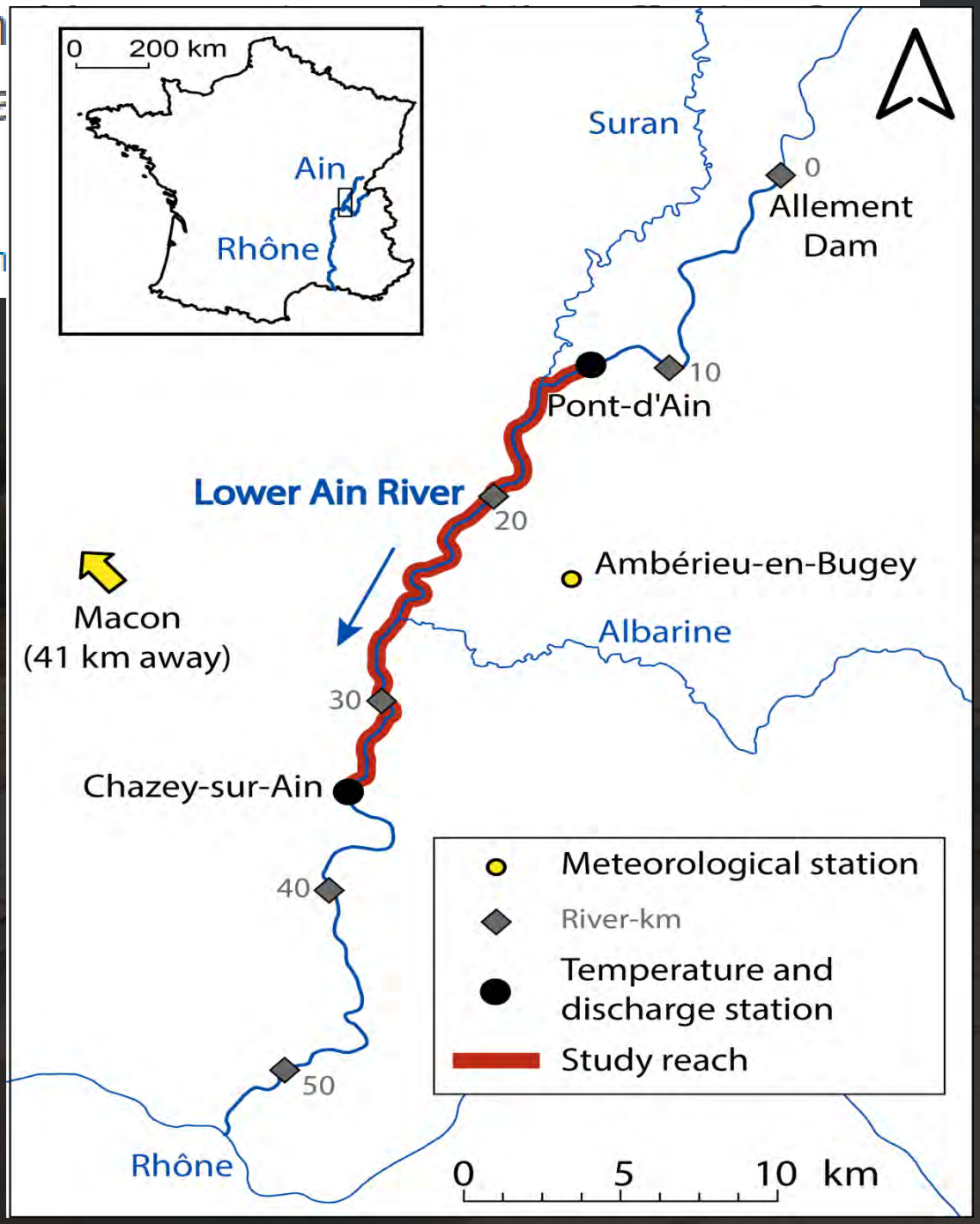
Nano-Hyperspec (Hadwall)

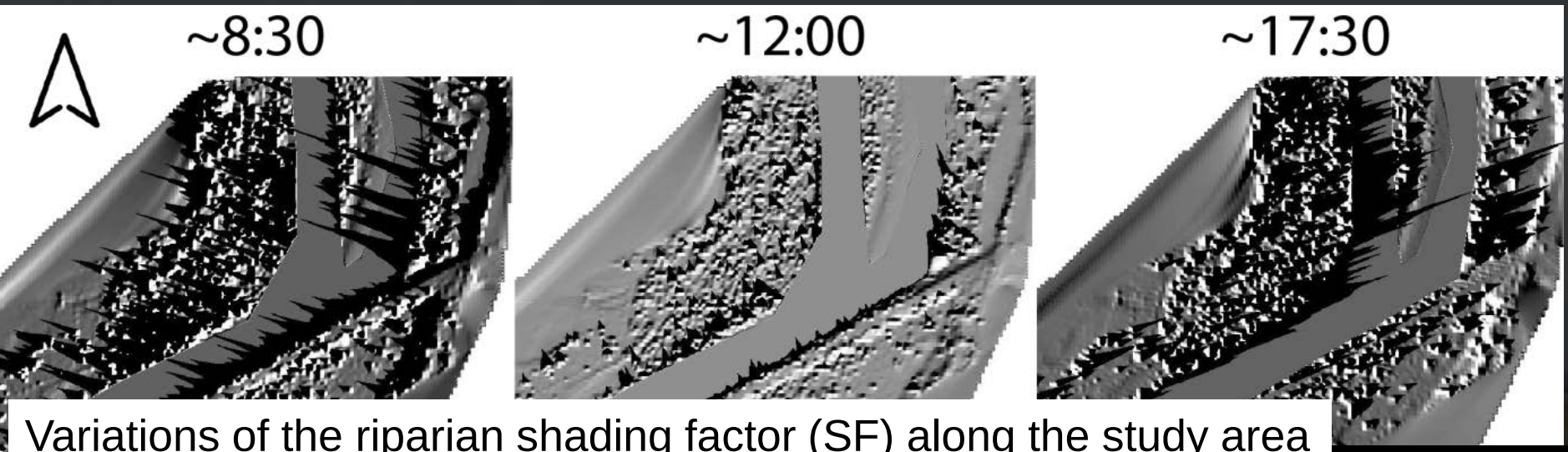


Coupling LiDAR and therm
riparian vegetation shade a
river temperature

Vincent Wawrzyniak [a, b], Pascal Alleman

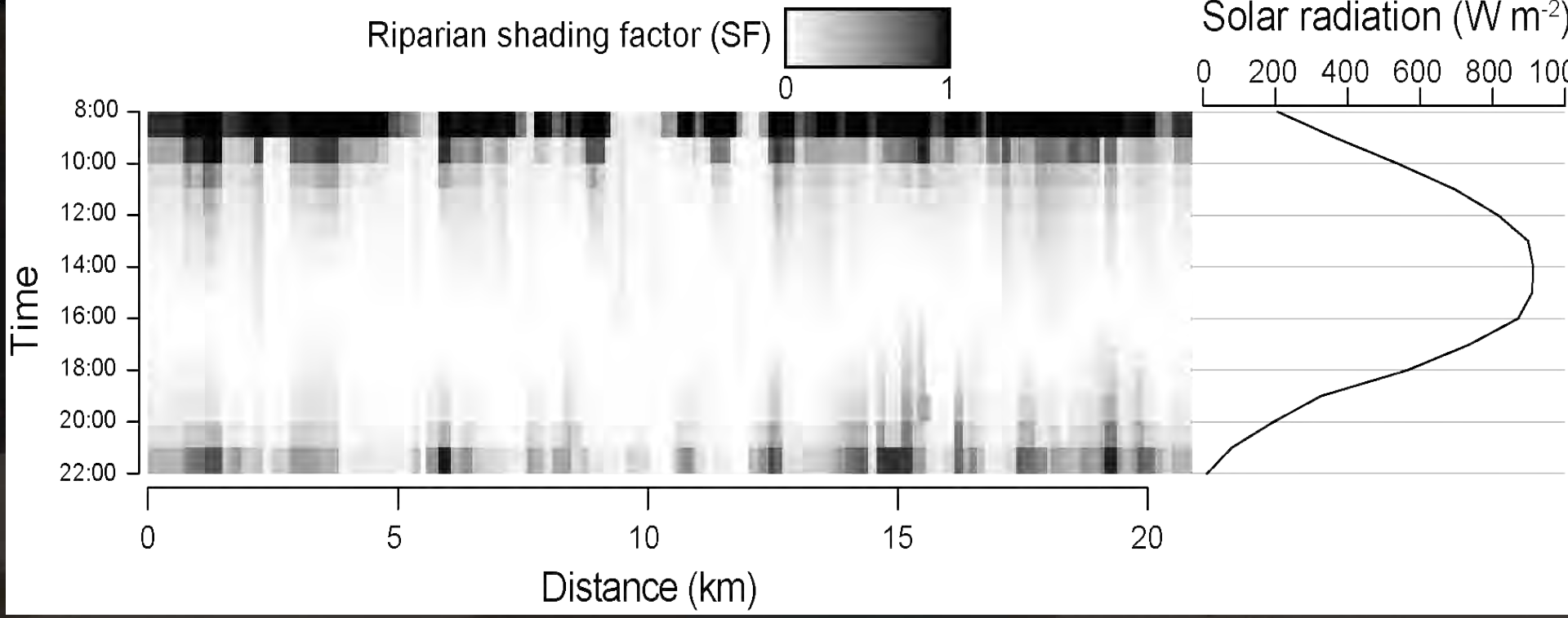
Sc. of the Total Env. 2017

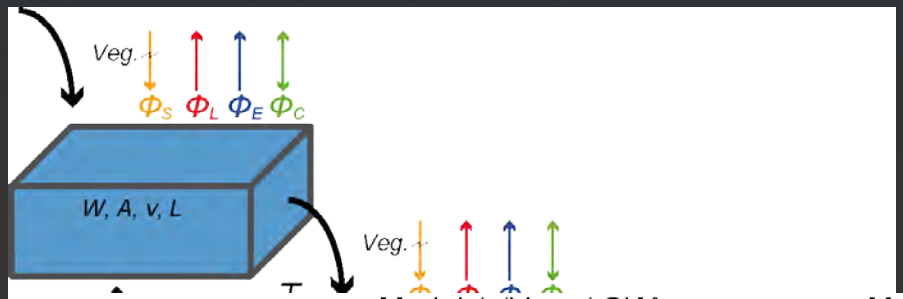




Variations of the riparian shading factor (SF) along the study area from 8:00 to 22:00. Solar radiation is for 26/06/2011.

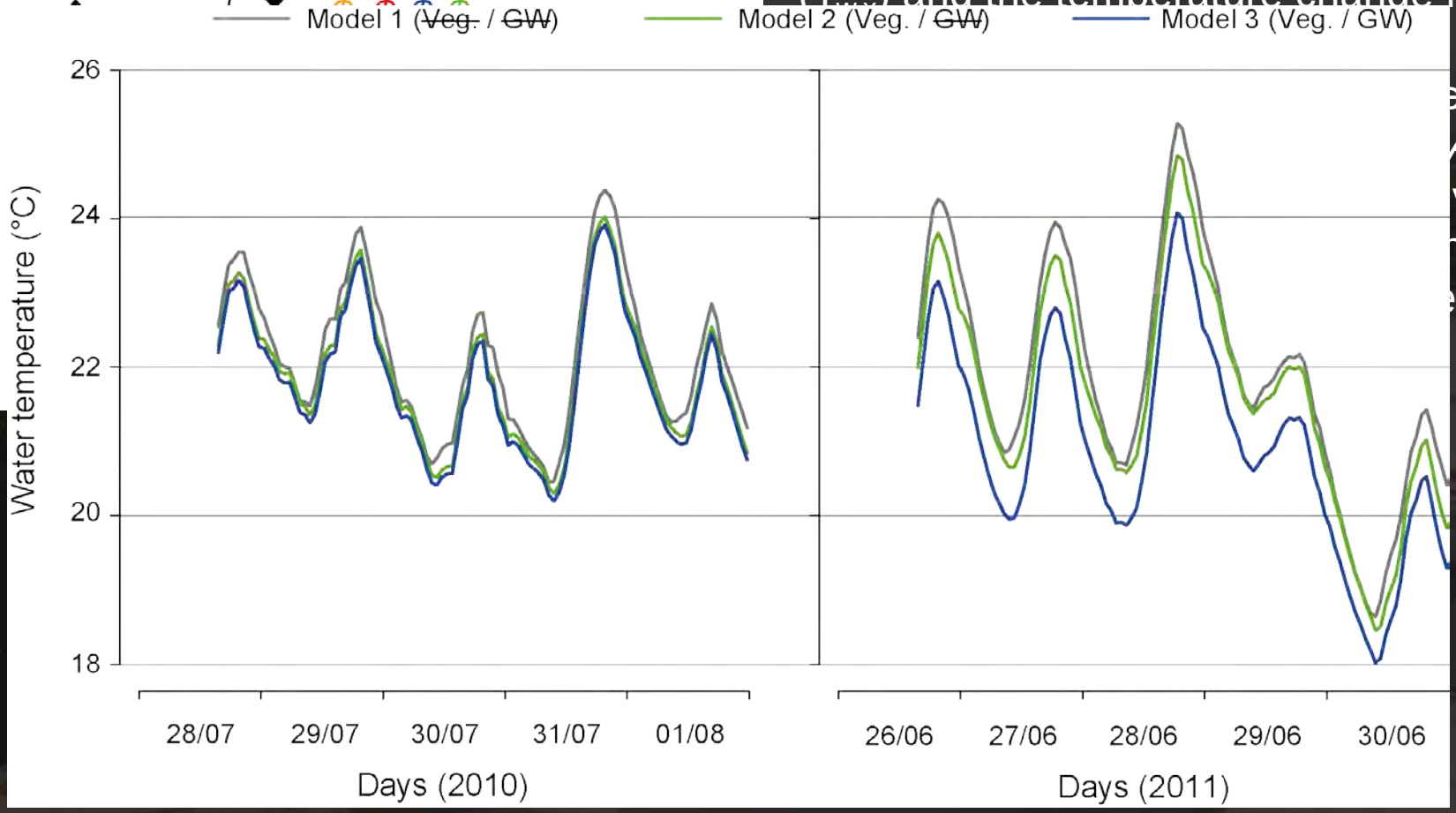
erent times of





Scheme of the model. For a segment, the outgoing water temperature ($T_{w,x+1}$) depends on the incoming water temperature from the upstream segment ($T_{w,x}$) and the temperature change in the

the heat
erties
A), the
velocity
nputs
e and

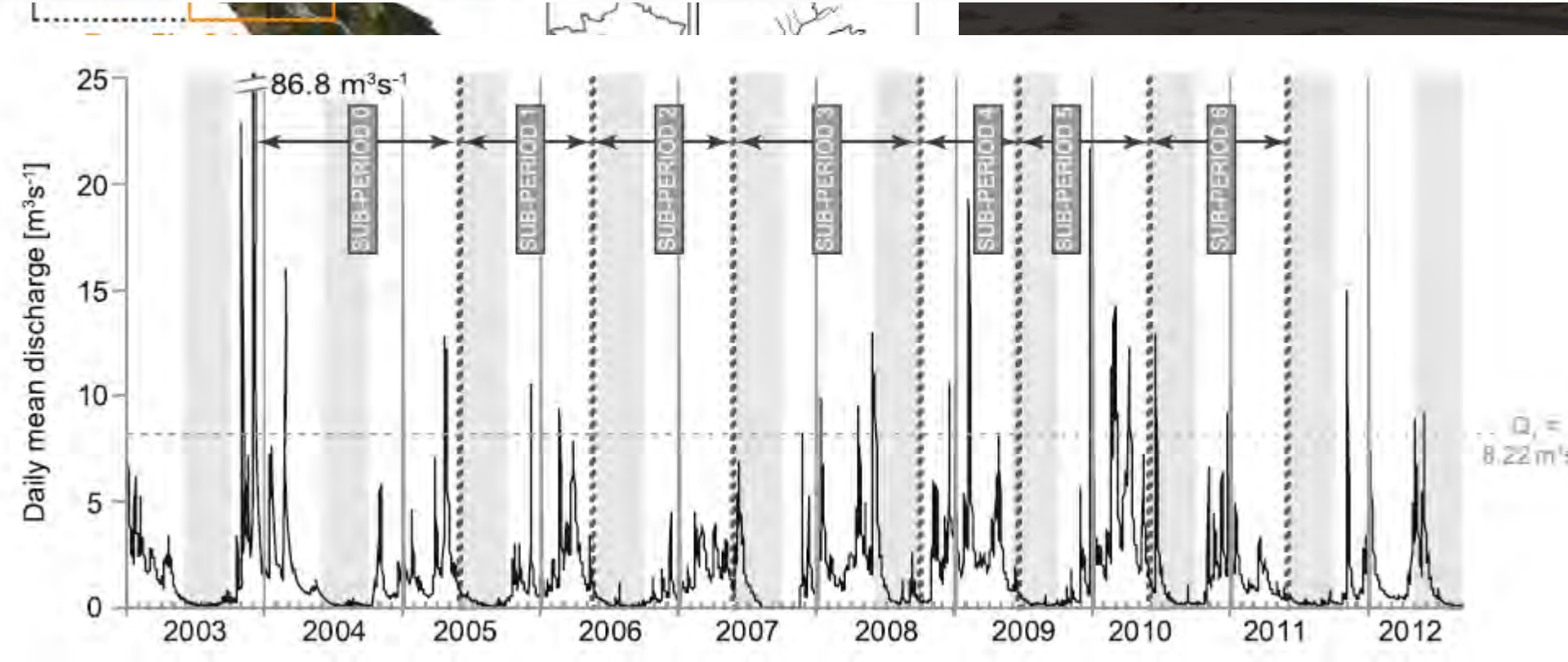


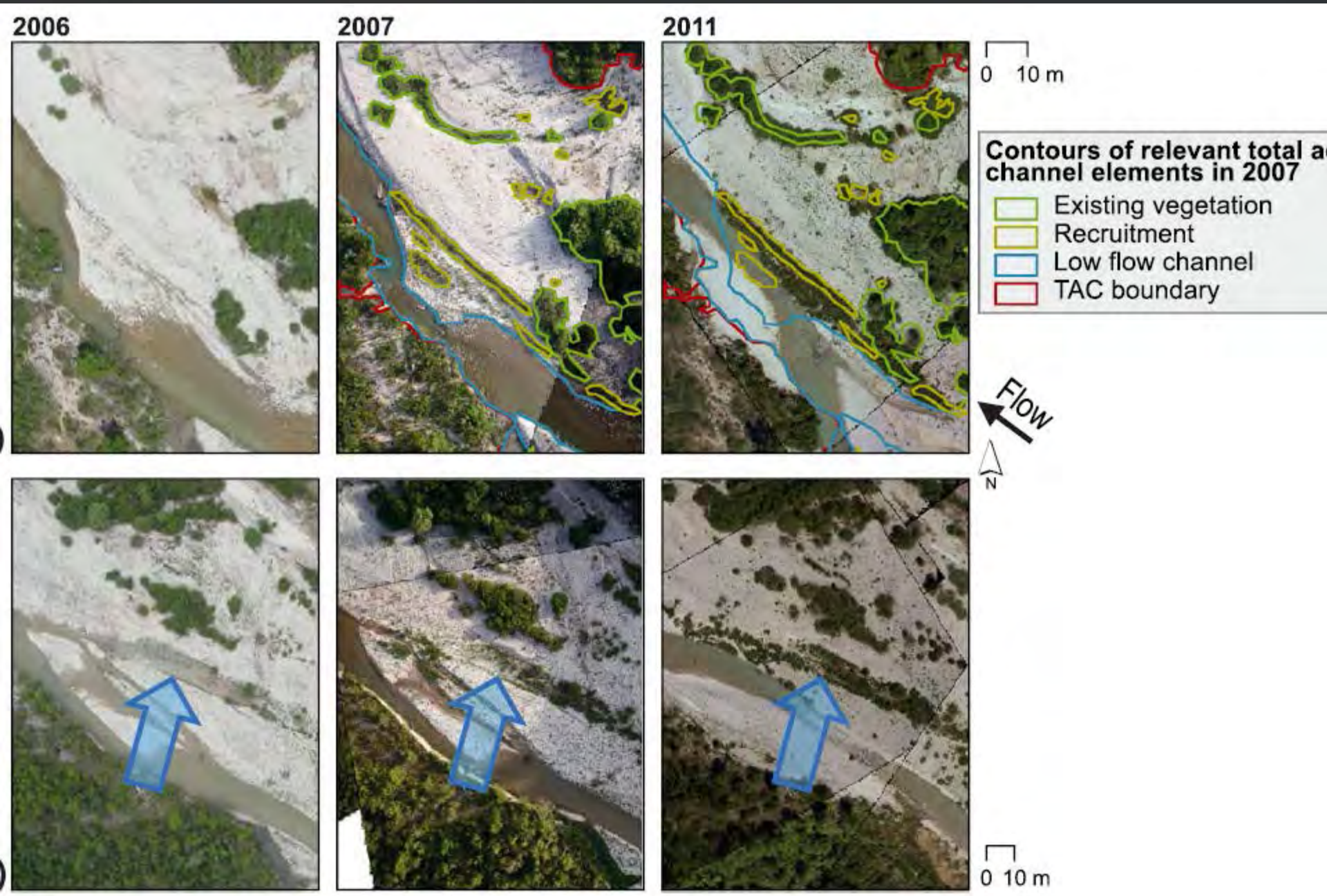
Modeled water temperatures in Chazey-sur-Ain. Model 1 does not take into account the effects of riparian vegetation and groundwater inputs. Model 2 only takes into account the effects of riparian vegetation shading. Model 3 takes into account both the effects of riparian vegetation and groundwater inputs.

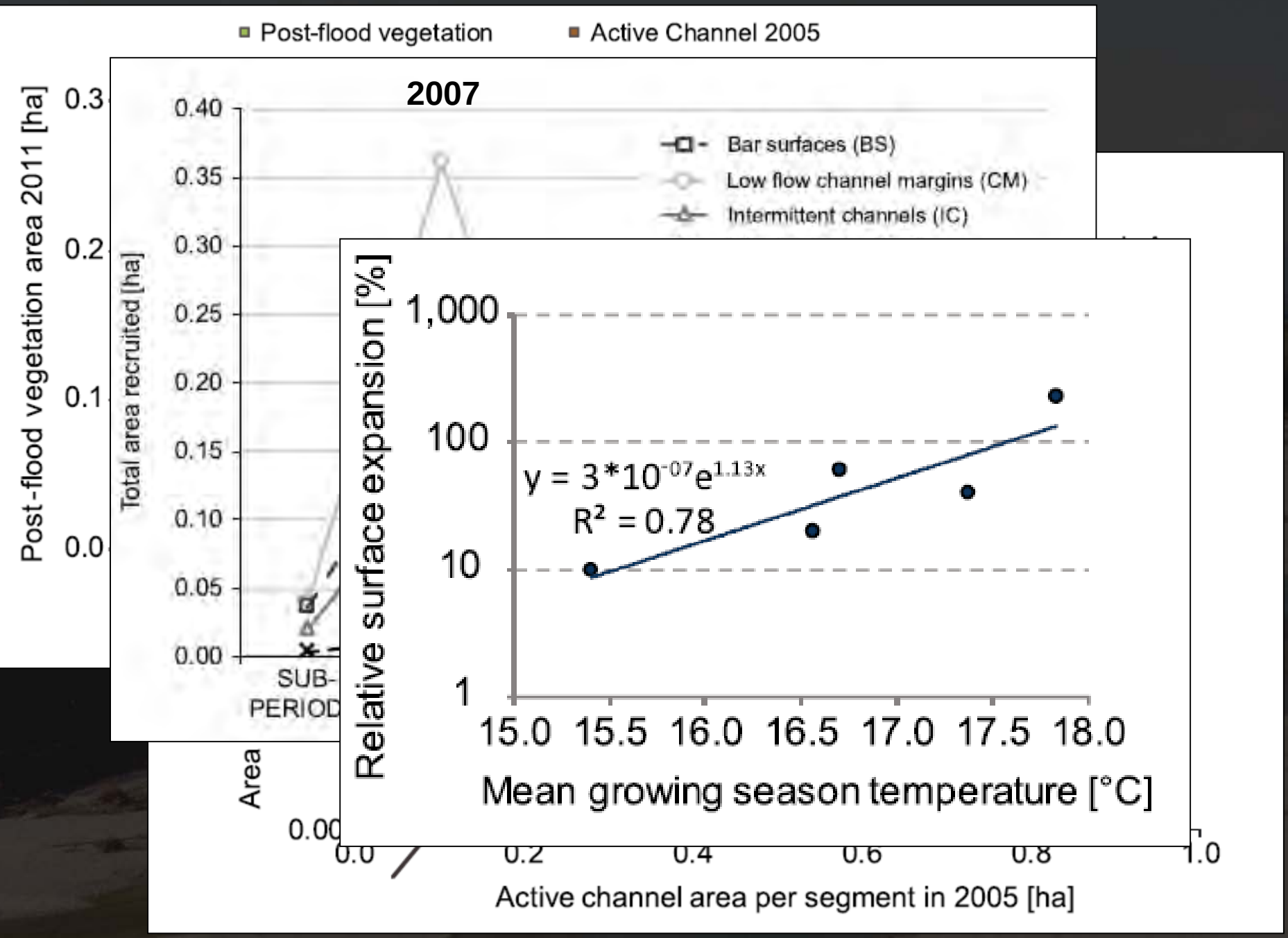
What drives riparian vegetation encroachment in braided river

TABLE 1 Characteristics of aerial image surveys and the resulting studied sub-periods, which are confined by the respective survey dates and, in case of sub-period 0, by the 2003 flood event

Survey year	Survey date	UAV/ULAV platform	Spatial resolution (cm)	Daily mean discharge during survey ($m^3\ s^{-1}$)	Represented sub-period
2005	23–27 May	Pixy drone (UAV)	10–15	1.18	Sub-period 0 (2003–2005)
2006	15–19 May	Pixy drone (UAV)	10–15	1.16	Sub-period 1 (2005–2006)
2007	21–25 May	Pixy drone (UAV)	6–12	0.94	Sub-period 2 (2006–2007)
2008	29–30 Sept	ULAV powered paraglider	6–8	0.30	Sub-period 3 (2007–2008)
2009	16–19 June	ULAV powered paraglider	15–16	0.70	Sub-period 4 (2008–2009)
2010	26–27 May	ULAV powered paraglider	3–11	1.67	Sub-period 5 (2009–2010)
2011	25 May	ULAV powered paraglider	3–11	0.55	Sub-period 6 (2010–2011)




2006
2007
2011
0 10 m
Contours of relevant total a
channel elements in 2007
Existing vegetation
Recruitment
Low flow channel
TAC boundary
Flow
N
0 10 m


Post-flood vegetation
Active Channel 2005
2007
Bar surfaces (BS)
Low flow channel margins (CM)
Intermittent channels (IC)
Total area recruited [ha]
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
SUB-
PERIOD
Post-flood vegetation area 2011 [ha]
0.3
0.2
0.1
0.0
Area
0.00
Relative surface expansion [%]
1,000
100
10
1
y = 3*10^-07e^1.13x
R² = 0.78
15.0 15.5 16.0 16.5 17.0 17.5 18.0
Mean growing season temperature [°C]
0.0 0.2 0.4 0.6 0.8 1.0
Active channel area per segment in 2005 [ha]

Classification of riparian forest species and health condition using multi-temporal and hyperspatial imagery from unmanned aerial system

Adrien Michez · Hervé Piégay · Jonathan Lisein · Hugues Claessens · Philippe Lejeune

Env. Monitoring Assess. 2016

Mapping of riparian invasive species with supervised classification of Unmanned Aerial System (UAS) imagery

Adrien Michez [a,*], Hervé Piégay [b], Lisein Jonat

Int. J

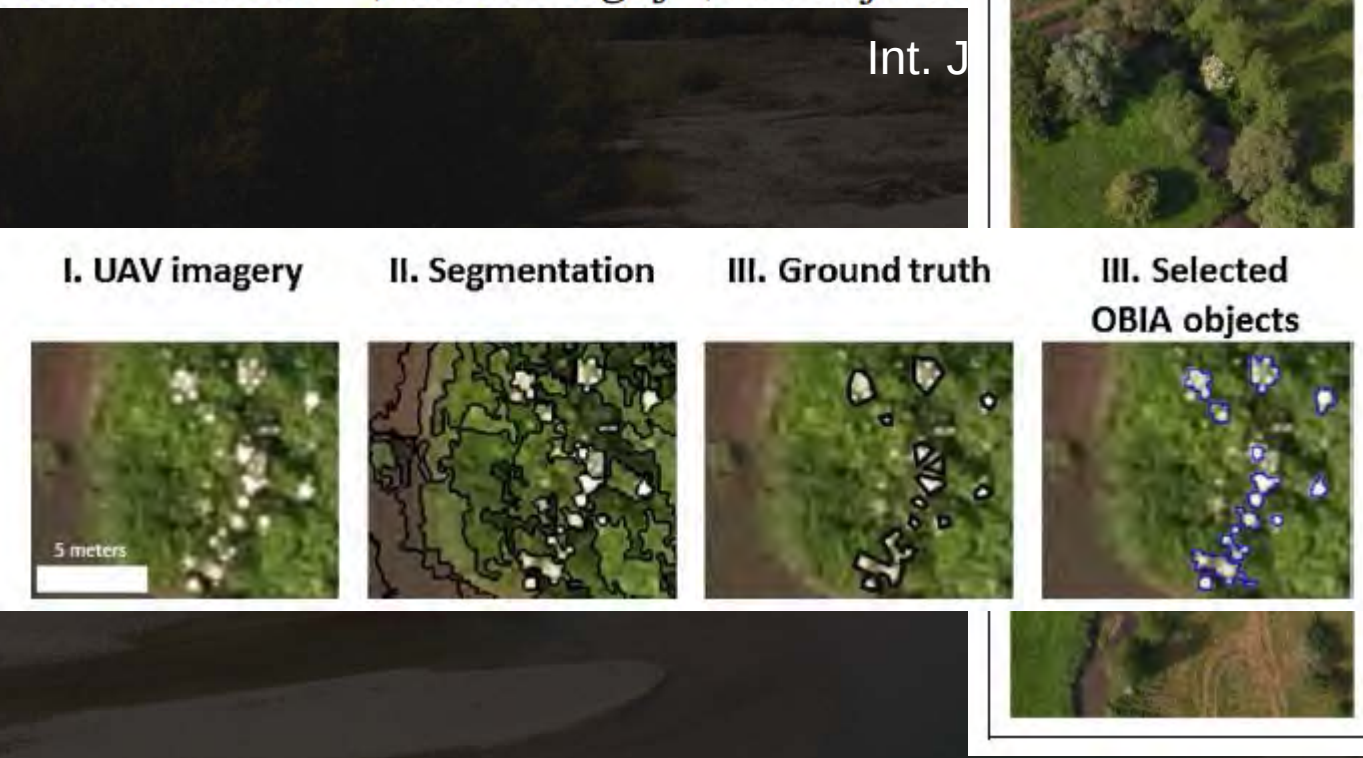


Table 1 Eighteen (site 1) and seven (site 2) orthophotos (0.1-m GSD) generated

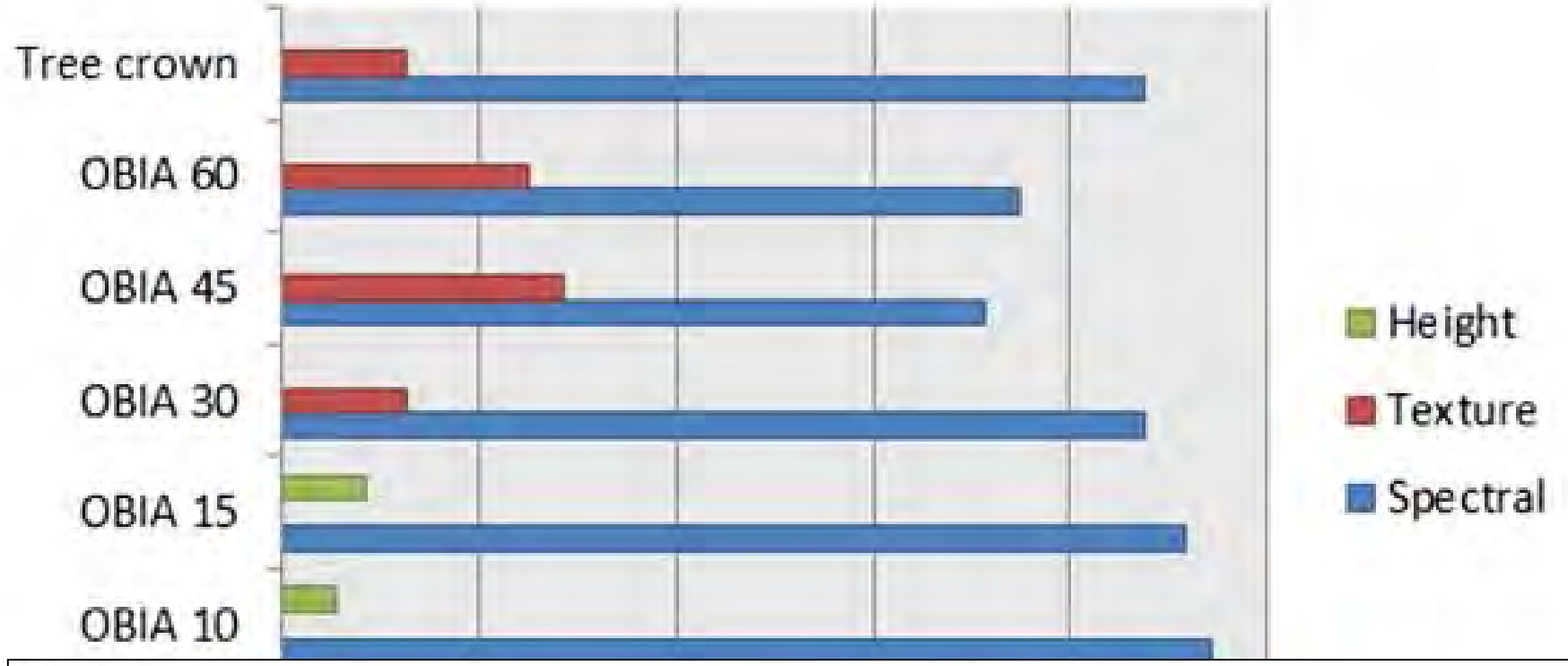


Table 5
Selected metrics (from the three highest values of the Gini index) for the best-performing classification model.

Species	Selected variable		
	1	2	3
I. glandulifera (07-2012)	GLCM contrast	GLCM homogeneity	GLCM homogeneity[a]
I. glandulifera (09-2012)	S.D. Ggreen[a]	S.D. NIR[a]	GLCM mean
H. mantegazzianum (06-2012)	GLCM homogeneity	S.D. red	S.D. green[a]
Japanese knotweed (10-2012)	Mean red	Mean blue	Brightness

[a] Variable derived from imagery captured with the RGNIR camera.

8 Nov. 2012	13:14	RGNIR	258	404	3.94	0.84
9 Nov. 2012	14:20	RGB	279	396	4.06	0.89
		Sum	2429	Mean (site 2): 375		Mean (site 2): 0.85

Conclusions

- Very very exciting period
  - A lot can be provided from the air (a new era in data collection)
  - Satellites (?). Pléiades, Sentinel-2
  - Archives, still a lot to do
- Temporal resolution
  - Vegetation dynamics
  - Monitoring success
  - Ground imagery (video/photo)

Thank you for your attention!

I.S. Rivers — Integrative Sciences — Recherches et Actions

3RD INTERNATIONAL CONFERENCE

Integrative sciences and sustainable development of rivers

4 > 8 JUNE 2018 Lyon - FRANCE

KEY DATES

- **September 2017**
  Call for abstracts
- **20 November 2017**
  Extended abstract
- **February 2018**
  Selection notification
- **March 2018**
  Programme and registration

About I.S.Rivers

The ambition of I.S.Rivers - **integrative sciences and sustainable development of rivers** - is to promote multidisciplinary approaches, to engage all stakeholders and to **build links to stimulate European and international collaborations between scientists and river managers**.
[more +]

I.S. Rivers — Integrative Sciences — Recherches et Actions

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