
Marrakech WW2011
Böder, V., T. Kersten, T. Thies, A. Sauer
Mobile Laser Scanning on Board Hydrographic Survey Vessels
-Applications and Accuracy Investigations
TS05J – Hydrography in Practise, May 20th, 2011
Under patronage of His Majesty King Mohammed VI
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– Bridging the Gap Between Cultures
Marrakech, Morocco
May 18–22, 2011
HCU HafenCity Universität Hamburg
Universität für Baukunst und Raumentwicklung
HAMBURGS NEUE UNIVERSITÄT
Europas erste Hochschule für die gebaute Umwelt
HCU HafenCity Universität Hamburg
HPA Hamburg Port Authority
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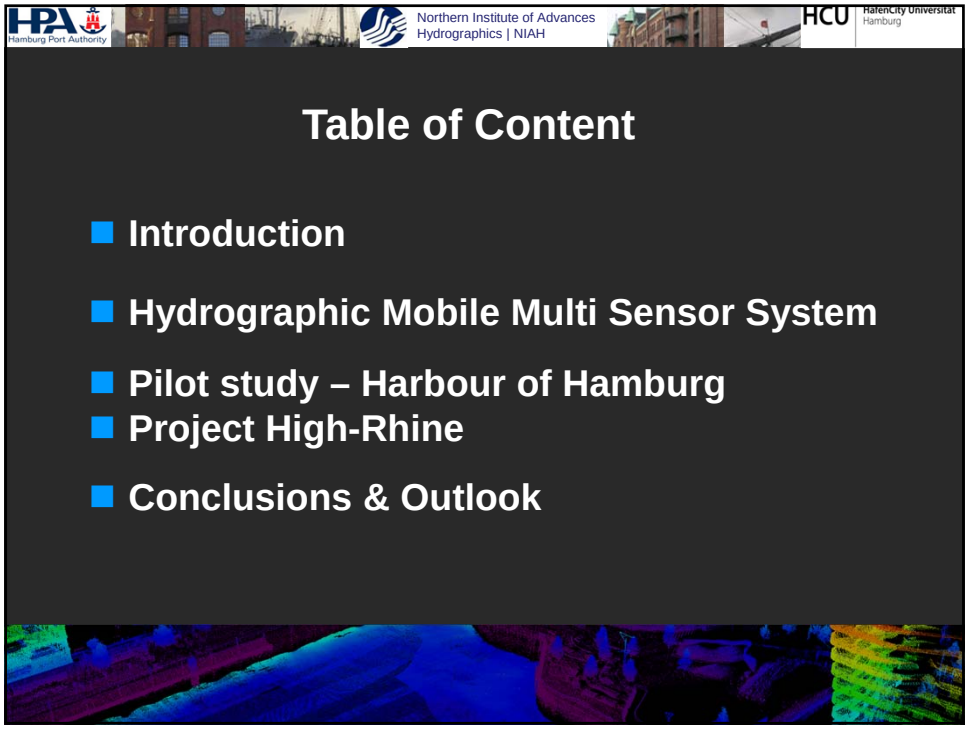
HPA Hamburg Port Authority
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HCU HafenCity Universität Hamburg
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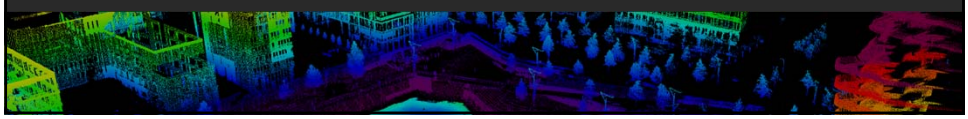
Introduction

- High resolution 3D mapping using modern mobile multi sensor systems below water in real time as standard (Kinematic 3D data acquisition)
- Difficult to scan waterside objects above water (river embankments, harbour)
- Studies for TLS integration into a hydrographic system



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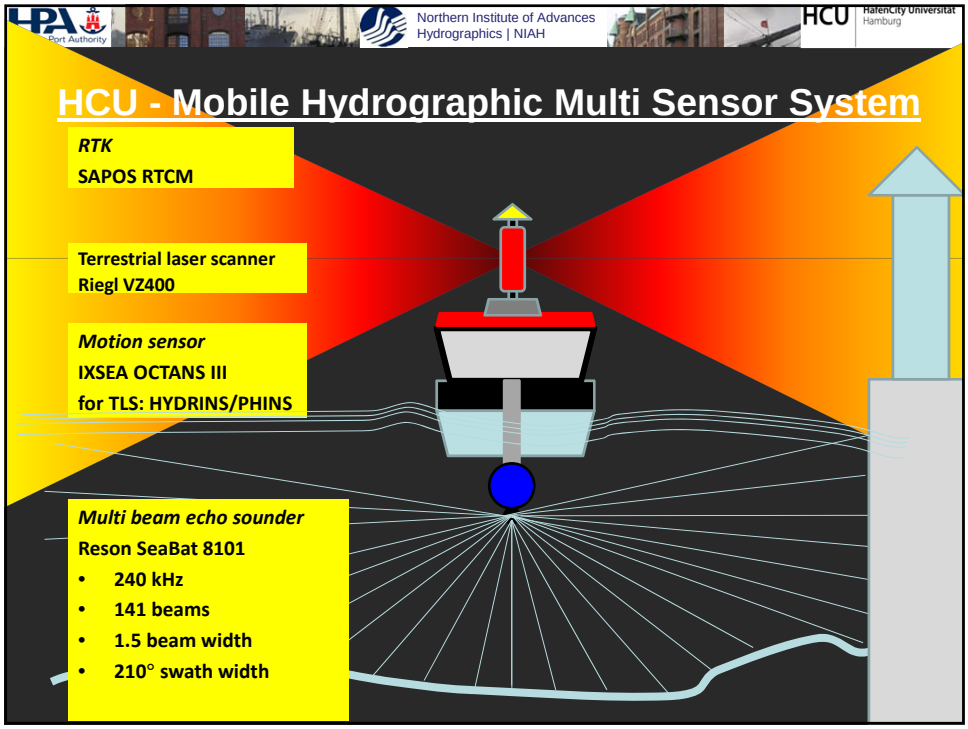
HCU - Mobile Hydrographic Multi Sensor System



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Pilot study – Riegl VZ-400

- Project Grasbrookhafen Hamburg using the surveying ship "Deepenschriewer" from Hamburg Port Authority
  - 17.2m length, 4.9m width, and 1.4m draught
- Master Thesis of Thomas Thies as co-operating project between HCU and HPA (finished 2011)

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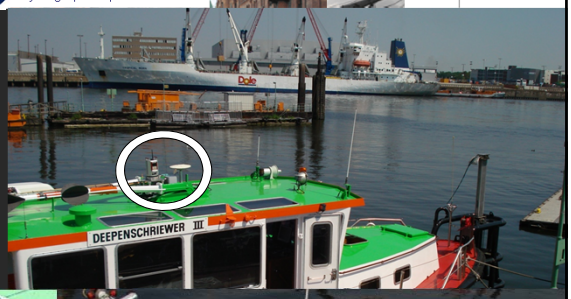
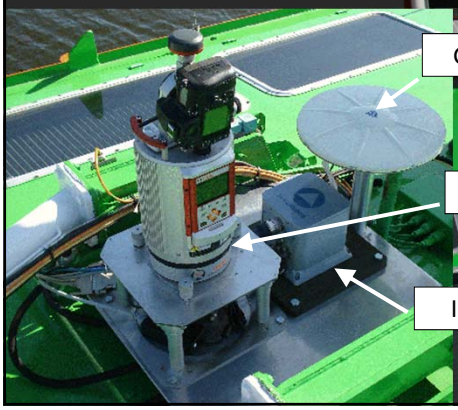
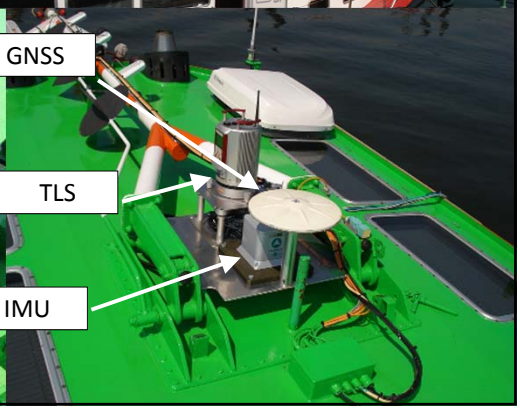
Pilot study – Riegl VZ-400

- Setup
  TLS – GNSS – IMU
  onboard of
  Deepenschriewer III







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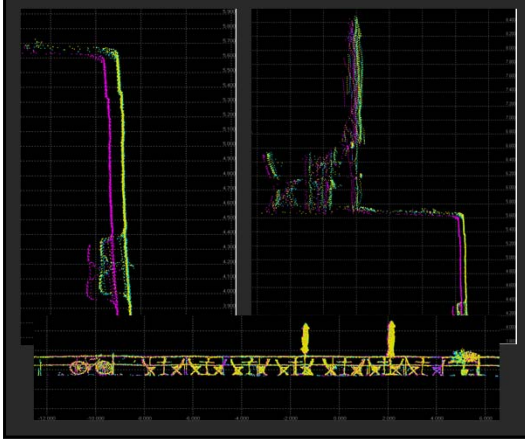
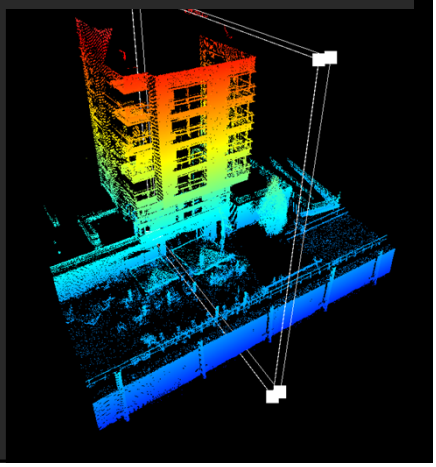
Pilot study – Riegl VZ-400

- Visual precision analysis at quay wall
  - ➔ 2 profiles East-West closely coincident
  - ➔ 1 profile West-East with deviation to EW: 7cm in XY & 4cm in Z





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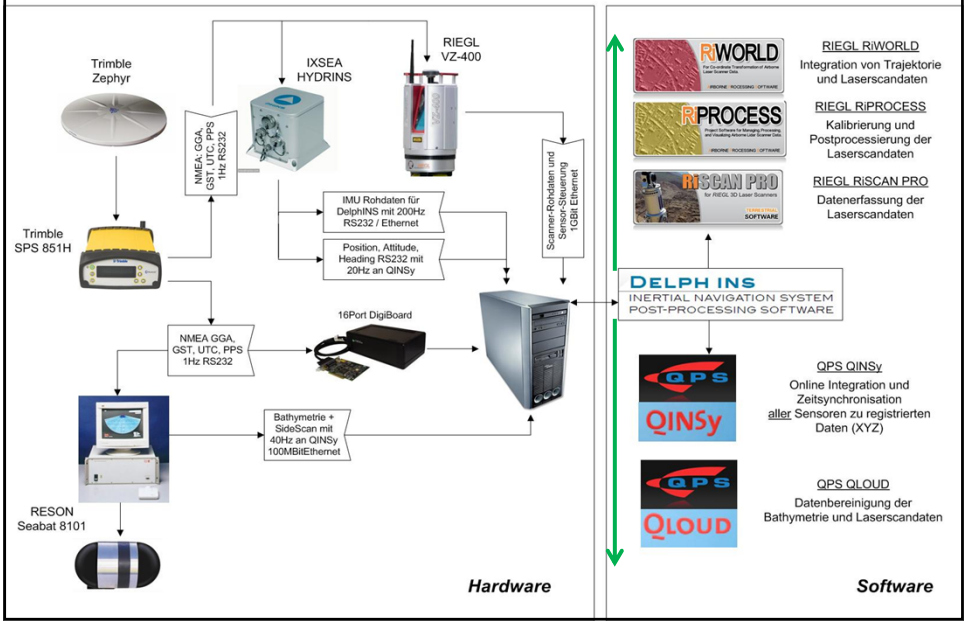
Sensor Integration of GNSS/IMU, echo sounder and terrestrial laser scanner



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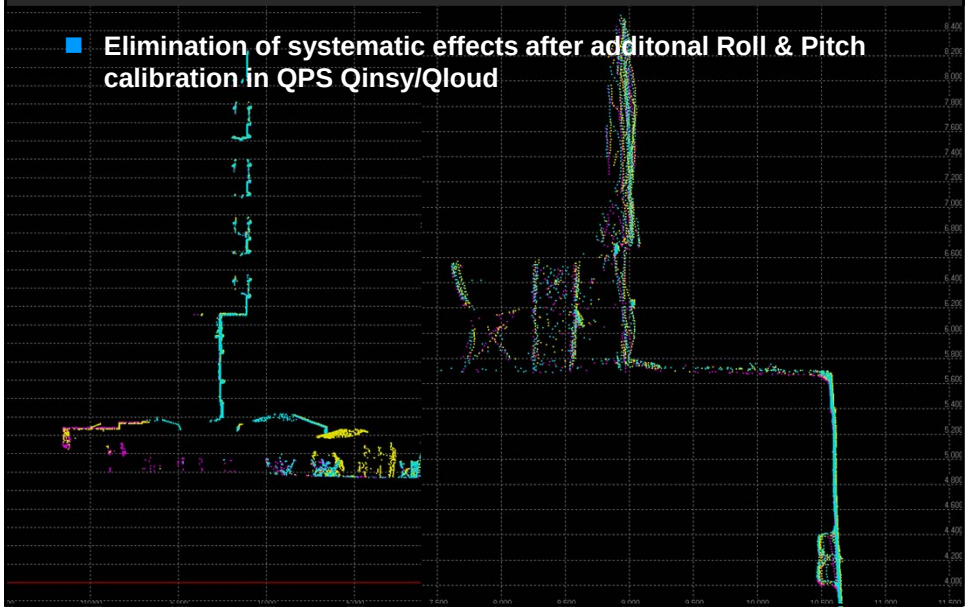
Pilot study – Riegl VZ-400 (Bar scene)

- Elimination of systematic effects after additonal Roll & Pitch calibration in QPS Qinsy/Qloud



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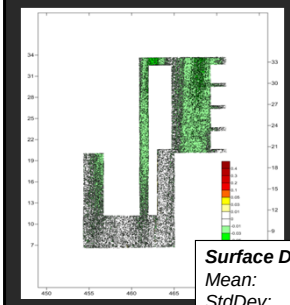
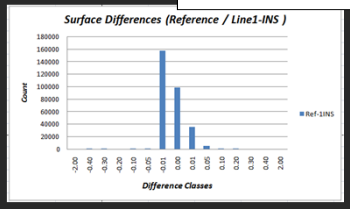
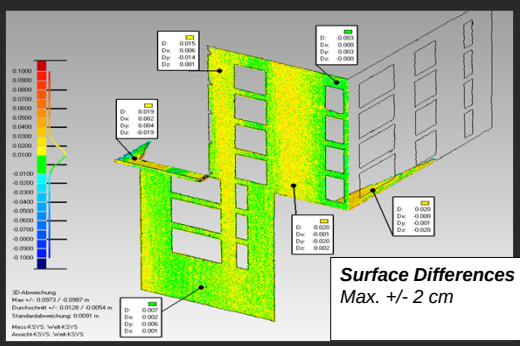
Pilot study – Riegl VZ-400

- Precision analysis – Surface Differences (Reference - Survey Line)



Surface Differences
Mean: -0.011m
StdDev: ±0.011m





Surface Differences
Max. +/- 2 cm

- ➔ Computation only with plane facade surfaces without windows etc.
- ➔ Small height dependent systematic artefacts have to be investigated in more detail

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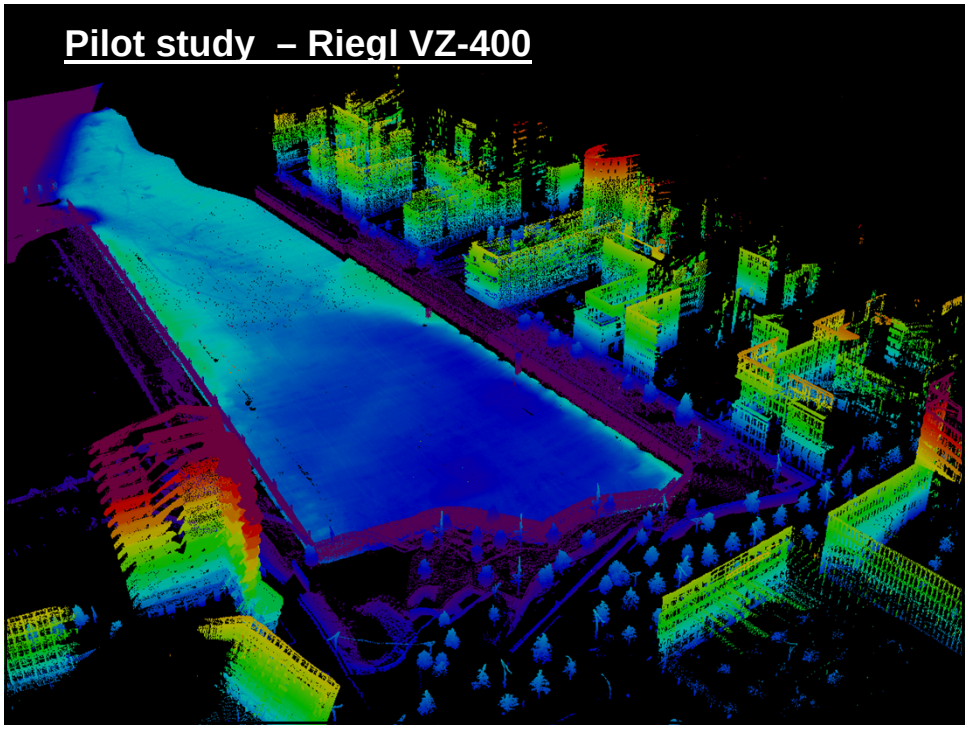
Pilot study – Riegl VZ-400



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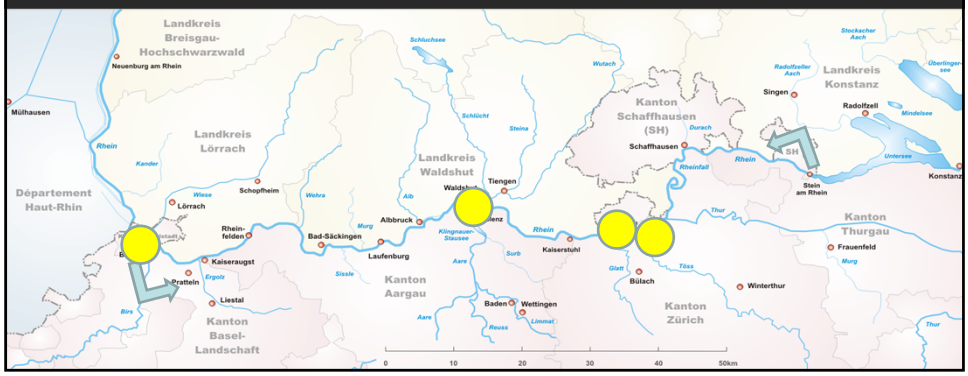
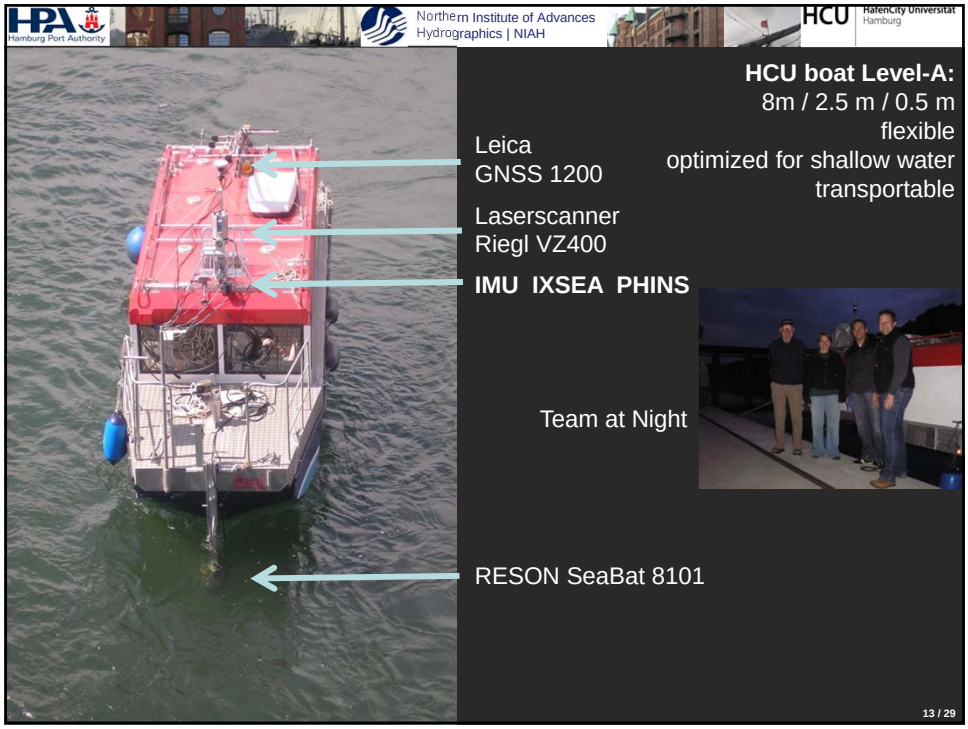
Project High-Rhine: Motivation

- Motivation of Orderer: Tiefbauamt Basel and Eidg. Bundesamt für Umwelt (CH)
  - Flood events in the last decades
  - International Rhine flood management (CH, F, D, NL)
  - City planning; Basel: increasing use of areas close to the banks for living
- Missing: precise 3-D model
- 4 test areas (around 17 km)

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HCU HafenCity Universität Hamburg
HCU boat Level-A:
8m / 2.5 m / 0.5 m
flexible
optimized for shallow water
transportable
Leica
GNSS 1200
Laserscanner
Riegl VZ400
IMU IXSEA PHINS
Team at Night
RESON SeaBat 8101
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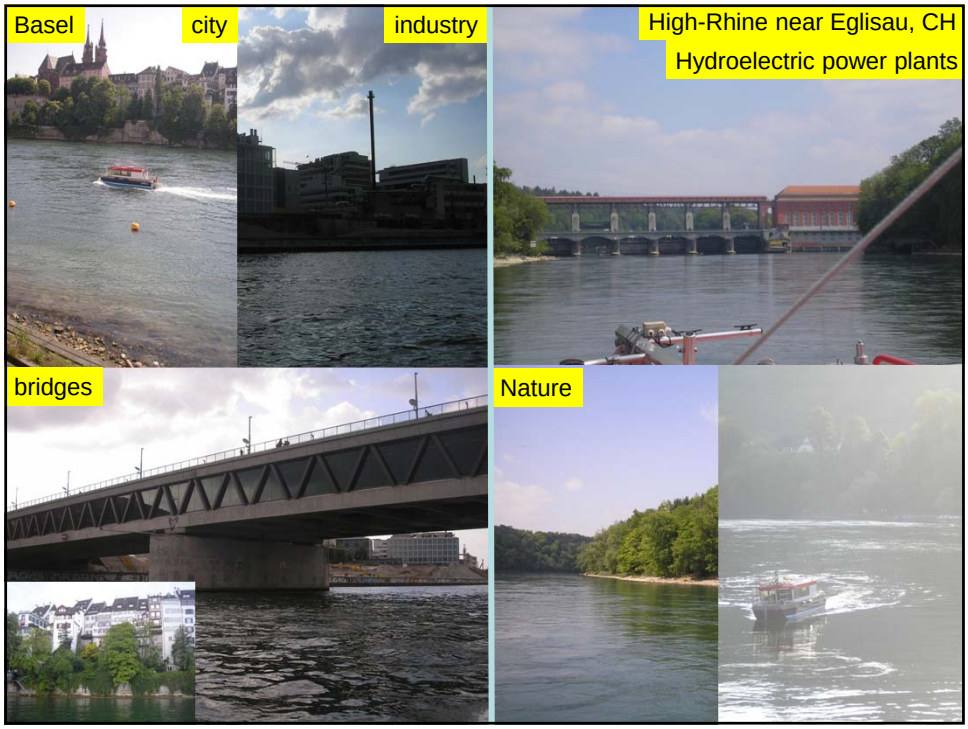
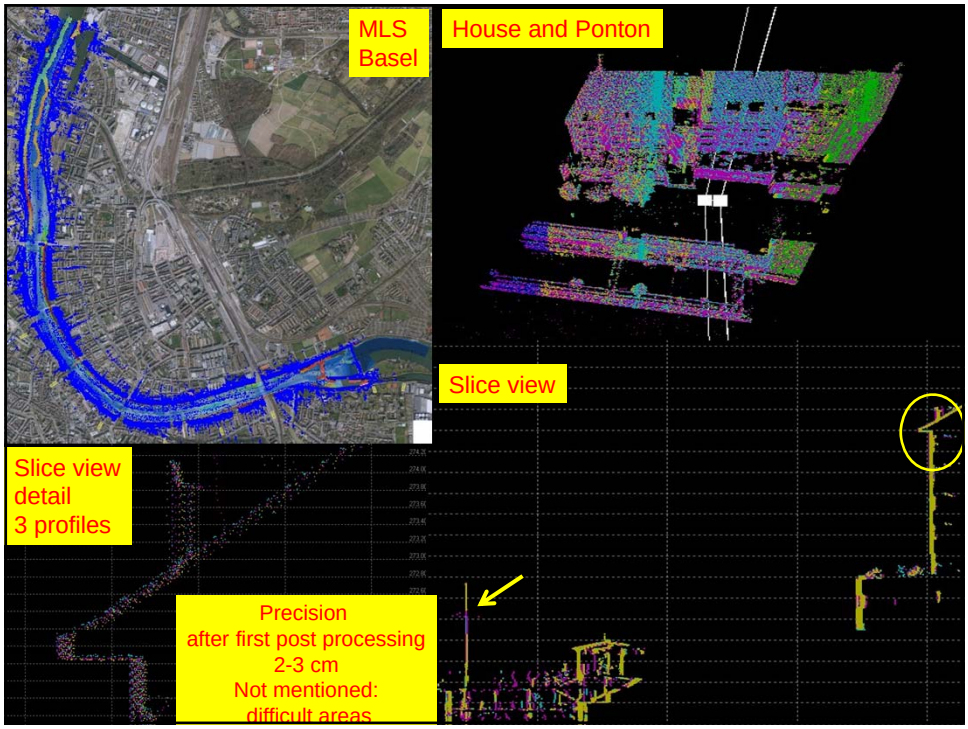
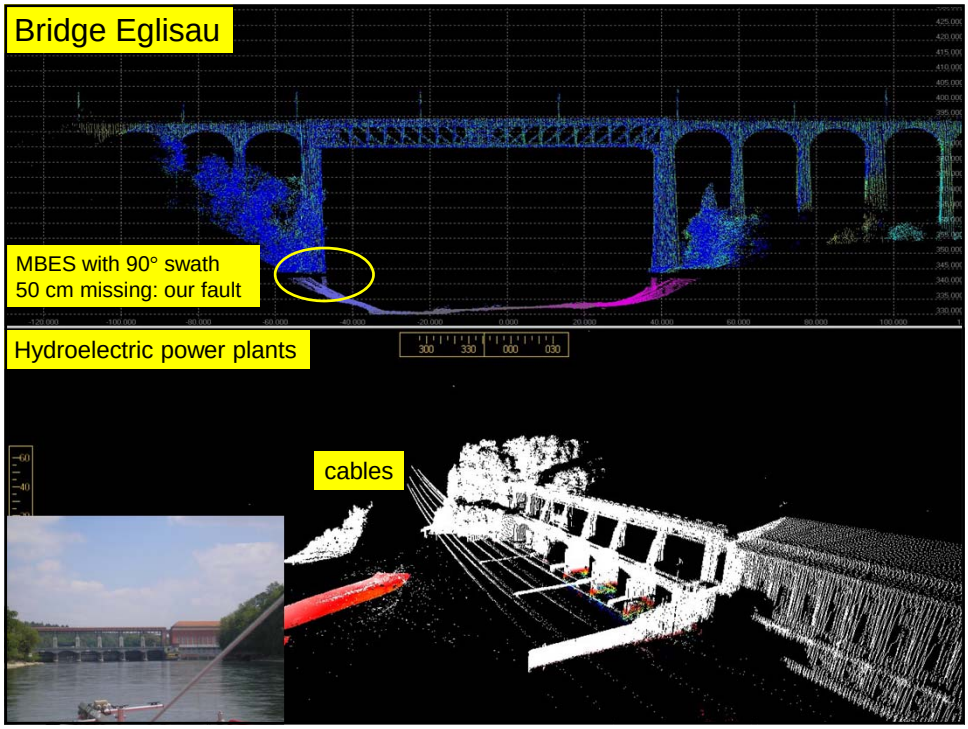

Basel
city
industry
High-Rhine near Eglisau, CH
Hydroelectric power plants
bridges
Nature


MLS
Basel
House and Ponton
Slice view
Slice view
detail
3 profiles
Precision
after first post processing
2-3 cm
Not mentioned:
difficult areas


Bridge Eglisau
MBES with 90° swath
50 cm missing: our fault
Hydroelectric power plants
cables

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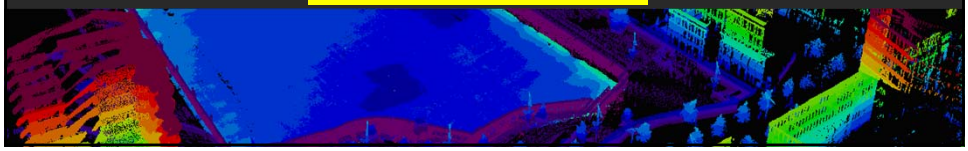
Conclusions & Outlook

- Successful integration of two TLS (IMAGER 5006i & VZ-400) into mobile hydrographic multi sensor systems in three projects
- High precision 3D scanning & data processing in real-time
- Precision of kinematic 3D scanning depending on quality of IMU
- Performance advantages for Riegl VZ-400 due to technical specs
- Several problems with the combinations of different sensor coordinate systems: only phone calls/trial&error helps

Accuracy: 2-3 cm reachable



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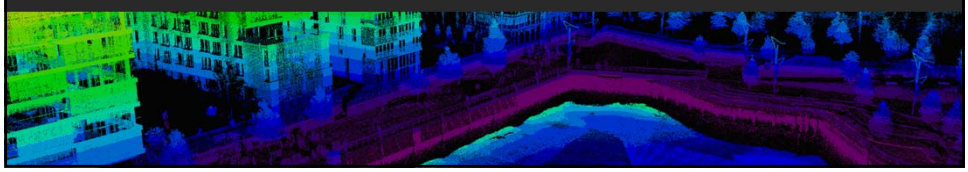
Conclusions & Outlook

BLASTer?

- Possible applications:
  - ➔ 3D mapping for harbour applications (wharfage, bridges, etc.)
  - ➔ 3D corridor mapping of rivers and its biotopes, flood analysis
  - ➔ Topographic survey of coastal and river banks
  - ➔ Monitoring of dike security & drying-falling tideland areas
  - ➔ Determination of trim behaviour (squat & settlement) of ships



Comm. 4 Working Group 3:

Multi-Sensor Systems for Hydrographic Applications
-Knowledge base for new technologies (not only LS)
-Report, analyze, document, (solve) problems of hydrographic MSSystems in general
- Contact volker.boeder@hcu-hamburg.de

niversität für Baukunst
nd Raumentwicklung

UNIVERSITÄT
r die gebaute Umwelt

Thank you for your attention

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