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# Pluri-annual bedload monitoring in a Mediterranean mountain stream prior and after a ~200-year flood

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## Context (fig.1)

- Alpine Mediterranean regime
- Semi-alluvial bed
- River infrastructures: embankments (roads), hydropower flow diversions...
- Oct. 2<sup>nd</sup> 2020: ≥1000-year rainfall (fig.1B), triggering a 100 to 500-year flood that led to fluvial metamorphosis

## Objectives

- Explore bedload travel distances in a Mediterranean mountain stream
- Explore spawning sediment material dynamics for trout habitat
- Capture a ~200-year flood in the catchment.

## Methods (fig.1A)

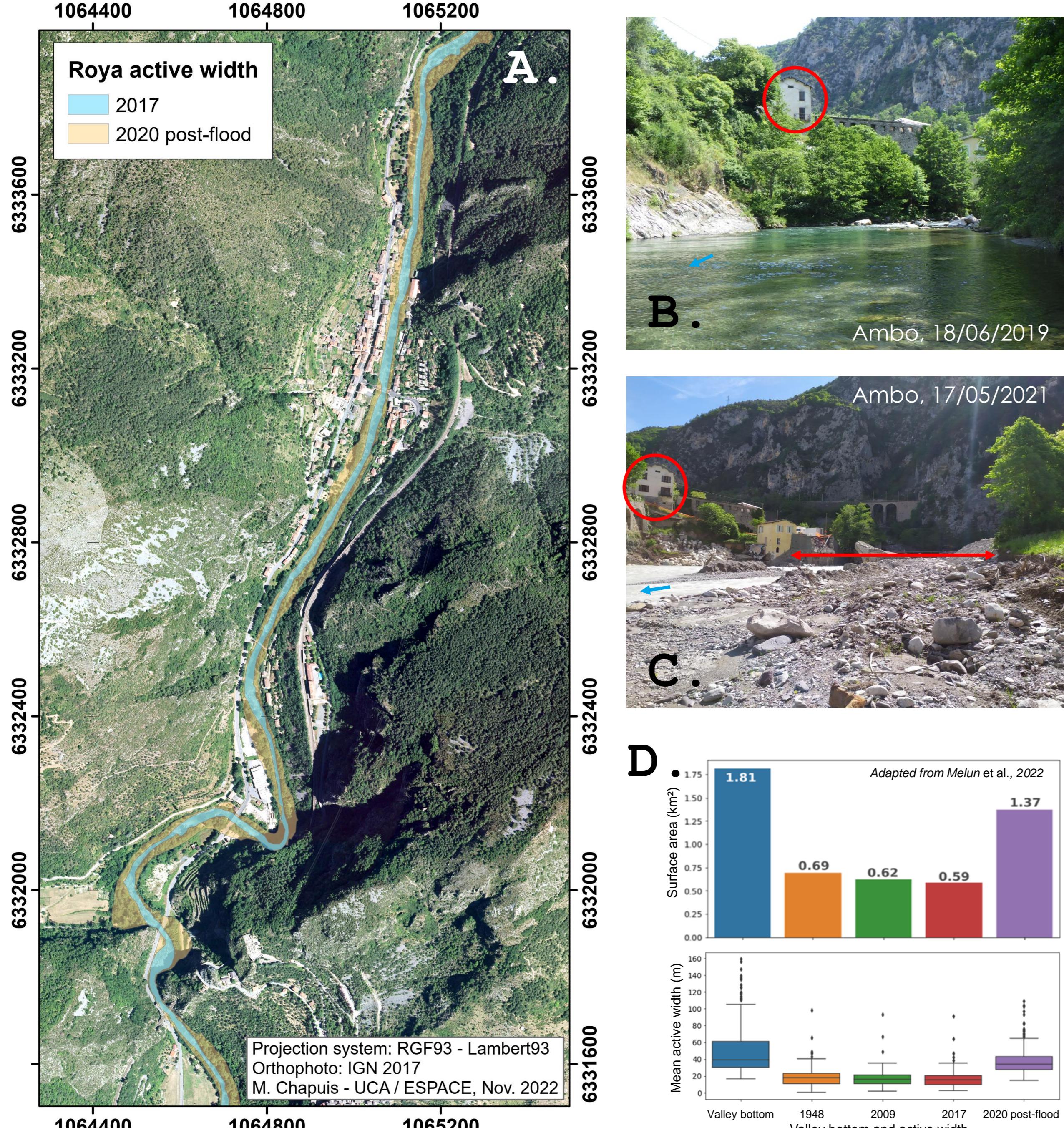
- Active + passive RFID tracking
- Passive seismic analysis (geophone) : bedload transport as a surrogate for missing hydrological data
- Rain/discharge analysis
- Topographic surveys...

## Results (tab.1, fig.2, fig.3)

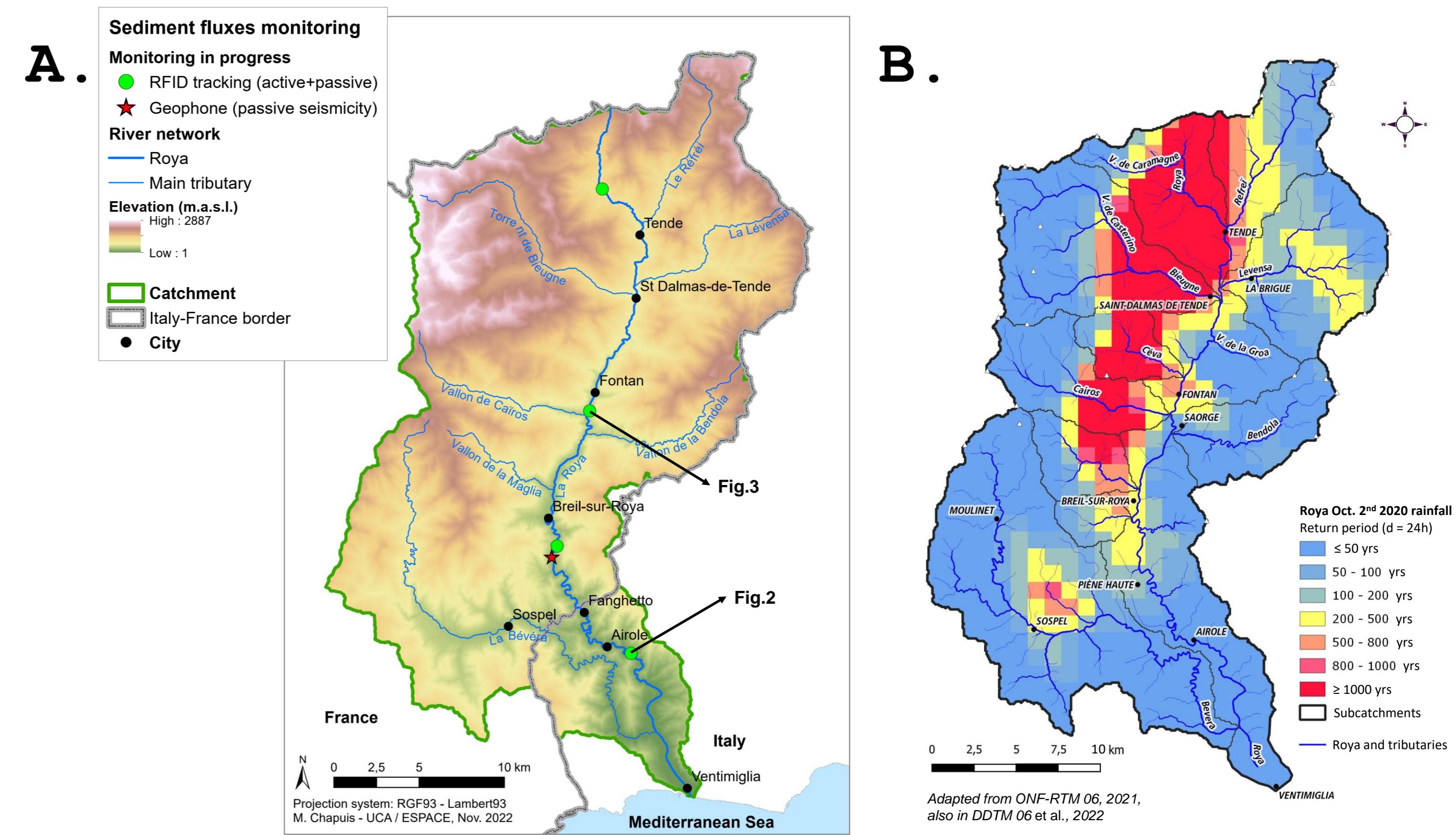
**Tab.1. Active RFID tracking and sediment transport distances**

Year of survey	2019	2020	2021	2022
Q <sub>max</sub> at Breil (m <sup>3</sup> /s)	133	140	[1000;1500]	n.r.
Nb of tracers found	17	16	4	22
Max. dist. of transport (m)			272	
Ambo/Fontan	240	632	5860	4273
Pertus	166	50	-	57
Lamberta	-	2875	474	403

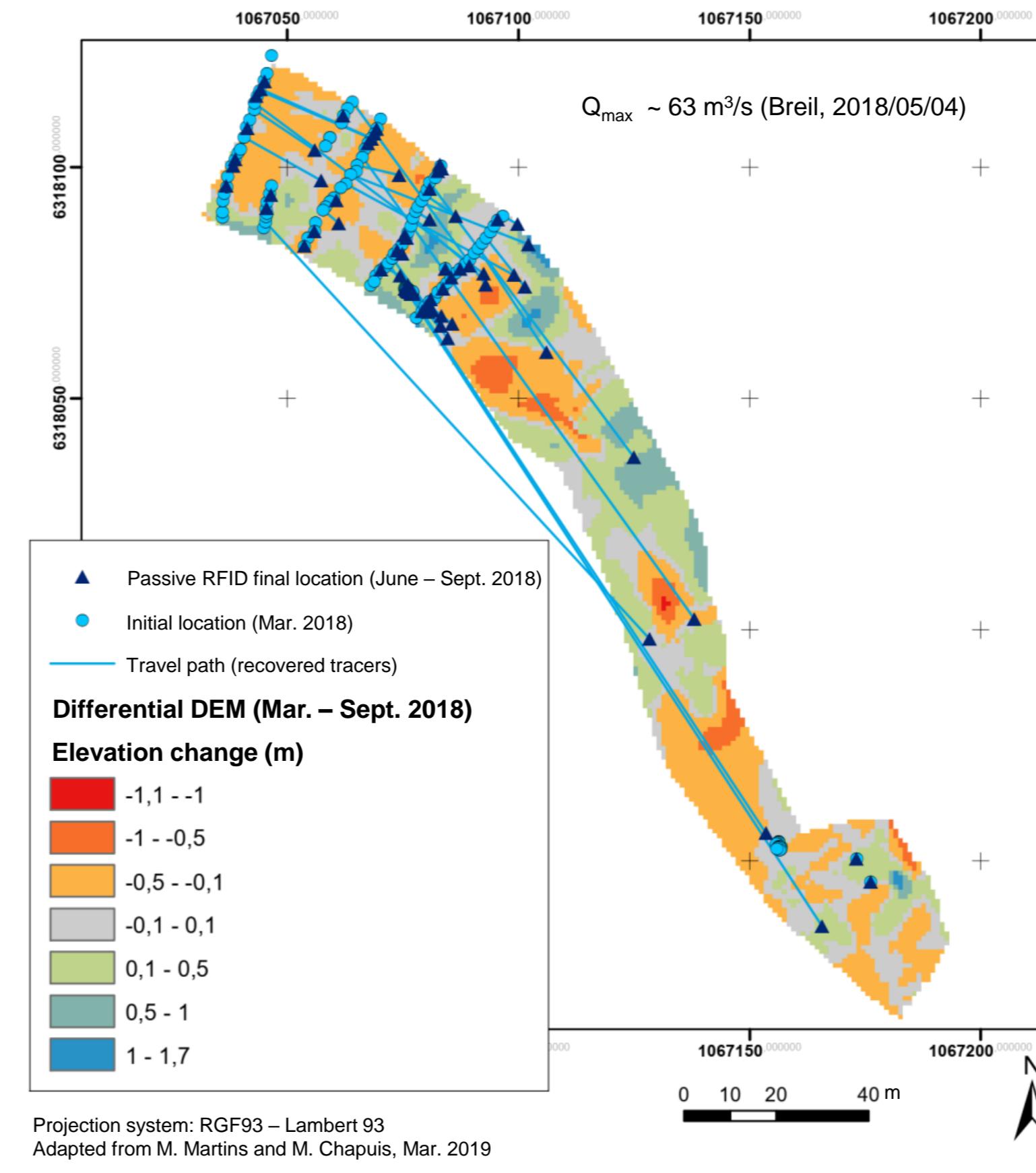
**Fig.3. Roya riverbed before/after Oct. 2<sup>nd</sup> 2020 flood**



**Fig.1. Roya catchment: sediment fluxes monitoring since 2017 and Oct. 2<sup>nd</sup> 2020 exceptional rainfall**



**Fig.2. Passive RFID tracking at Lamberta bridge for trout habitat dynamics monitoring**



## Trout spawning habitats

- Intense mobility of alluvial sediments ( $\sim \leq 512$  mm), even for small floods ( $< Q_2$ ) prior to Oct. 2<sup>nd</sup> 2020 flood
- Frequent mobility of spawning material ( $< 64$  mm)
- Sediment mobility driven by boulders (inherited from past glacial activity), and by riverbed macroforms.

## Conceptual sediment connectivity model at catchment scale

- Sediment pulses during floods; when reaching the main branch, sediment are flushed (slope: 3,2%)
- Potential reactivation of hillslope sediment sources (e.g. 2020 flood), but sediment transfer to the main branch seems scarce
- Sediments are efficiently transferred downstream during long phases ( $> 30-50$  yrs?) even during ordinary floods.

## Post-flood management guidelines

- Sediment management planning at catchment scale
- “Freedom space for rivers” concept to be integrated in the river floodplain management decisions.

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