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Semi-Quantitative Analysis of Transient Sediment Storage in a Mediterranean River System

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Introduction

- Sediment yields of Mediterranean basins characterised by connectivity between sediment source areas and catchment outlet
- Transient sediment storage in rivers a key process influencing sediment yields
- Terrestrial LiDAR scanning (TLS) monitoring tool for surface morphology

Objectives

- Can spatial patterns of material redistribution be detected with multi-temporal TLS datasets?
- How are temporal dynamics of morphological changes linked to precipitation events?

Study Area

Isábena catchment

- 445 km²; 450 – 2720 m a.s.l.
- Mean rainfall 450 – 1600 mm
- Mediterranean-mountainous climate
- Lithology mainly sedimentary rocks

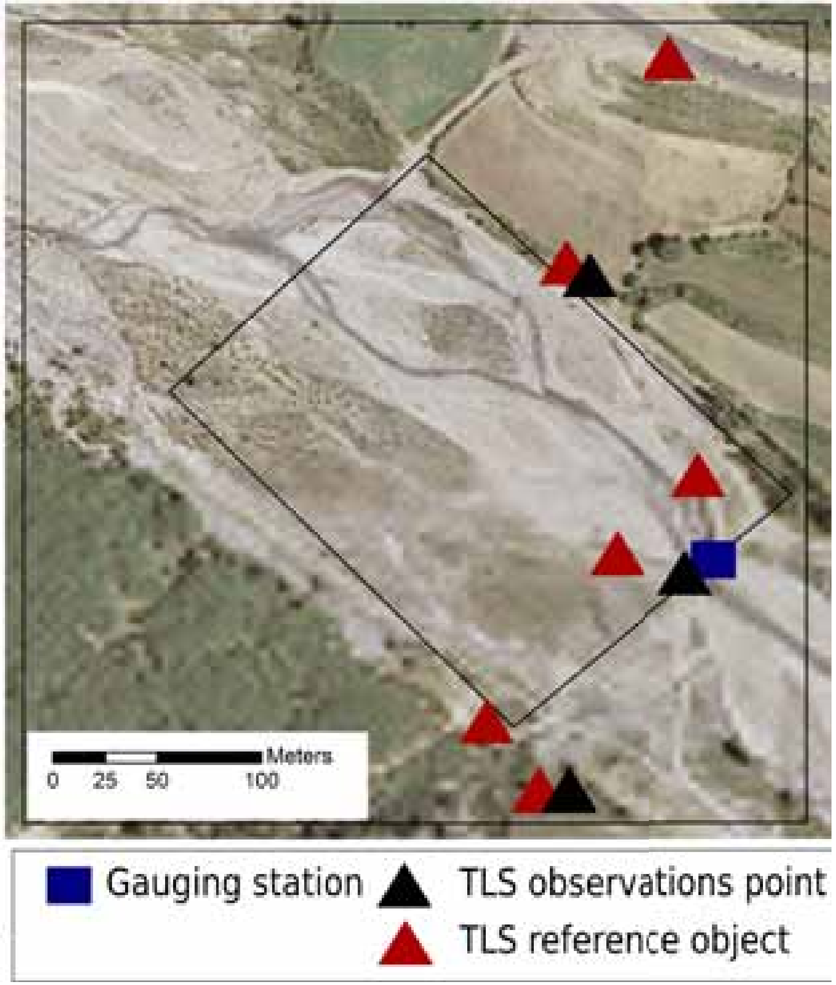
Villacarli subcatchment

- 41 km²
- Badland systems (~6%)

Methodology & Results

Data situation 03/2011 - 04/2012

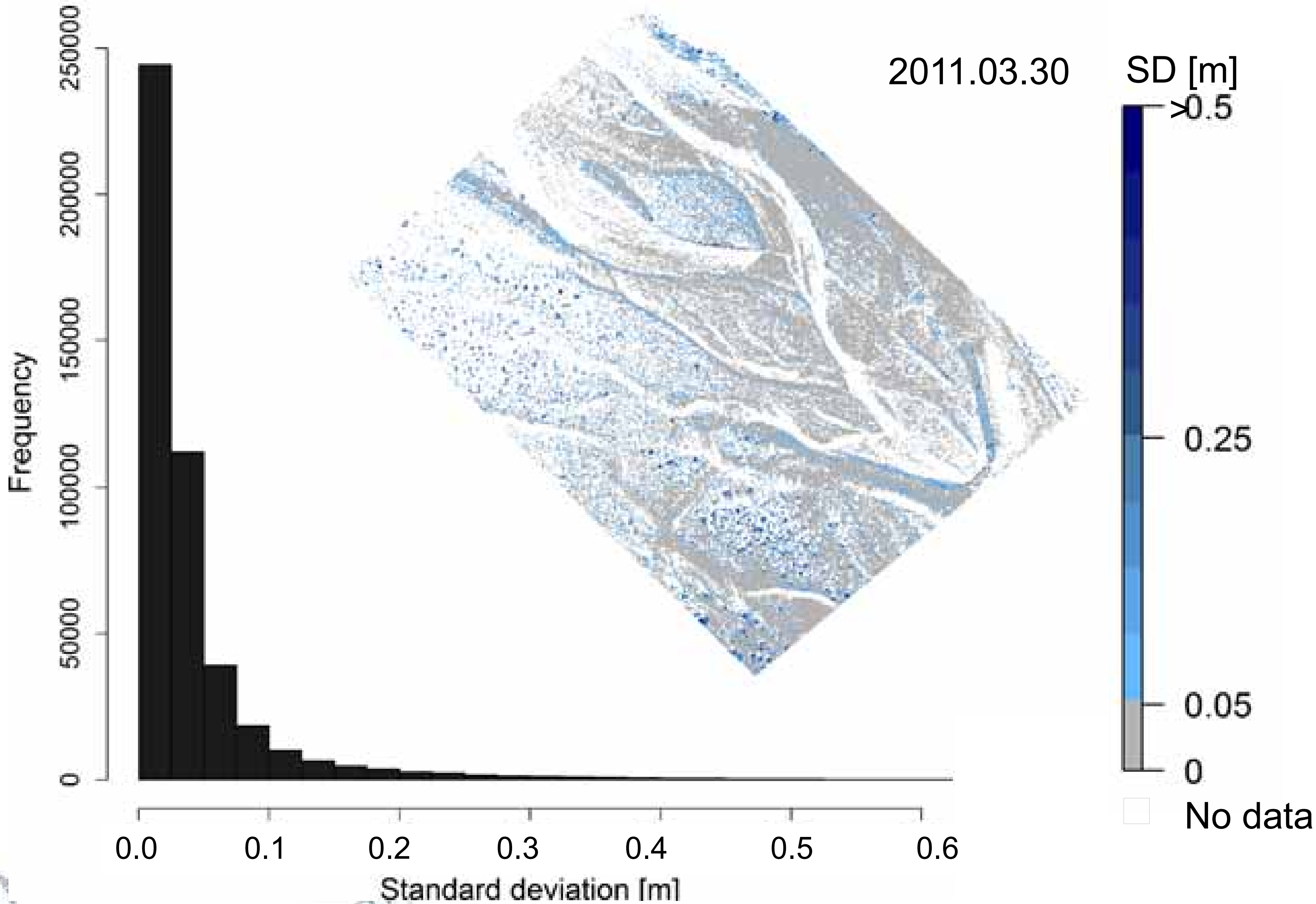
- 9 TLS surveys:
  - Riegl VZ-400
    (near-infrared laser, multi-pulse)
  - 3 scan positions
  - 6 reference objects
- Continuous discharge measurements
- Precipitation data (tipping bucket)



The orthofoto was obtained by the Instituto geográfico nacional de Espana- Govierno de Aragón.

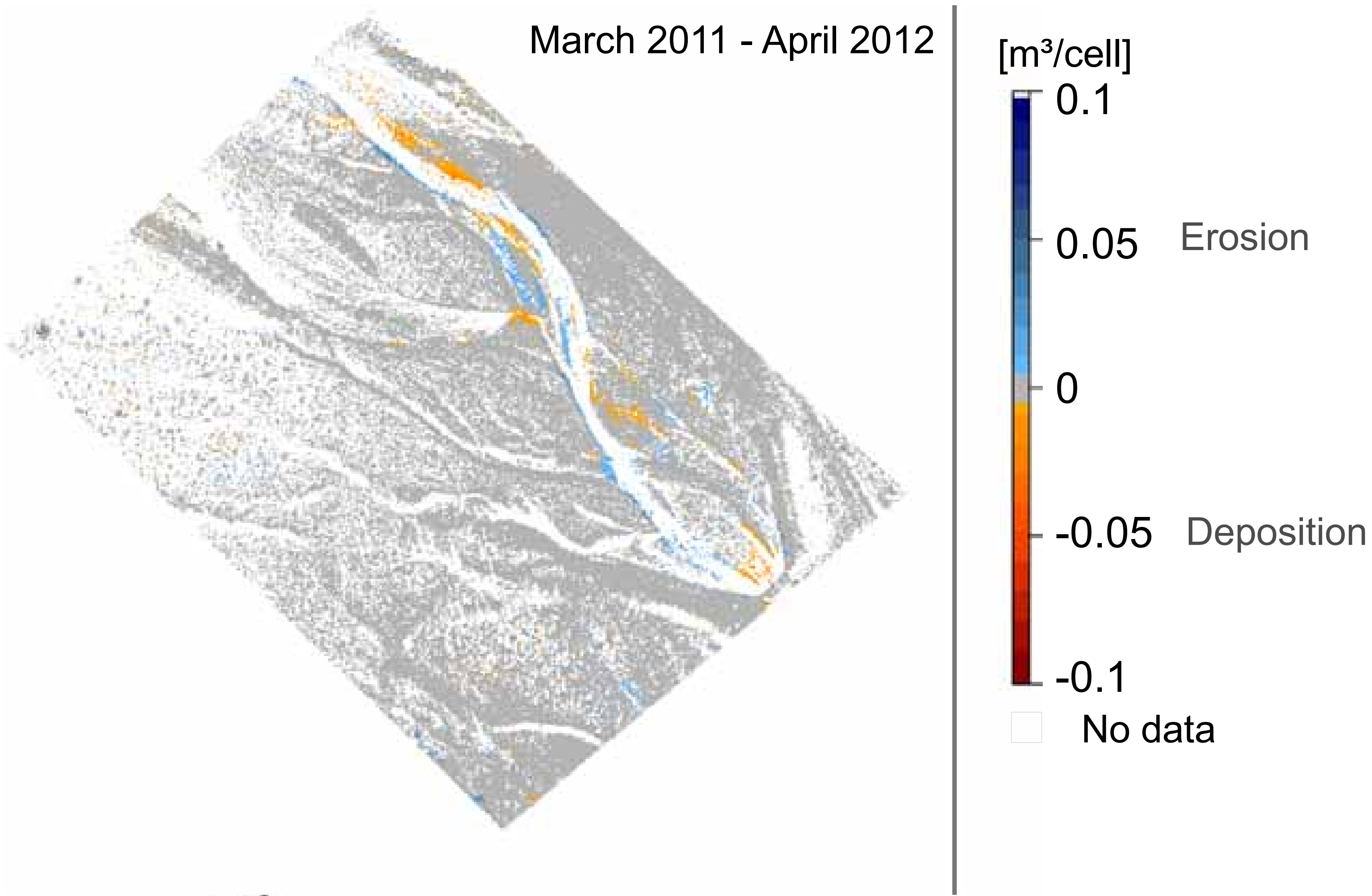
Methodology & Results

- Standard deviations of elevation per raster cell (0.2 m x 0.2 m)



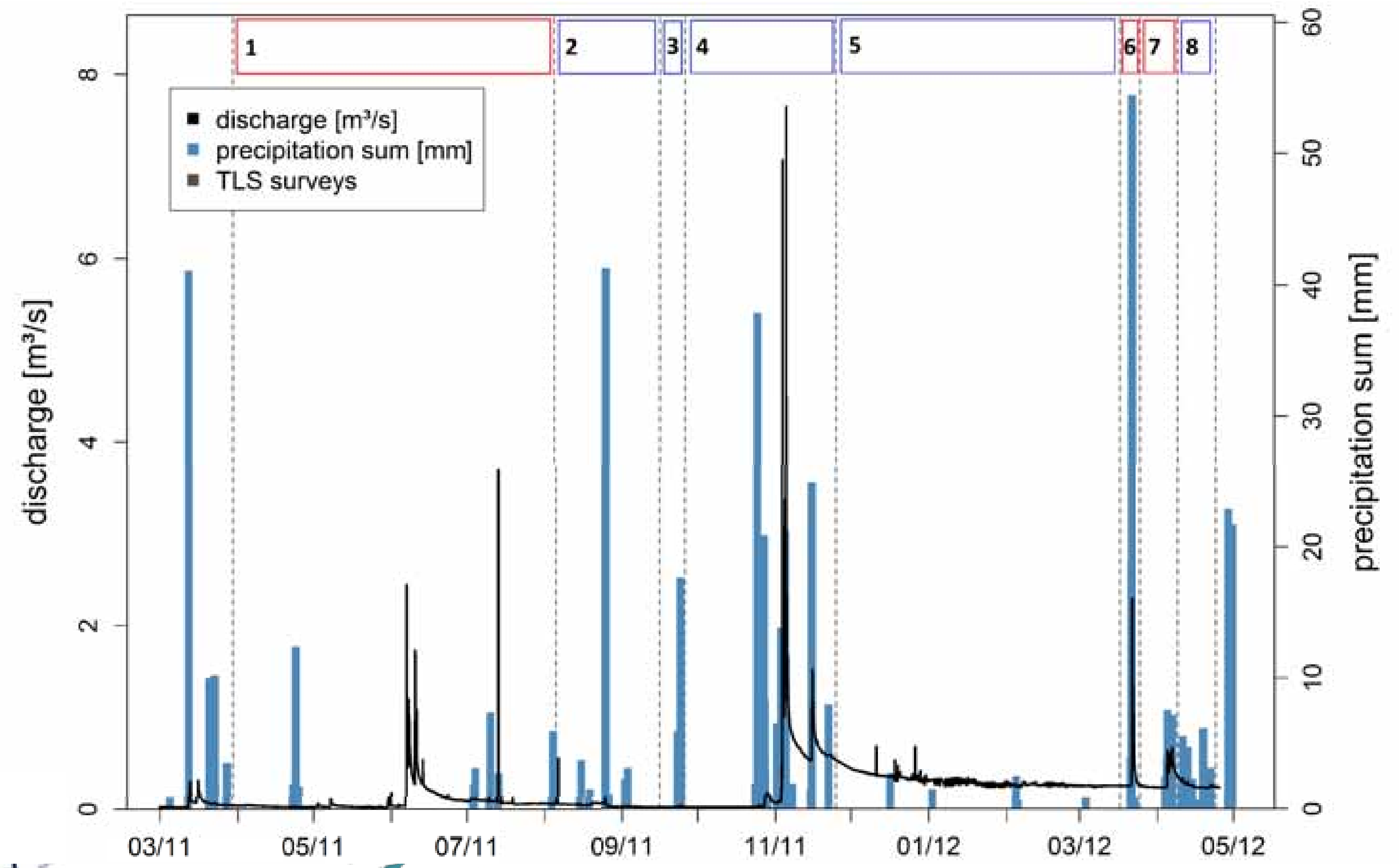
Methodology & Results

- Volumetric change based on 0.2 m x 0.2 m raster



Methodology & Results

- Villacarli hydrograph and precipitation sums per event



Results

- TLS periods grouped according to storage behaviour

	Nr.	Mean vol. change [m³/m^{-2}]	$J_{daystart}$ [d]	J_{day_end} [d]	Nr. of P events [-]	P_{total} [mm]	Max P_{int} [mm h^{-1}]	Q_{max} [m³ s^{-1}]	$Q_{duration}$ [h]
Deposition	1	**-0.018**	89	217	18	38.8	19	2.44	8
	6	-0.001	76	88	6	77.8	19	2.30	22
	7	**-0.016**	88	99	14	36.4	8	0.67	15
Erosion	2	0.005	217	259	7	51.7	108	0.56	5
	3	0.005	259	269	4	50.9	61	0.04	5
	4	**0.015**	269	329	26	190.9	32.0	7.65	4
	5	0.009	329	76	7	8.1	3.0	0.68	7
	8	0.008	99	114	9	24.2	12.0	0.34	0

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Conclusions

- Structures under active morphological change can be followed by TLS
- Results suggest a seasonal dependence of the Julian day linked to sediment input from external sediment sources

Challenges:

- Dealing with data gaps
- Classification of sediment and gravel by scan data
- Linking TLS data to suspended sediment concentrations

Universität Potsdam

Erd- und Umweltwissenschaften

Universitat de Lleida

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Project homepage

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