Monitoraggio video della morfologia fluviale fuori acqua: fiume Po a Ostiglia

M. Nones; R. Archetti; M. Guerrero

Workshop finale, 22 – Marzo – 2018

Tecnopolo CNR Area della Ricerca Via Gobetti, Bologna

POR FESR EMILIA-ROMAGNA 2014/2020
UNIONE EUROPEA
Fondo europeo di sviluppo regionale
RegioneEmilia-Romagna

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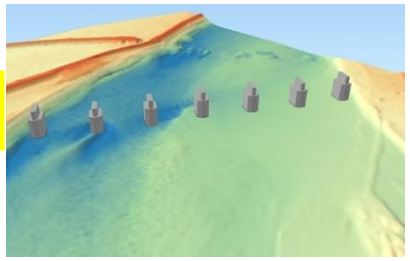
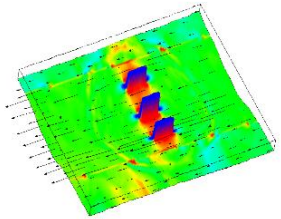
The use of non-invasive techniques in monitoring riverine hydro-morphodynamics permits to:

- monitor flooding events
- monitor long periods, reducing the expenses associated to traditional monitoring
- couple monitored data with modelling tools to create **Early Warning Systems** and **Decision Support Systems**

Integrated monitoring

Real-time modelling

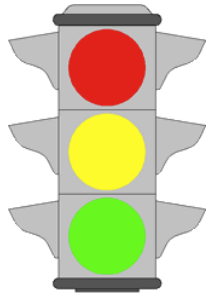




Synthetic parameters to forecast future trends

Early Warning System

Decision Support System



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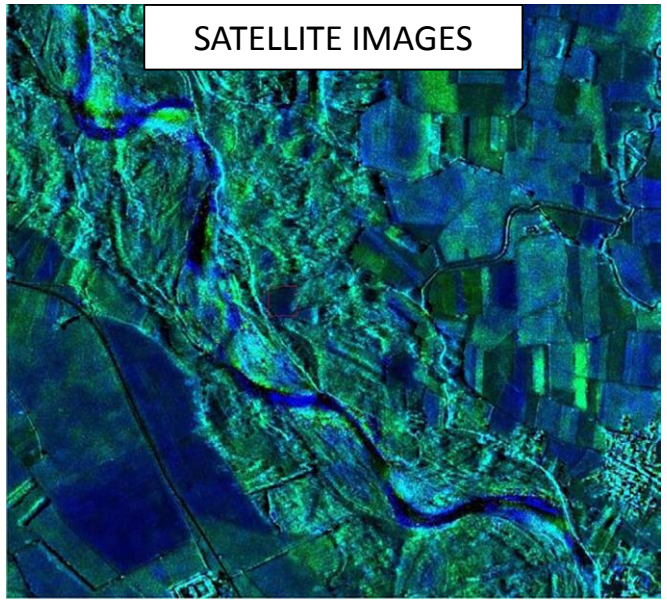
Long-term morphological trends of alluvial rivers can be derived from:

- satellite imagery (resolution 15-30 m)
- aerial images (resolution of few meters)
- historical maps (variable resolution)



Orco River (Italy), from Mitidieri et al., EJRS 2016

Adige River (Italy), from Scorpio et al., ESPL 2016

Spree River (Germany), from Nones et al., YMC 2015

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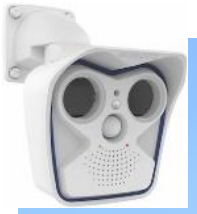

video camera Mobotix MX-M15D-SEC

router Sierra Wireless RV50

images acquired every 12 hours (day/night sensors)

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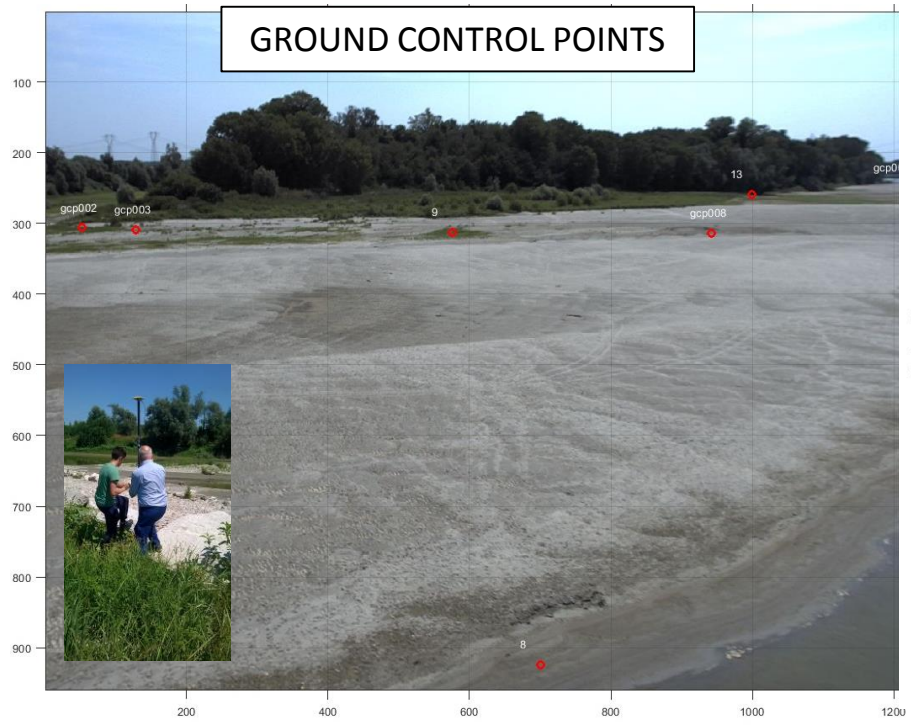
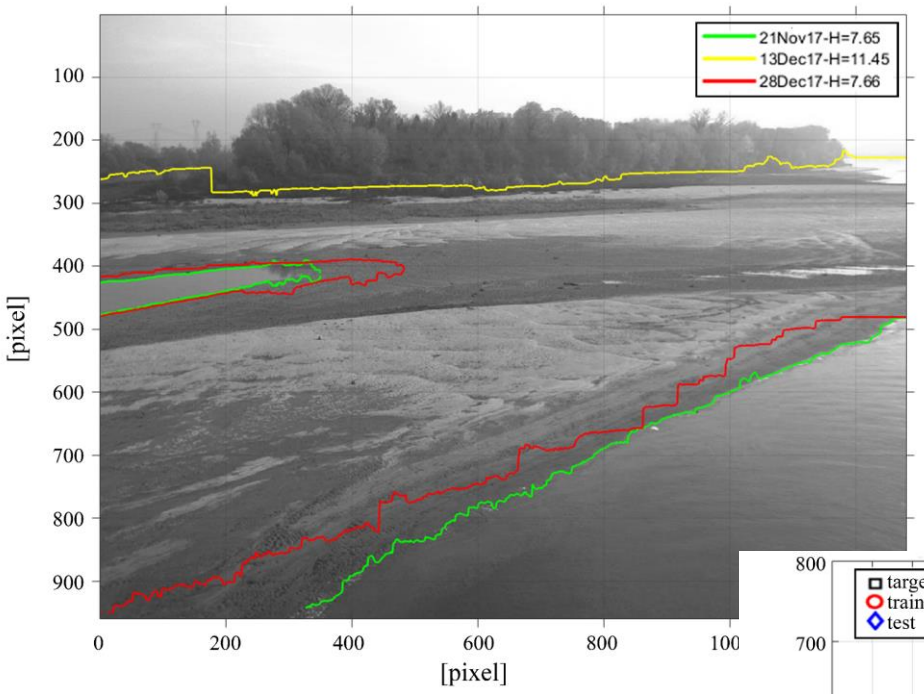
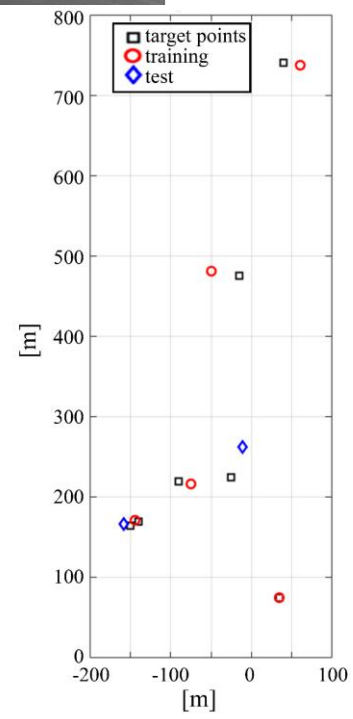
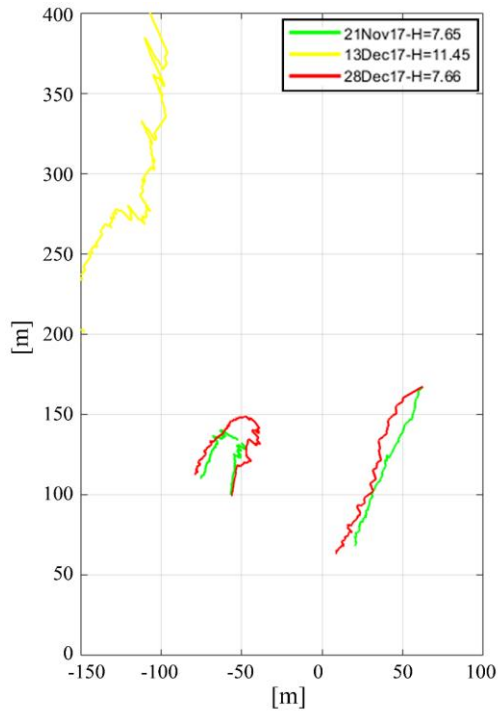


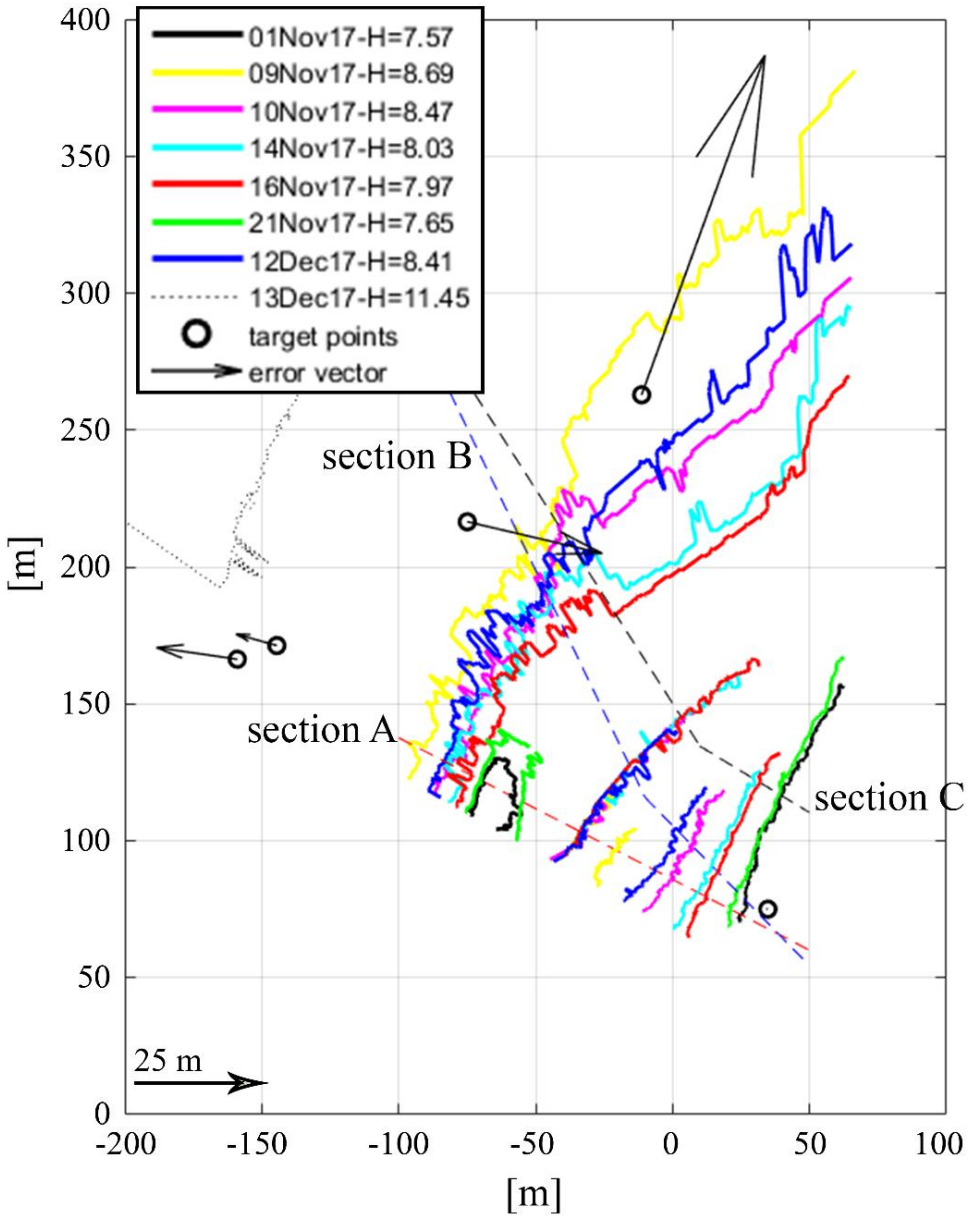


Linear homography

7 target points (5 training + 2 test)







Given the small number of target points, the homography involves errors:

section A ==> 1-4 m

section B ==> 1-5 m

section C ==> 1-8 m

The higher the distance from the camera, the higher the planimetric error.

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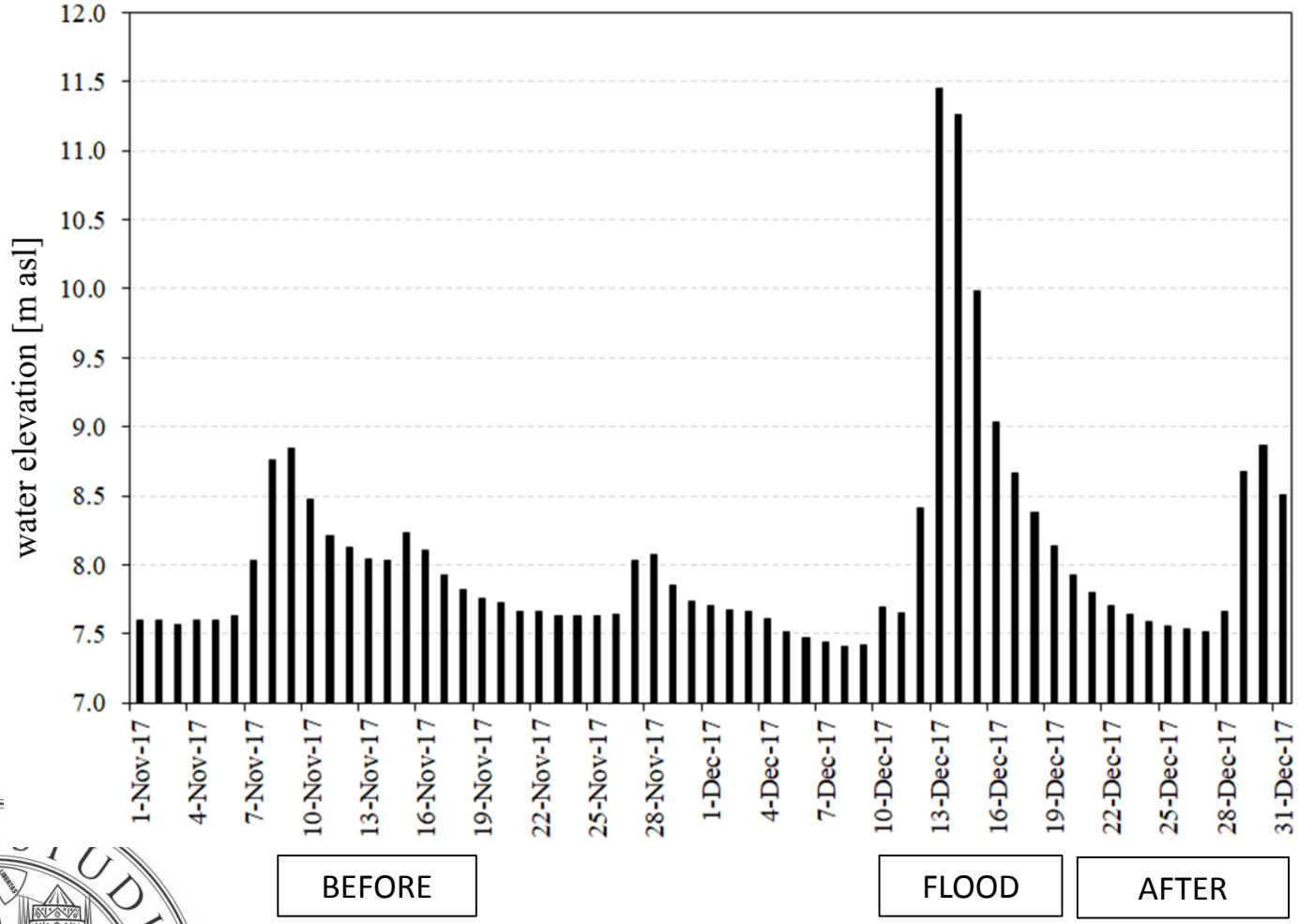
Flooding event of December 2017



BEFORE

AFTER

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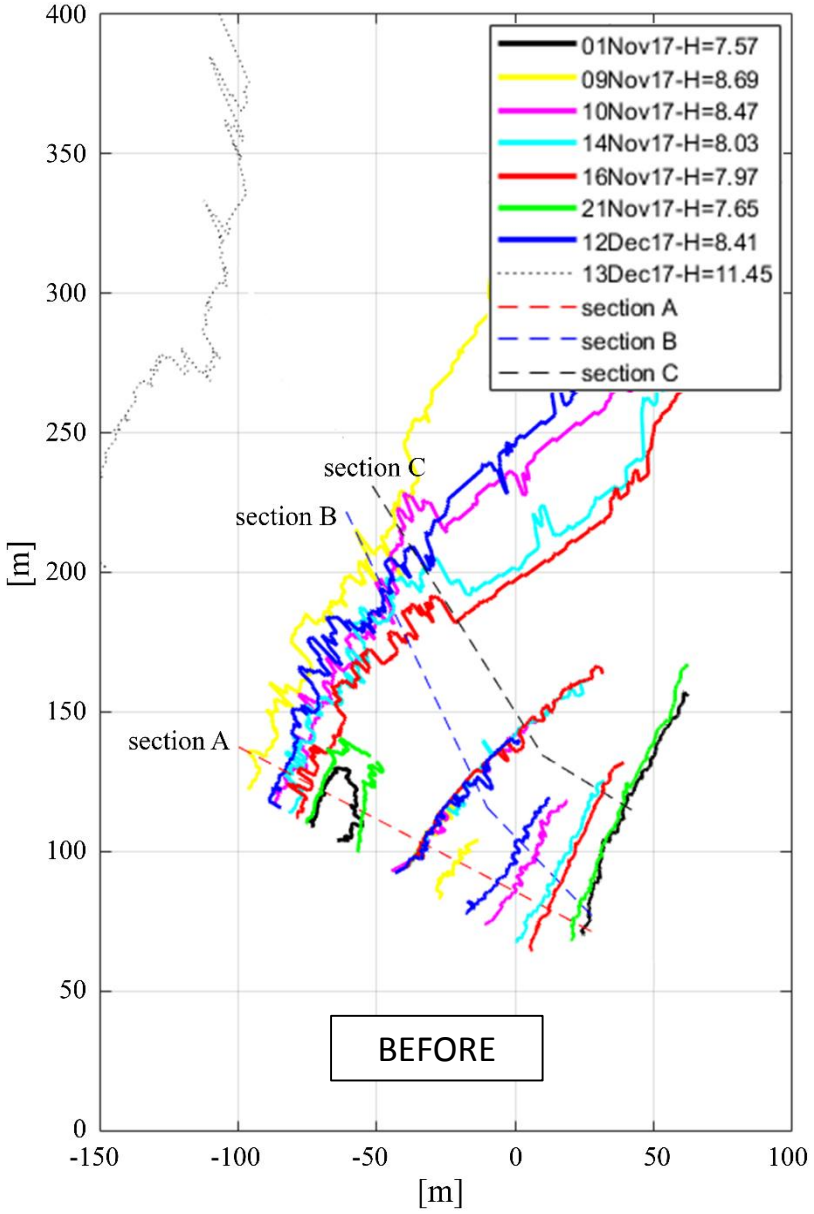

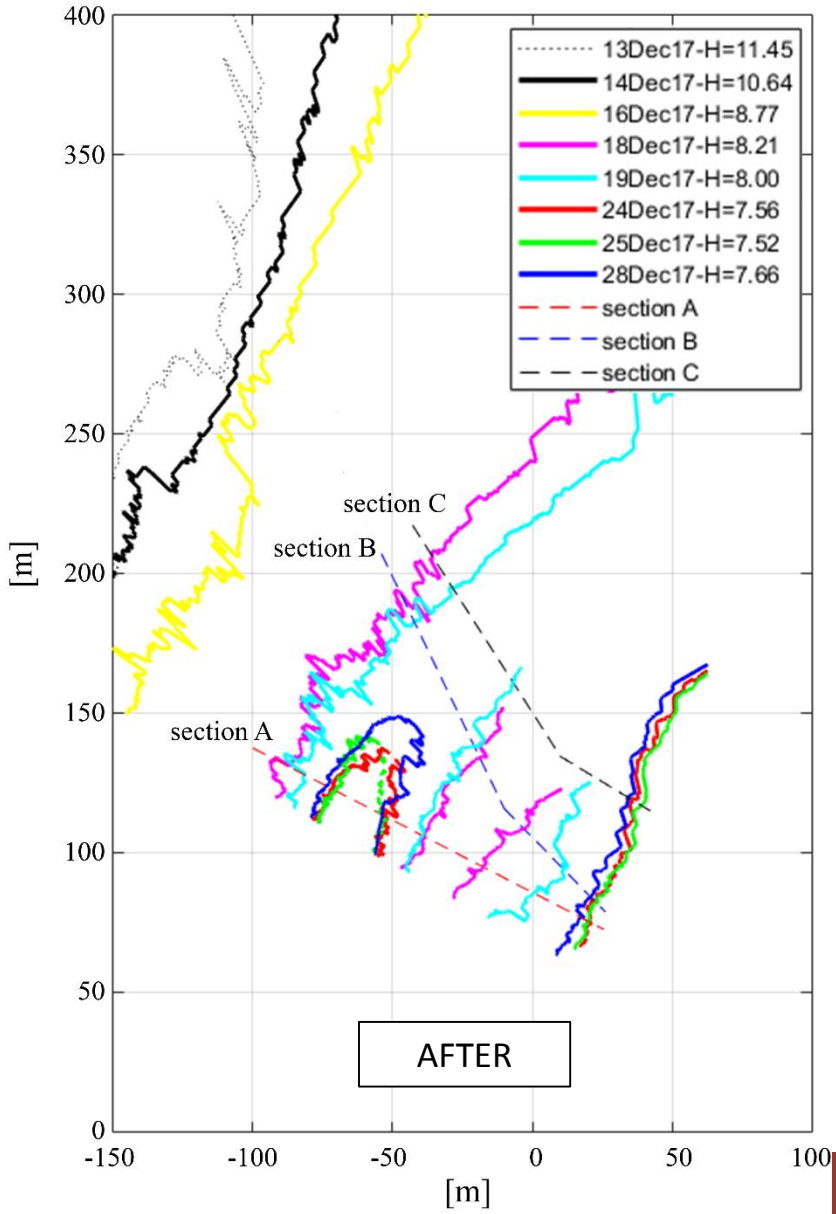

- Semi-automatic bankline tracking
- Extraction of cross-section altimetric variations

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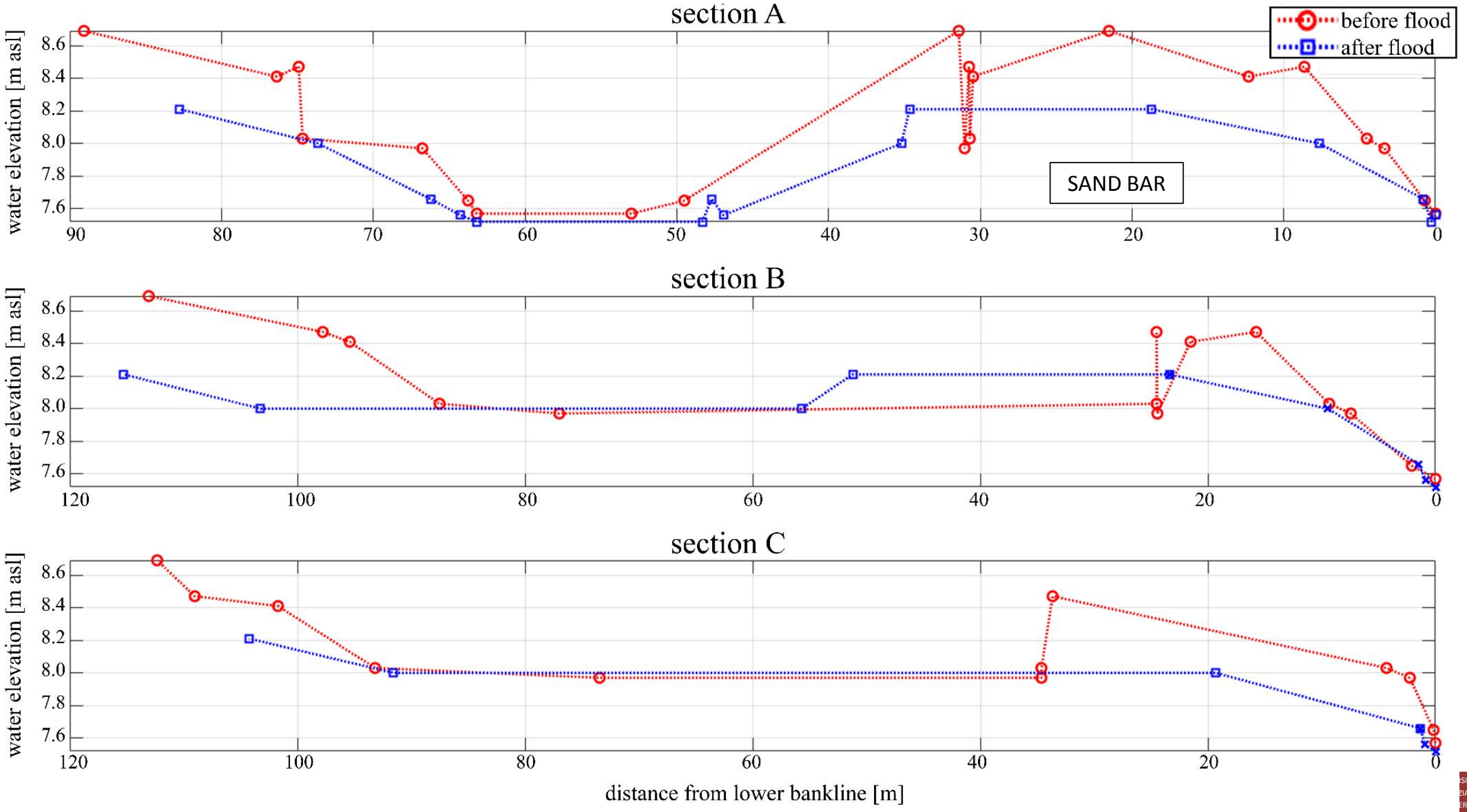

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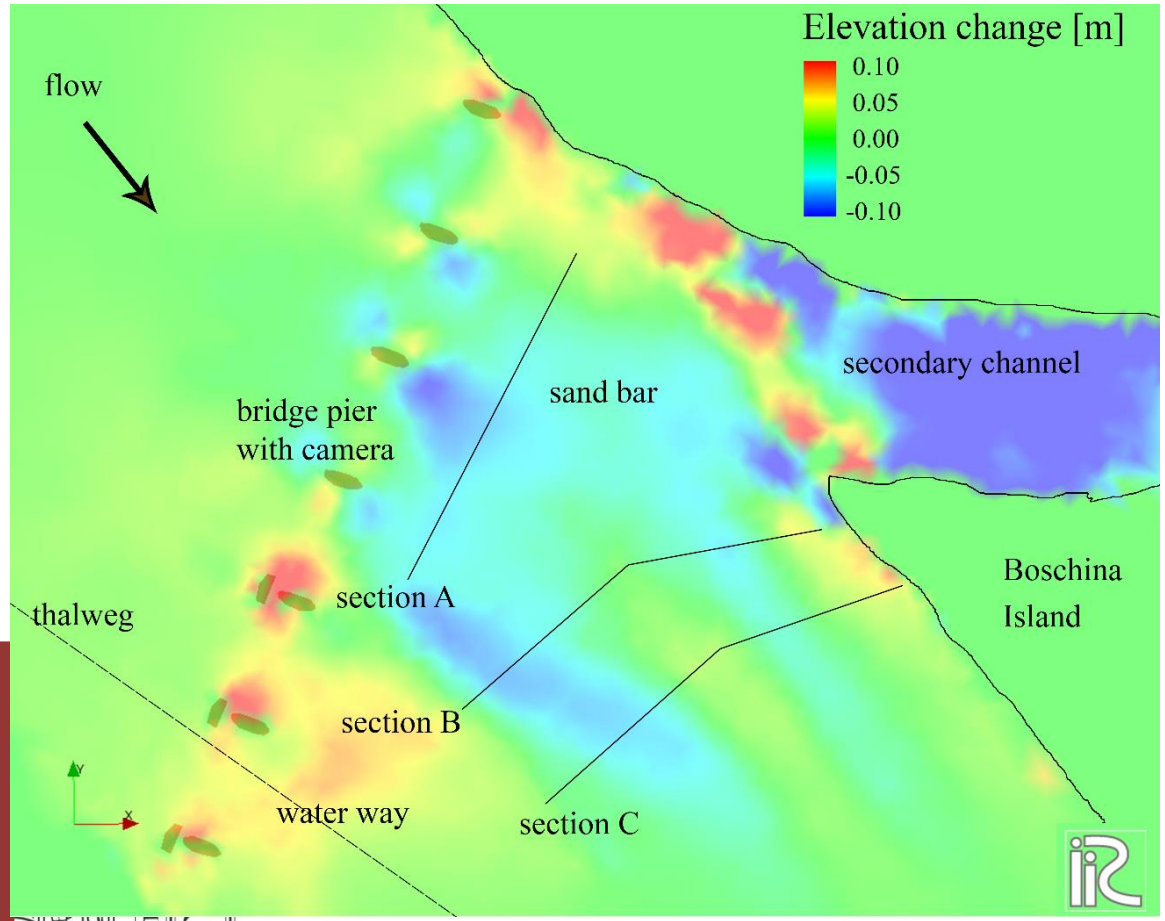
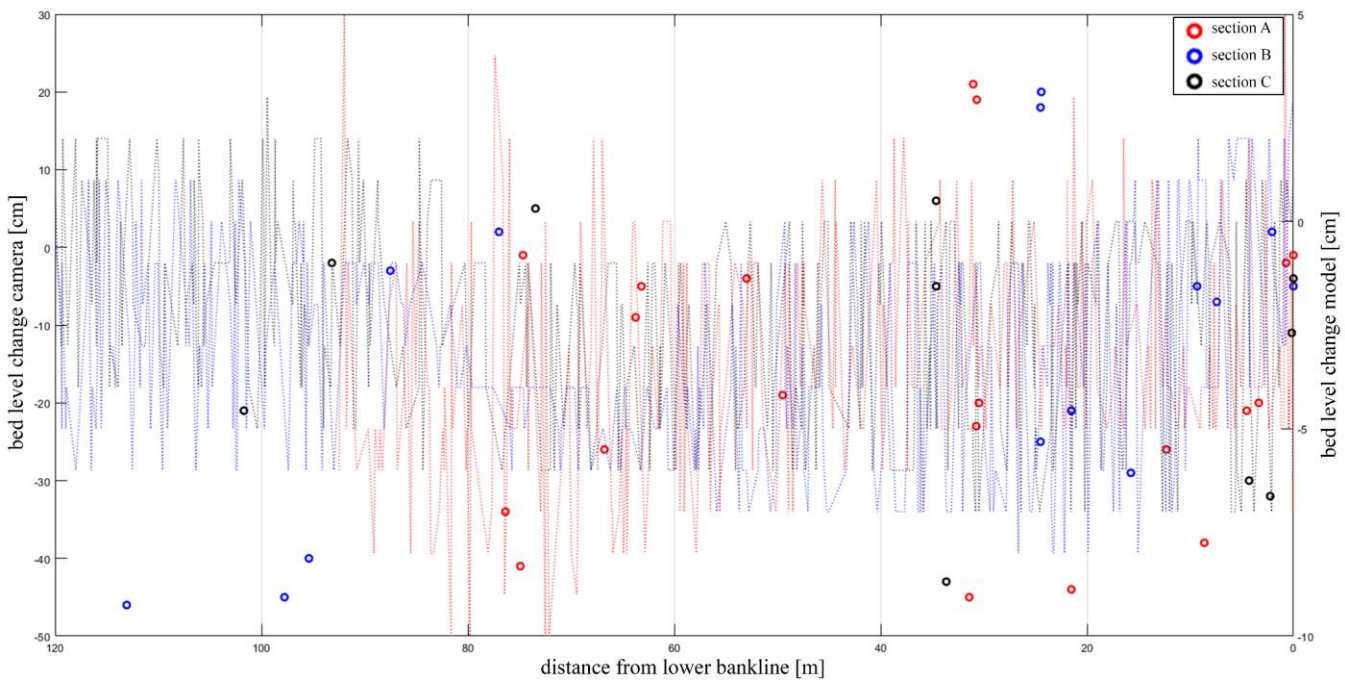
A numerical 2D models is used to qualitatively confirm the results of the videography.

The model is calibrated on the water way data, but cannot adequately reproduce the sand bar physics.



EROSION OF THE SAND BAR
REDISTRIBUTION OF SEDIMENT ACROSS THE RIVER SECTION



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CONCLUSIONS

- flooding waves can remove sediments that accumulated on bars during low flow conditions
- floods redistribute the river flow into a wider cross section, reshaping the deepening and narrowing of the main channel typically observed during dry periods
- monitoring the riverine bankline displacements with a fixed camera is an economic and reliable method for reproducing the river morphodynamics

FUTURE WORKS

- application to larger periods to simulate the long-term evolution
- comparison with models able to reproduce the dynamics of emerged regions (sand bars)
- coupling with CFD tools in Decision Support Systems

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Thank you for your attention

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