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Gewässervermessung aus der Luft

ALB-Daten für Studien der Hydraulik von Gebirgsbächen und Kiesflüssen

Möglichkeiten für die Habitatmodellierung

Michaela Wörndl & Stefan Jocham

2. Workshop zum Comet K – Projekt „Alpine Airborne Hydromapping“ 11. Februar 2016

Studysite: Sill-STATZ

Studysite: Sill-STATZ

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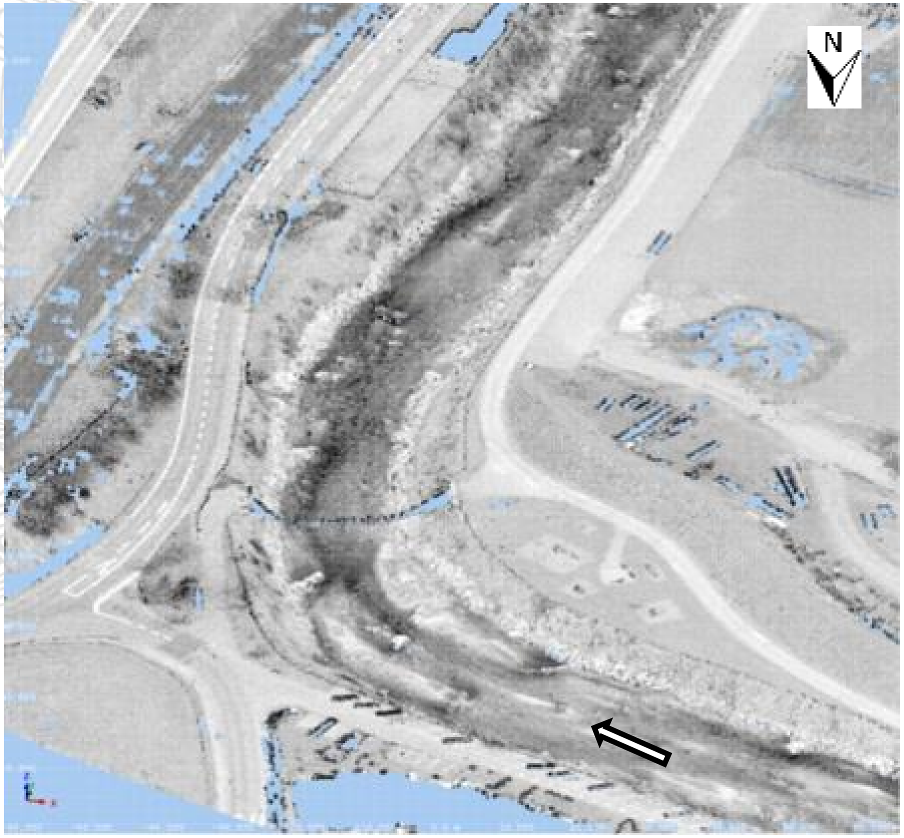
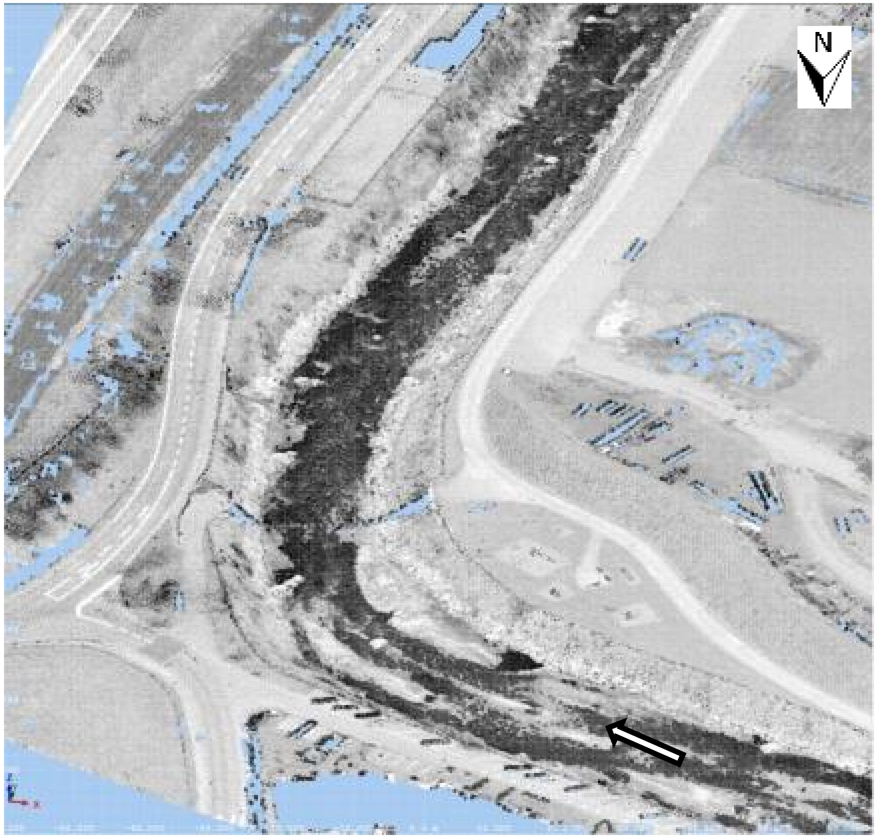
Pointcloud from AHM bathymetry

riverbed

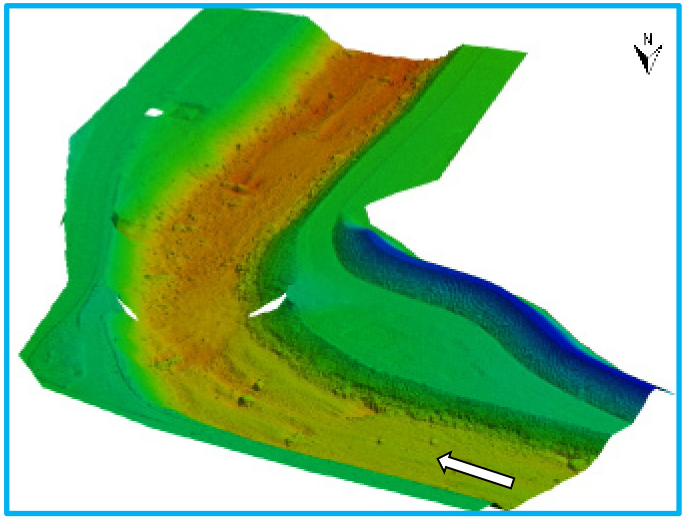


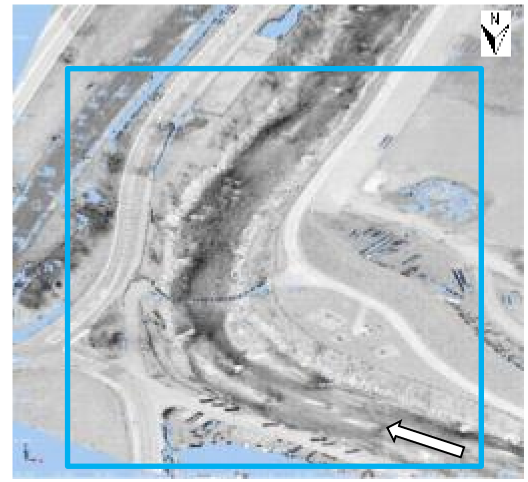
water surface



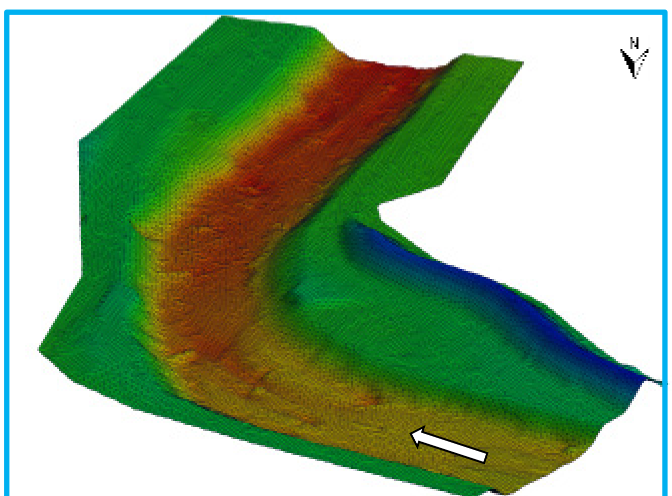
Hydraulic meshes

original points

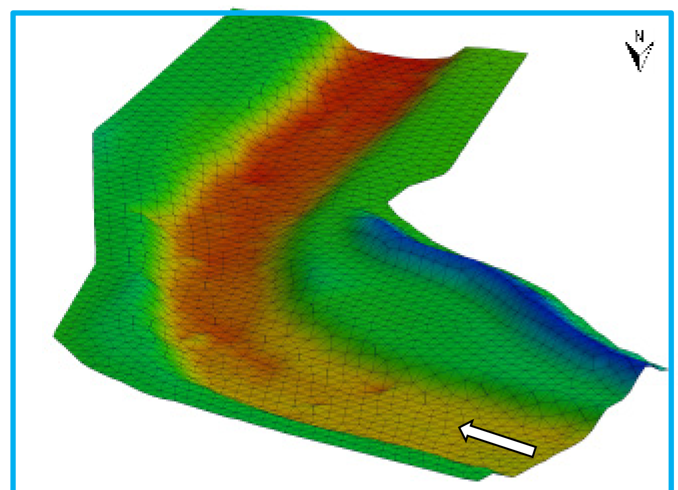




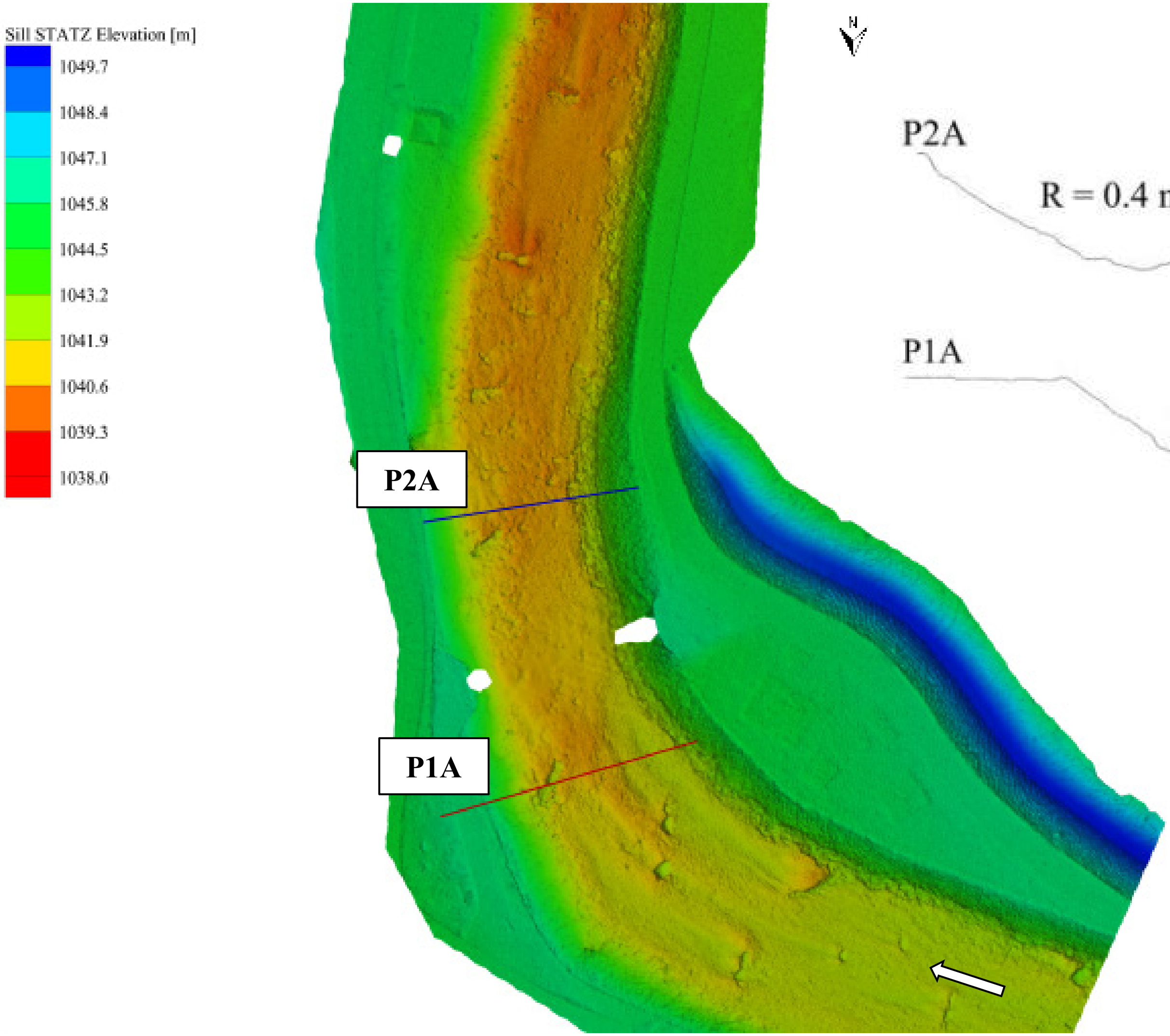
l_elements = 1 m

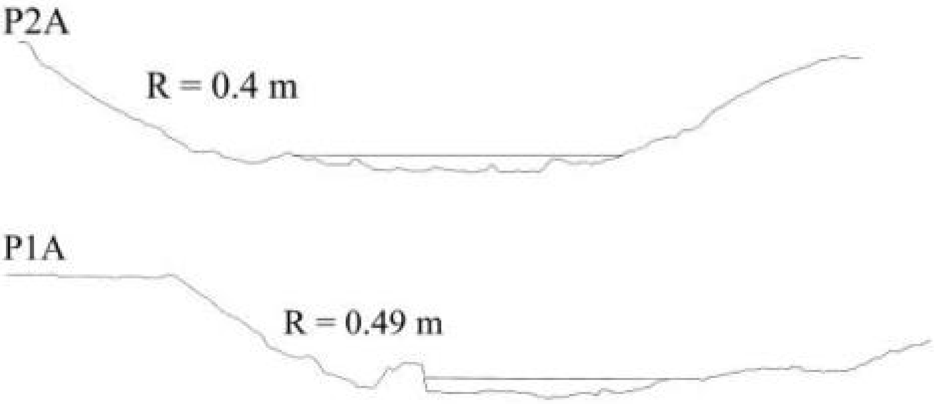


l_elements = 3 m

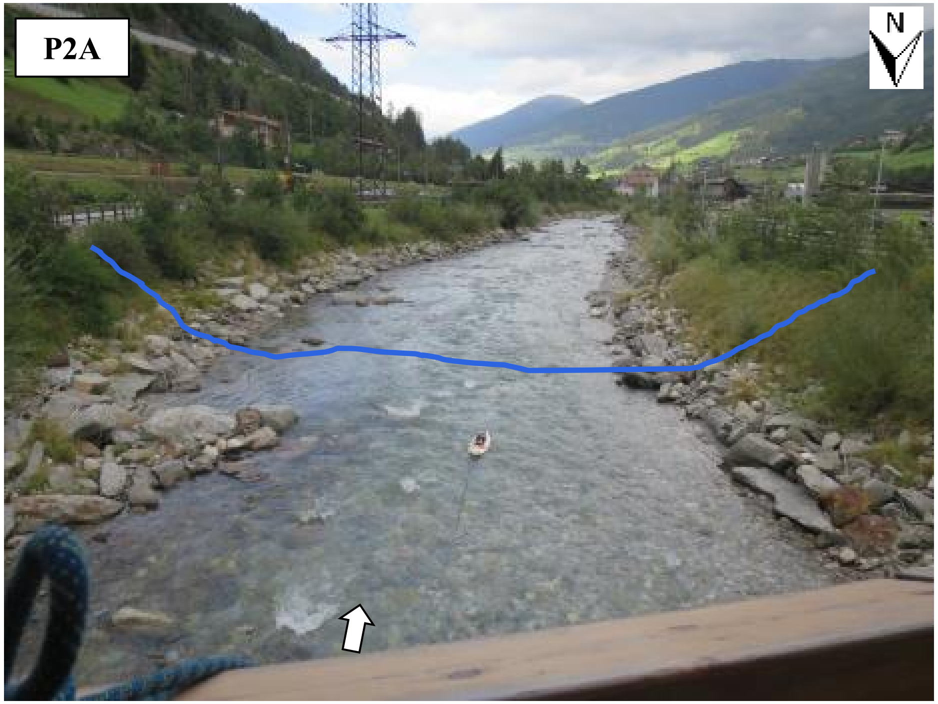


Control Sections

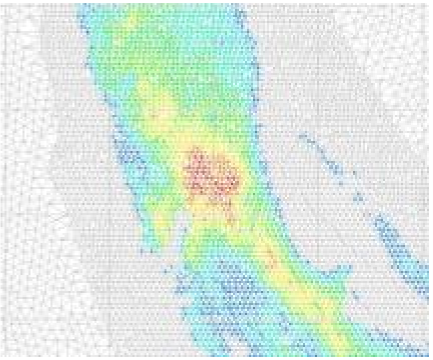




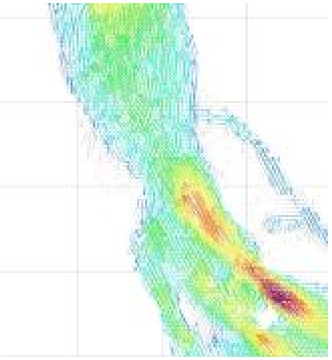
Field observations



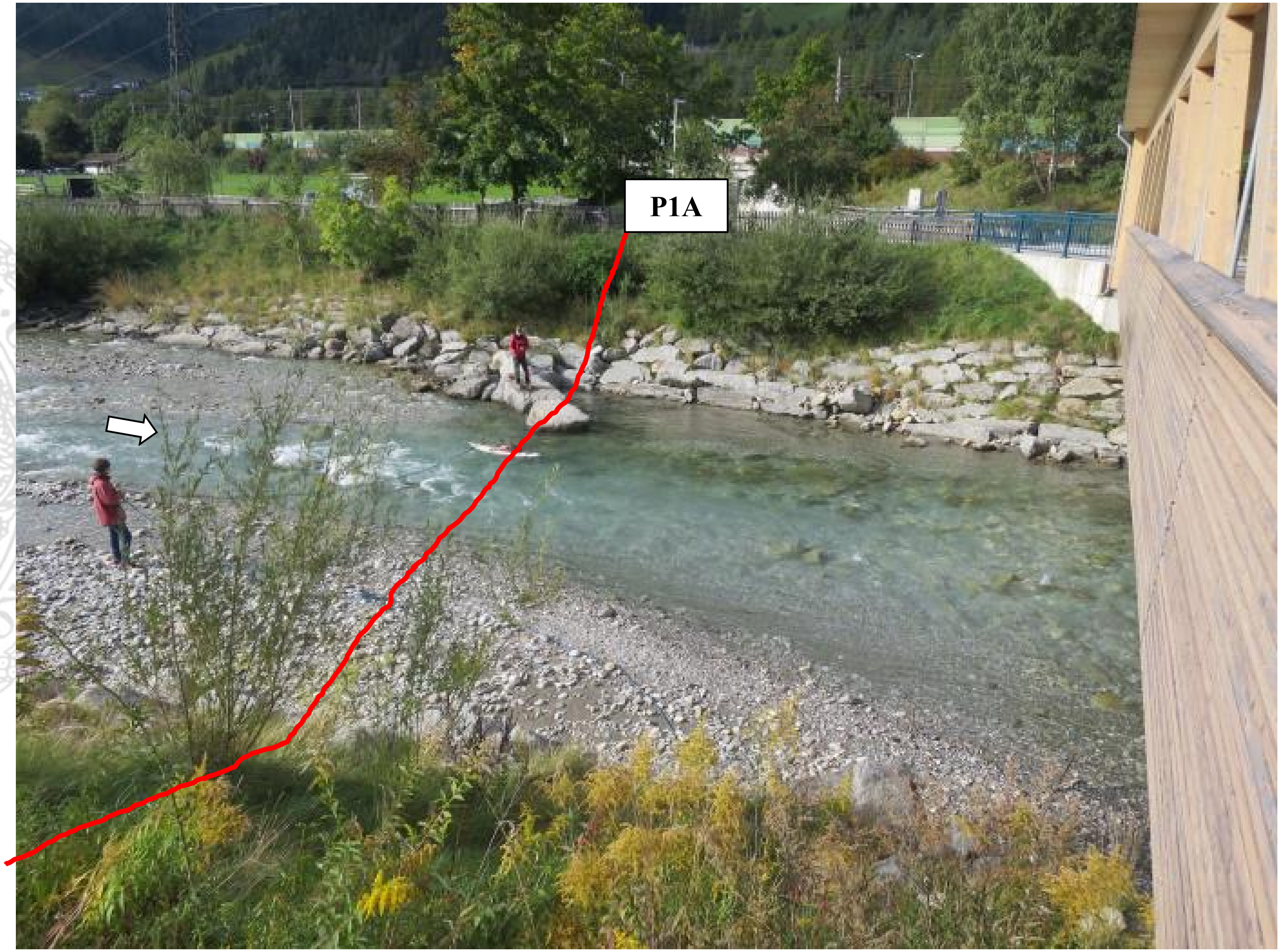
water levels



flow velocities

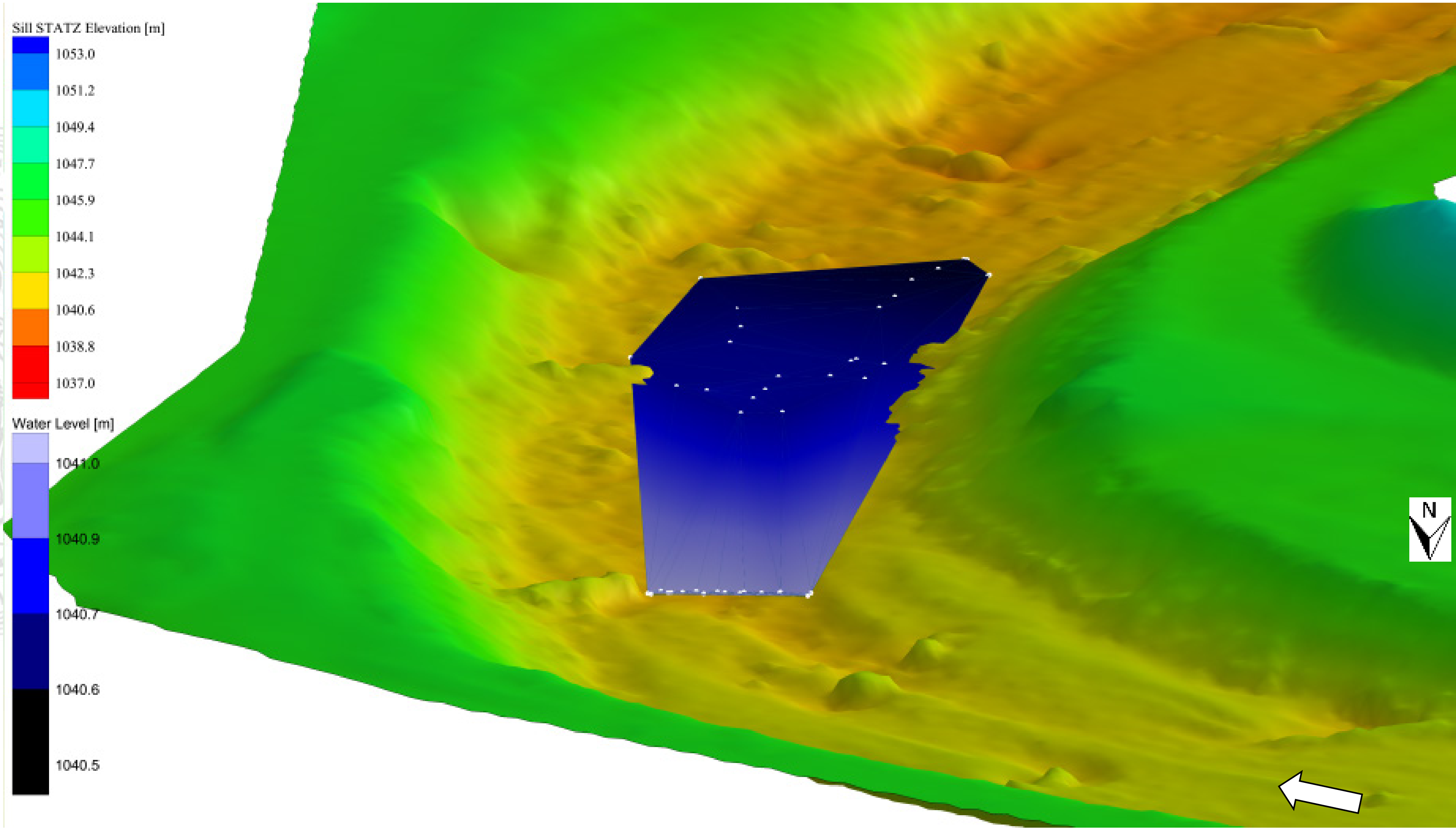


Field observations



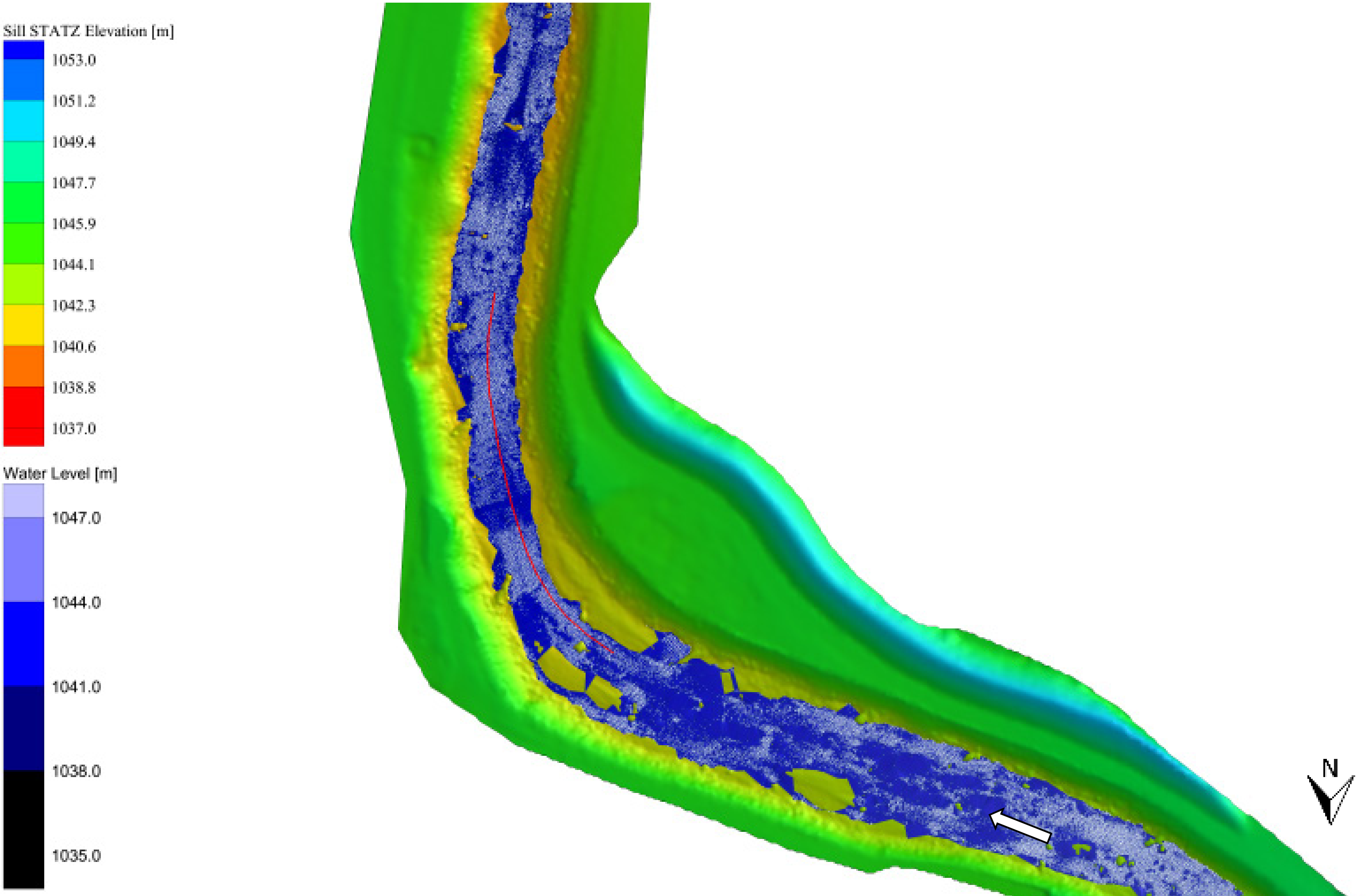
Field observations

Ie_measured = 0.007



AHM flight observations

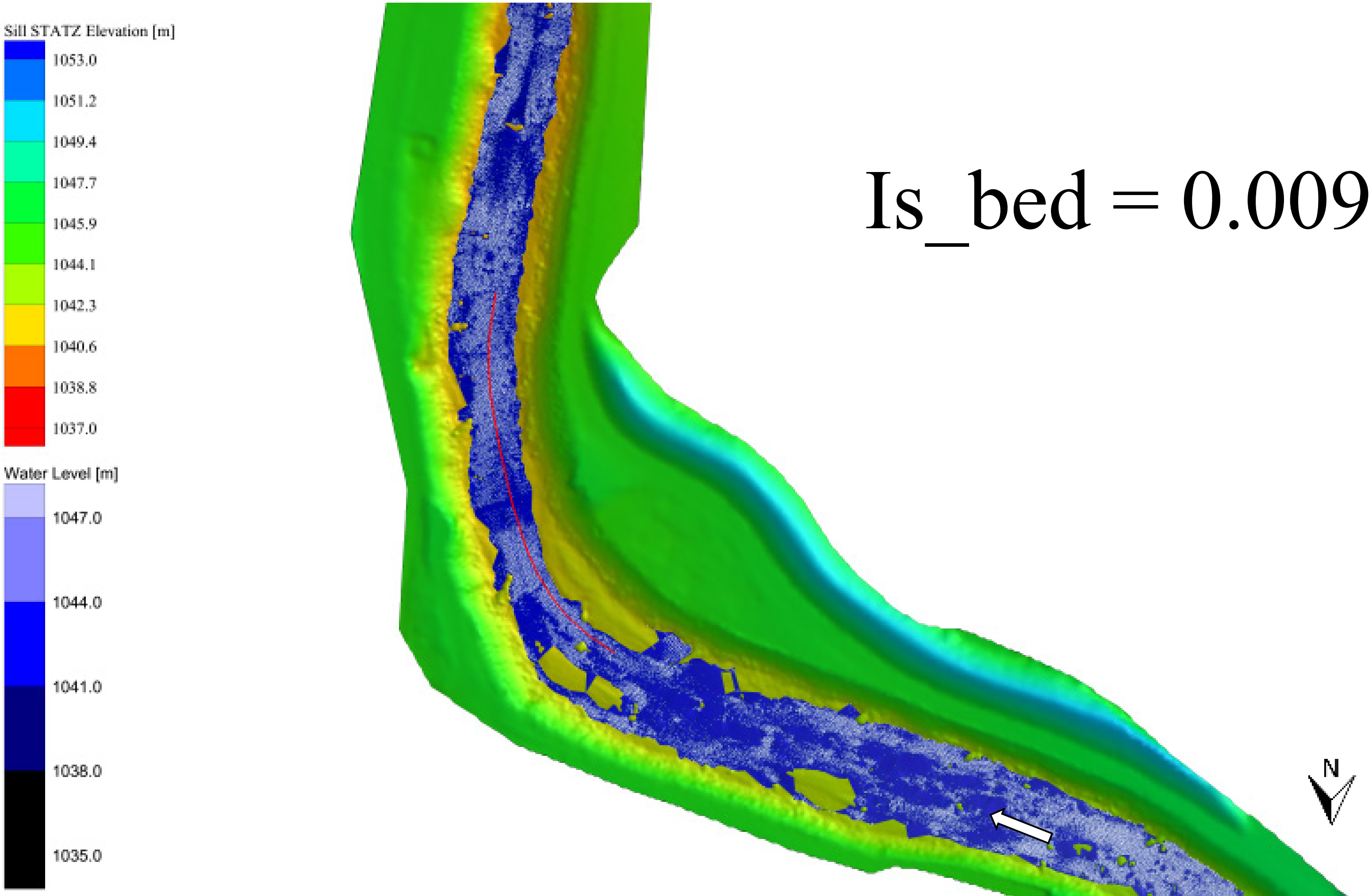
Ie_measured = 0.008



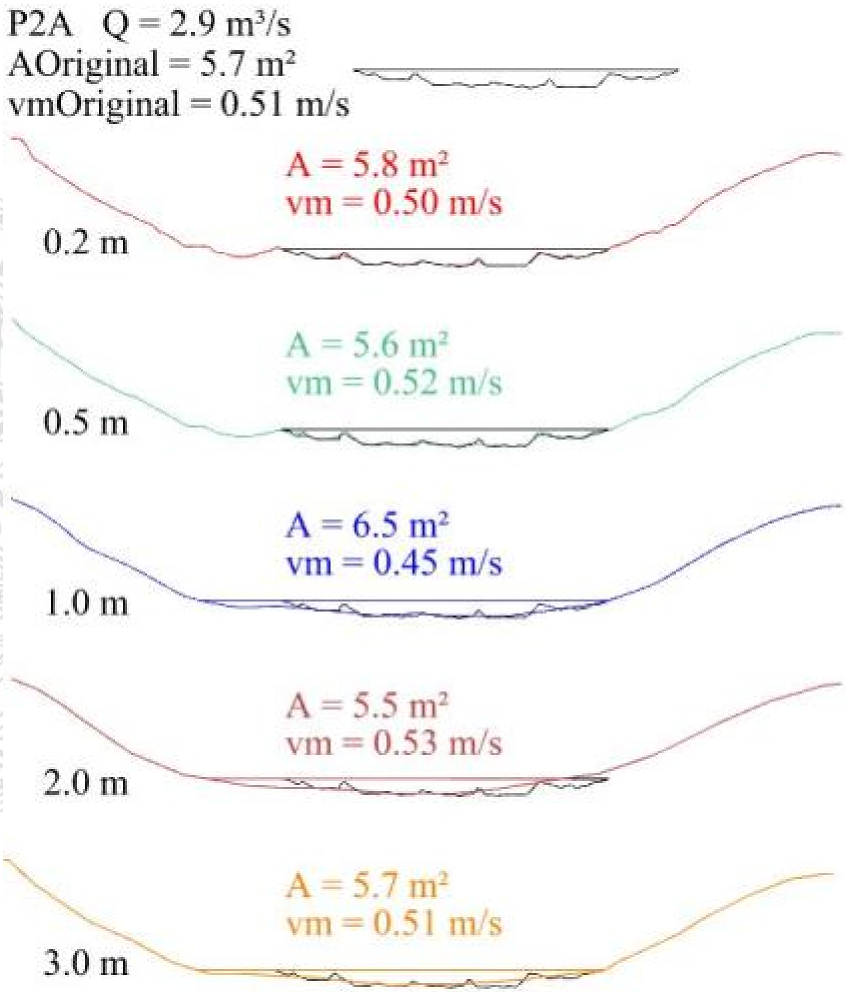
AHM flight observations

Ie_measured = 0.008

Is_bed = 0.009

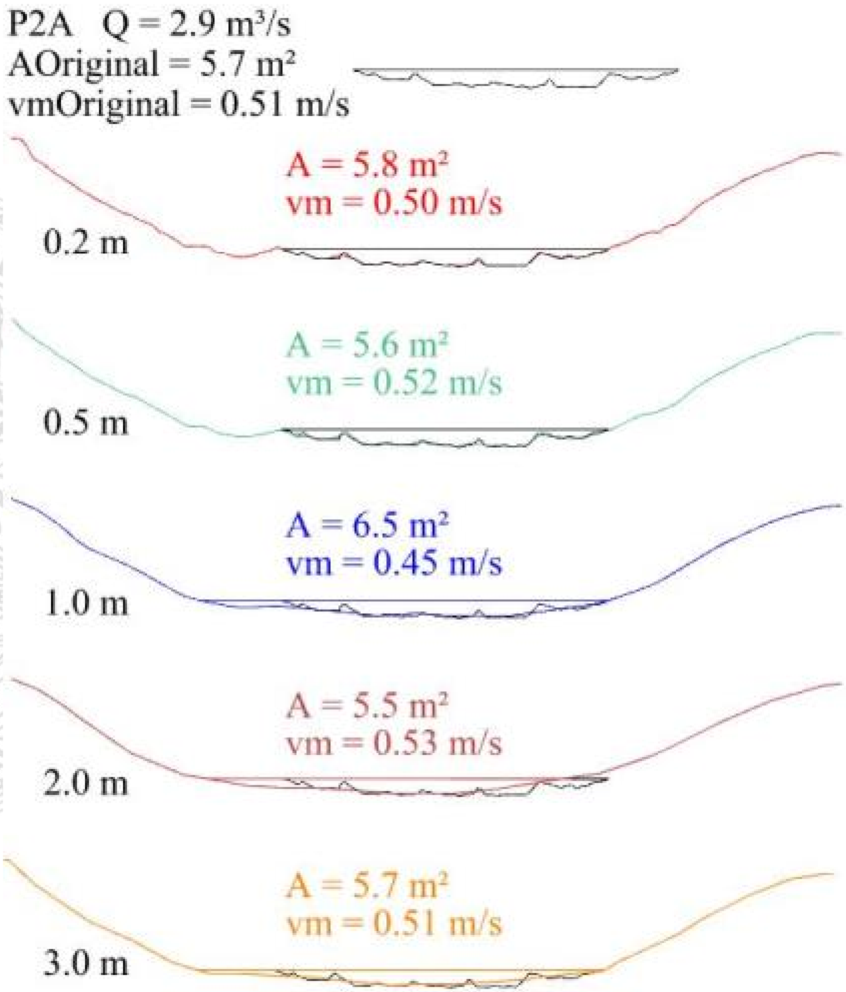


Conveying cross-sectional area



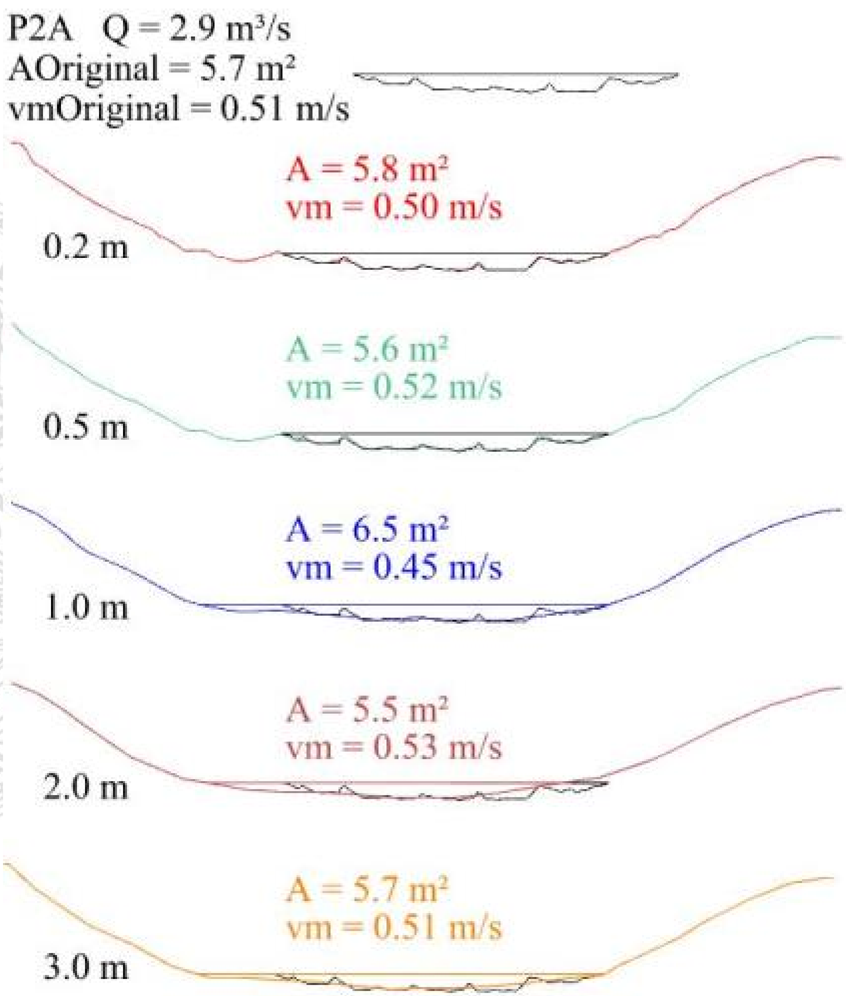
$$vm = kst * Rhy^{\frac{2}{3}} * Ie^{1/2}$$

$$vm = kst * Rhy^{\frac{2}{3}} * Ie^{1/2}$$



Ie = 0.007

$$vm = kst * Rhy^{\frac{2}{3}} * Ie^{1/2}$$

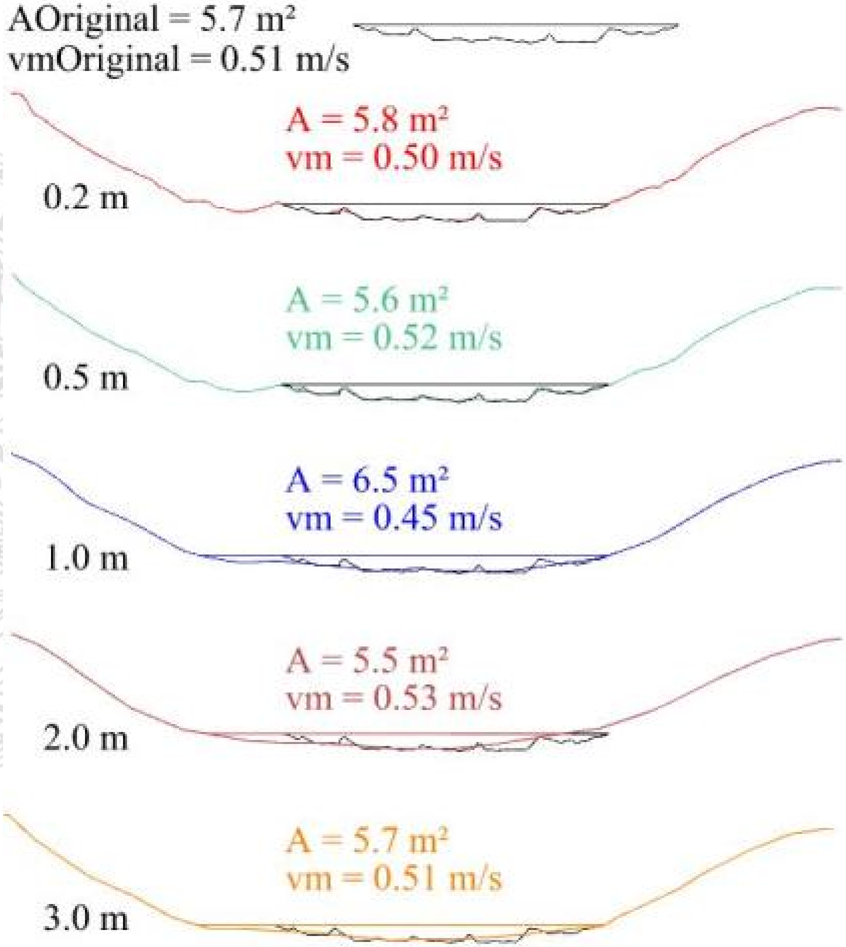


$Ie = 0.007$

$$vm = kst * Rhy^{\frac{2}{3}} * Ie^{1/2}$$

$$kst = 11.1\ (m^{1/3}/s)$$

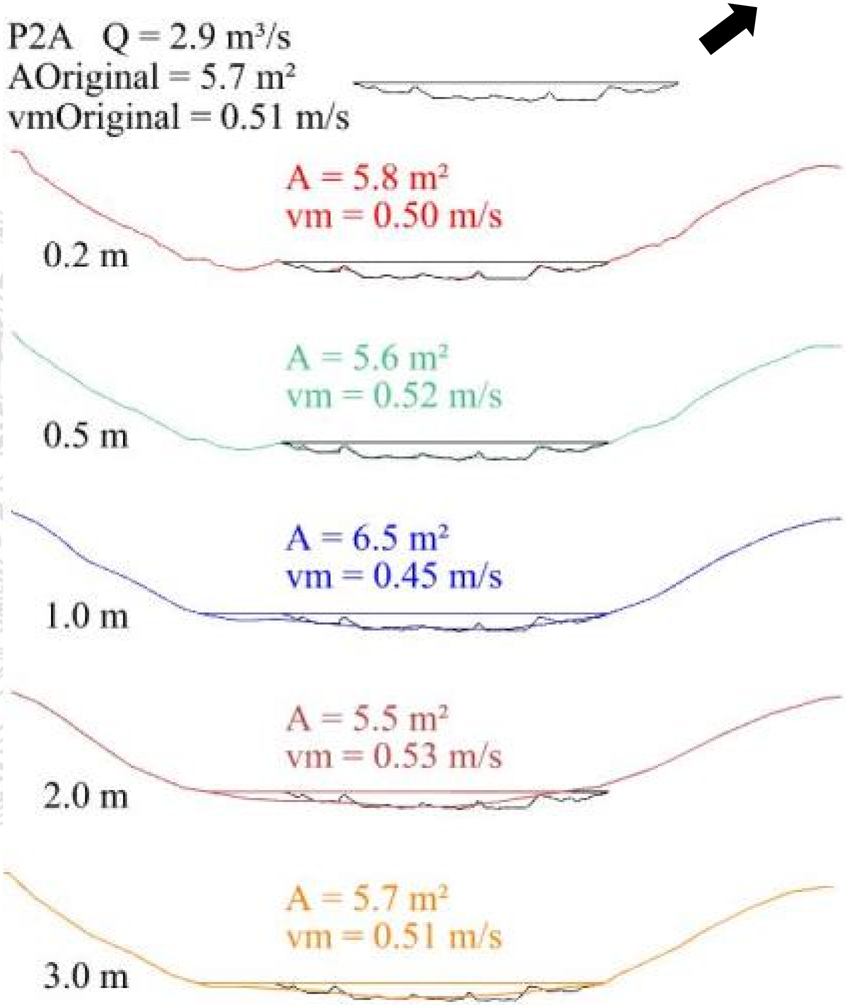
P2A Q = 2.9 m³/s
AOriginal = 5.7 m²
vmOriginal = 0.51 m/s



$$Ie = 0.007$$

$$vm = kst * Rhy^{\frac{2}{3}} * Ie^{1/2}$$

$$kst = 11.1\ (m^{1/3}/s)$$



$kst = 10.7\ (m^{1/3}/s)$

$kst = 11.0\ (m^{1/3}/s)$

$kst = 10.0\ (m^{1/3}/s)$

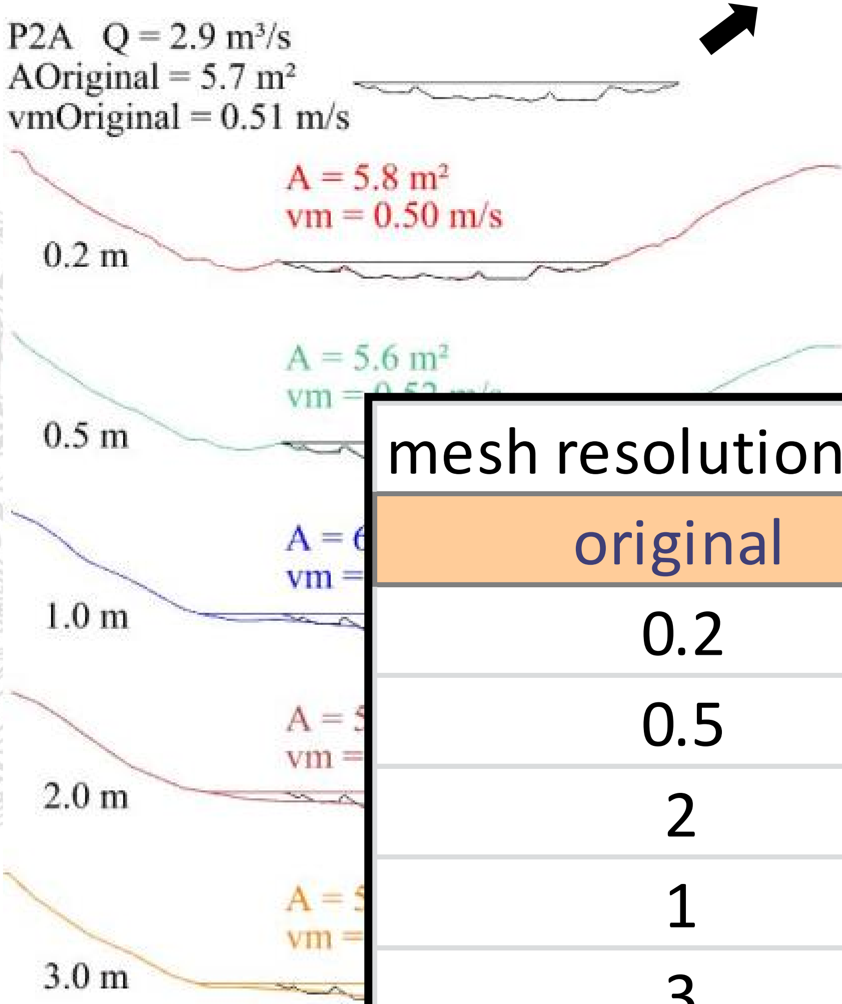
$kst = 12.0\ (m^{1/3}/s)$

$kst = 12.4\ (m^{1/3}/s)$

$$Ie = 0.007$$

$$vm = kst * Rhy^{\frac{2}{3}} * Ie^{1/2}$$

$$kst = 11.1\ (m^{1/3}/s)$$



$$kst = 10.7\ (m^{1/3}/s)$$

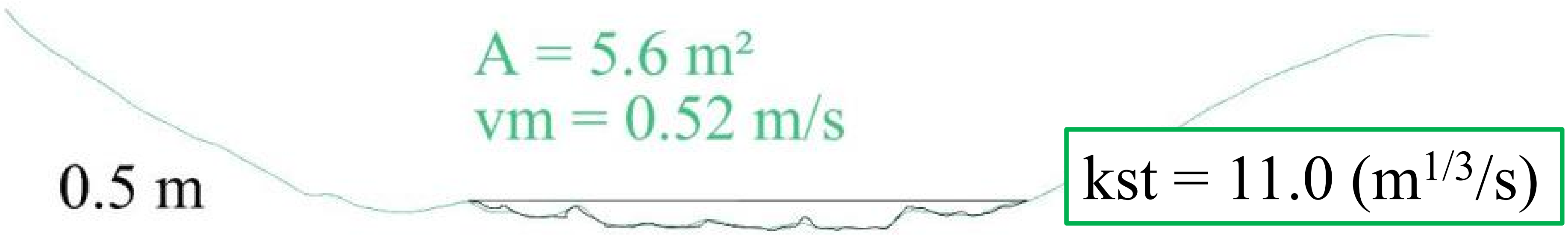
$$kst = 11.0\ (m^{1/3}/s)$$

mesh resolution [m]	hydraulic radius [m]
original	**0.40**
0.2	0.42
0.5	0.42
2	0.40
1	0.39
3	0.35

Choice of topographic representation

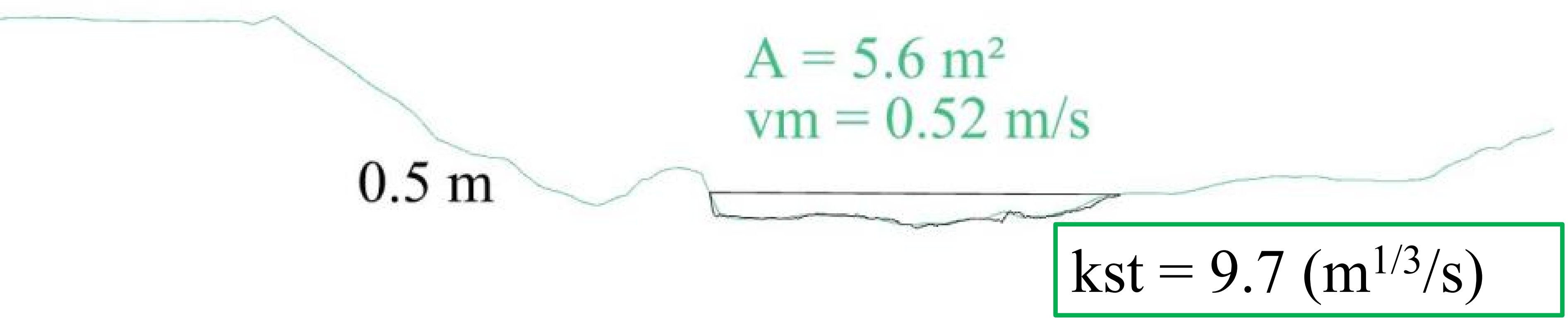
AOriginal = 5.7 m²
kstOriginal = 11.1 $(m^{1/3}/s)$
vmOriginal = 0.51 m/s

P2A

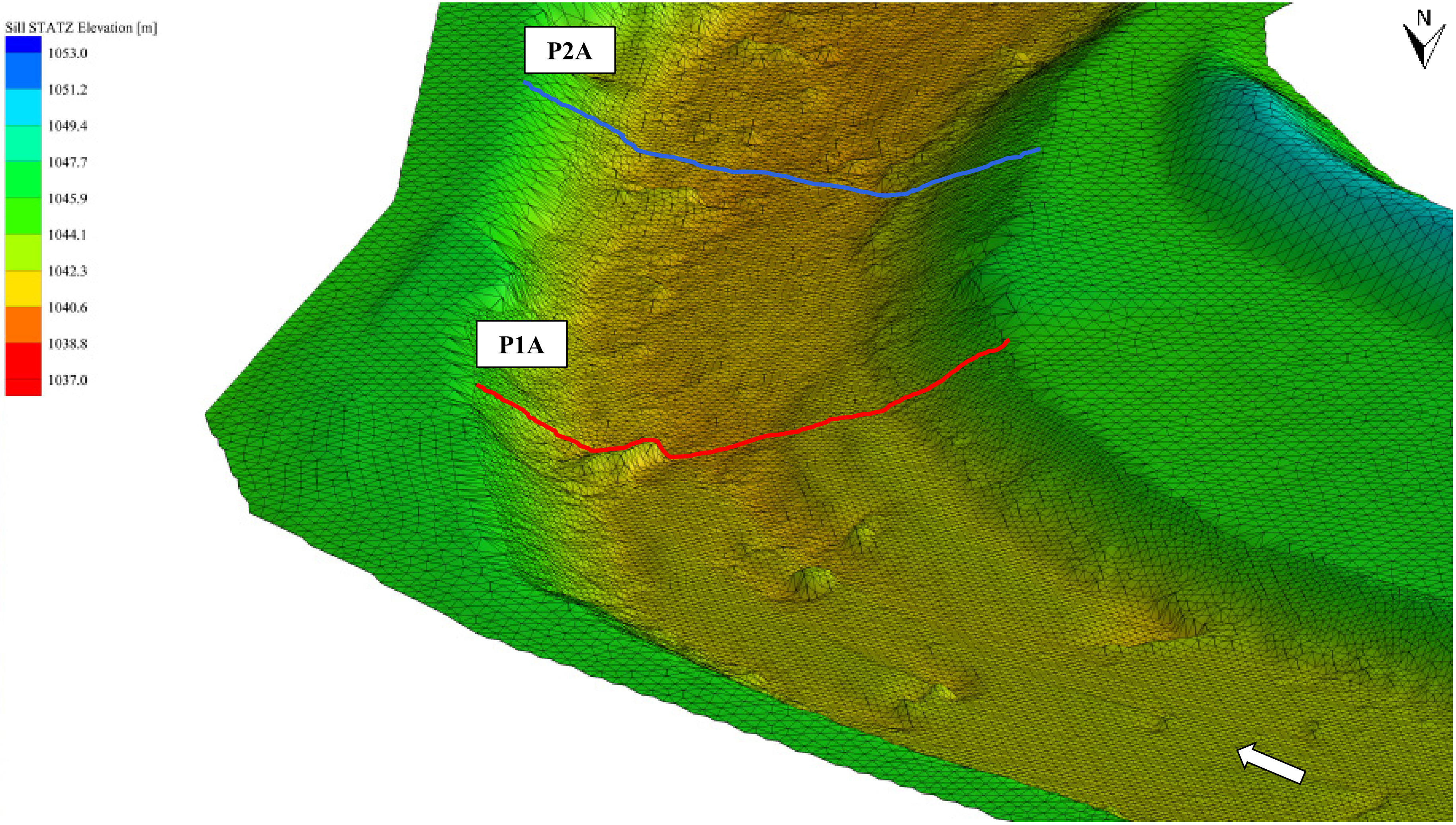


AOriginal = 5.8 m²
kstOriginal = 9.7 $(m^{1/3}/s)$
vmOriginal = 0.5 m/s

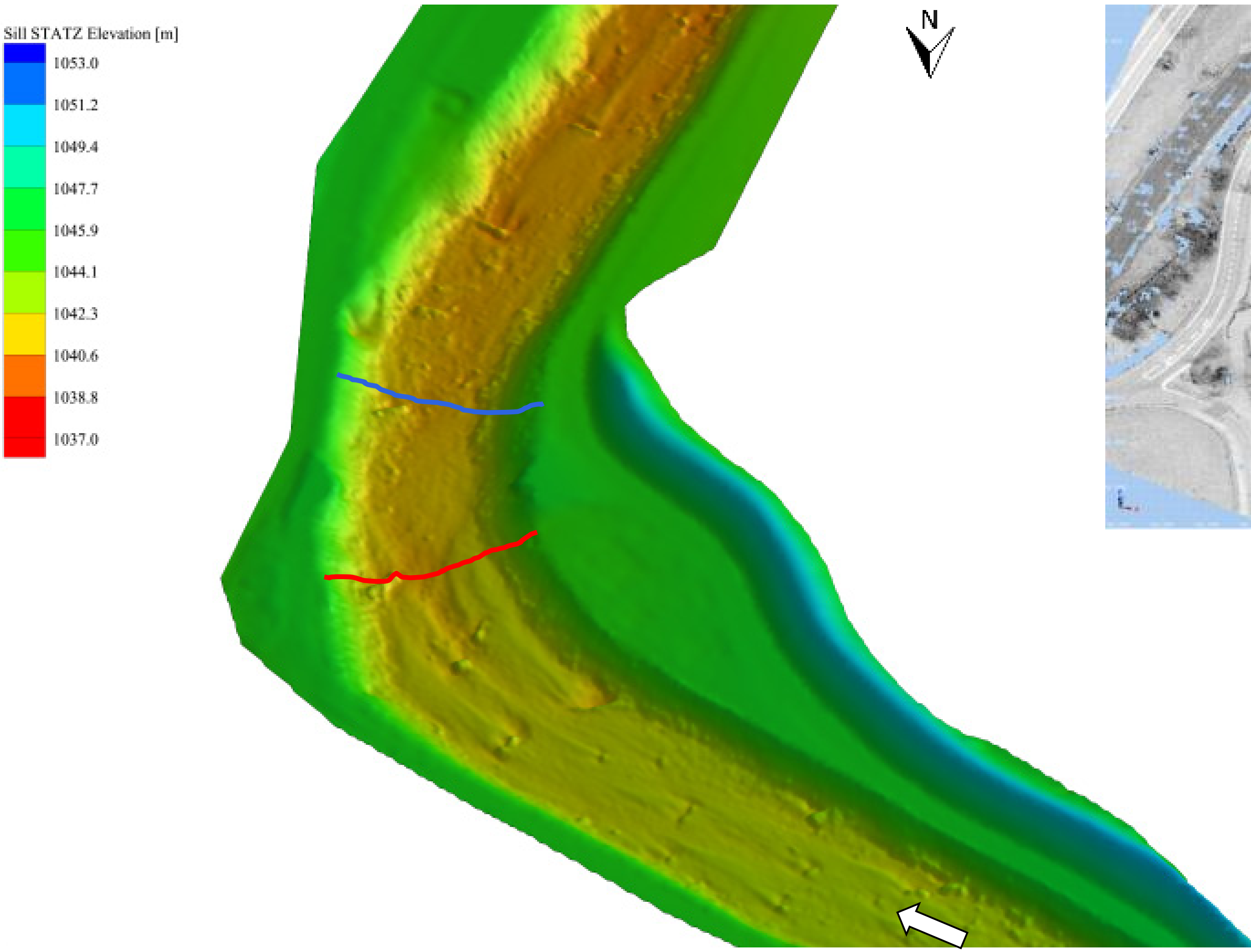
P1A

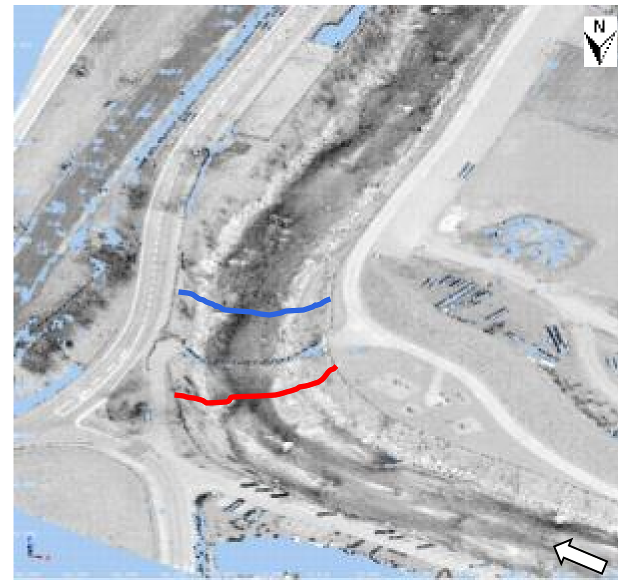


Computational mesh



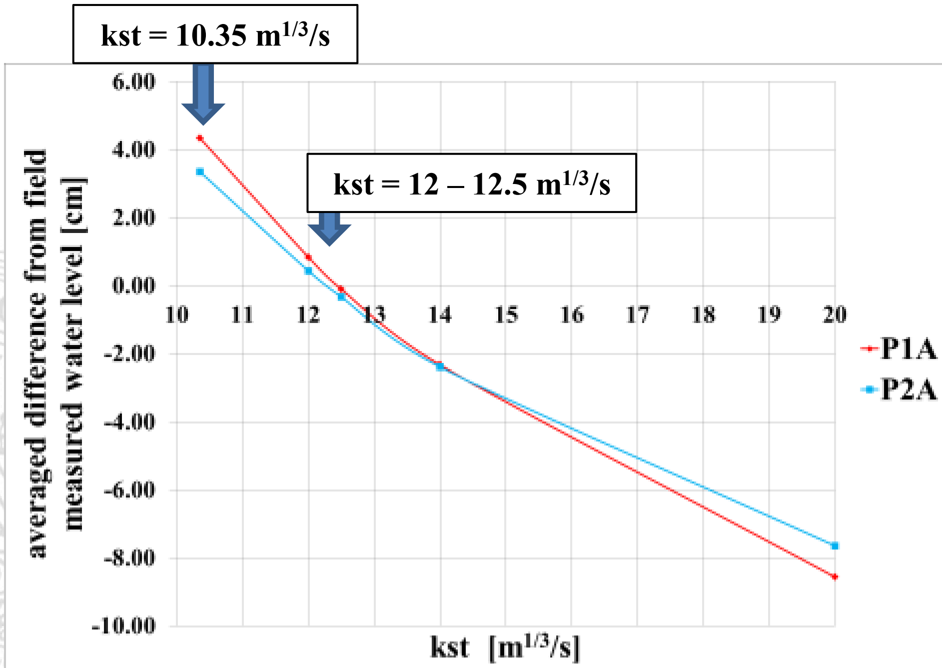
Computational mesh

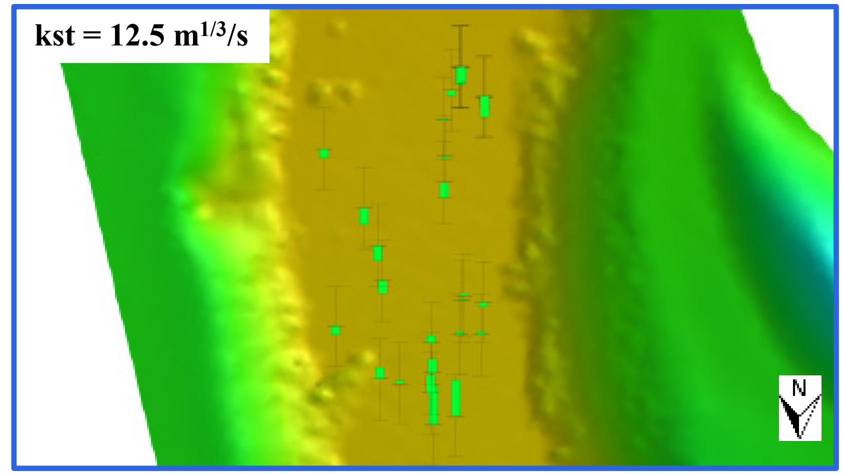


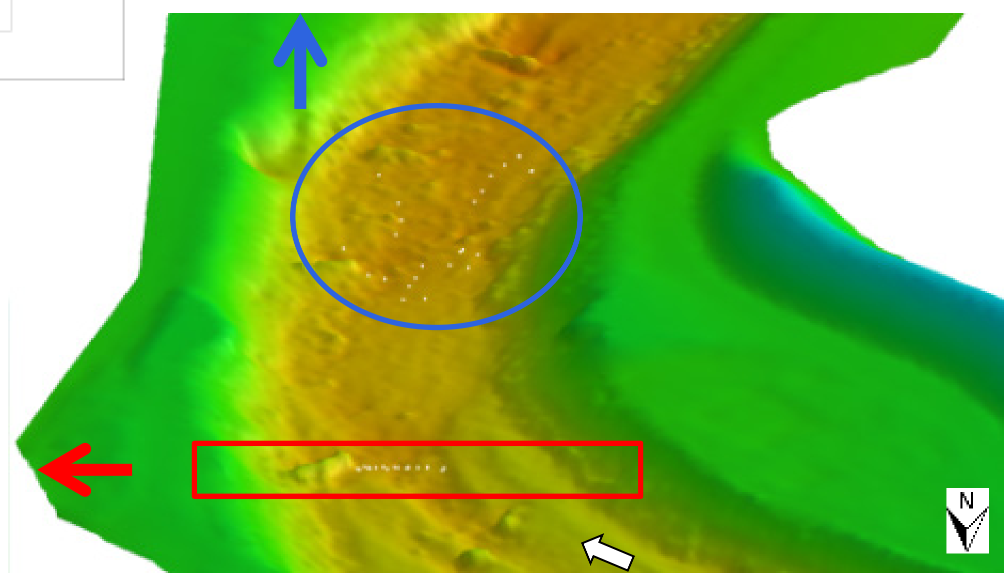


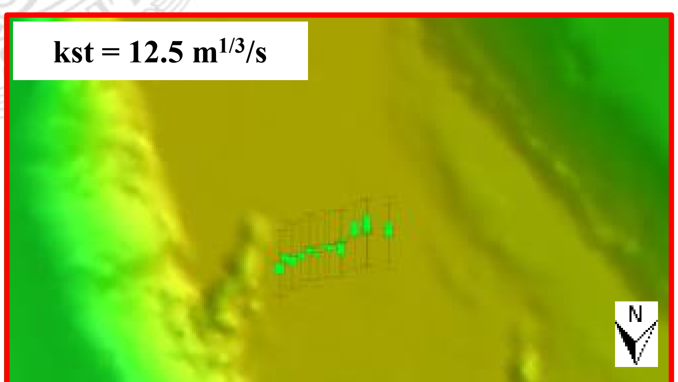
Calibration

Telemac 2D v7p0 FV

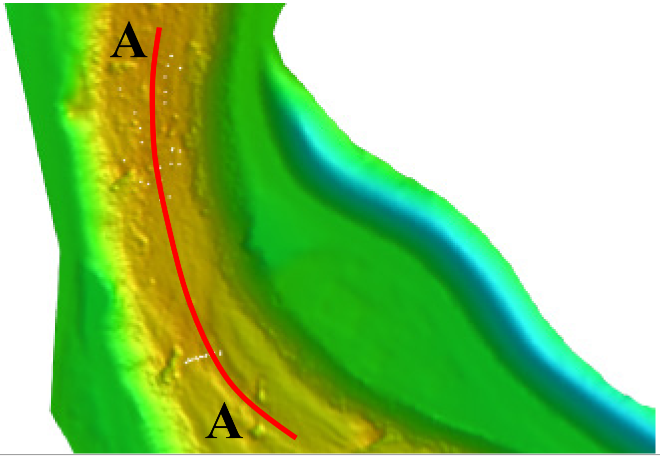


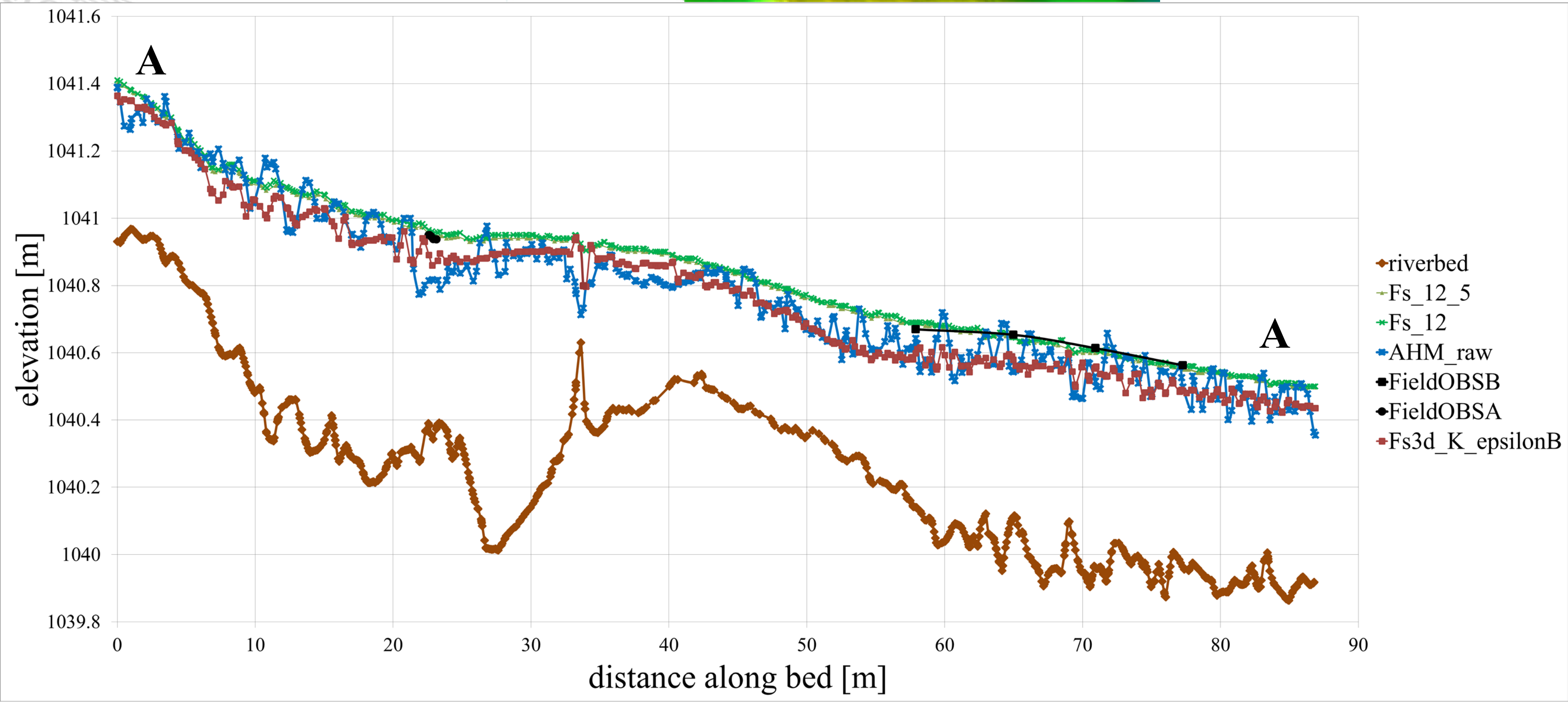




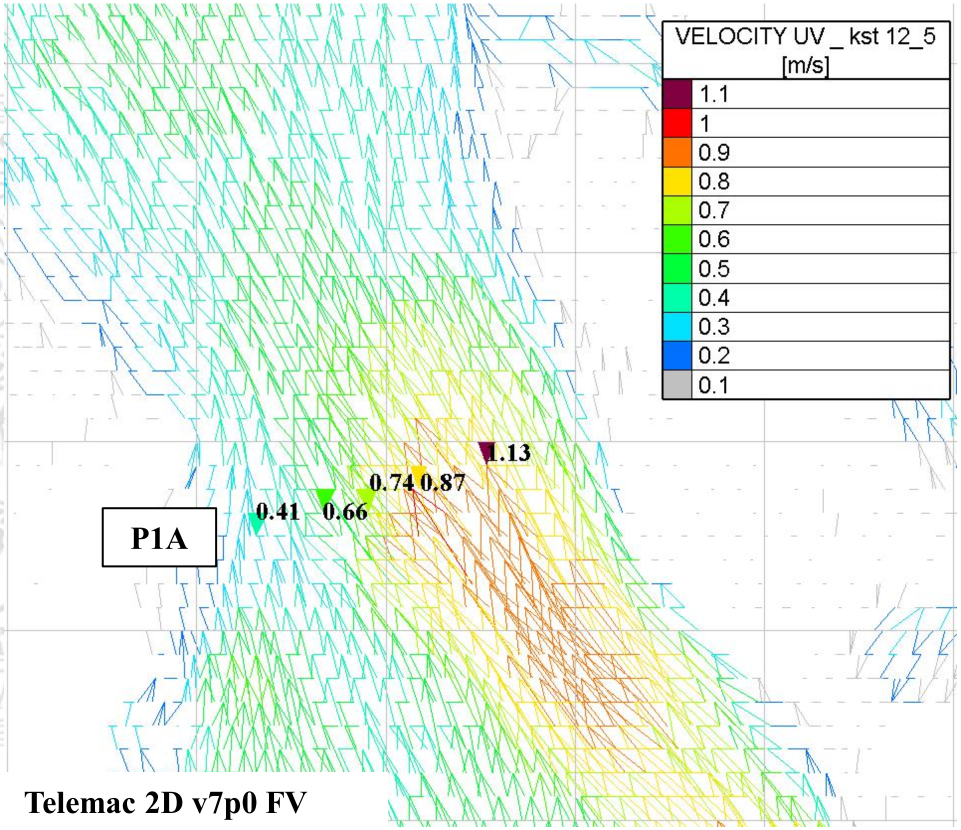


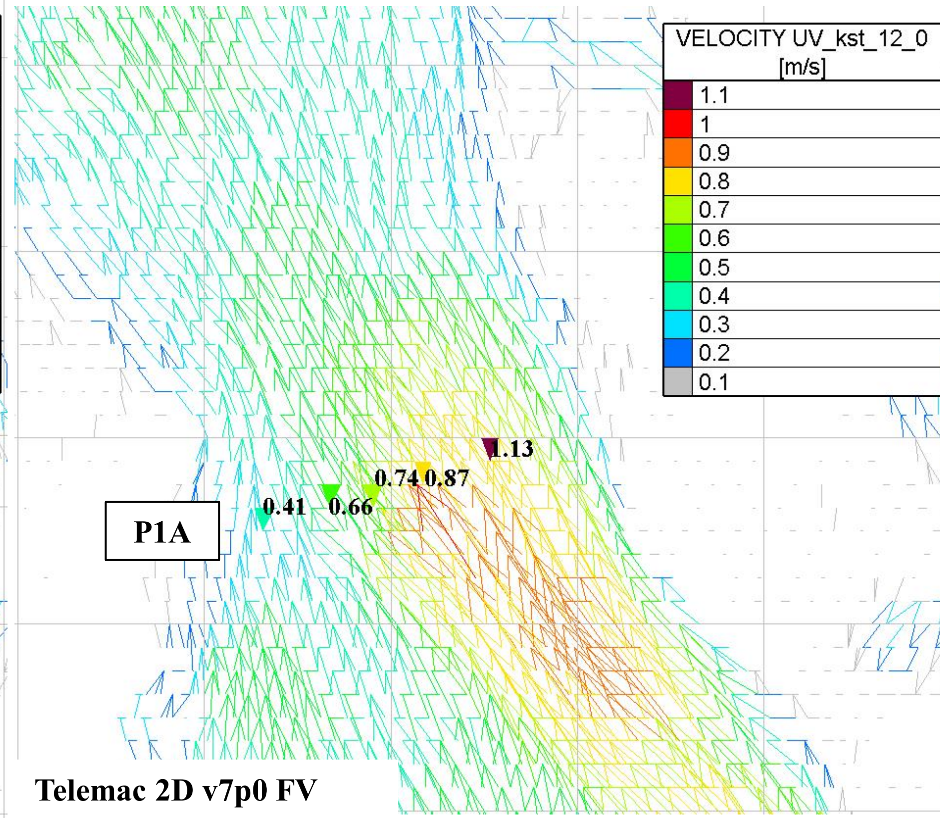
Free surface elevation





Depth-averaged velocities





Conclusions

Importance of consistency of cross-sectional area and hydraulic radius in model design

Relevance of comprehensive knowledge of the water surface elevation and its shape

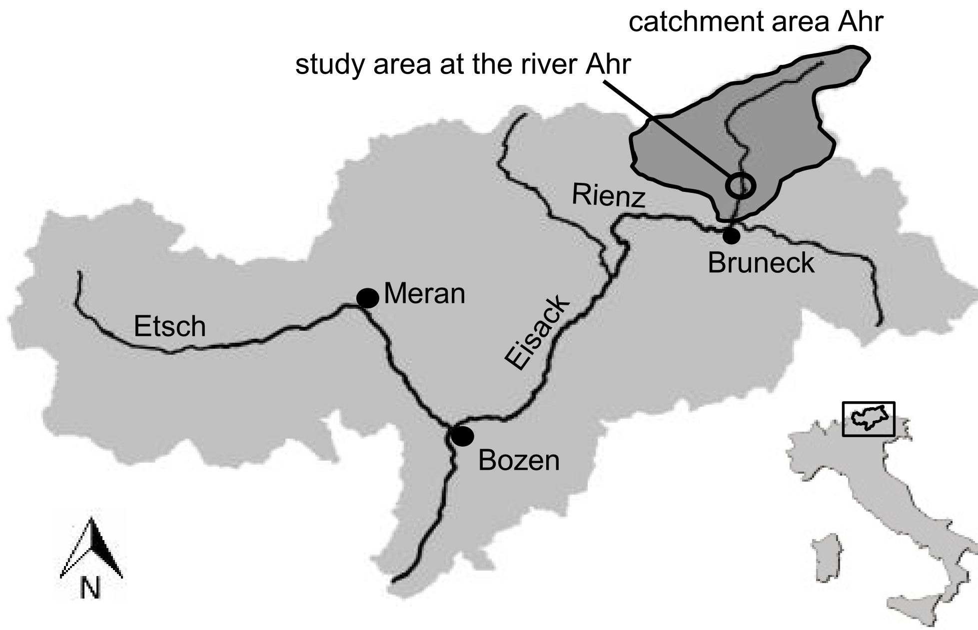
Hydraulic models: 1D roughness $\neq$ 2D roughness $\neq$ 3D roughness

Study area

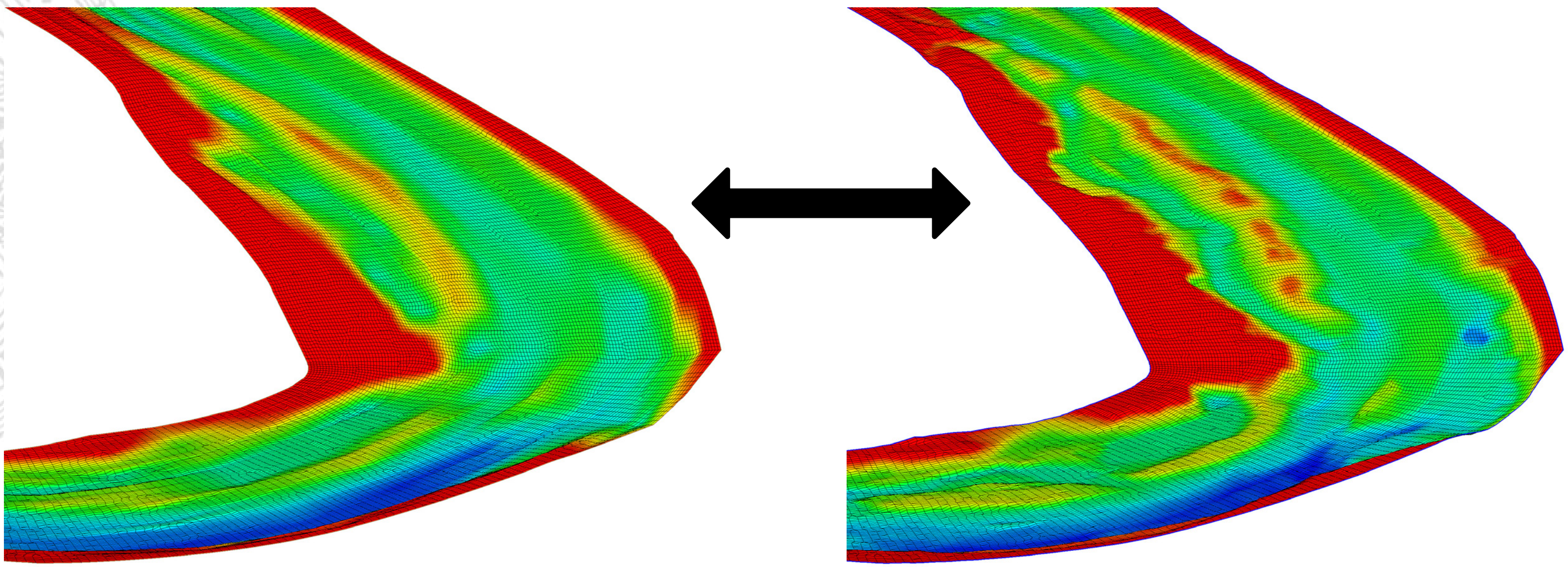
Ahr - Gatzaue

river width ca. 40 m

Average discharge (MQ) ca. 20 m³/s

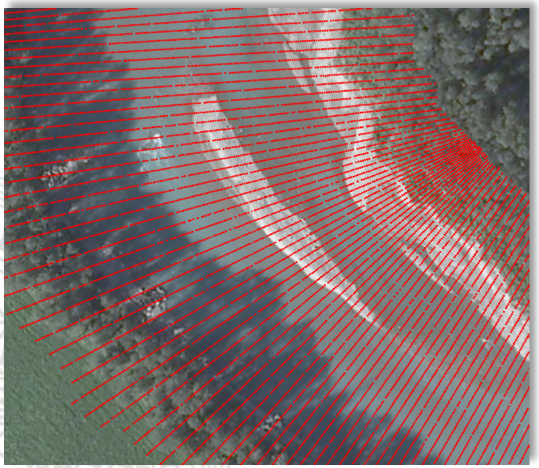


Quantifying the influence of the resolution of the river bed geometry on 2D numerical modelling results and the impacts on habitat modelling of running waters



Resolution

Survey data

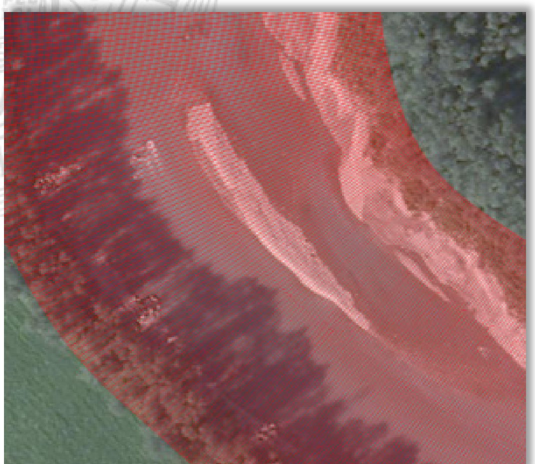


Cross sections 1-2m

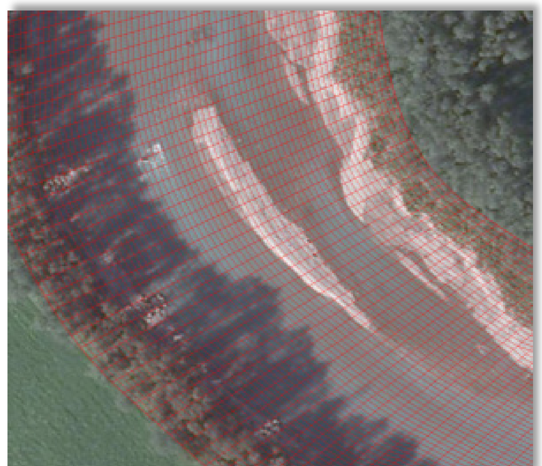
Cross sections 20m

Cross sections 40m

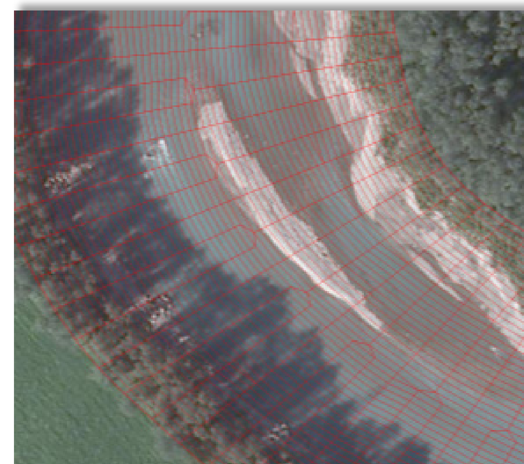
Calculation meshes



0.5 x 1 m



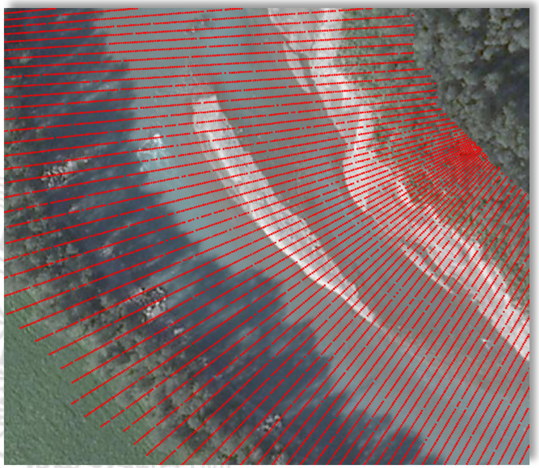
1 x 3 m



3 x 6 m

Resolution

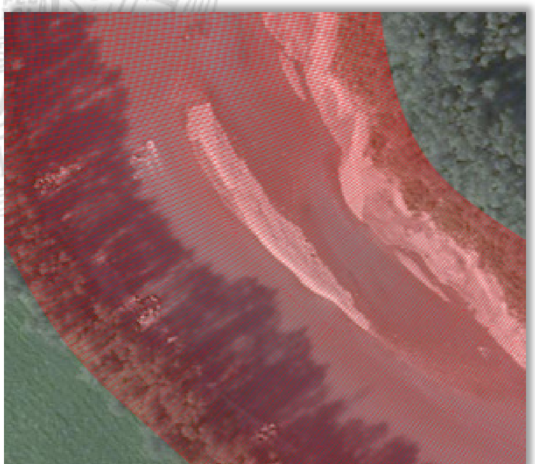
Referencemodel



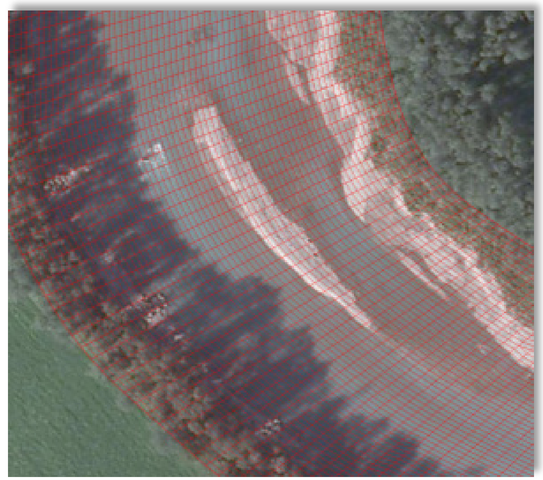
Cross sections 1-2m

Cross sections 20m

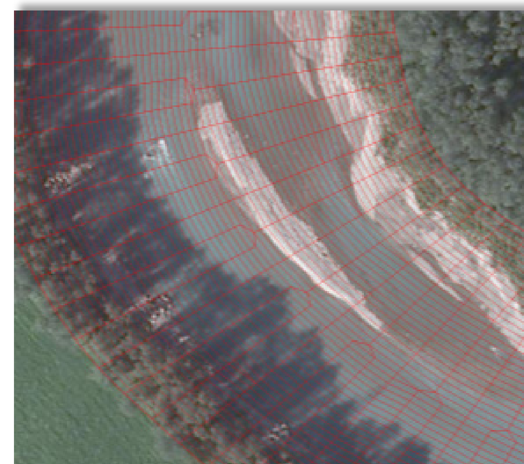
Cross sections 40m



0.5 x 1 m

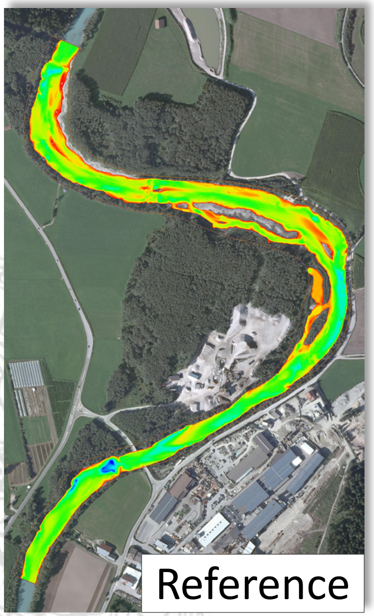


1 x 3 m

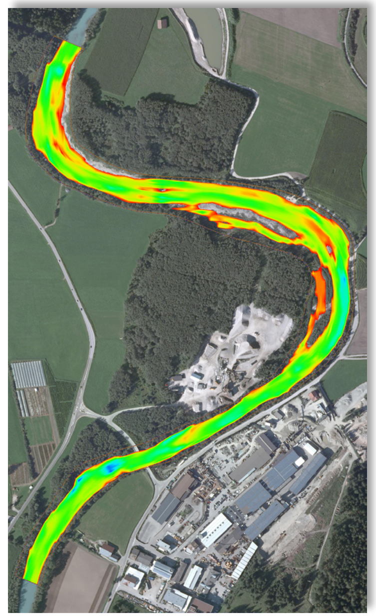


3 x 6 m

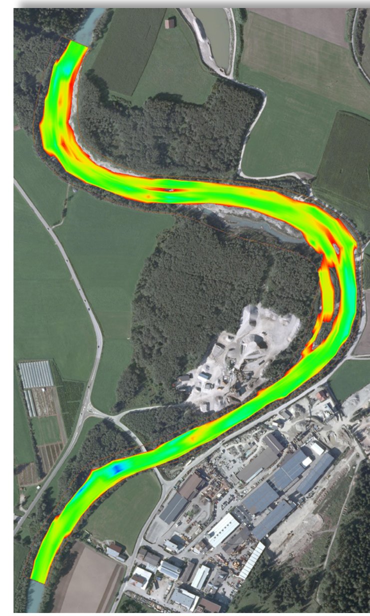
Waterdepth



QP02

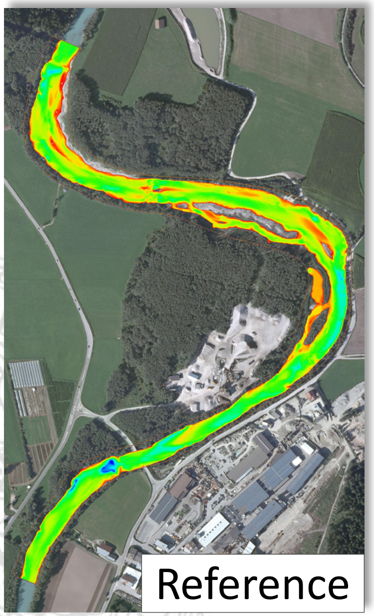


QP20



QP40

Waterdepth



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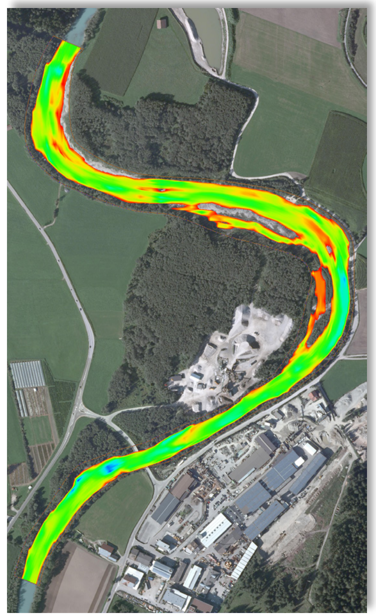

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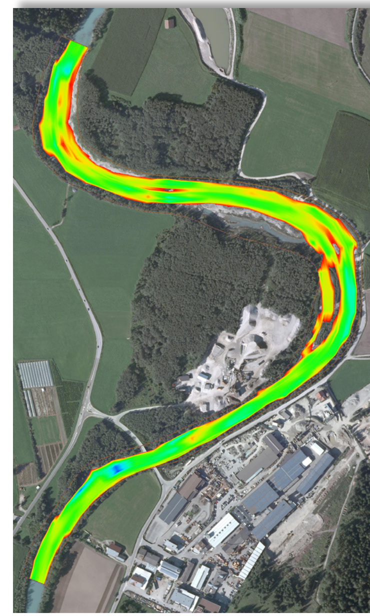

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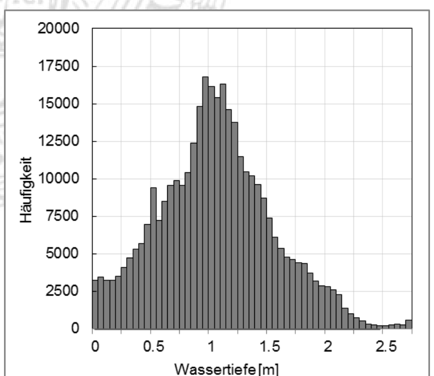
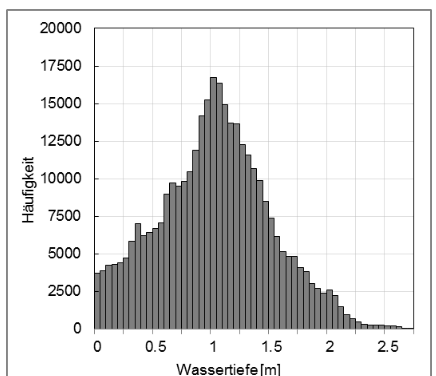
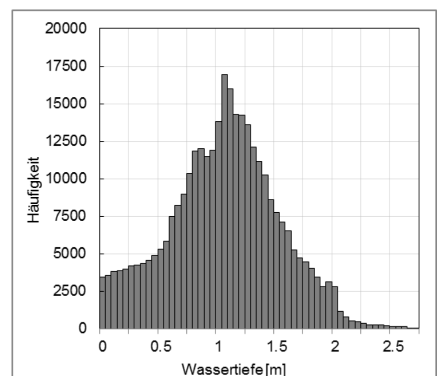
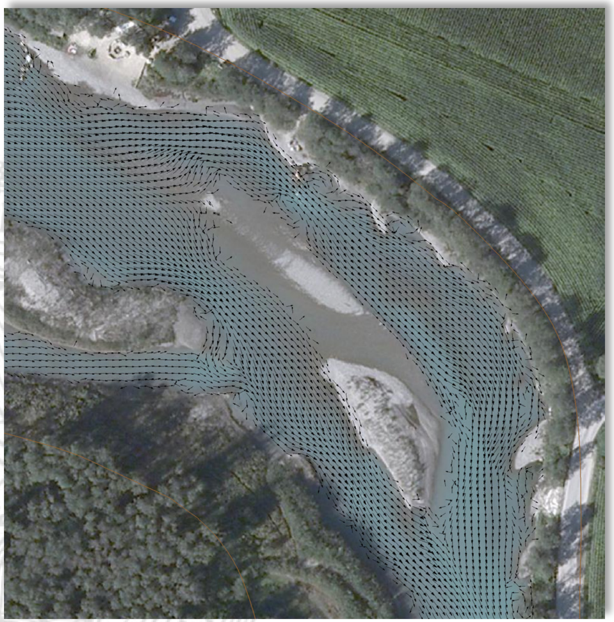


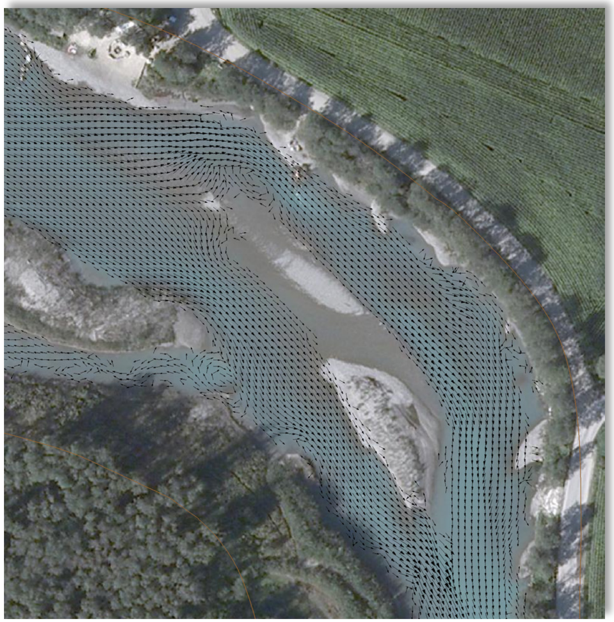




Flow velocity - Horizontal eddys



QP02



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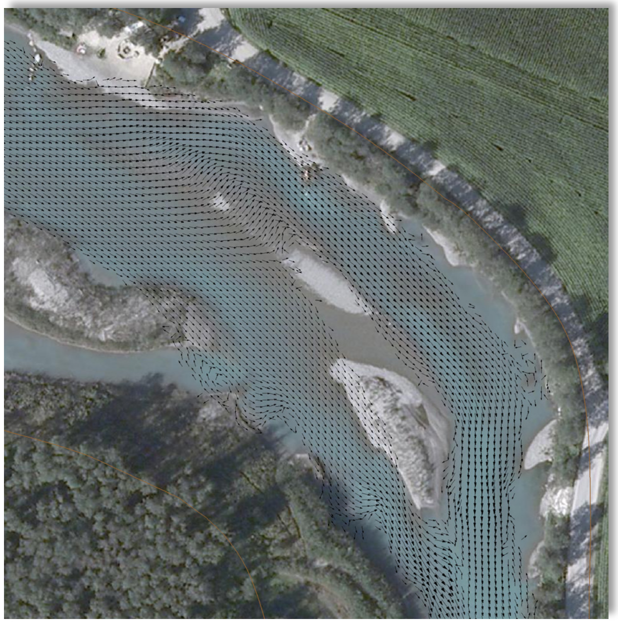


QP40

Investigations on habitat modelling

CASiMiR

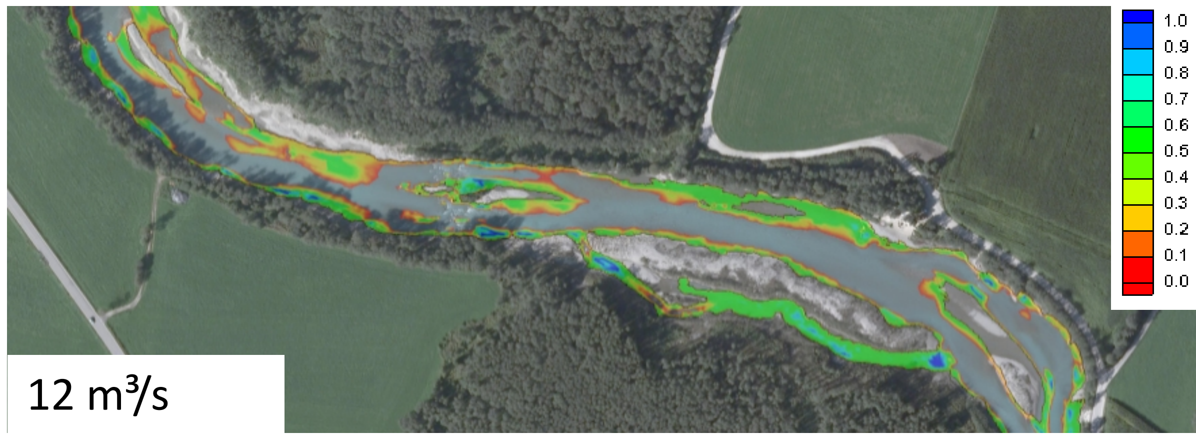
Computer Aided Simulation Model for Instream Flow and Riparia

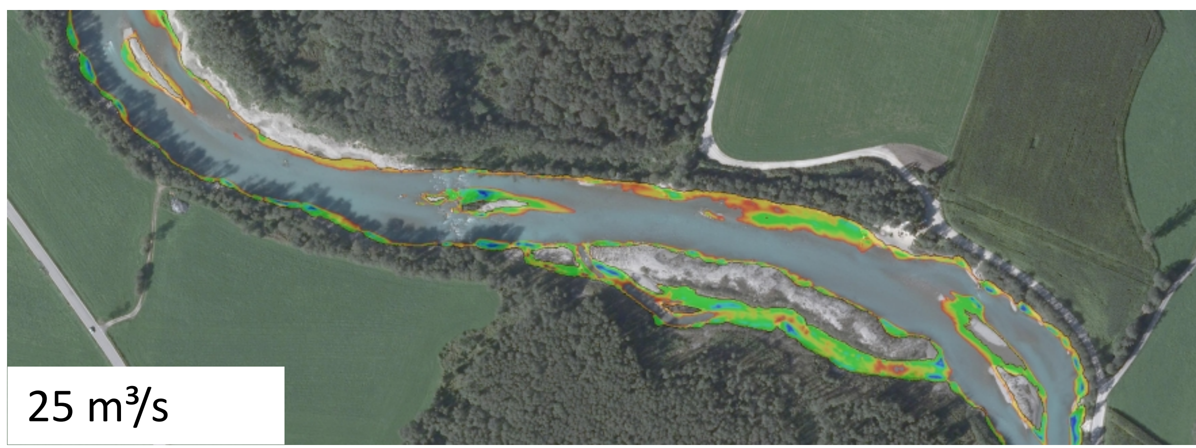
Grayling - Thymallus thymallus

Distribution of habitat suitability

juvenile grayling

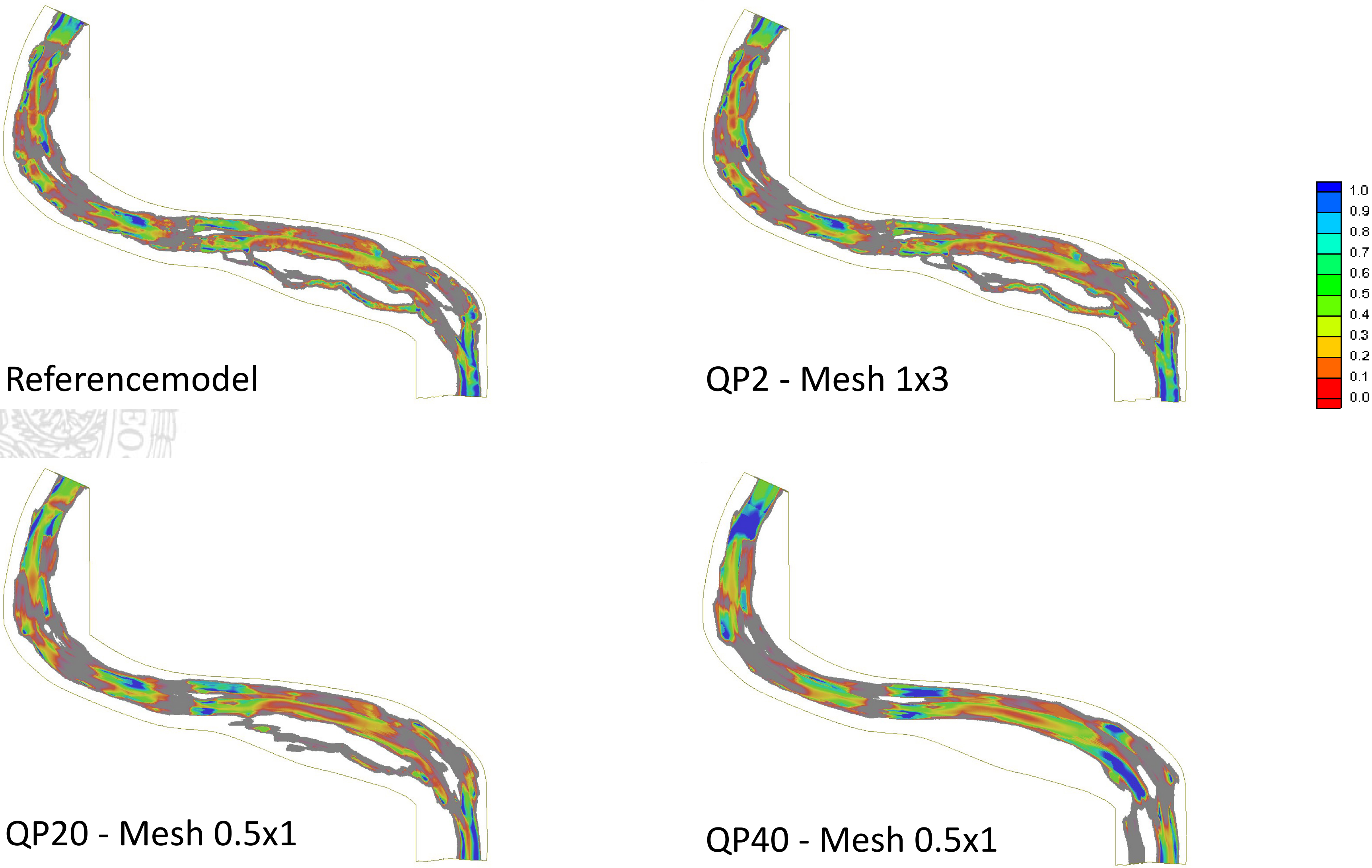
Referencemodel





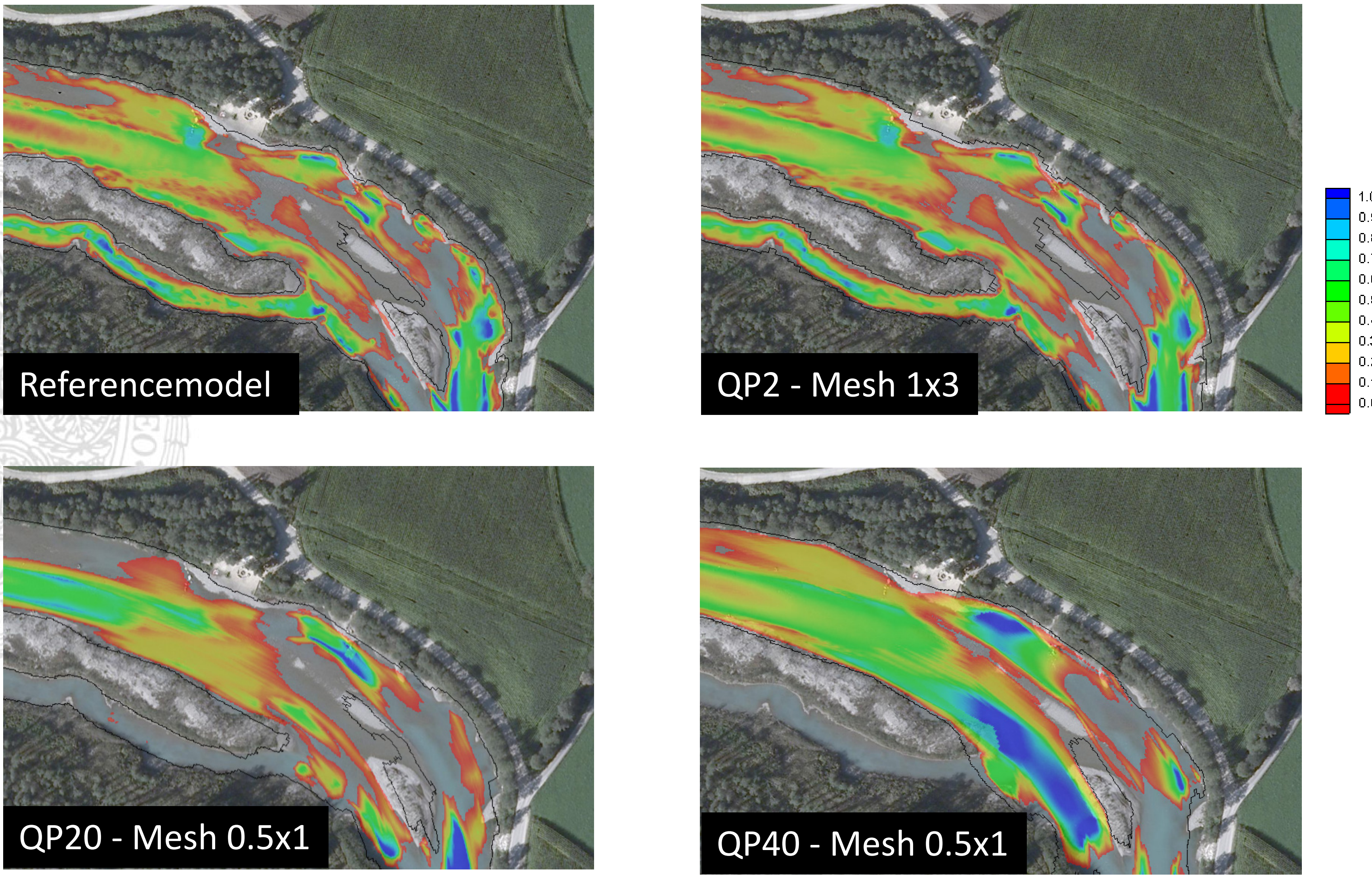
Investigations on habitat modelling

Distribution of habitat suitability   adult grayling   25m³/s



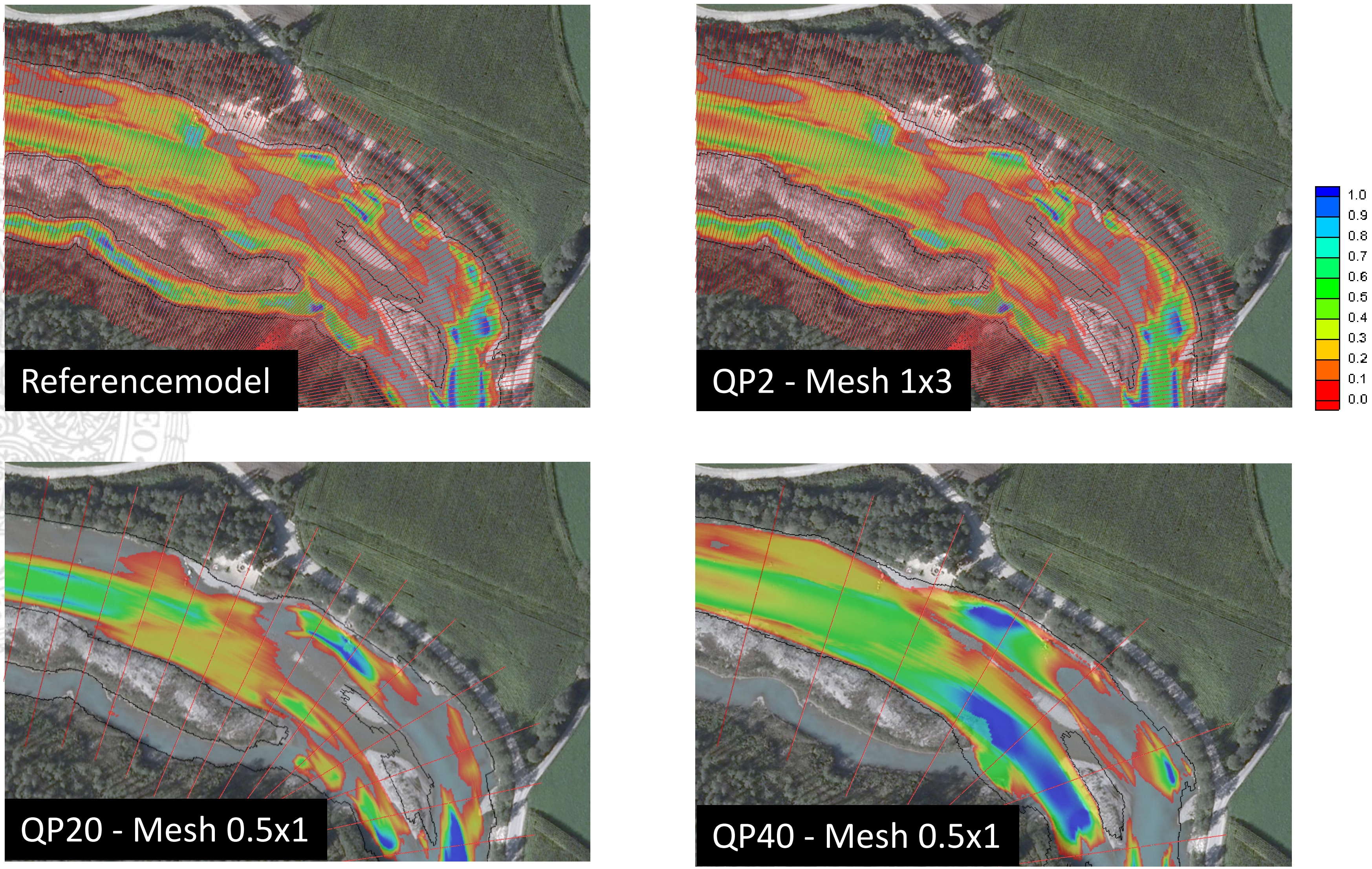
Investigations on habitat modelling

Distribution of habitat suitability adult grayling 25m³/s



Investigations on habitat modelling

Distribution of habitat suitability adult grayling $25m^3/s$



Danke für die Aufmerksamkeit