

## Gewässervermessung aus der Luft

# Untersuchungen zum Einsatz hochauflösender Bathymetriedaten in der 2D-Abflusssimulation am Beispiel eines alpinen Kiesflusses

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# Untersuchungsgebiet

## Ahr - Gatzaue



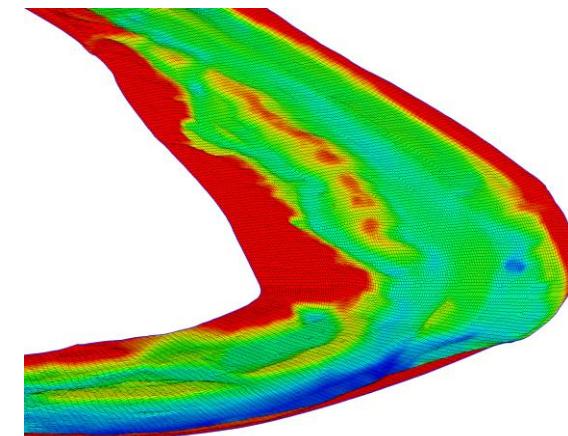
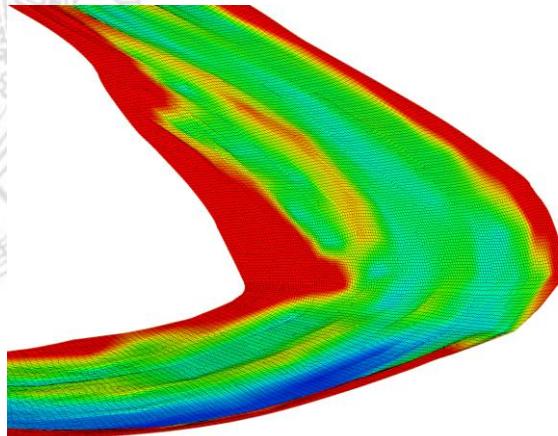
Gerinnebreite ca. 40 m

Mittlerer Abfluss (MQ) ca. 20 m<sup>3</sup>/s



# Quantifizierung des Einflusses der Abbildung der Gewässergeometrie auf Berechnungsergebnisse von 2D numerischen Simulationen

1. Einfluss der Auflösung der Vermessungsdaten
2. Einfluss der Auflösung des Berechnungsnetzes



## Auflösung



## Vermessungsdaten



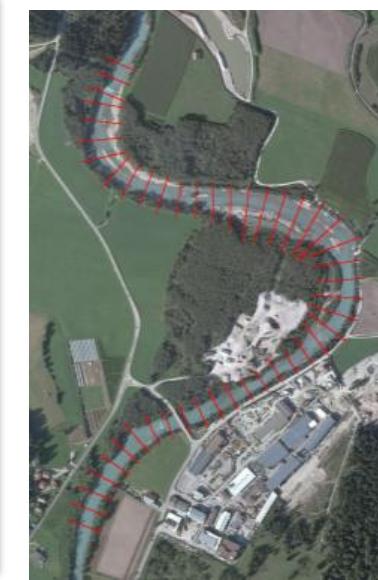
Querprofile 2m



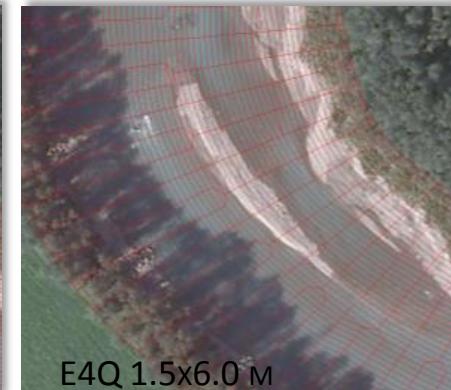
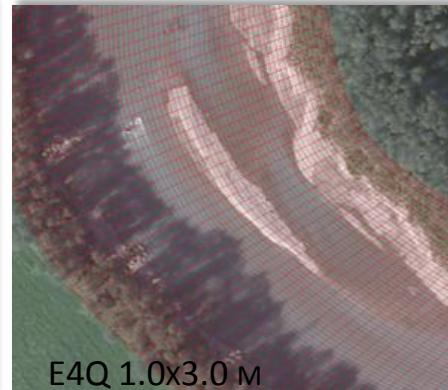
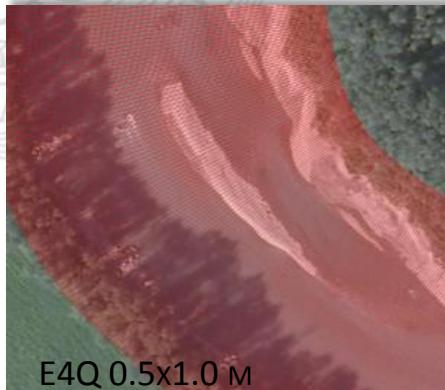
Querprofile 20m



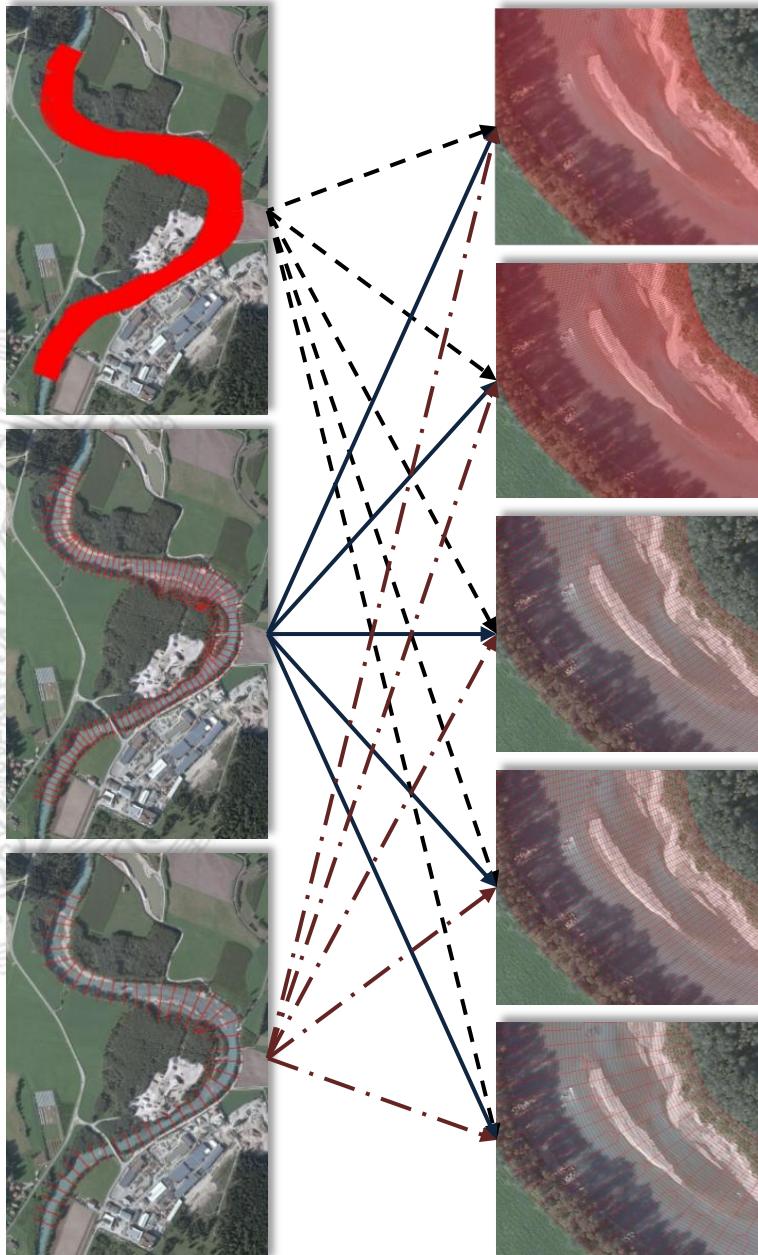
Querprofile 40m



## Berechnungsnetze

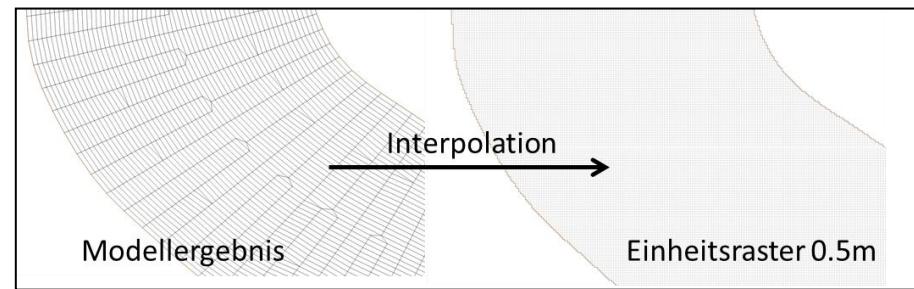


NETZ	ANZAHL ELEMENTE	ELEMENT GRÖSSE $\phi$
E4Q 0.5x1.0 m	231.189	0.6 m <sup>2</sup>
E4Q 0.5x1.0 m	115.145	1.1 m <sup>2</sup>
E4Q 1.0x3.0 m	38.896	3.3 m <sup>2</sup>
E4Q 1.5x4.0 m	19.546	6.6 m <sup>2</sup>
E4Q 1.5x6.0 m	13.720	9.5 m <sup>2</sup>



	E4Q 0.5x1.0 M	E4Q 0.5x2.0 M	E4Q 1.0x3.0 M	E4Q 1.5x4.0 M	E4Q 1.5x6.0 M
<b>CS02</b>	Sim model 1 (Referenz)	Sim model 2	Sim model 3	Sim model 4	Sim model 5
<b>CS20</b>	Sim model 6	Sim model 7	Sim model 8	Sim model 9	Sim model 10
<b>CS40</b>	Sim model 11	Simulation 12	Sim model 13	Sim model 14	Sim model 15

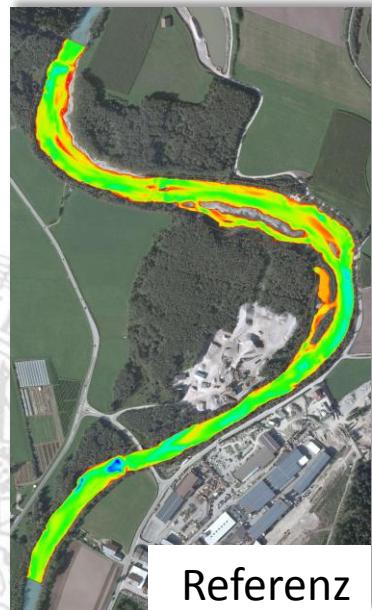
12 m<sup>3</sup>/s  
3 Abflüsse 40 m<sup>3</sup>/s  
64 m<sup>3</sup>/s



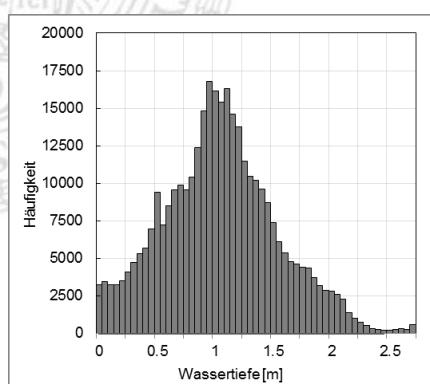
## Wassertiefen

64m<sup>3</sup>/s

E4Q 0.5x1.0



QP02

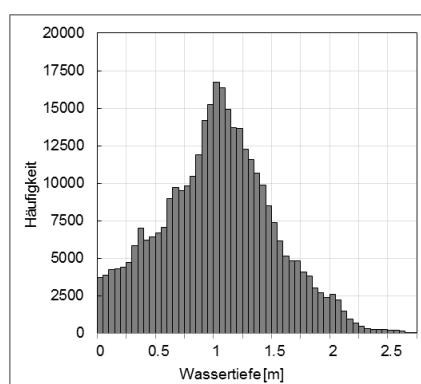


Mittlere Wassertiefe

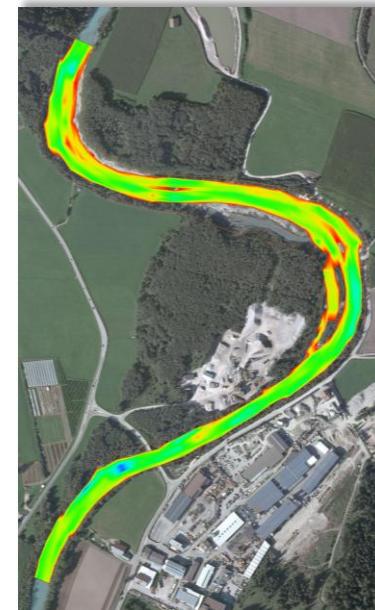
1.07 m



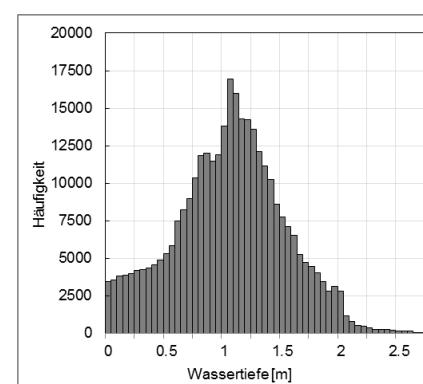
QP20



1.04 m



QP40

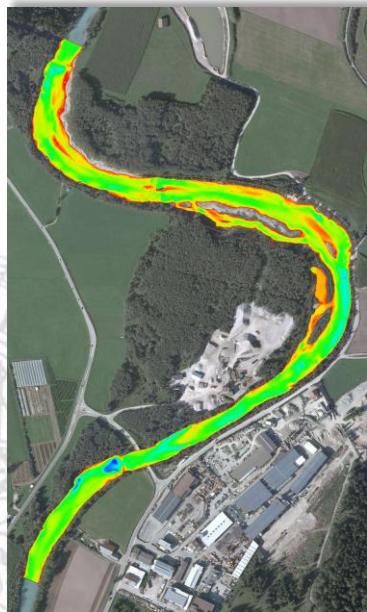


1.07 m

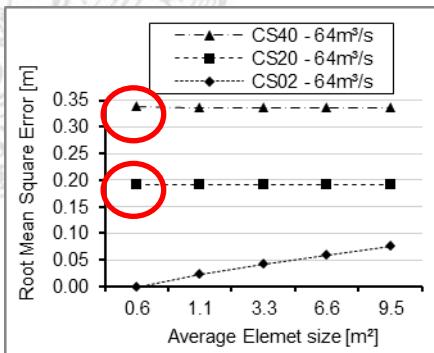
## Wassertiefen

64m<sup>3</sup>/s

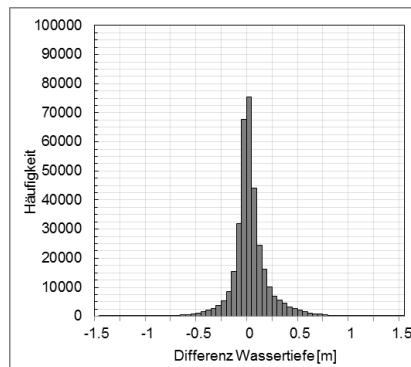
E4Q 0.5x1.0



QP02

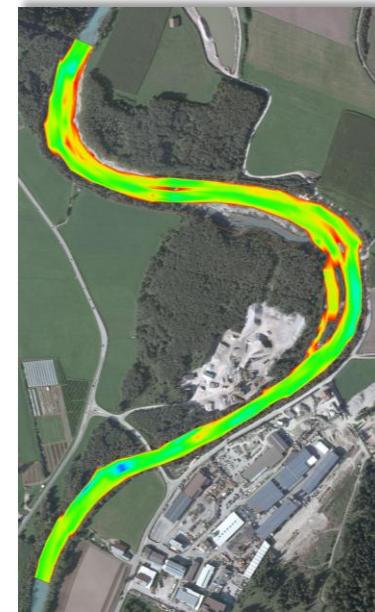


QP20

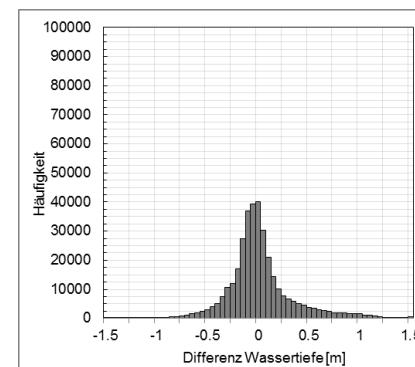


E4Q 0.5x1.0 - QP20 - 64m<sup>3</sup>/s

Mittelwert: 0.038 m +  $\sigma$   $\pm 0.19$  m



QP40



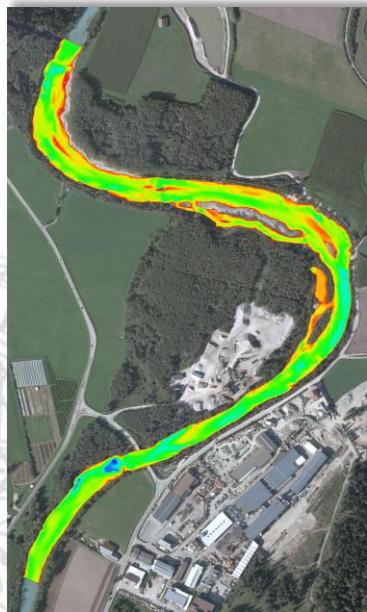
E4Q 0.5x1.0 - QP40 - 64m<sup>3</sup>/s

Mittelwert: 0.047 m +  $\sigma$   $\pm 0.33$  m

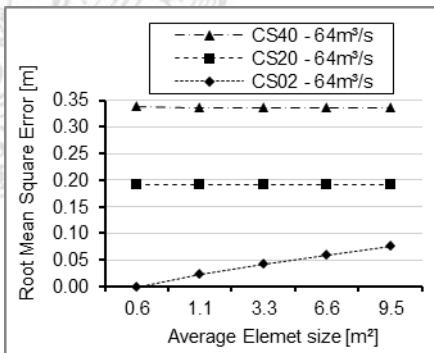
## Wassertiefen

64m<sup>3</sup>/s

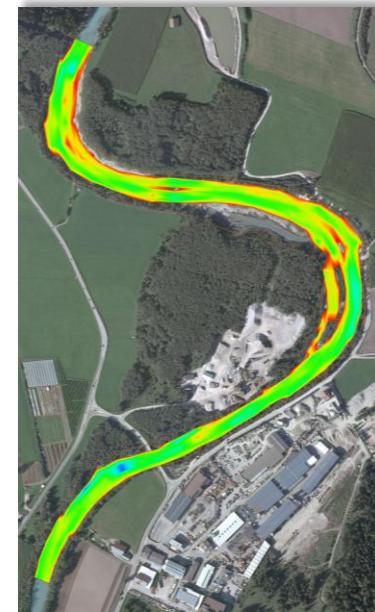
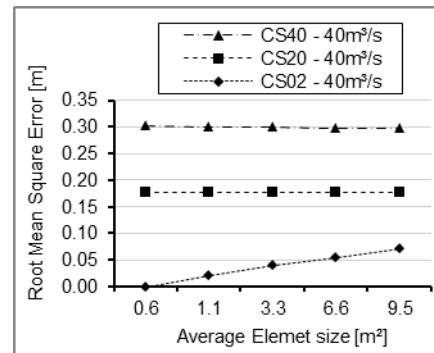
E4Q 0.5x1.0



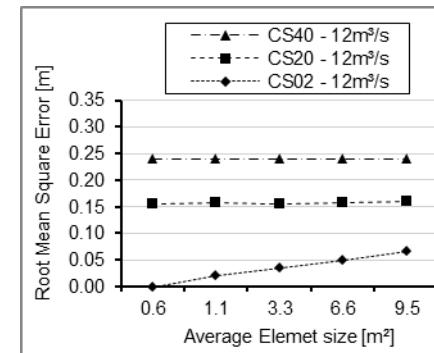
QP02



QP20



QP40



# Fließgeschwindigkeiten - Horizontalwirbel

12 m<sup>3</sup>/s      E4Q 0.5x1.0



QP02



QP20



QP40

## weiteres Vorgehen



- Untersuchung weiterer Flussabschnitte
- Untersuchungen im Hinblick auf Habitatmodellierung
- Untersuchung der Netzgenerierungsmethoden  
(Dreieck - Viereck - selektives Ausdünnen)
- Detaillierte Untersuchungen hinsichtlich der Auswirkungen auf die Kalibrierung



Danke für die Aufmerksamkeit

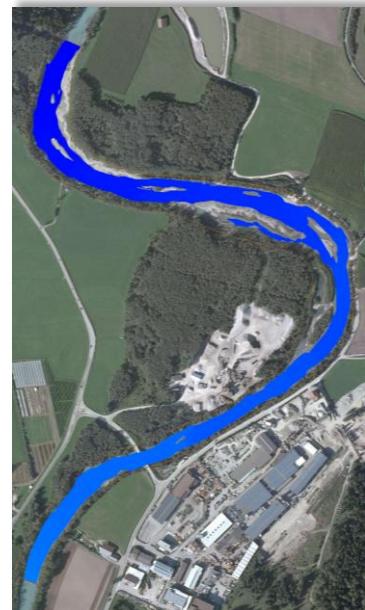
# Wasserspiegellagen

12m<sup>3</sup>/s

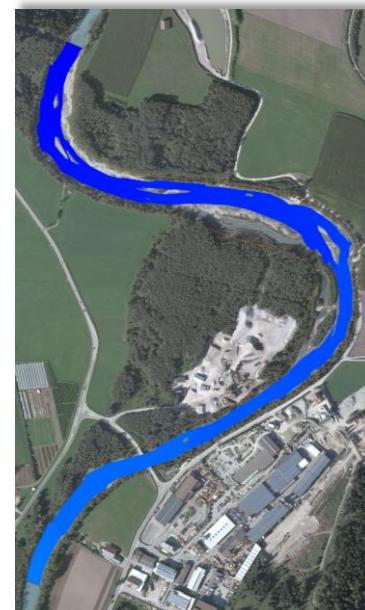
E4Q 0.5x1.0



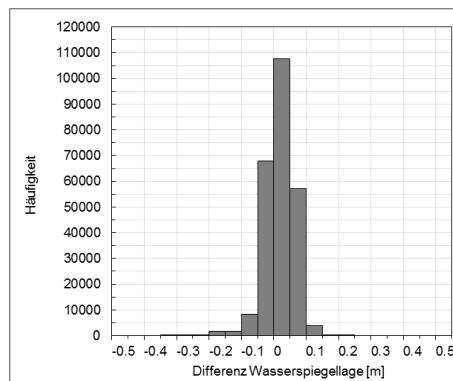
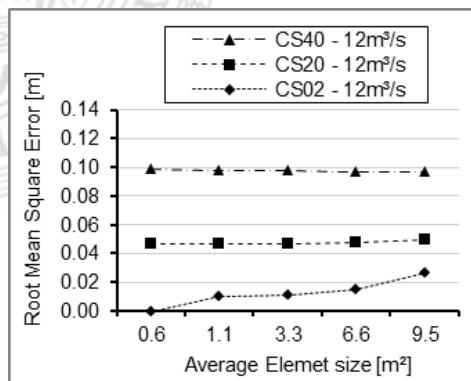
QP02



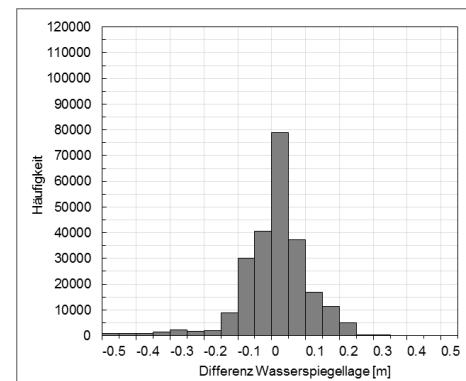
QP20



QP40



Mittelwert: 0.016 m +  $\sigma$  0.04 m

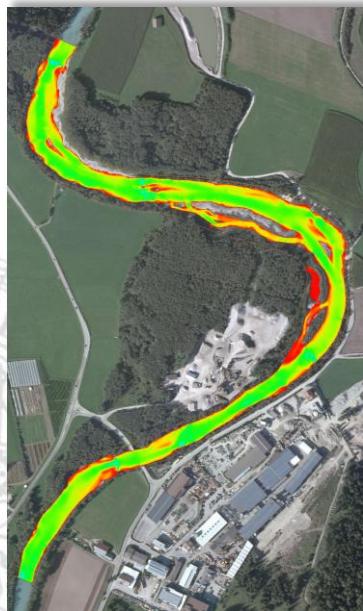


Mittelwert: 0.011 m +  $\sigma$  0.098 m

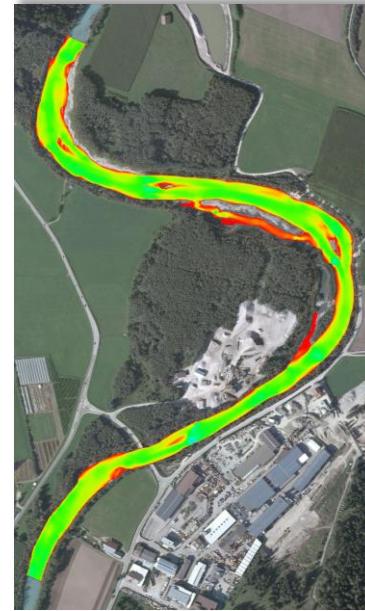
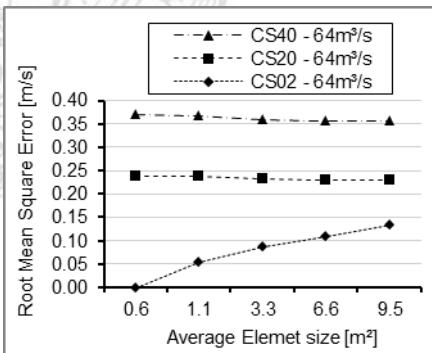
# Fließgeschwindigkeiten

40m<sup>3</sup>/s

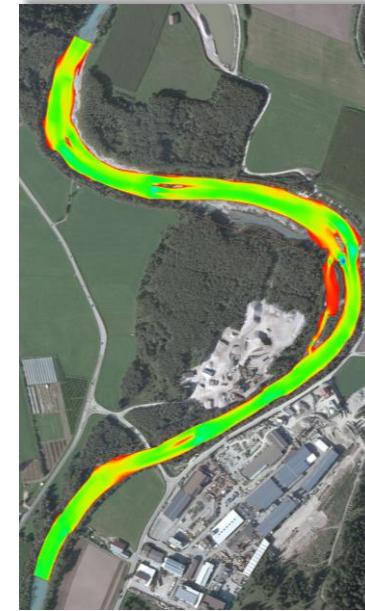
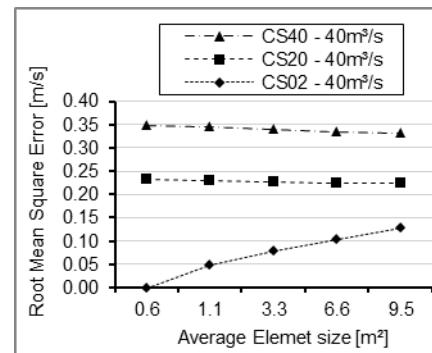
E4Q 0.5x1.0



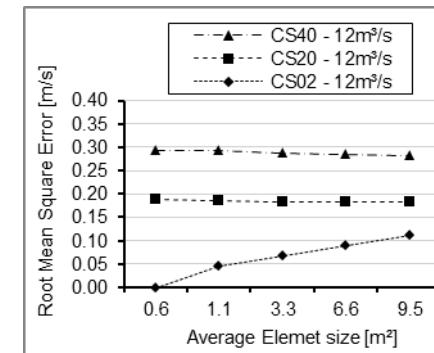
QP02



QP20



QP40



Mittlere Geschwindigkeit 1.16 m

0.96 m

0.58 m

- Einmessung von (selbst) vermarkten Punkten mit diff. GPS



- Einmessung von Wasserspiegellagen mittels Tachymeter



- Kalibrierdaten - für Abflüsse 12, 20, 25, 40, 64 m<sup>3</sup>/s