





pebbles in rivers

First feedbacks on new method using active transponders (a-UHF) for tracking

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GeoPeka



Material (1/2)



45 – 64 mm

64 – 90 mm

- ➤ TAGS : active, operating live up to 10 years, size (Ø ≈ 31 mm, h ≤ 15 mm), in synthetic pebbles (d = 2.6 g.cm⁻³)
- **BEACON SIGNAL : UHF (433.92 MHz), Anti-collision, RSSI**
- ANTENNA (+8 dBm): semi-directive with aperture angle of 80°
 Range of prospection methods
 90-128 mm
 32-45 mm



Material (2/2)

- **DETECTION RANGE :**
 - Atmosphere : up to 80 m
 - Buried in sediment (up to 4 m when depth \ge 2.6 m)
 - Submerged (up to 2 m when depth \approx 2.6 m)

ACCURACY OF POSITIONING (≈ 50 cm):

- f(time & prospection method)
- Adjustable to study purposes
- Estimated by Nb. of detection points and RSSI

Assessment of a new solution for tracking pebbles in rivers based on active RFID EARTH SURFACE PROCESSES AND LANDFORMS Earth SURFACE PROCESSES AND LANDFORMS Earth SURFACE PROCESSES AND LANDFORMS (2) 1938-1951 (2017)

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(†)





Objective : assess tracking in 2 sensitive contexts

A large wet channel : Le Rhône at Miribel

- Water depth locally > 5 m
- But variable → embarked prospection complicated

A large gravel bar area : le Buëch at St Sauveur

- Large emerged surfaces to prospect and high tracers dispersion
- Risk of burial

Field feedbacks : Le Rhône Miribel Canal Overview

Miribel canal

Old Rhône

De Neyron

Jons Dam OSR Project : oct – 2016 200 tracers 4 transects : 2 up- & 2 downstream 4 clusters/transect



Field feedbacks : Le Rhôn 2 Miribel Canal



 Field feedbacks : Le Rhôn - Miribel Canal

 - 8 man-days of pedestrian and embarked prospection

 - Recovery rate (DO) : 70 %

 - mean/max distances : 323/1060m

8.0 0 8 00

Release transects

Jons Dam

Flushing flood in Janvier 2018

Field feedbacks : Le Buëch Saint Sauveur Dam overview



Serres

St-Sauveur Dam Release : Nov – 2016 148 tracers 9 transects 3 to 4 clusters

source : GEOPEKA

Sisteron







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Review of the experimental in limit conditions

Study sites	Dist. max (m)	Dist. mean (m)	Recov. rates	Prospec. time (man/day)	Accuracy (m)	Observations
Le Rhône Jons Dam	1066	323	70%	8	≈ 2	Water depth up to 3 m Rapid turbulent flow
Le Buëch St-Sauveur Dam	3240	982	72%	5	≈ 10	Quickest prospection

High recovery rates despite low field effort, hydrosediment context and large distance of travel



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Compared to PIT tags studies							
Le Rhin Arnaud et al. (2017)	658	171	43%	11	≈1.5	Environment similar to Rhône	

La Durance	668	83	40%	16	≈1.5	Environment
Chapuis et al. (2014)						similar to Buëch

Cassel et al.

Key-points of these tests in 2 constrained contexts

> High equipment cost (> than PIT tags)

> Prospect° in deep channel (< 3/4m) still complicated</p>

BUT

> Equipment cost balanced or lower if more than 2 surveys

- > Exceptional recovery rates vs prospection time
- > Accurate positioning
- > Adapted to river with wide bars and shallow water channels
- Potentially very adapted to small or shallow rivers (< ?? Depth & width)</p>

Cassel et al.

04-13-2018

Perspectives (1/2):









Intelligent : Intelligent

Complementary prospections : : 1 central path : 1 path/banks : Pedestrian grid : UAV grid

- Test and compare new methods/vec
 - **RECOVERY RATES**
 - **POSITIONING ACCURACY**
 - **FIELDS EFFORT: MAN/DAY**

Characterize the most adapted depending on study purposes or resources :

> FLUVIAL FORMS DYNAMICS (2D – ACCURACY NEEDED)

> BEDLOAD TRANSFER DOWNSTREAM (1D – ACCURACY NEEDED)



- > **Recovery rates**
- Positioning accuracy
- WHICH QUALITY INDICATOR TO COMPARE
- SURVEYS BOTH A-UHF AND PIT TAGS?
- FIELDS EFFORT: MAN/DAY + SURFACES PROSPECTED

Characterize the most adapted depending on study purposes or resources :

FLUVIAL FORMS DYNAMICS (2D – ACCURACY NEEDED)

BEDLOAD TRANSFER DOWNSTREAM (1D – ACCURACY NEEDED)

Perspectives (2/2):



Assess the interest of a-UHF tag column for evaluating scouring layer : erosion before deposition not restituted by Dod



Improve submerged detection in deep channels (< 2.5 m) :

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> COUPLING 2 WATERPROOF ANTENNAS

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OBJECTIVE : A SENSING FIELD OF 4 - 5 M WIDE IN CHANNEL DEEPER THAN 4 M









Cassel M, Piégay H, Dépret T. 2017. "Assessment of new solution for tracking pebbles in rivers based on active RFID" Earth Surface Processes and Landforms: DOI: 10.1002/esp.4152A