EGU General Assembly 2020

Online | 4–8 May 2020

HS1.1.4

Advances in river monitoring and modelling: data-scarce environments, real-time approaches, Inter-comparison of innovative and classical frameworks, uncertainties, Harmonisation of methods and good practices

Co-organized by GM2/NH1

Convener: Alonso Pizarro[ECS] | Co-conveners: Filippo Bandini[ECS], Silvano F. Dal Sasso[ECS], Nick Everard, Alexandre Hauet, Ida Westerberg, Anette Eltner[ECS], Mark Randall

Displays | Chat Mon, 04 May, 10:45–12:30

D47 |EGU2020-18413|

Continuous measurement of open channel discharge using a video data logger and subsequent LSPIV analysis

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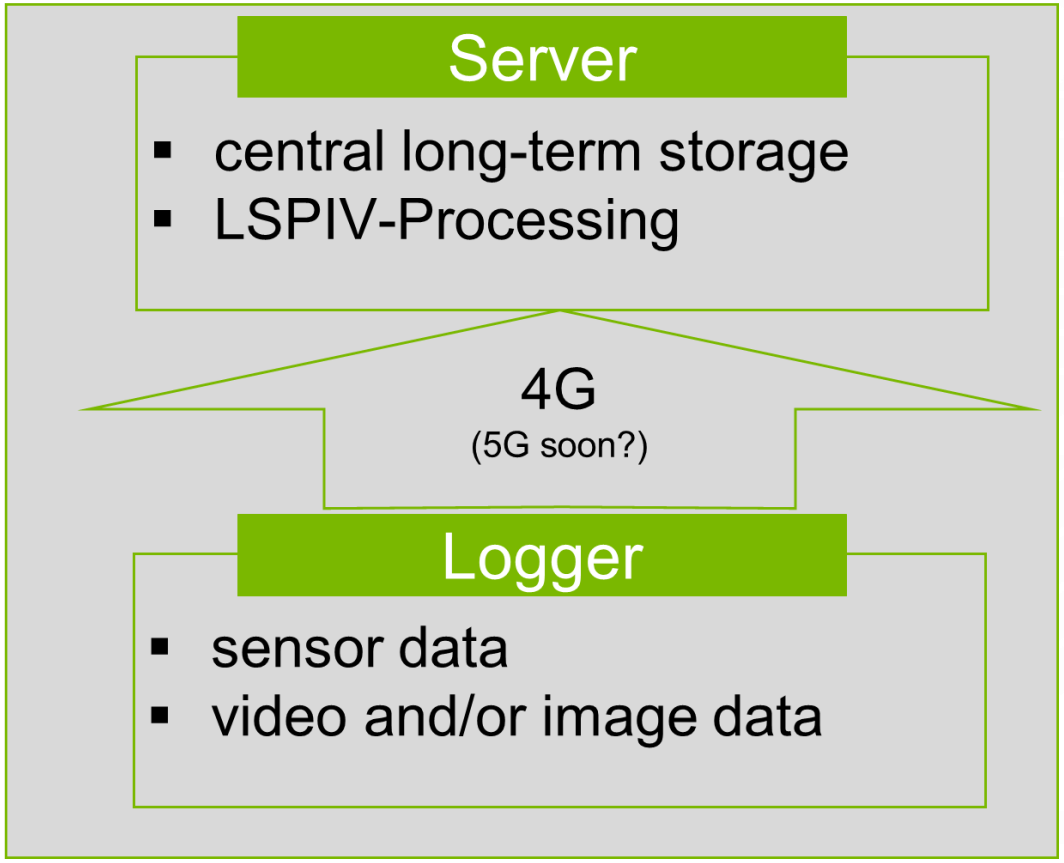
Video Logger

- no electricity grid required
- recording videos
- logging water stage
- upload data to server via cellular network

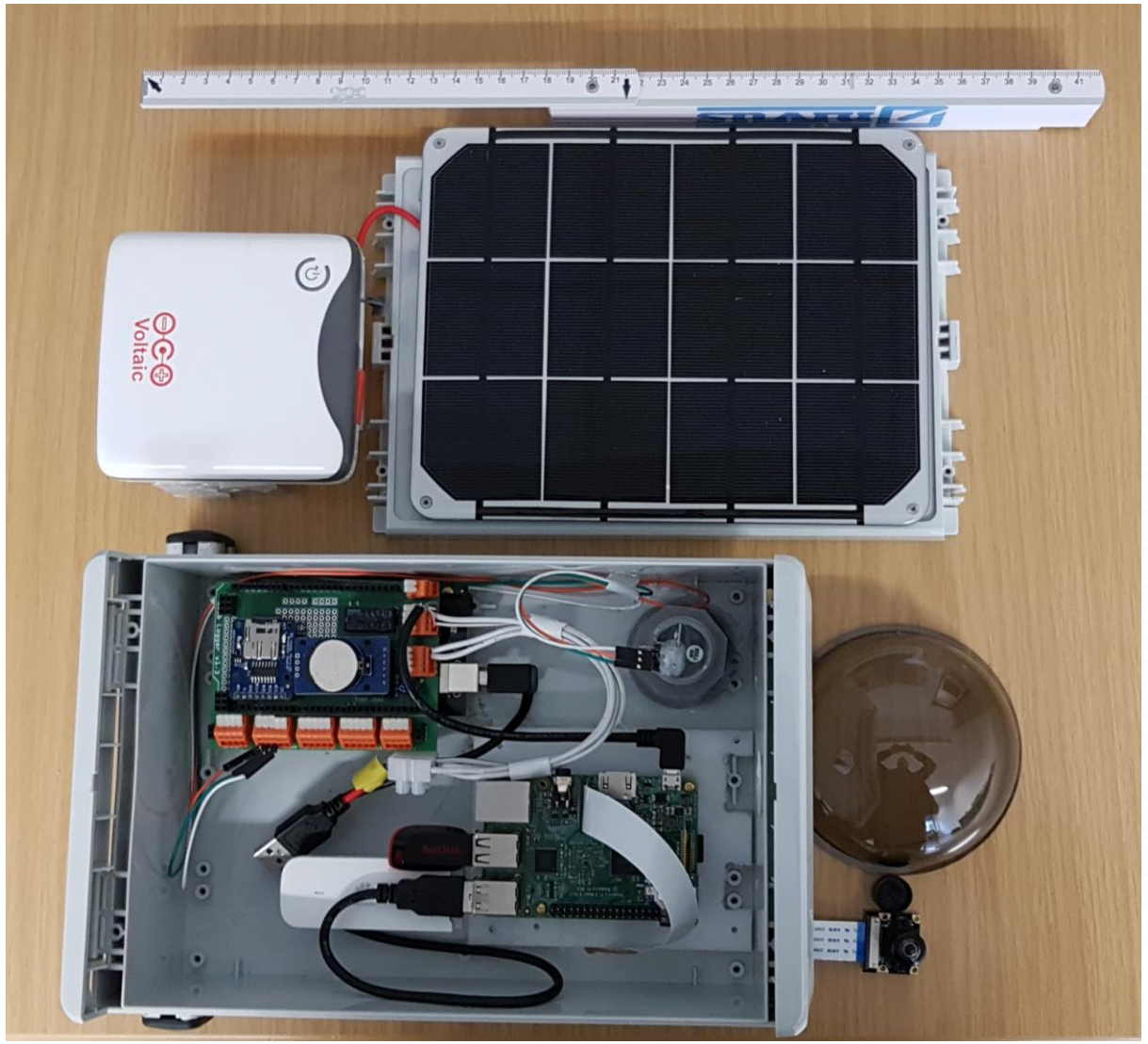
Server

- One central Server for multiple Loggers
- at the moment: Owncloud File Storage, Desktop-PC Use, Python and Matlab Scripts
- Future: virtual Linux Server



Video Logger Parts

- Arduino MEGA 2560 rev 3 Board
  - manufactured Board with Real Time Clock (RTC, DS3231), micro-SD-Shield, RTC-alarm switch circuit
  - Maxbotix mb7386 ultrasonic range sensor
- Raspberry Pi 2 Model B
  - USB flash drive
  - Micro-SD-Card with Raspbian OS Image
  - Huawei USB LTE (4G) Stick
  - Camera module (200° Fisheye lens)
- Battery Pack with solar cell
- Camera Dome

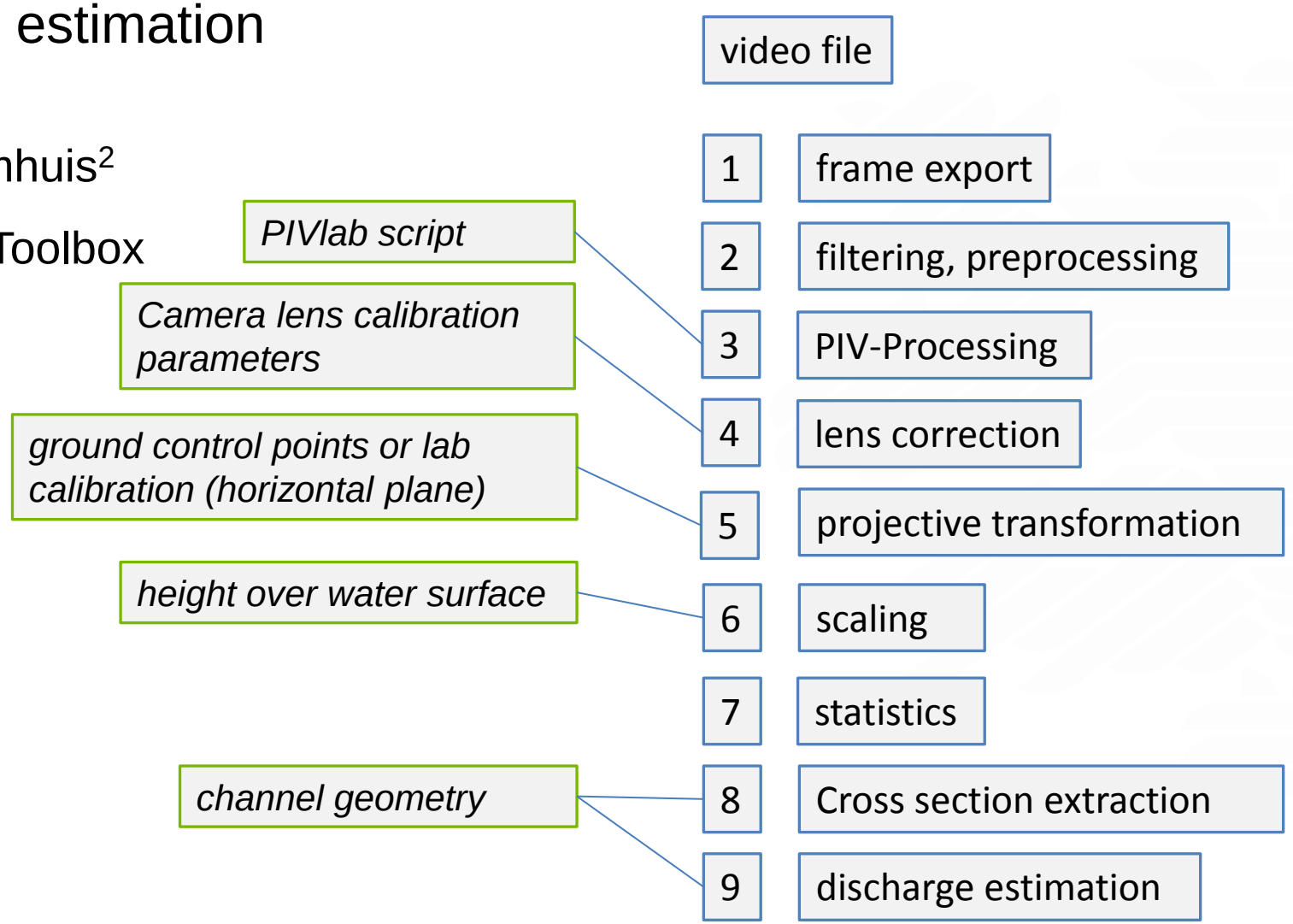


Video Logger working principle

- Arduino (5 minutes time interval)
  - Reads connected sensors (water stage)
  - writes sensor data to micro-sd-card
  - Switches raspberry Pi on
    - Hourly and adaptive: When defined water stage or gradient threshold is reached every 15 min
- Raspberry Pi
  - Records videos to usb flash
  - Communicates with Arduino to gather sensor data from arduino micro-sd card
  - Uploads video and sensor data to Server (~once a day)

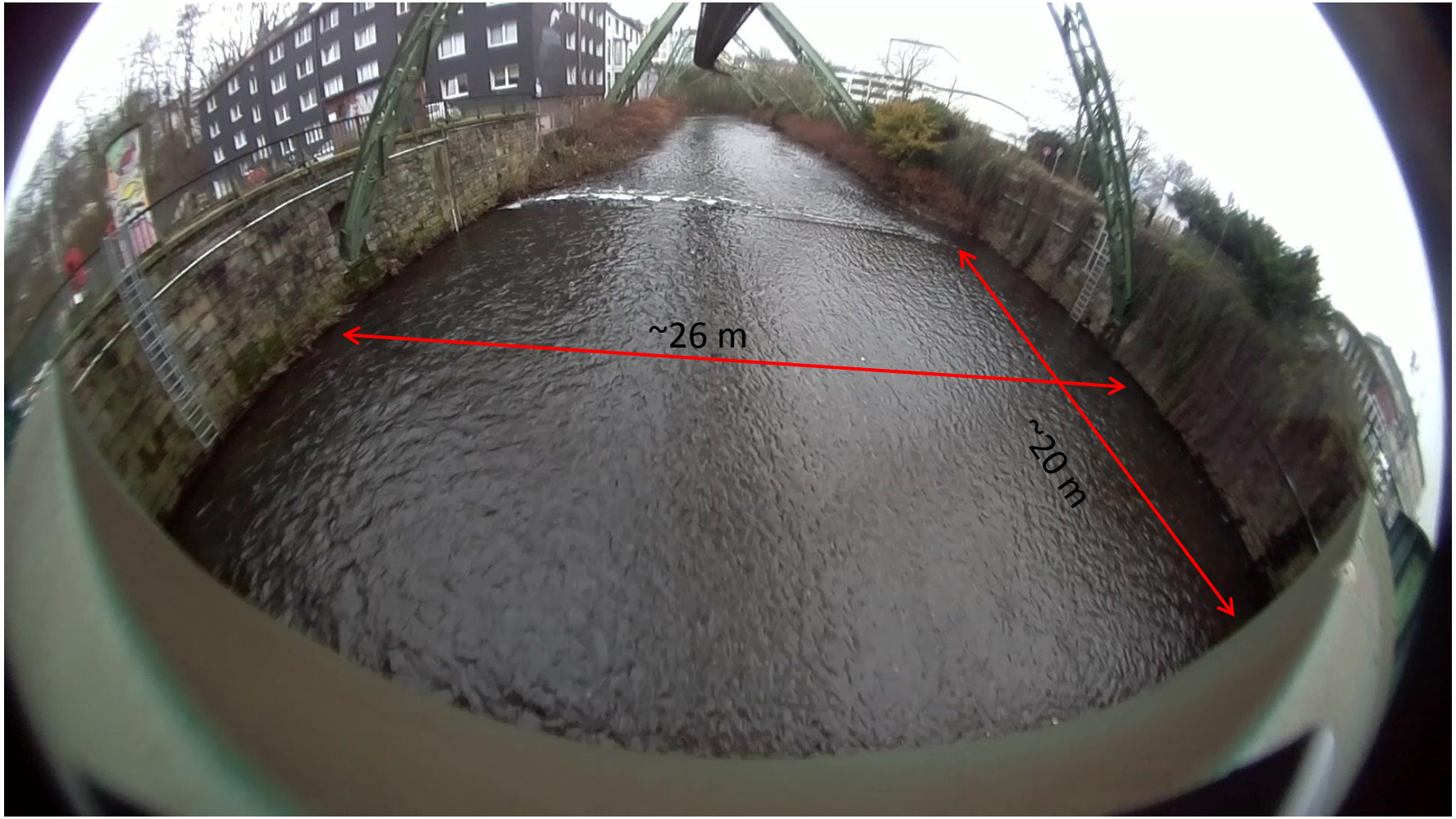
main tasks of LSPIV discharge estimation

- PIV-Processing:
  PIVlab-Toolbox by Thielicke&Stamhuis[2]
- Use of Matlab Image Processing Toolbox
- one Matlab masterscript does all the work



Gauge site

Kluserbrücke (Wupper), NRW,Germany

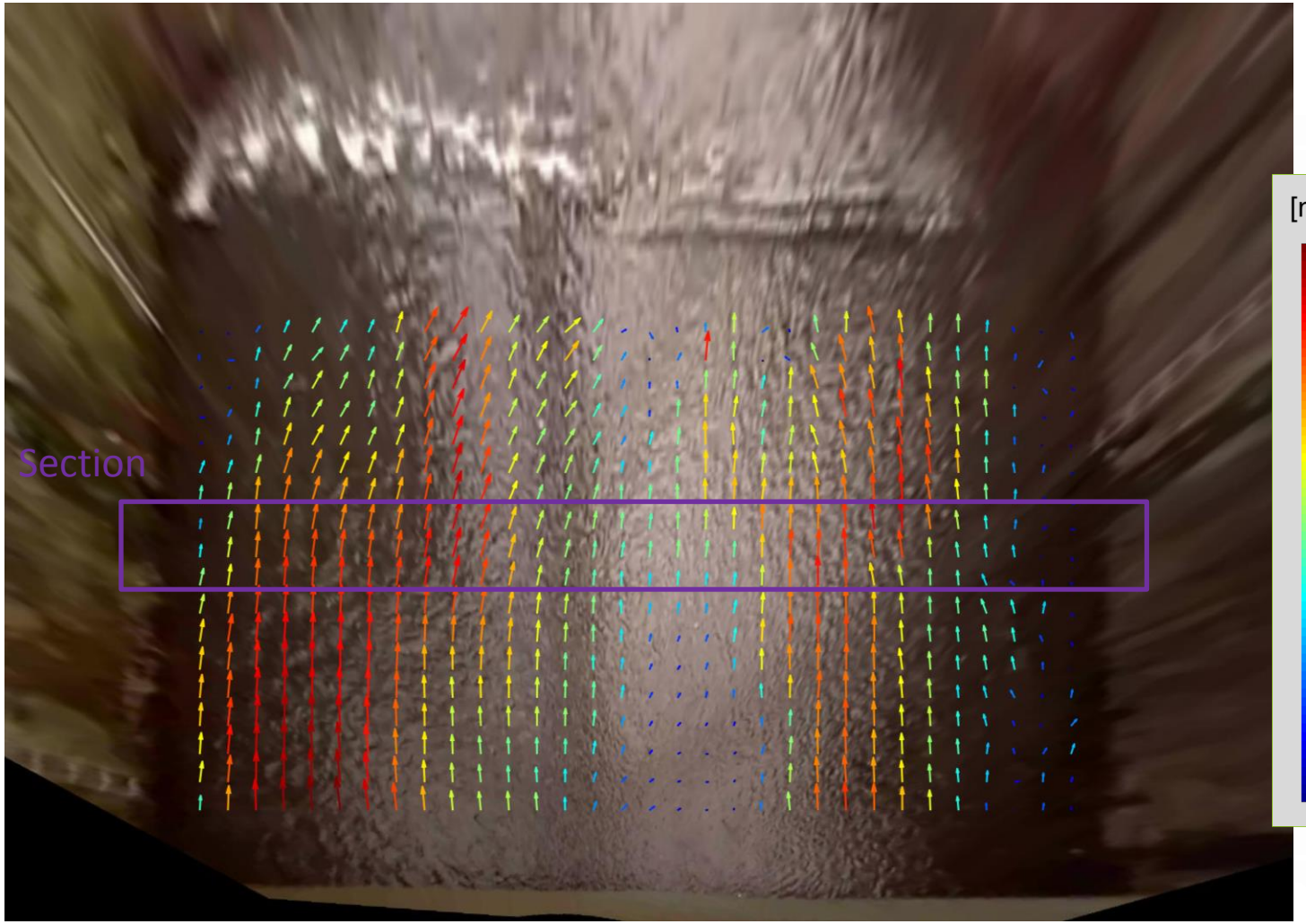


Location Link (google maps)

https://www.google.de/maps/place/51%C2%B015'20.3%22N+7%C2%B009'30.9%22E/@51.2556389,7.157839,389m/data=!3m2!1e3!4b1!4m5!3m4!1s0x0:0x0!8m2!3d51.255639!4d7.158595

surface velocity

- median of 300 frame pairs (30 fps, 10 sec)
- patchy distribution



surface velocity

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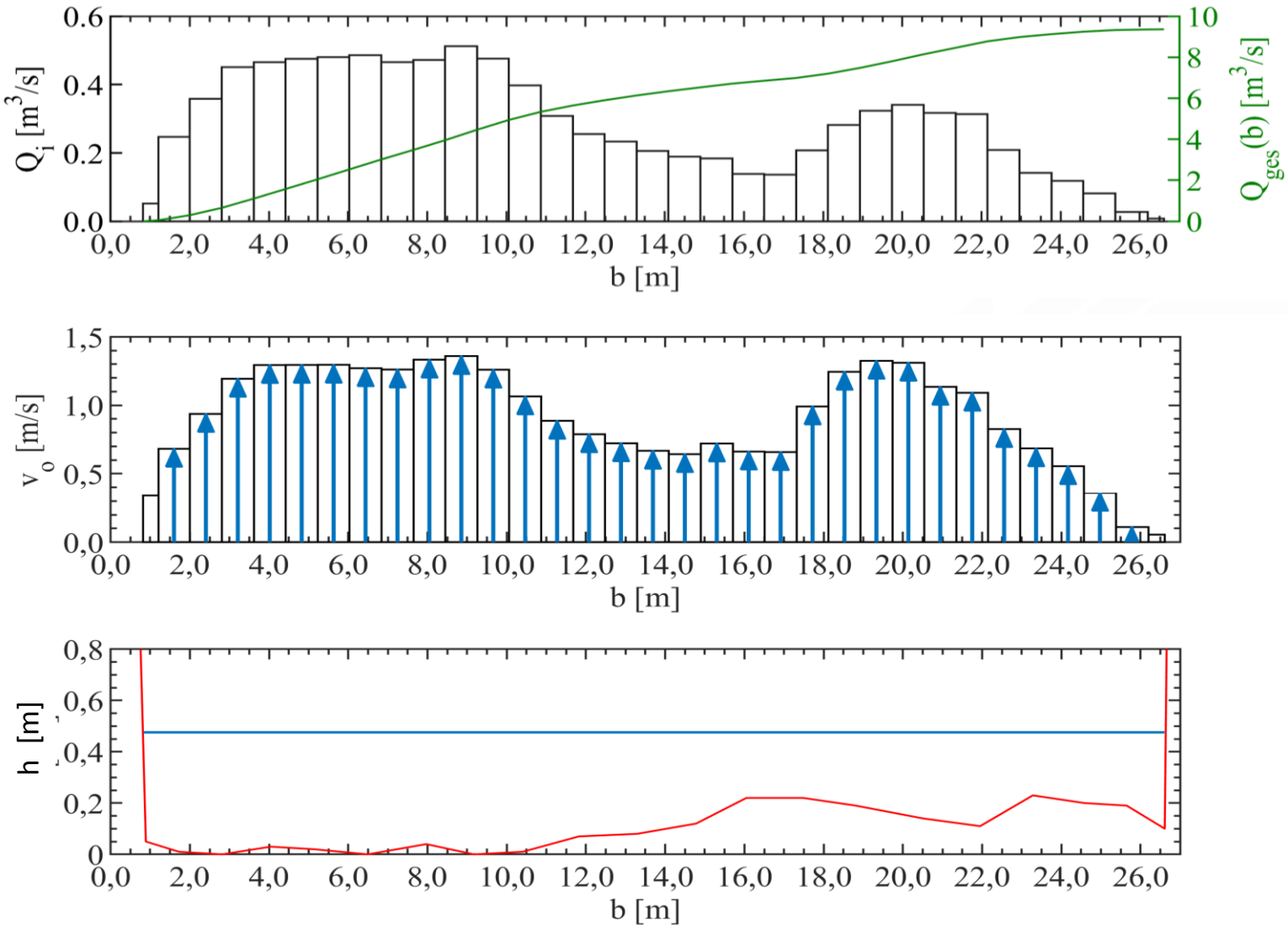
- patchy distribution

discharge estimation

- 9.2 m³/s * 0.9 = 8.3 m³/s
  cf. [3] EN ISO 748:2007
- Rating Curve: 9.5 m³/s



current and future work

- enlarging solar and battery capacity
- enabling night mode with artificial illumination
- Setting up Linux Server
- optimize Server processing scripts
- more reference measurements

Literature

[1] *Muste, M., Fujita, I., & Hauet, A.(2008): Large-scale particle image velocimetry for measurements in riverine environments. Water Resour. Res, 44*

[2] *Thielicke, W . & Stamhuis, E.J. (*2014): PIVlab – Towards User-friendly, Affordable and Accurate Digital Particle Image Velocimetry in MATLAB. J. of Open Research Software 2(1):e30

[3] ISO 748:2007 (2008): Hydrometry - Measurement of liquid flow in open channels using current-meters or floats (ISO 748:2007); German version EN ISO 748:2007