Hydrometry data management at the CHMI

data collection, evaluation and storage

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- government institution
- The biggest employer of Ministry of the Environment (720 employees)
- headquarter (Prague) + 7 regional districts
- Dep. of Applied Hydrology (Jablonec nad Nisou)

- 520 gauging stations (stage, temp., water quality); mountainous borders, flat central areas
- 80 000 km²; no coming rivers, only outflows; largest river Labe (annual avg. 319 [m³s⁻¹])
History and development:

- first continual observations in early 20th century (before only floods + droughts)
- 1919 Hydrological institute
- 1954 HydroMeteorological Institute – hydro+meteo+air quality „under one roof“
- complex organization covering data monitoring, data management and analyses, expertise evaluations and forecasting of water, air and air quality elements

Christian A. Doppler
- Technical University profesor in Prague (1835-1847)

Andreas Rudolf Harlacher
- Swiss engineer (from 1869 in Prague)
- current meter improvement (electr. registration unit)
Discharge measurement (network):

- stage measurements: stage (2 cm resolution) + pressure sensor (2x) + float + radar
- 10 min interval, GPRS transmission
- channel control + bottom structure for low flow + flood protection
- multiple output data logger units (stage, temp., rainfall, voltage, etc.)
- online data servers (settings, alarms)
- avg. 5 discharge measurements per year + flood, drought events
Discharge meas. (instruments): **ADCPs**

- **2004** first pieces (2 RioGrande)
  - after huge floods in 2002, coop. with Germany (SW Agila)
  - „black box“ instrument
  - only expert users on big flows

- **2005 -2010** Stream Pro for 7 districts
  - more practical for „our“ rivers
  - easy to set up + operate (via PDA)
  - too new for old-school 😊

- **2015** SonTek M9 + hydroboard II
  - funds from EU, generous purchase (RTK GPS, tripod)

- **2017** more experiences => more specific demands
  - M9 + SP suits best to ordinary use
  - smaller TorrentBoards for M9
  - remote control (rQPOD, ArcBoat)

- **2020** equipment renewal (SPs)
Discharge meas. (instruments): **Current meters**

- Propeller
  - long tradition, several modifications, no alternations
  - 1 propeller = 1 user (service)
  - still the only for „official“ meas.

- last decade: „convincing old-school“

- first Flowtrackers in 2011
  - too sophisticated instrument…
  - regular use since 2016

- OTT Mf-Pro tested since 2014
  - easy to use / lower precise
  - for specific cases (vegetation, low depths, boulders)

- Flowtrackers 2 since 2017
  - practical + QC in the field

- nowadays: acoustic is Nr.1
Discharge meas. (instruments): other devices

- **RP 30**
  - since 2014 (testing)/ 2016 (CHMI)
  - high/extreme flows
  - ADCP no response (air) or too much material (wood, ice)
  - safe solution (non contact, from bridge)
  - demanding pre-/ post- processing, but simple data collection
  - sometimes the one and only source of flow data

- **TQ Tracer**
  - one device since 2014
  - more useful than expected (mountainous region + dry years)
  - practical and fast in the field
  - good discharge results
  - in 2019 for every department
Total number of measurements = 2277
Discharge meas.: Q evaluation

- **QRev**
  - need for uniform ADCP data output
  - QC in the field
  - limited user editing
  - regular use since 2018
  - SW Agila for detailed view + neighbor countries coop.

- **SW Vrtule**
  - one tool for all current meters
  - default computation – Spline
  - universal uncertainty definition
  - graphical outputs

- **RP Commander**
  - profile import from ADCP
  - editable interface
  - even for measurements by floats
Discharge meas.: Q (quality control)

- scheme for choosing the right instrument (beginners)
- FlowTracker+ StreamPro+M9 (75%)
- 1-3 hydrometric teams / district
- Instrument for every flow

- scheme for assigning objective quality code
- combination of conditions in the field (flow patterns, user skills, wind) and numerical outputs from SW (Qcov; uncertainty, measured Q)
- user’s subjective opinion (experiences, mood, exhaustion)
- inspiration in NZ NEMS
Discharge meas.: **training**

- "Hydrometric session"
- 1x/year; 2 profiles; approx. 15 devices
- testing instr. and users
- certification of user and instr.
- methodical presentations
- open forum for about 25 people

- "ADCP regatta"
- 1x/year; 3 profiles; approx. 20 dev.
- intercomparation of ADCP = calibration
- methodical presentations
- inspiration in IRSTEA (Jer. LeCoz)
- international guests (Slovakia, Poland)
Discharge meas.: **data storage**

- SW „WinZPV“ (customized for CHMI)
- rating curve editor
- stage + Q + temp. database, station diary, channel parameters
- daily, month, annual statistics
- data converted into GIS
Visions and opportunities:

- follow the latest trends and approaches
- 1. testing -> 2. implementation to praxes
- best quality data => best quality data rows => best quality analyses and outputs
- homogenous data (local scale)
- comparable data quality (international scale)
- institutional identification
  - importance of raw data collection
  - self responsibility for measured data (field control)
Actual troubleshooting:
• ADCP uncertainty outputs for official meas.
  – metrological authorization
• ADCP calibration (intercomparision regatta)
• low flow meas. (water vegetation, stage determination)
• What to do with older instruments that still work?
• personal investments (equipment, knowledge background, helpdesk)
  – bigger claims on technics (high school / university)
  – low unemployment (industrial sector competition)
Thanks for your attention