



CZECH
HYDROMETEOROLOGICAL
INSTITUTE

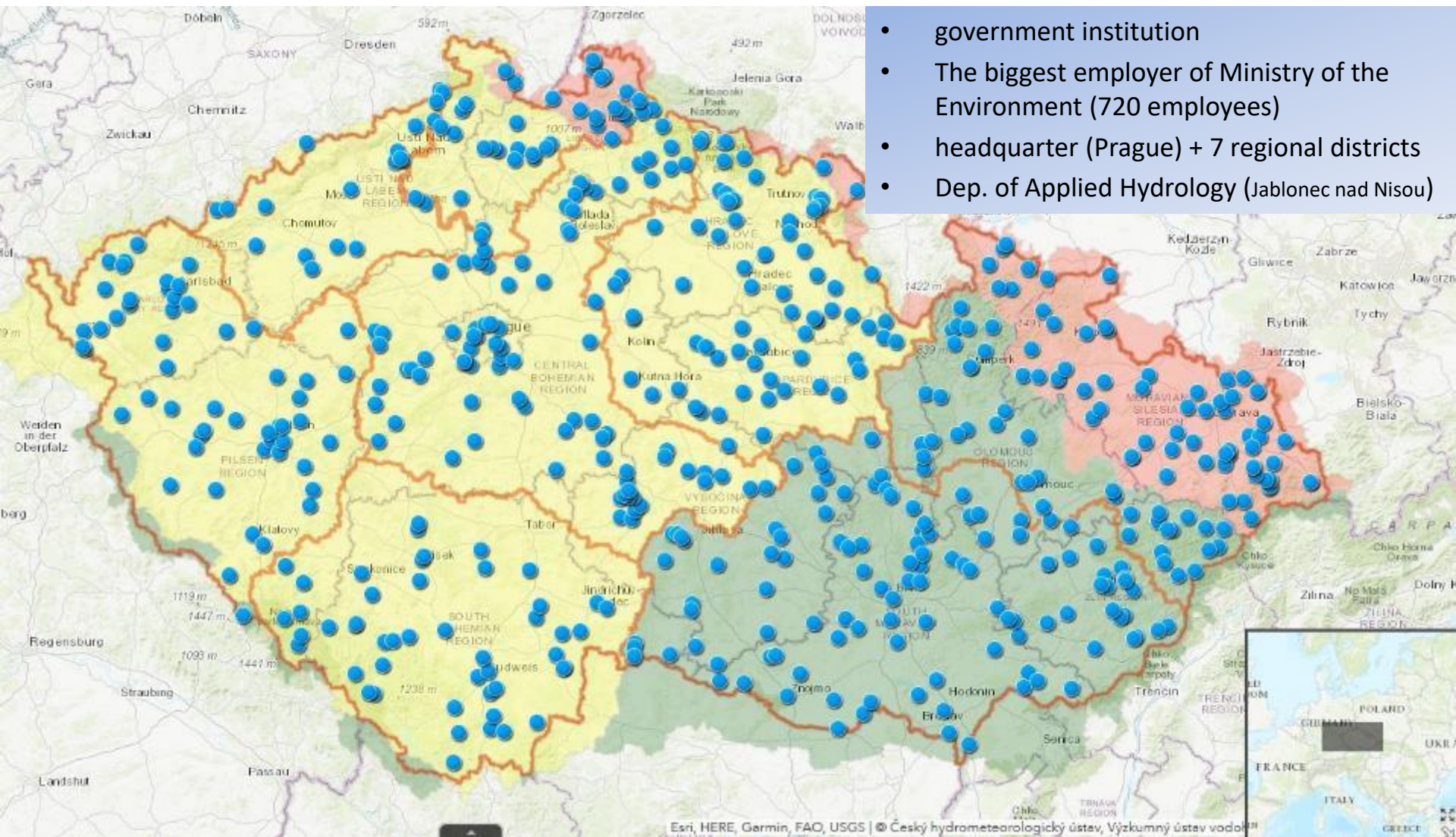
Hydrometry data management at the CHMI

data collection, evaluation and storage

Mgr. Libor Duchacek



About us: <http://portal.chmi.cz/?l=en>

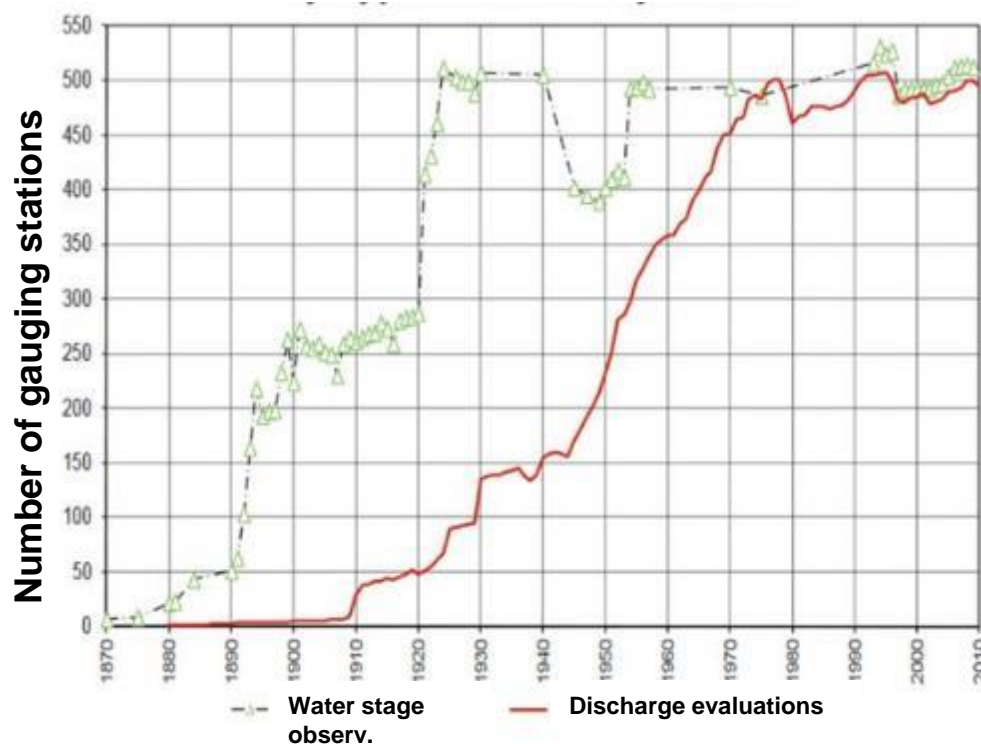


- government institution
- The biggest employer of Ministry of the Environment (720 employees)
- headquarter (Prague) + 7 regional districts
- Dep. of Applied Hydrology (Jablonec nad Nisou)

- 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



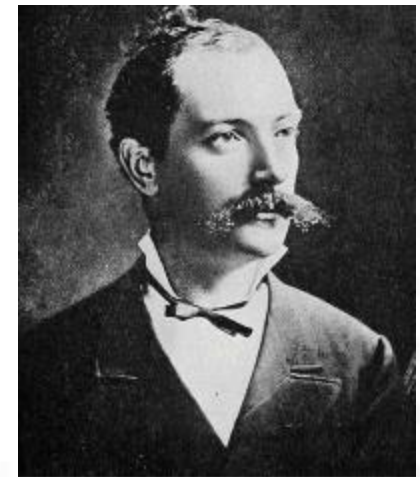
Christian A. Doppler

- Technical University professor 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)

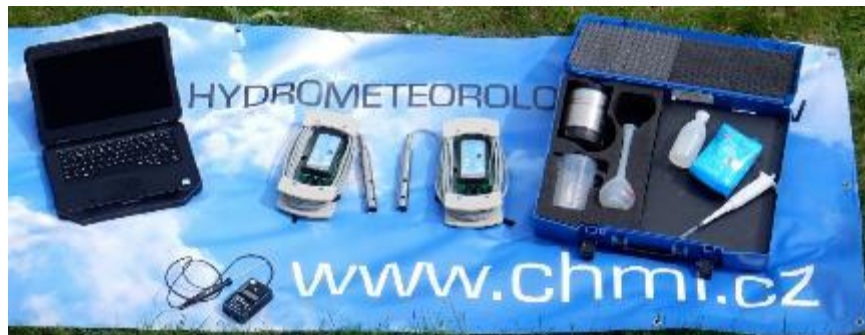
Discharge meas. (instruments): **Current meters**



- 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**

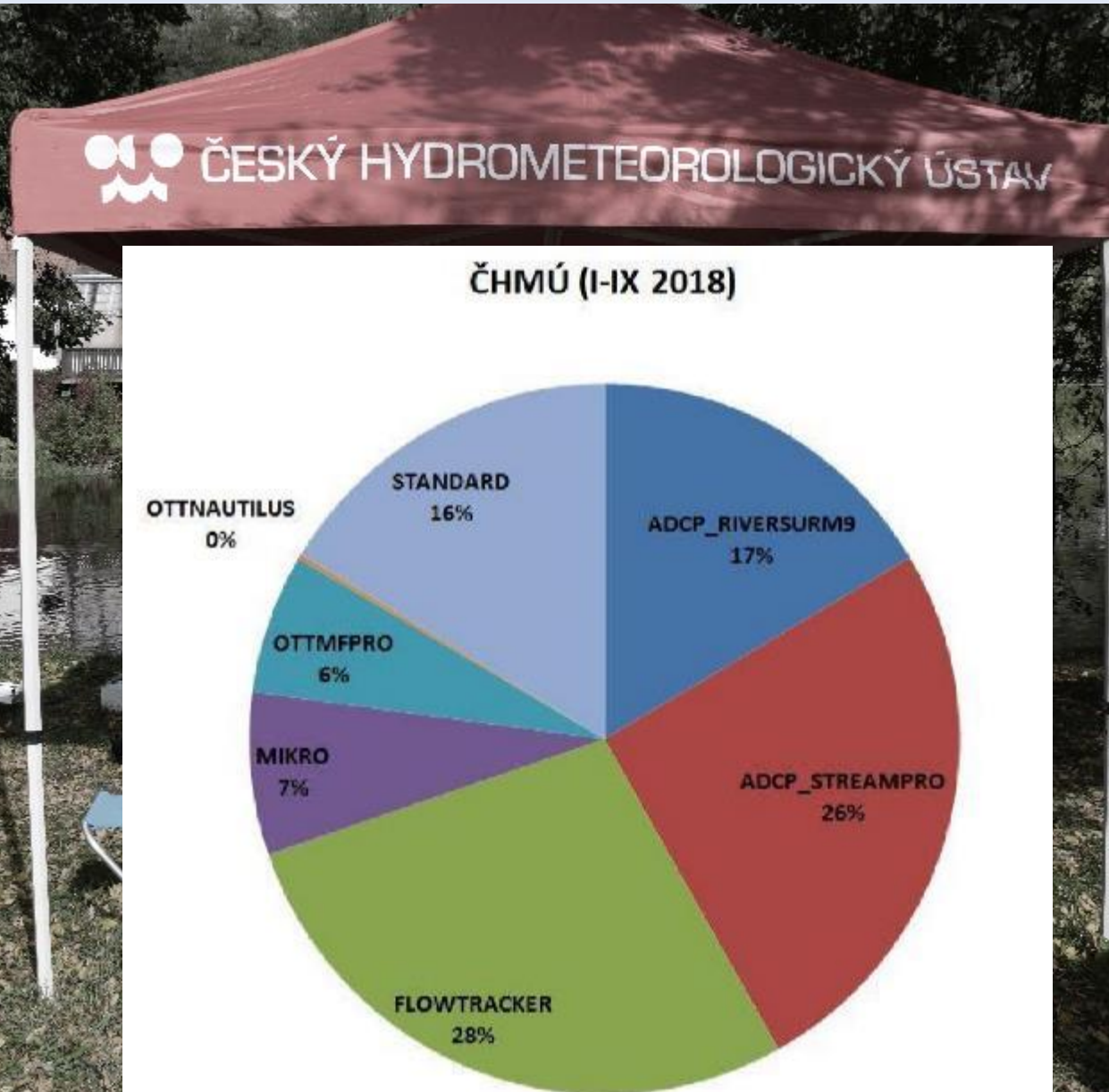


- RP 30
 - since 2014 (testing)/ 2016 (CHMI)
 - high/extreme flows
 - ADCP no response (air) or too much material (wood, ice)
 - safe solution (non contact, from bridge)
 - demanding pre-/ post- processing, but simple data collection
 - sometimes the one and only source of flow data

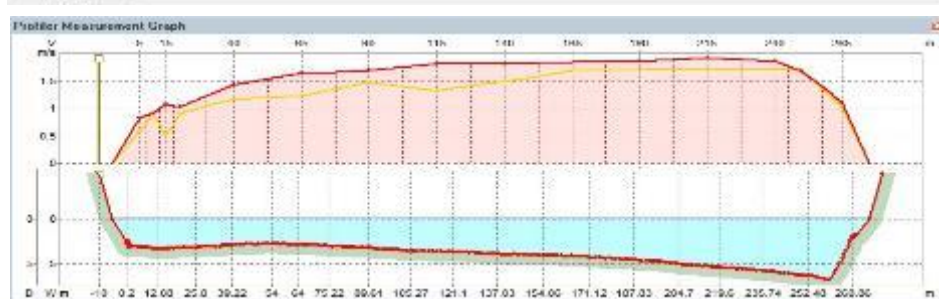
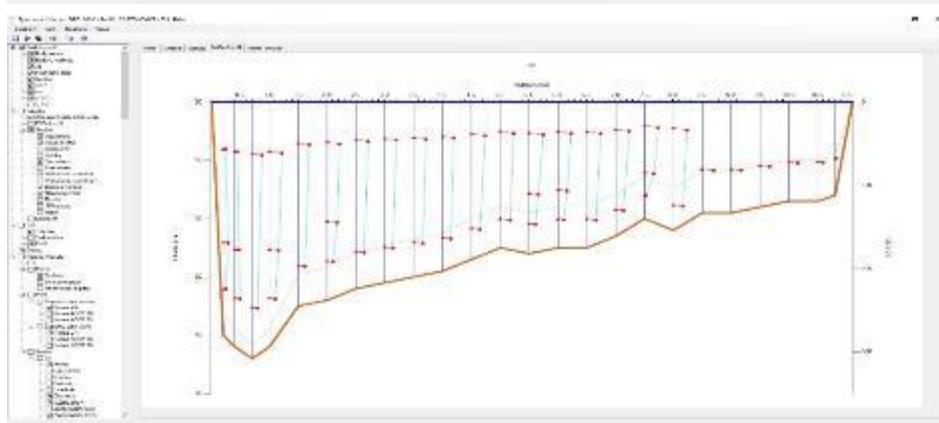
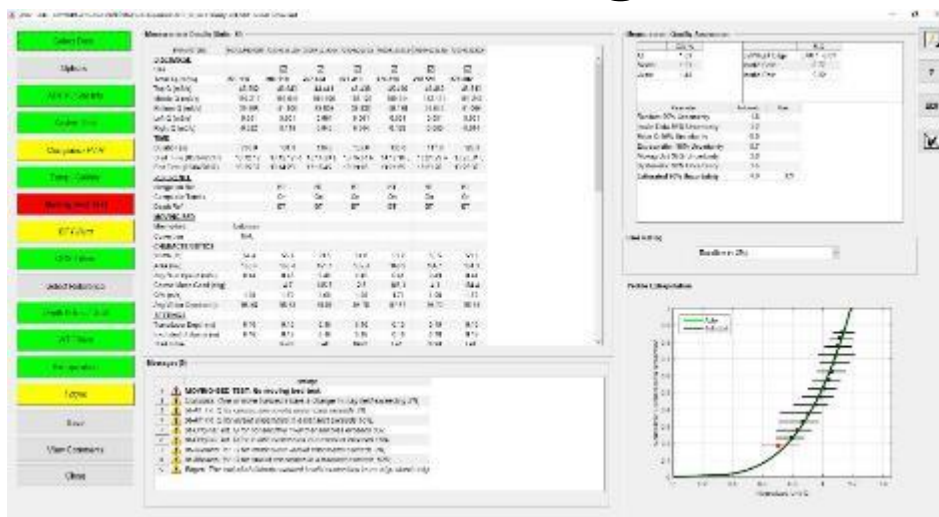
- TQ Tracer
 - one device since 2014
 - more useful than expected (mountainous region + dry years)
 - practical and fast in the field
 - good discharge results
 - in 2019 for every department



Total number of measurements = 2277

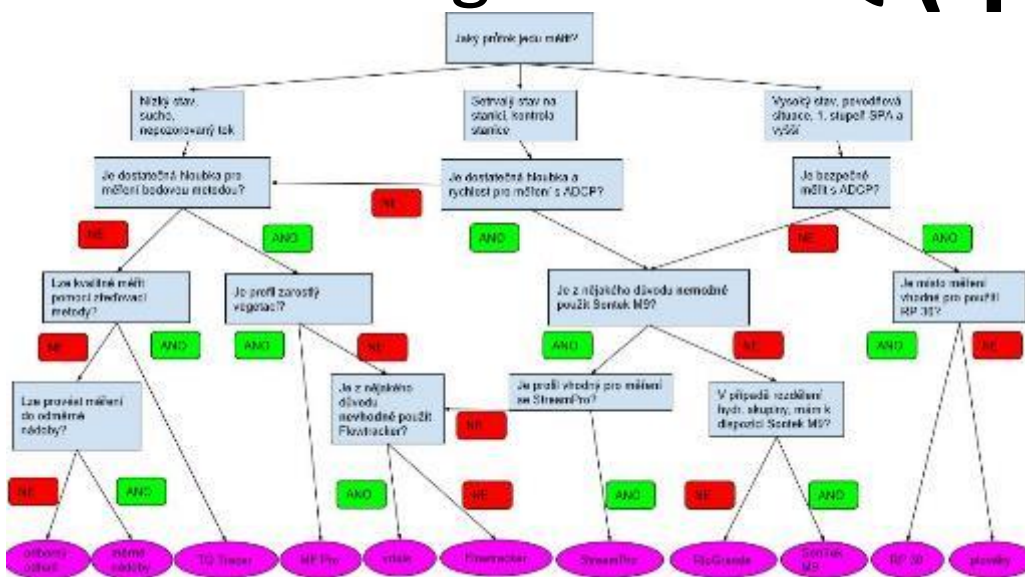


Discharge meas.: **Q** evaluation



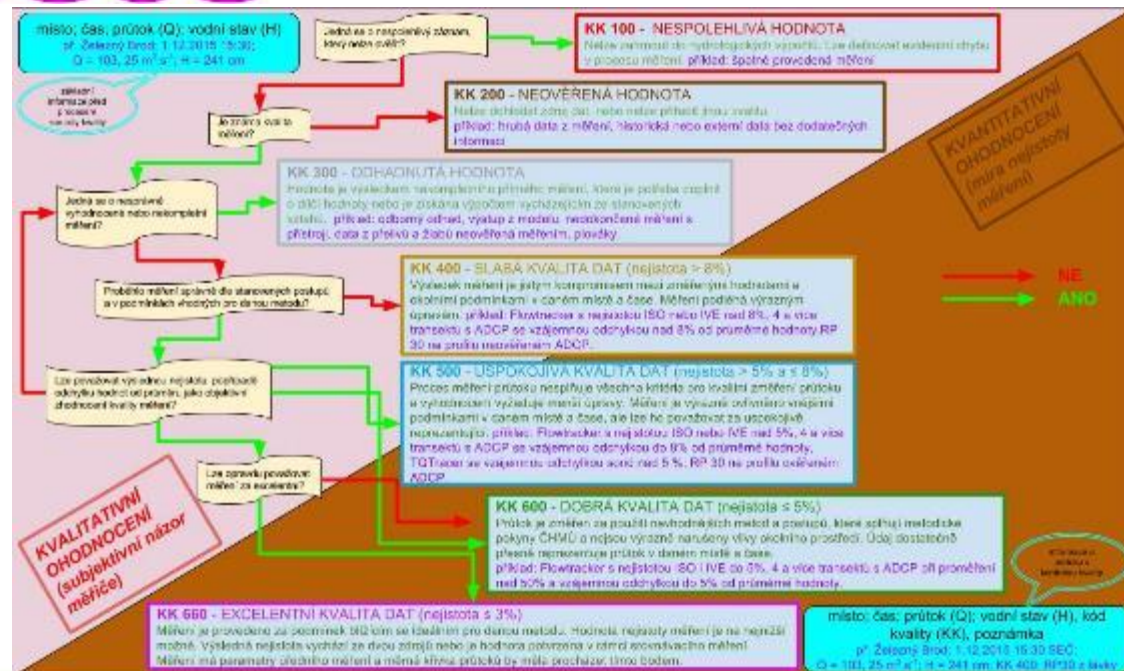
- QRev
 - need for uniform ADCP data output
 - QC in the field
 - limited user editing
 - regular use since 2018
 - SW Agila for detailed view + neighbor countries coop.
- SW Vrtule
 - one tool for all current meters
 - default computation – Spline
 - universal uncertainty definition
 - graphical outputs
- 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**

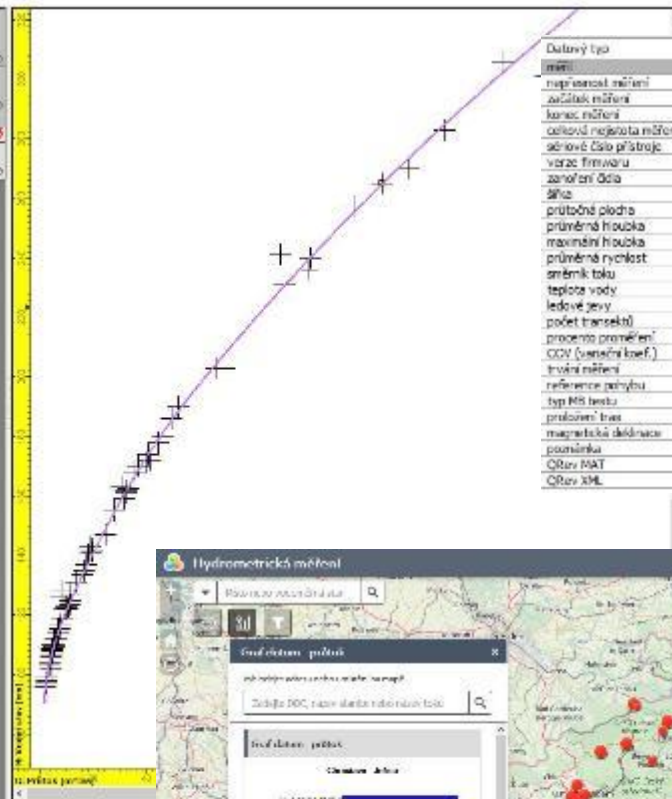
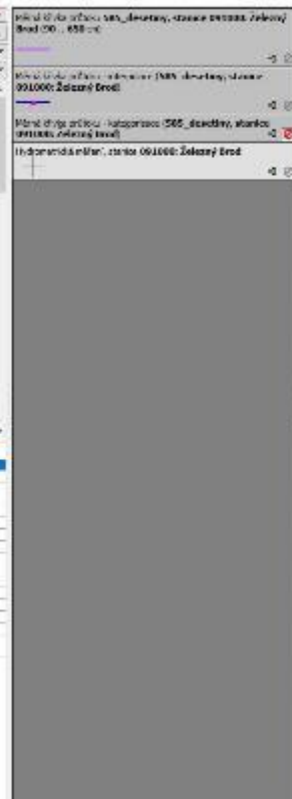
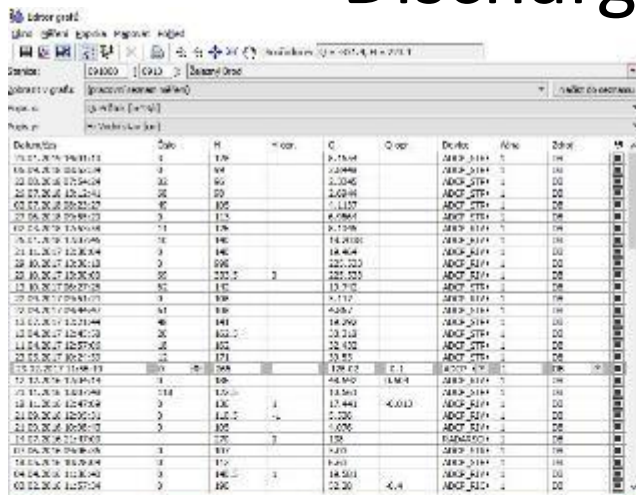


- „Hydrometric session“
- 1x/year; 2 profiles; aprox. 15 devices
- testing instr. and users
- certification of user and instr.
- methodical presentations
- open forum for about 25 people

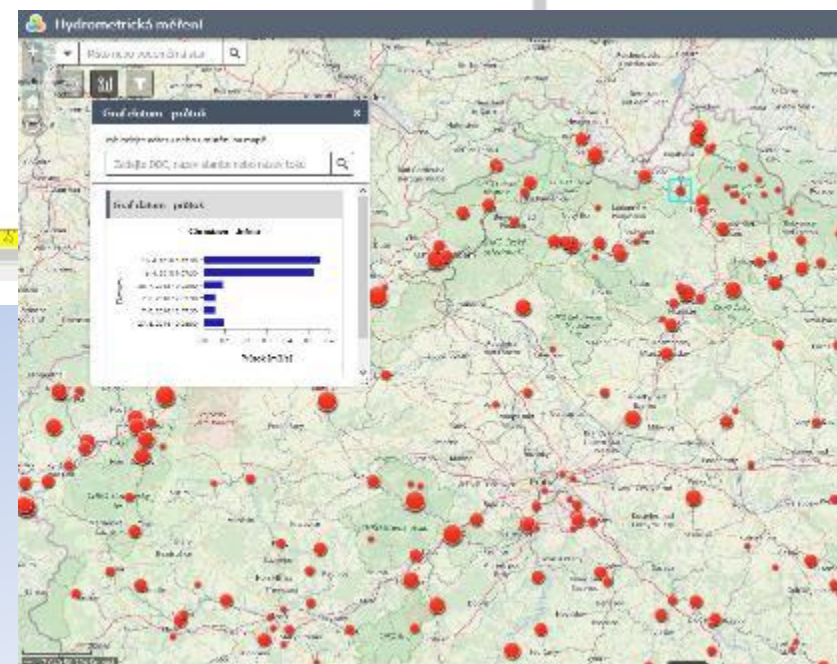
- „ADCP regatta“
- 1x / year; 3 profiles; aprox. 20 dev.
- intercomparison of ADCP = calibration
- methodical presentations
- inspiration in IRSTEA (Jer.LeCoz)
- international guests (Slovakia, Poland)



Discharge meas.: **data storage**



| | |
|--------------------------|-------------------------------------|
| Datový typ | modul |
| met | link: Duchačel |
| napřesání měření | 0500: 4 / 5% |
| azimut. měření | 23.01.2019 13:55:15 |
| kanal. měření | 23.01.2019 14:07:05 |
| celkový nejistota měření | 5.353 |
| seriové číslo přístroje | 1036 |
| verze firmwaru | 31.11 |
| zanefení čísla | 0.05 m |
| šifra | 33.205 m |
| přiběžná plocha | 23.63 m2 |
| průměrná hustota | 0.695 m |
| maximální hustota | 0.898 m |
| průměrná rychlost | 0.345 m/s |
| směrník toku | 128.939 ° |
| teplota vody | -0.2 °C |
| ledové jevy | 1: ledové jevy |
| počet transektů | 4 |
| procento proměření | 67.25 % |
| CCW (uvažná koef.) | 2.435 % |
| trojité měření | 191.88 s |
| referenční pohyb | 81 |
| typ RS hesla | Nepřezdílen |
| pozování tras | DIFF |
| magnetická deklinace | 0 ° |
| poznámka | Měřeno pro vyhodnocení přístroje. V |
| QRy NAT | 20190124_095245_QRy |
| QRy XML | <?xml version="1.0" encoding="utf |



- 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 (intercomparison 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

