XXXVIII
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Monitoring of riparian vegetation growth on fluvial sandbars

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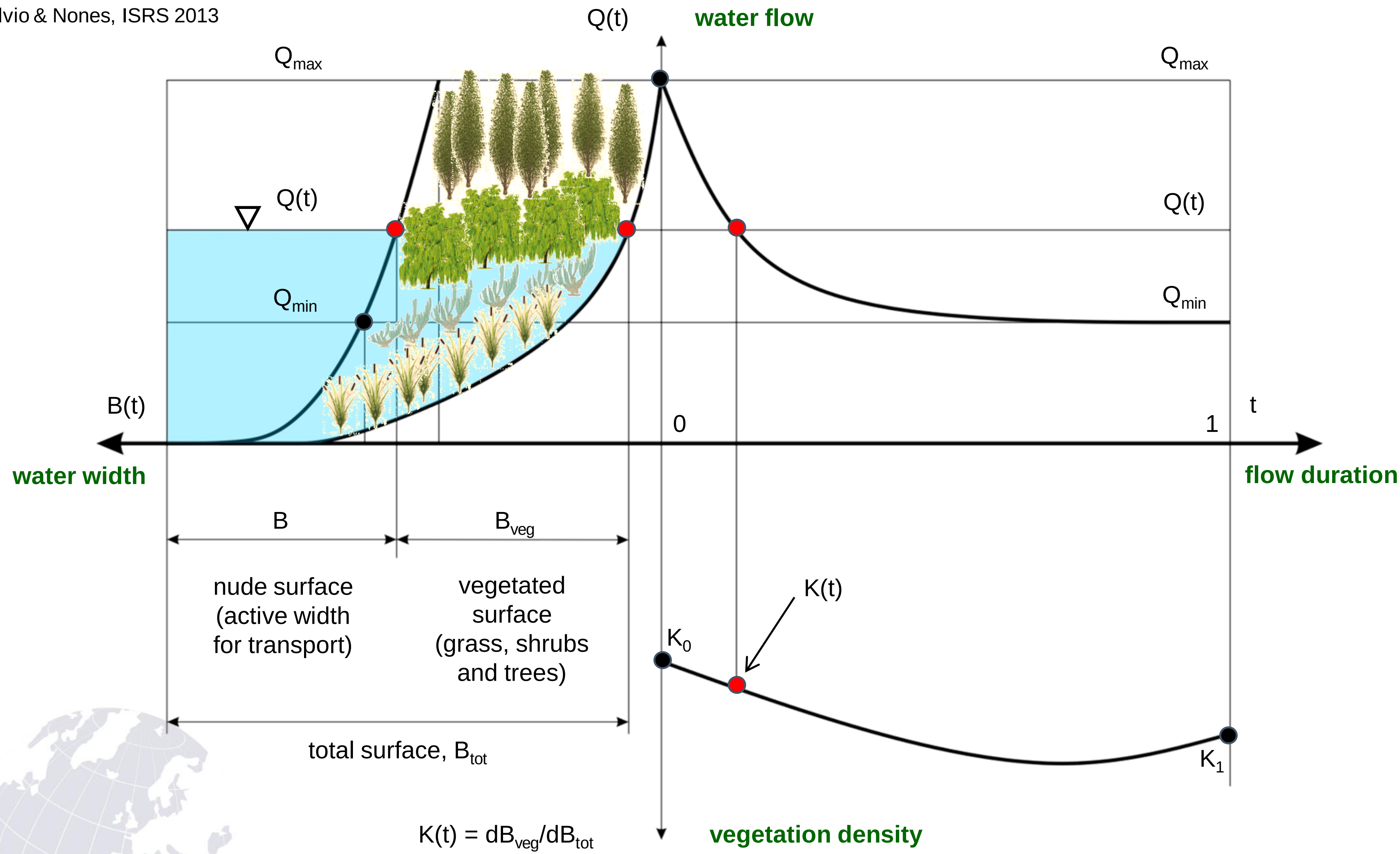
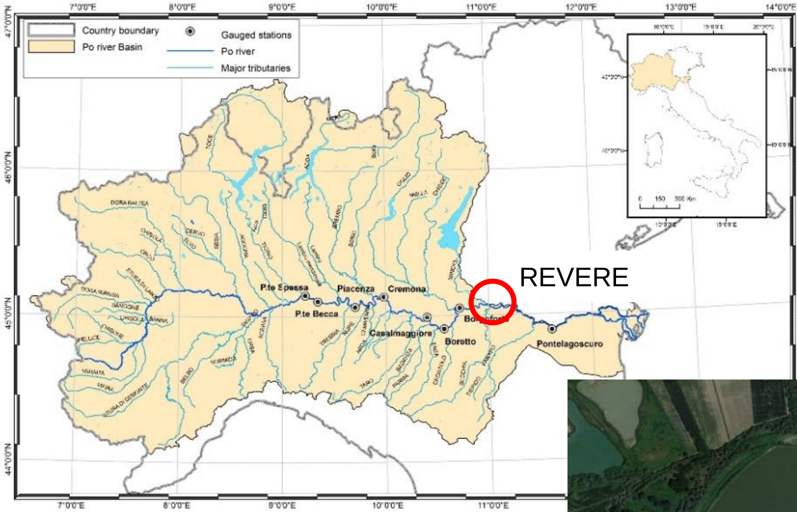
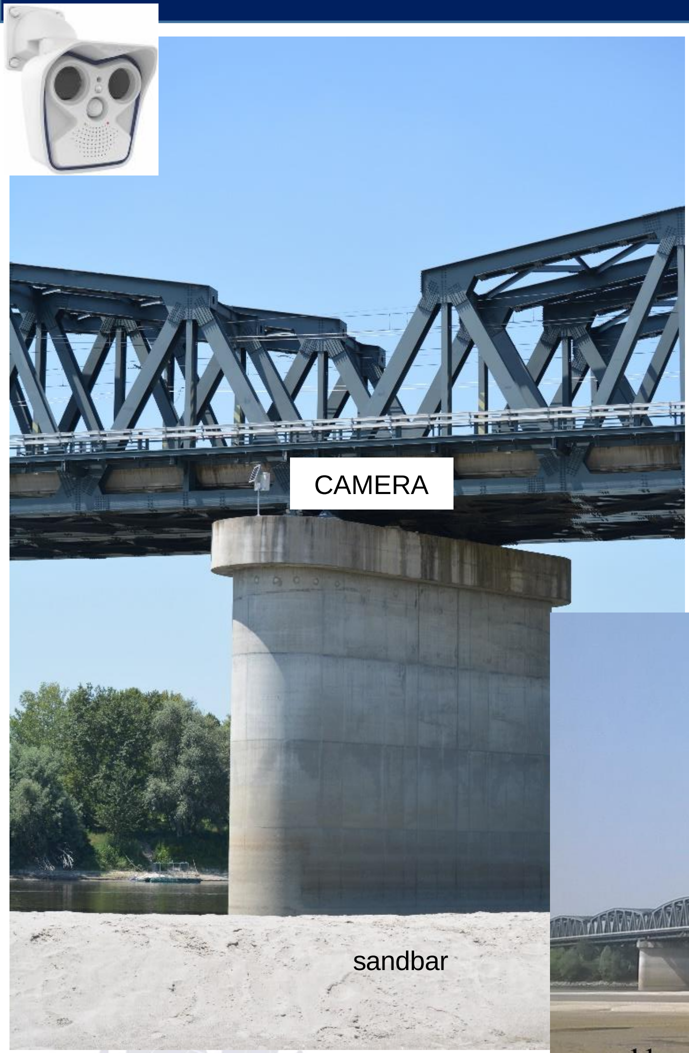
Di Silvio & Nones, ISRS 2013




Country boundary
Po river Basin
Gauged stations
Po river
Major tributaries
REVERE
P.te Spessa
Piacenza
Cremona
P.te Becca
Casalmaggiore
Boretto
Pontelagoscuro


OSTIGLIA
RAILWAY BRIDGE
CAMERA
UPSTREAM
REVERE
BOSCHINA ISLAND
DOWNSTREAM

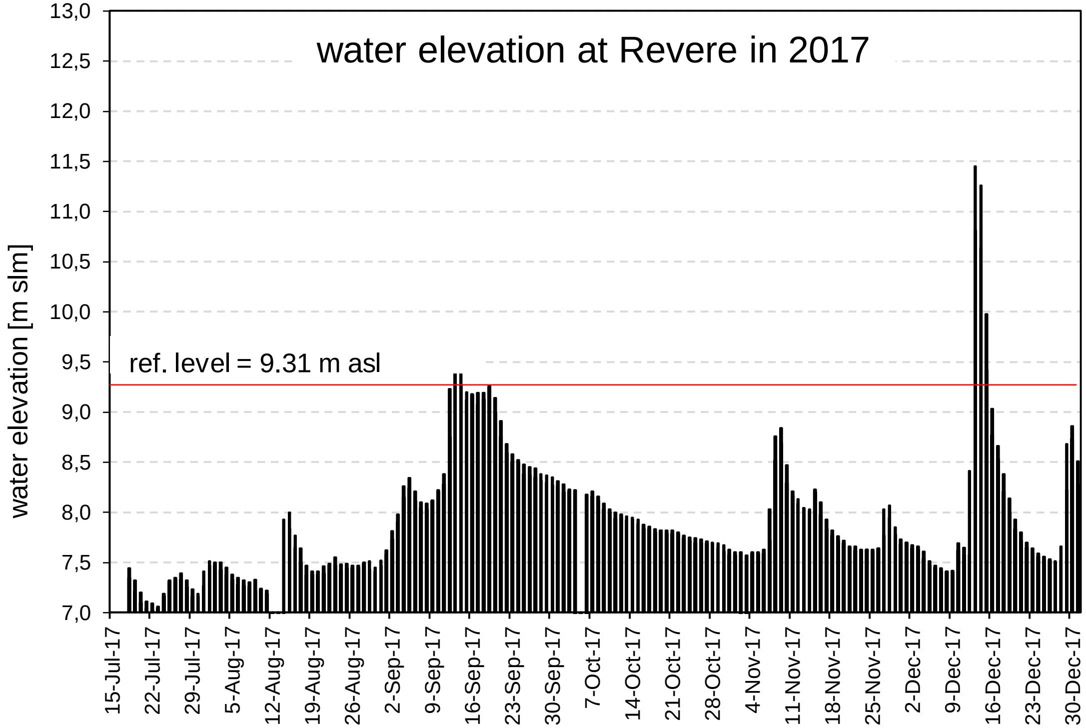


- video camera Mobotix MX-M15D-SEC
- router Sierra Wireless RV50
- images acquired every 12 hours (day/night sensors)
- monitored period: July 2017-November 2018

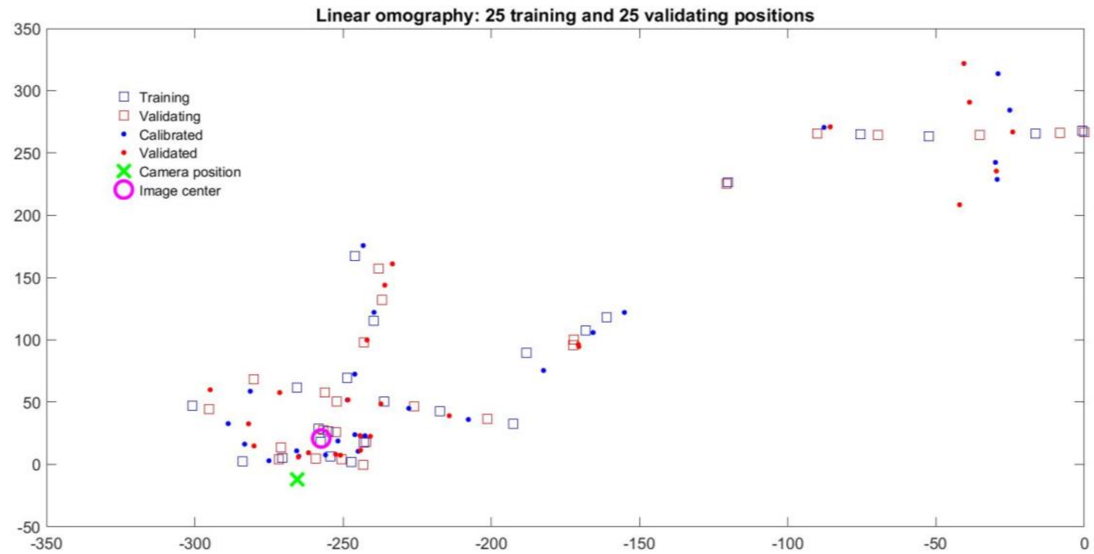
water levels monitored every 30’

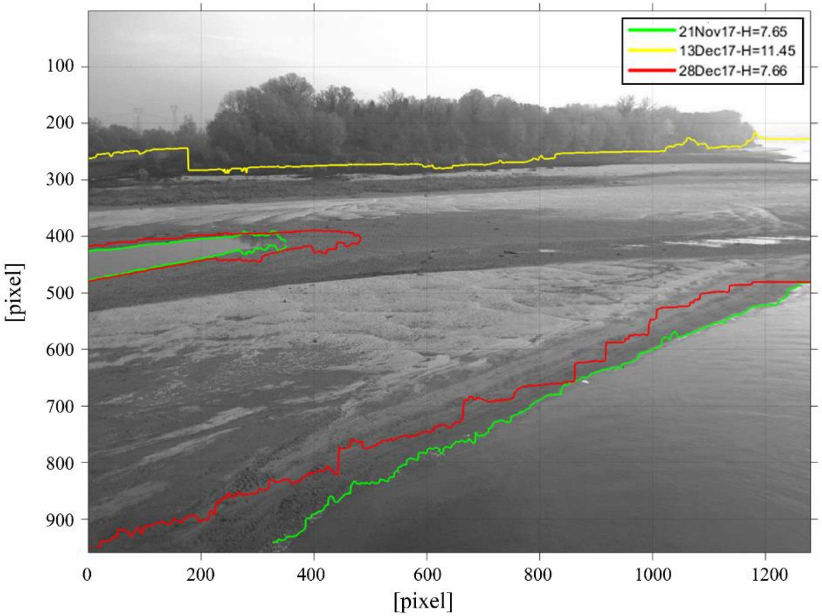
hourly averaged and adjusted considering the water slope

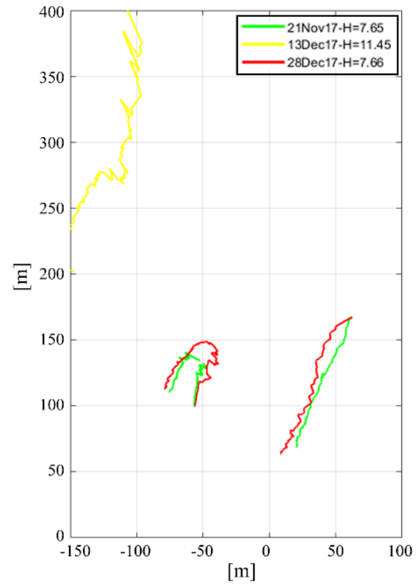
the reference level is used for water management and flood/drought warning



FLOOD CONDITIONS





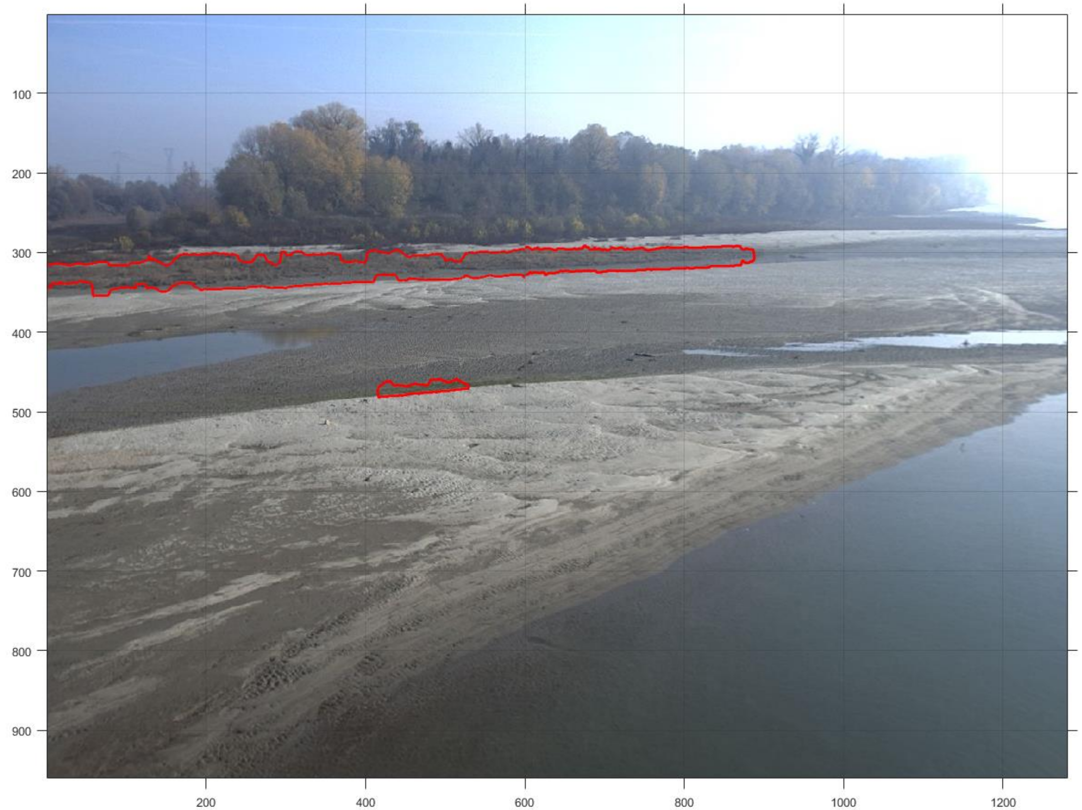


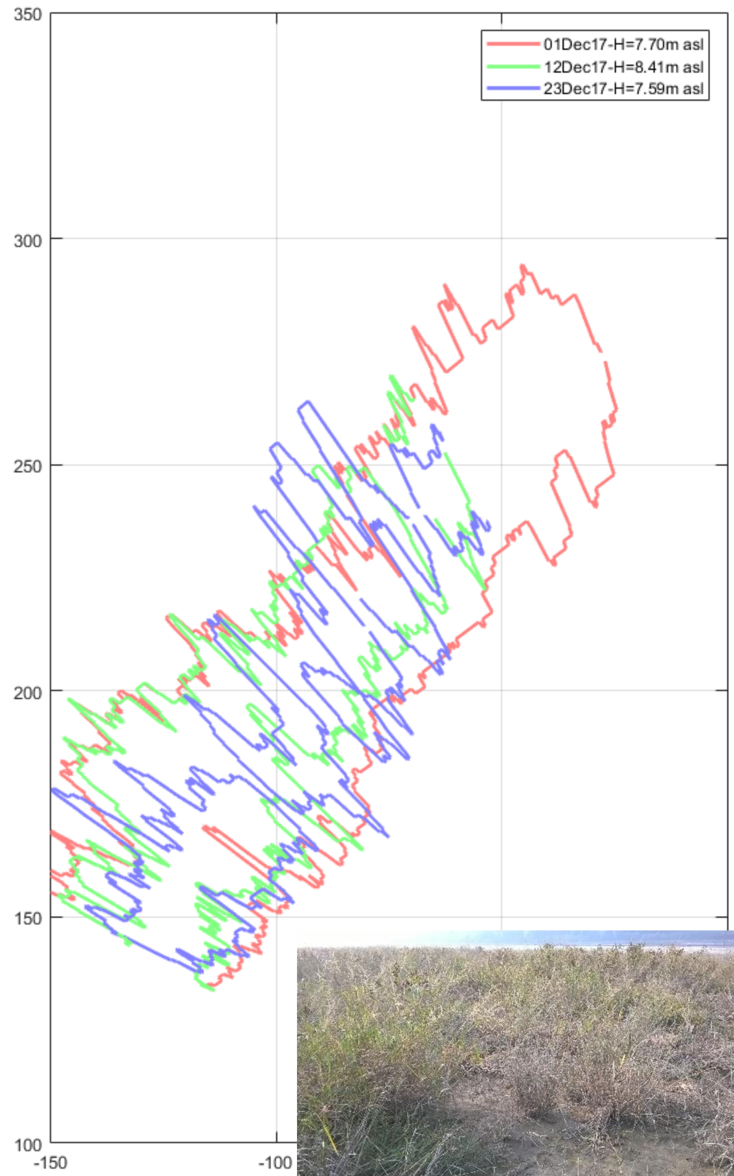
linear homography

50 target points

(25 training + 25 validation)

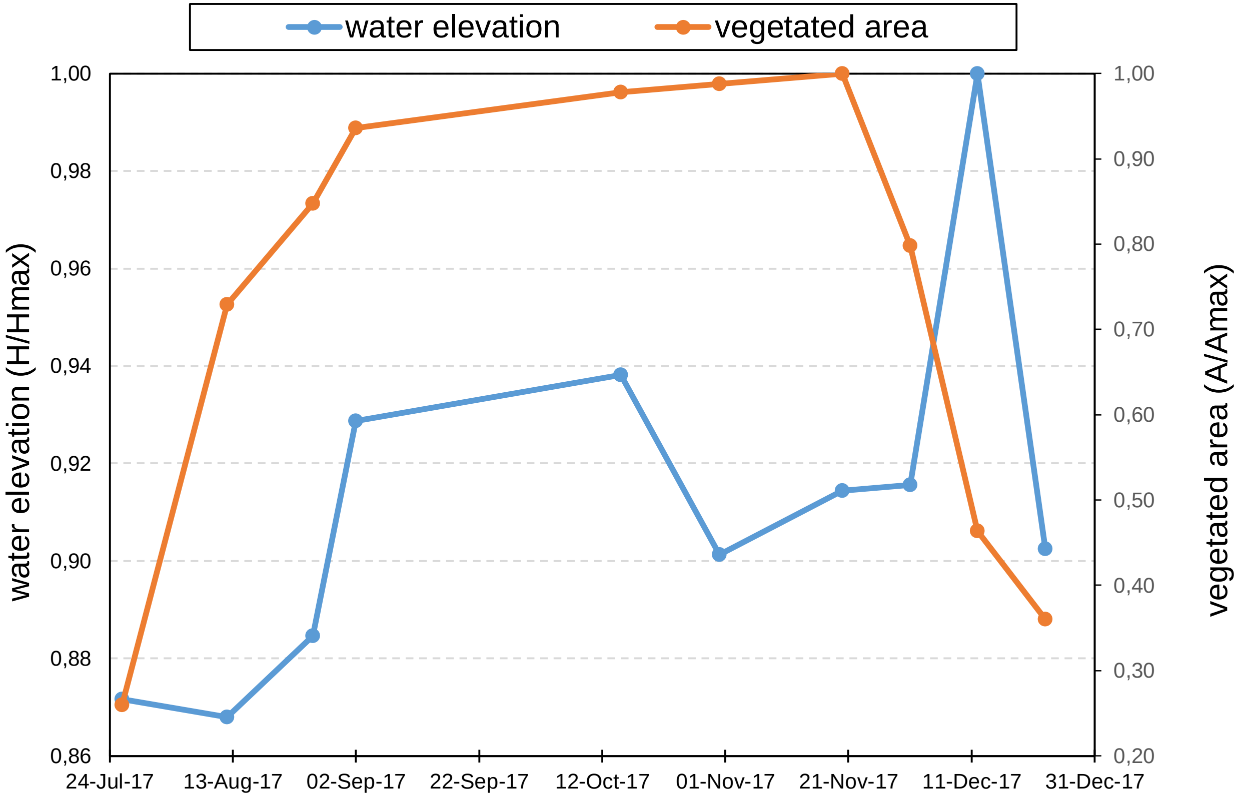
studied period: July-December 2017





- maximum vegetated areas follow a dry period
- floods tend to destroy the vegetation
- being seasonal, during the winter the vegetation dies

what are the main drivers of the vegetation growth?



- monitoring edge-of-water lines displacements and vegetation patterns with a fixed camera is an economic and reliable method for pointing out fluvial dynamics at the reach scale
- flooding waves remove sediments (and seeds) accumulated on the central bar during low flow conditions, redistributing them across a wider cross section
- floods destroy vegetation patterns created during low flow conditions, but contribute in redistributing the seeds along and across the channel
- vegetation patterns are related to seasonality, therefore a longer monitoring period is necessary

- combining field survey (camera) with remote sensing (satellite) can provide insights on the medium- to long-term vegetation dynamics over fluvial sandbars
- intrinsic uncertainties related to camera (image rectification) and satellite (image resolution) data affect the final results

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Thank you for your attention

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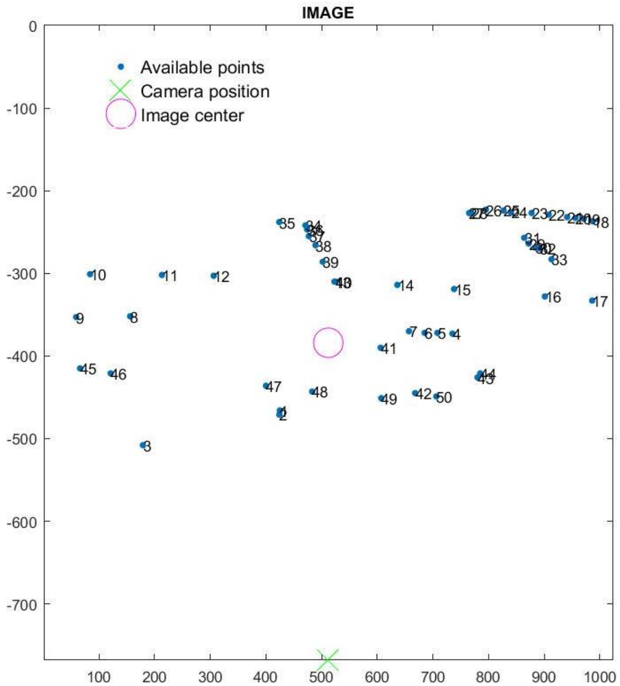

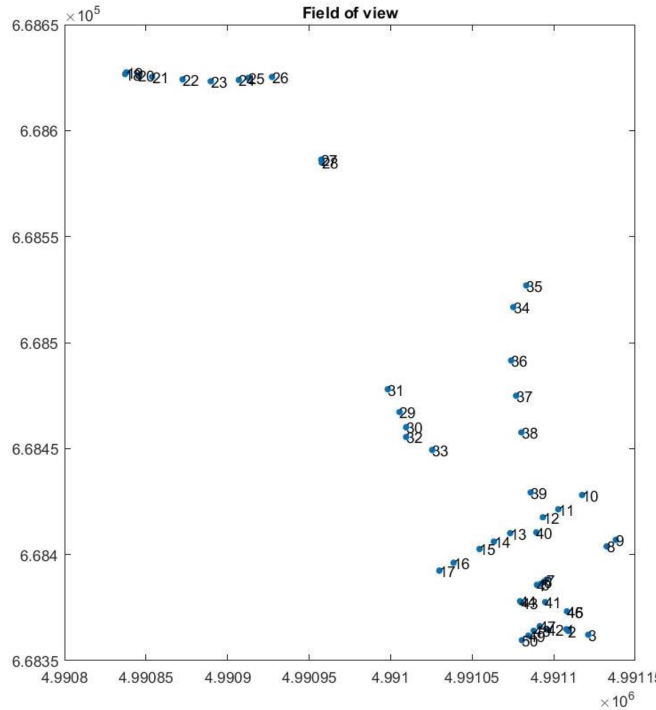

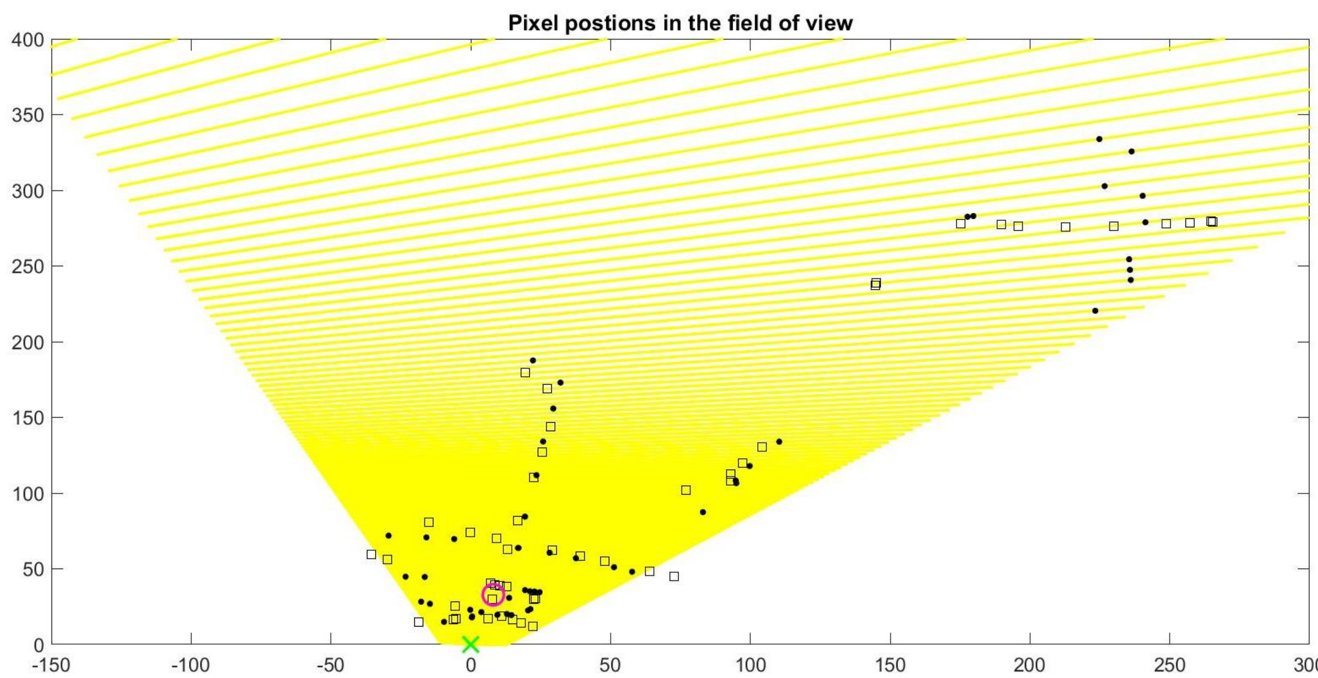

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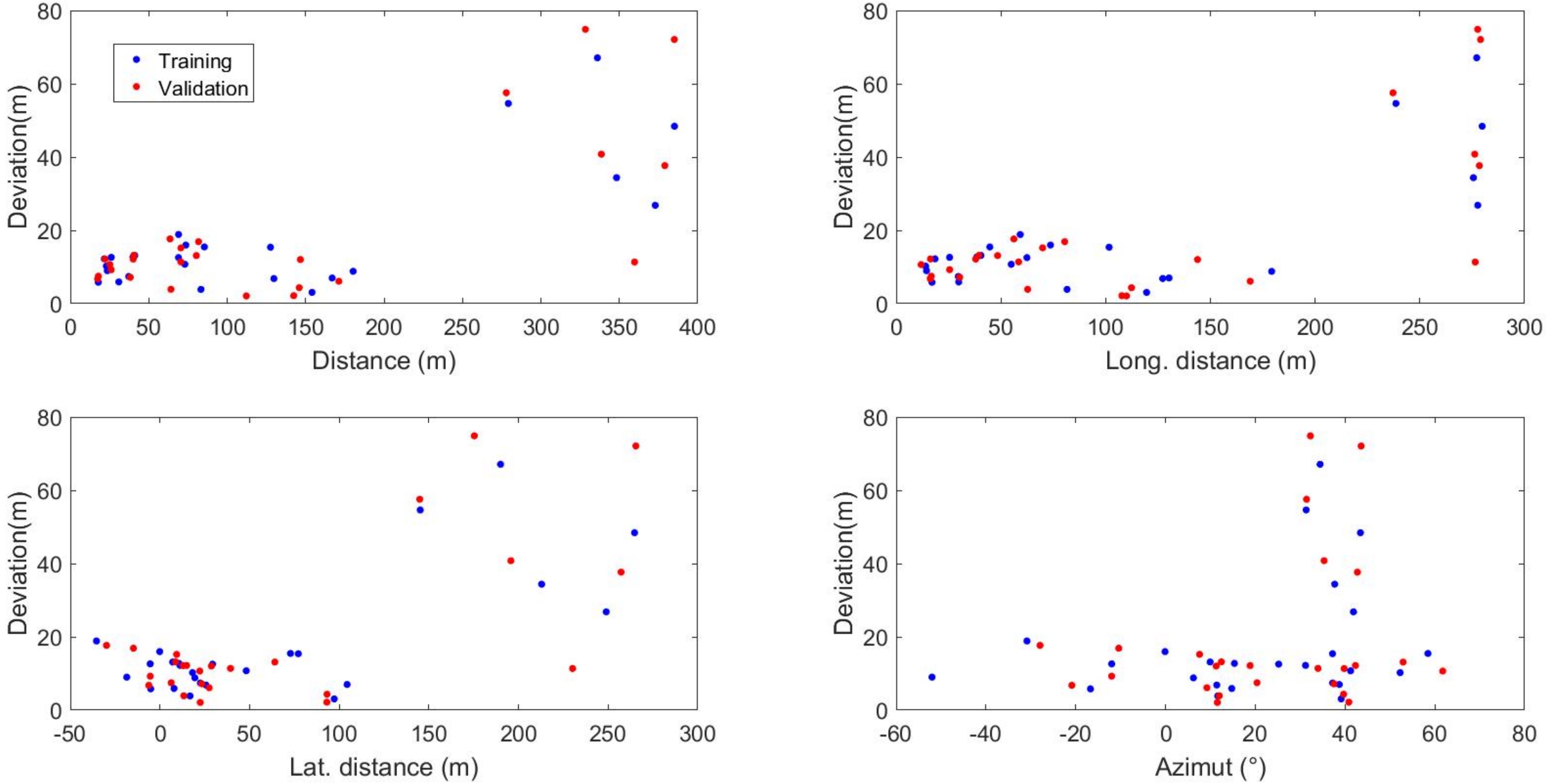

- errors computed by subtracting the actual position of the target points from the assessed one
- errors <20 m till a distance of 250 m from the camera, then reach a max of around 70 m
- the error is a function of the lateral distance (azimuth): for points having the same longitudinal distance, the higher the distance from the optical axis, the higher the error

$$NDVI = \frac{NIR - Red}{NIR + Red} = \frac{band5 - band4}{band5 + band4}$$

Class I	NDVI<0.0	water
Class II	NDVI 0.0–0.1	bare soil
Class III	NDVI 0.1–0.2	seasonal vegetation
Class IV	NDVI 0.2–0.4	semi-permanent vegetation
Class V	NDVI >0.4	permanent vegetation