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Margot Chapuis, Cyriel Adnès

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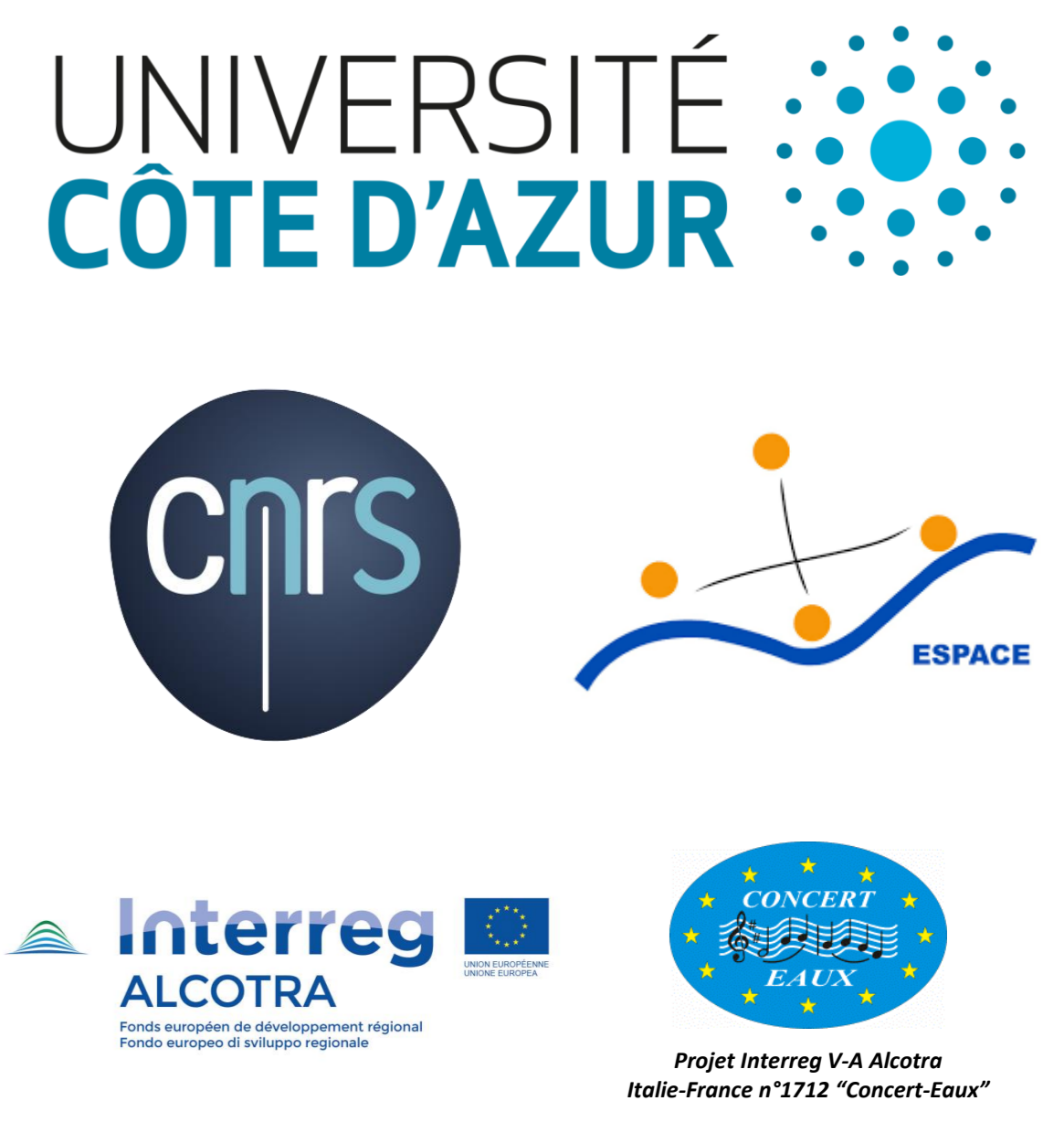


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Pluri-annual bedload monitoring in a Mediterranean mountain stream prior and after a ~200-year flood

M. Chapuis^a, C. Adnès^a
 Université Côte d'Azur, CNRS, ESPACE, France (a)



Context (fig.1)

- Alpine Mediterranean regime
- Semi-alluvial bed
- River infrastructures: embankments (roads), hydropower flow diversions...
- Oct. 2nd 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_{max} at Breil (m^3/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.1. Roya catchment: sediment fluxes monitoring since 2017 and Oct. 2nd 2020 exceptional rainfall

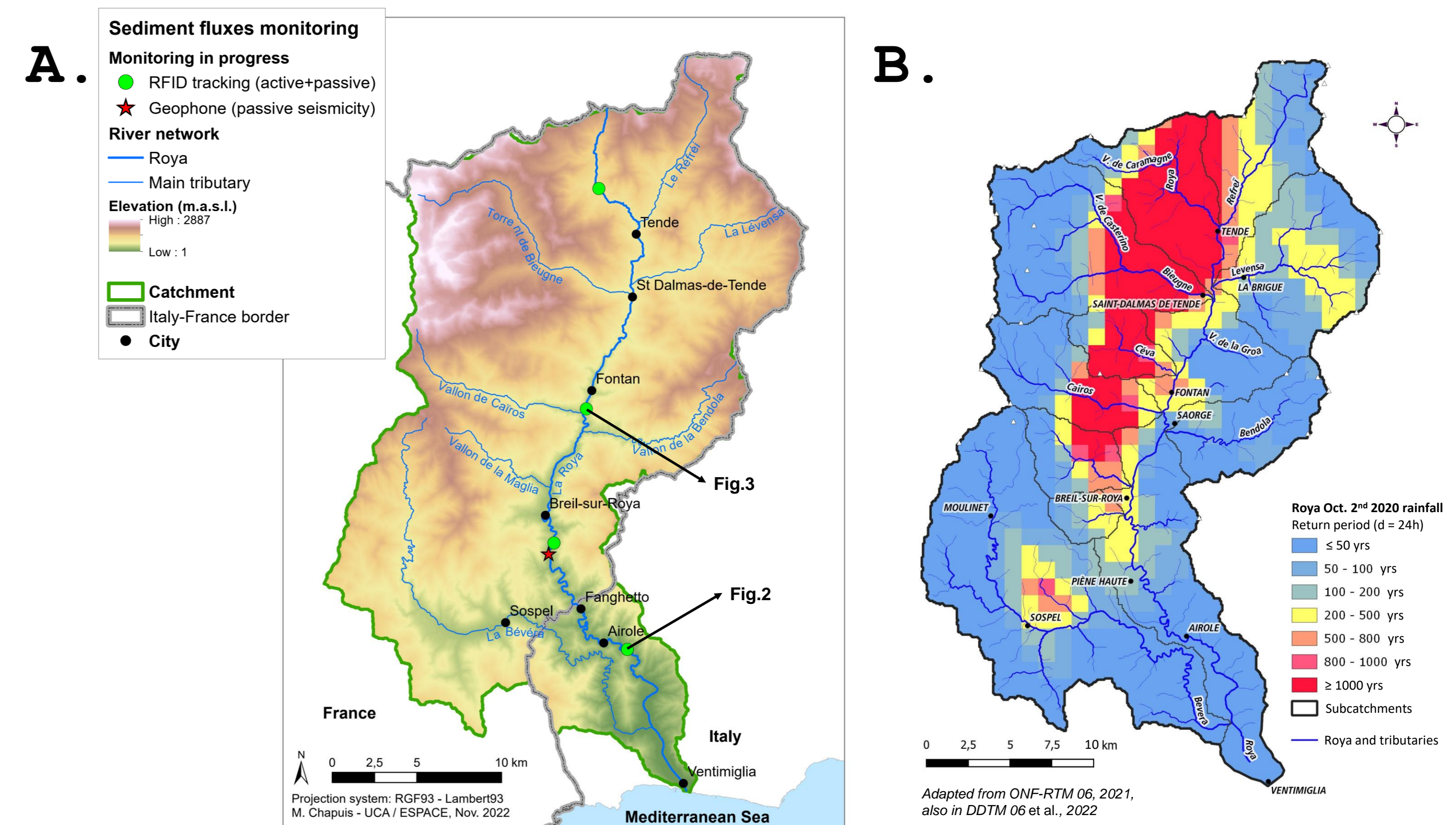
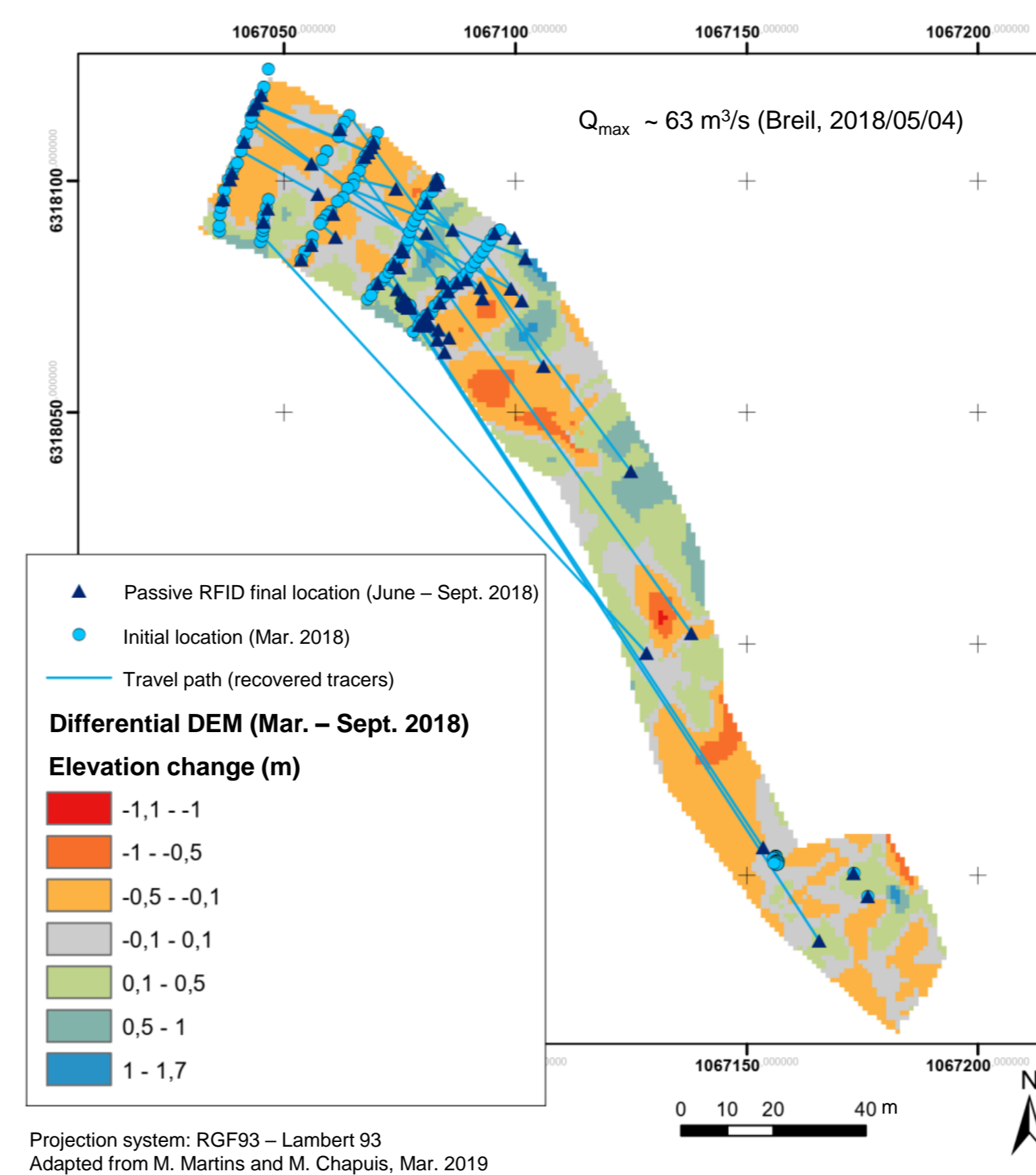


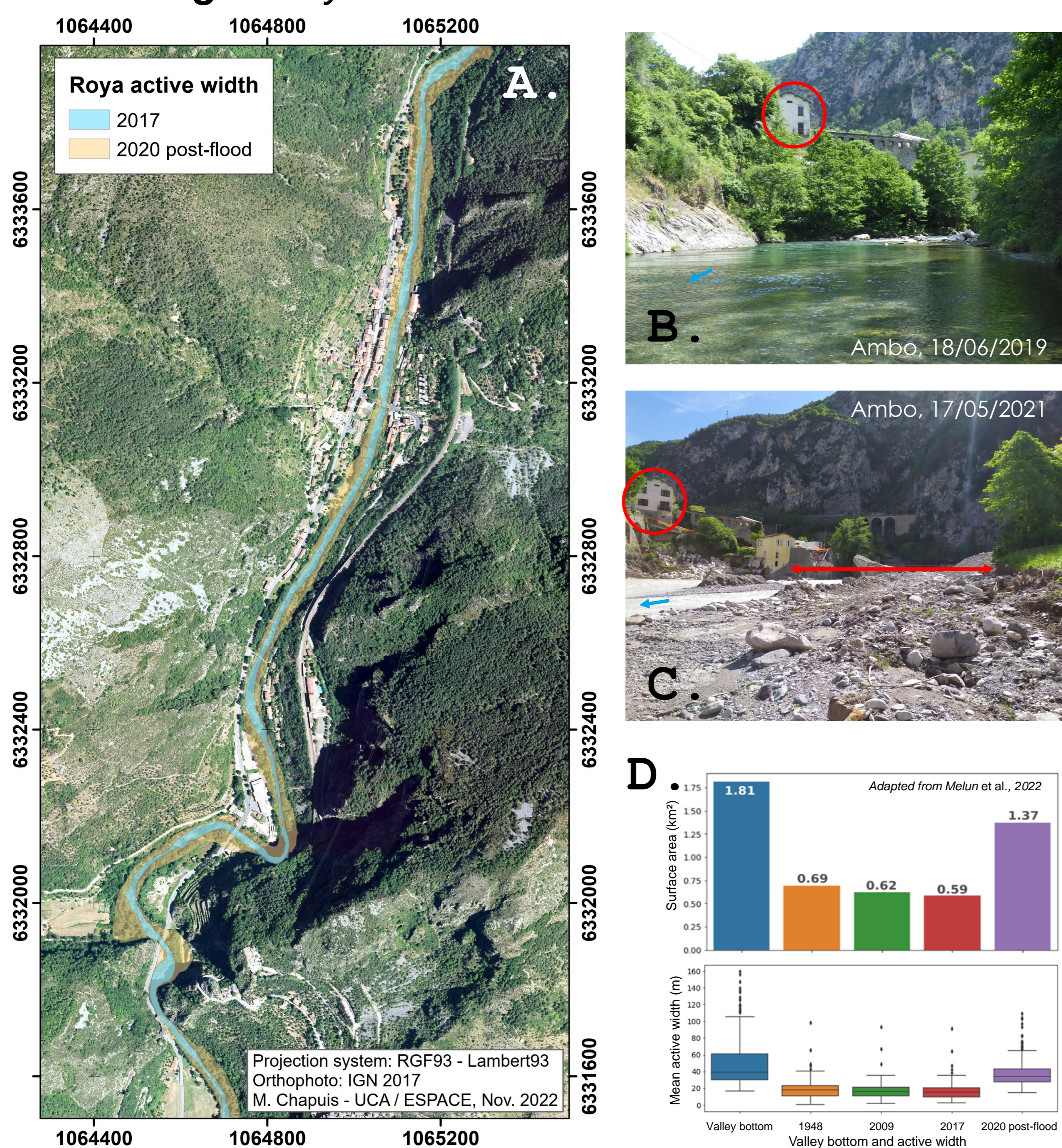
Fig.2. Passive RFID tracking at Lamberta bridge for trout habitat dynamics monitoring



Trout spawning habitats

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

Fig.3. Roya riverbed before/after Oct. 2nd 2020 flood



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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