Alberding solutions for GNSS infrastructure operators

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Alberding GmbH

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Outline

Alberding Ntrip Caster

Alberding GNSS Status Software

Correction service monitoring

Alberding GNSS receivers

Alberding GmbH

- German GNSS software and hardware development company
- Based in Wildau (near Berlin)
- More than 20 years of experience in high-accuracy GNSS positioning
- Specialised in GNSS data communication, management, processing and monitoring
- Customised solutions for GNSS infrastructure operators and RTK service providers
- Independent from GNSS receiver manufacturers

Alberding Ntrip Caster

Alberding GNSS Status Software

Correction service monitoring

Alberding GNSS receivers

Alberding Ntrip Caster

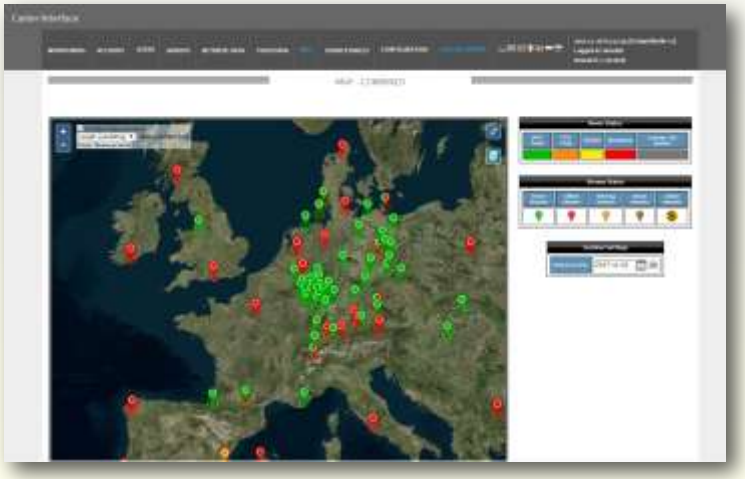
- Professional Ntrip Caster software for Linux OS
- Supports both Ntrip versions 1.0 and 2.0
- Dirk Stöcker (Alberding GmbH) is chair of the RTCM SC-104 Internet Protocol WG: Ntrip standardisation
- Designed for mass usage
  - can handle hundreds of reference stations (mountpoints) and thousands of simultaneous user connections
  - minimal latency times, low system requirements

Alberding Ntrip Caster advantages

- Brand neutral solution – no GNSS receiver priorities
- Separation of network RTK correction service from raw data provision to neighbouring countries, other service providers, etc.
  → optimise licencing
- Scalable, easily expandable software
- Supports multiple ports and domain names (virtual casters)
- User NMEA position forwarding to 3rd party Ntrip Casters
- Fault-tolerant architecture: backup Ntrip Caster

Alberding Ntrip Caster advantages

- Nearest base station auto-selection and auto-switch
- Web interface for system configuration, data and user management and monitoring
- Different levels of access to the web interface (admin, subadmin, basic)
- Map display with fleet management functionality and rover quality control
- SQL export of user connection information



Alberding Ntrip Caster

Alberding GNSS Status Software

Correction service monitoring

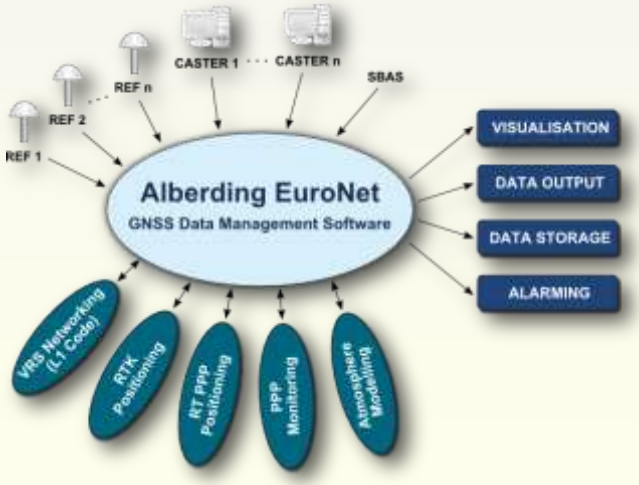
Alberding GNSS receivers

Alberding GNSS Status Software

- **Modular software for monitoring**
  - GNSS observation data quality
  - Reference station antenna stability (post-processed PPP)
  - DGNSS/RTK/PPP service quality
  - External sensor data
  - Troposphere (real-time PPP)

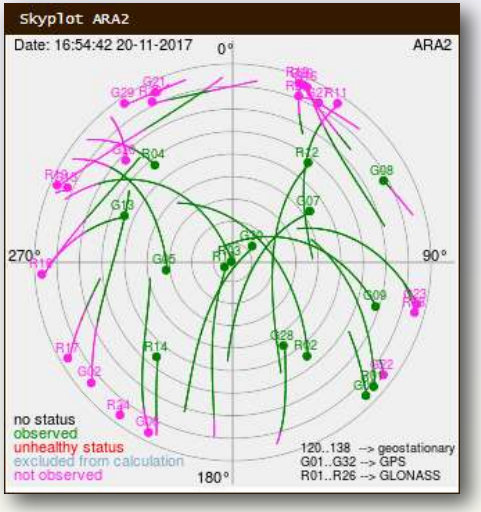
- **Data logging and redirection**
  - RINEX logging (v 2.11, v 3.0x)
  - Real-time data redirection (TCP, Ntrip)

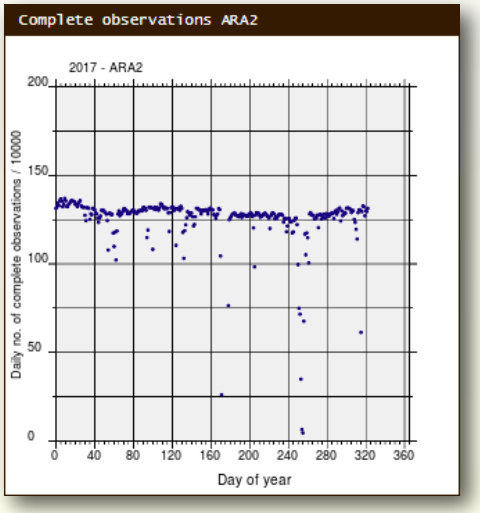
- **Web interface**
  - Visualisation
  - Alarming
  - Reporting



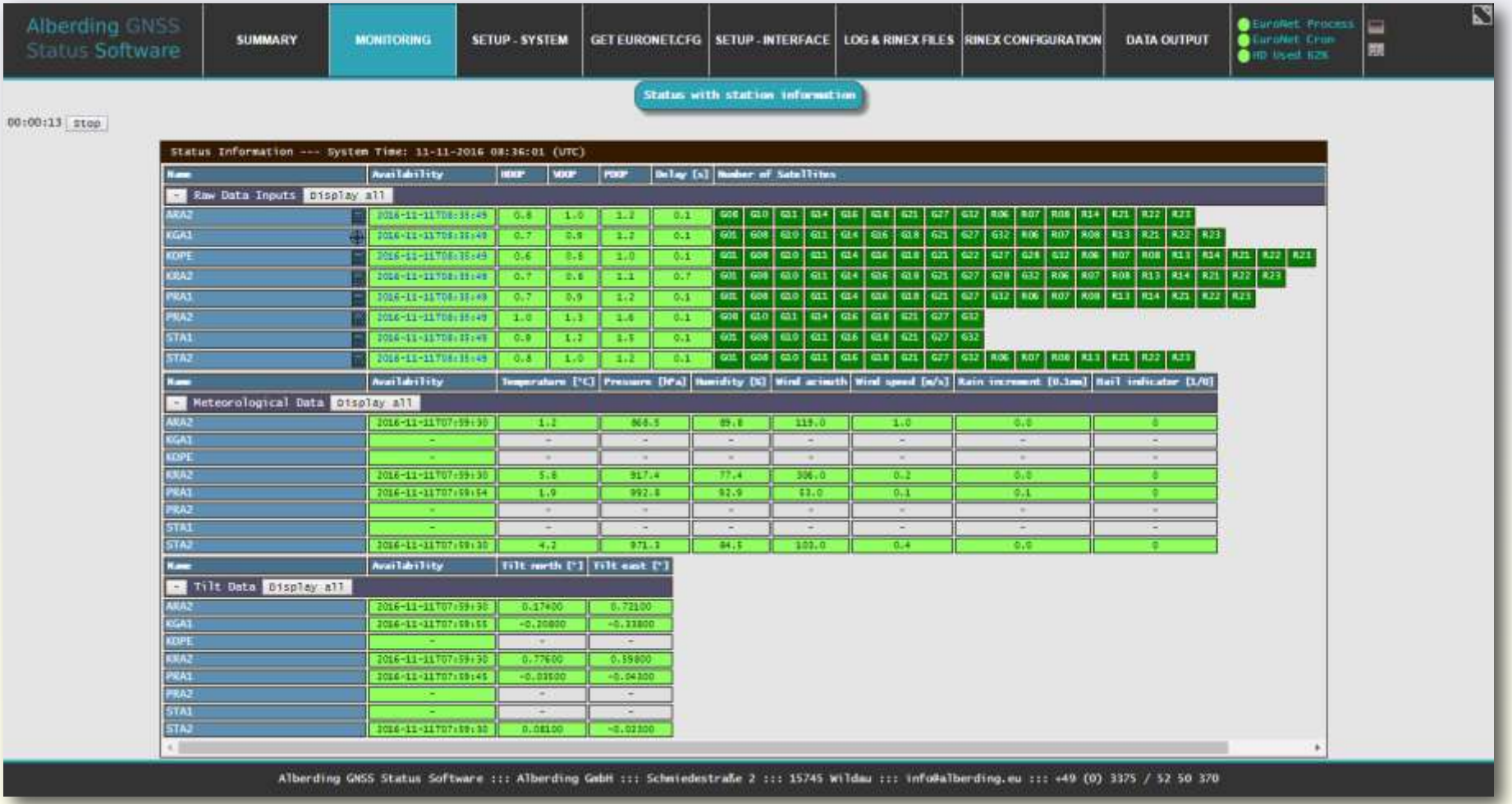
Alberding GNSS Status Software

- **GNSS observation data quality**
  - Raw data availability, latency, completeness
  - Number of satellites
  - DOP values, skyplot
  - Multipath
  - Cycle slips
  - Signal quality (C/N_0)
- **Position quality**
  - Accuracy (N,E,H)
  - Statistical values
- **External sensor data**
  - Weather station
  - Tilt sensor
  - Geotechnical sensors
- **Troposphere**
  - Zenith Total Delay
  - Integrated Water Vapour





GNSS Status Software web interface



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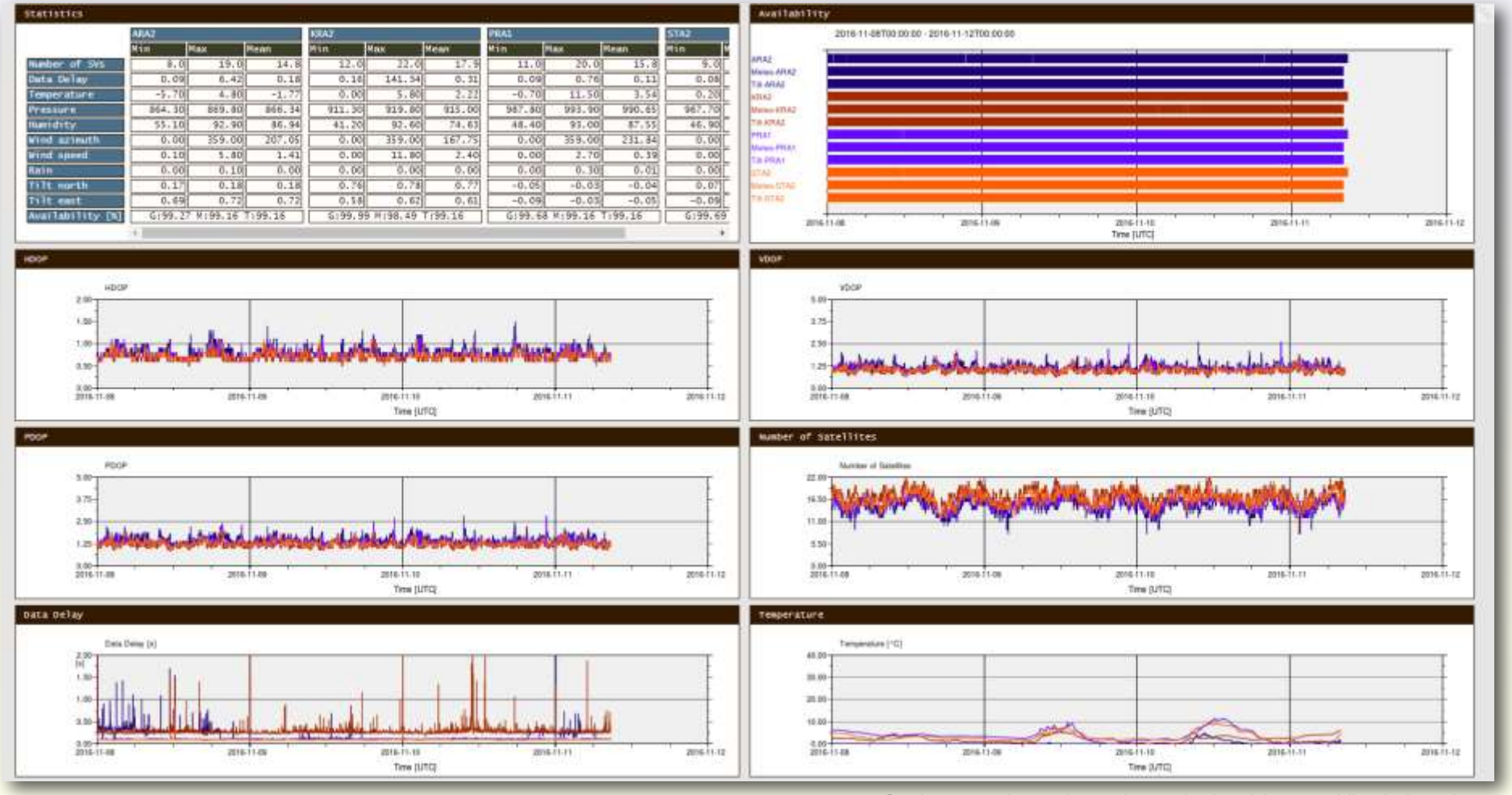
Observation data monitoring



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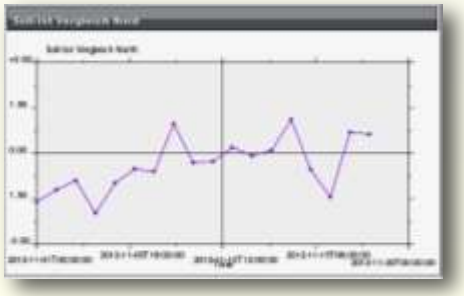
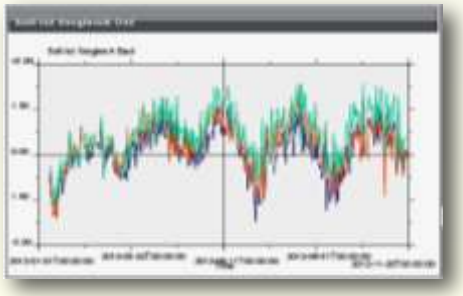
Post-processed PPP monitoring

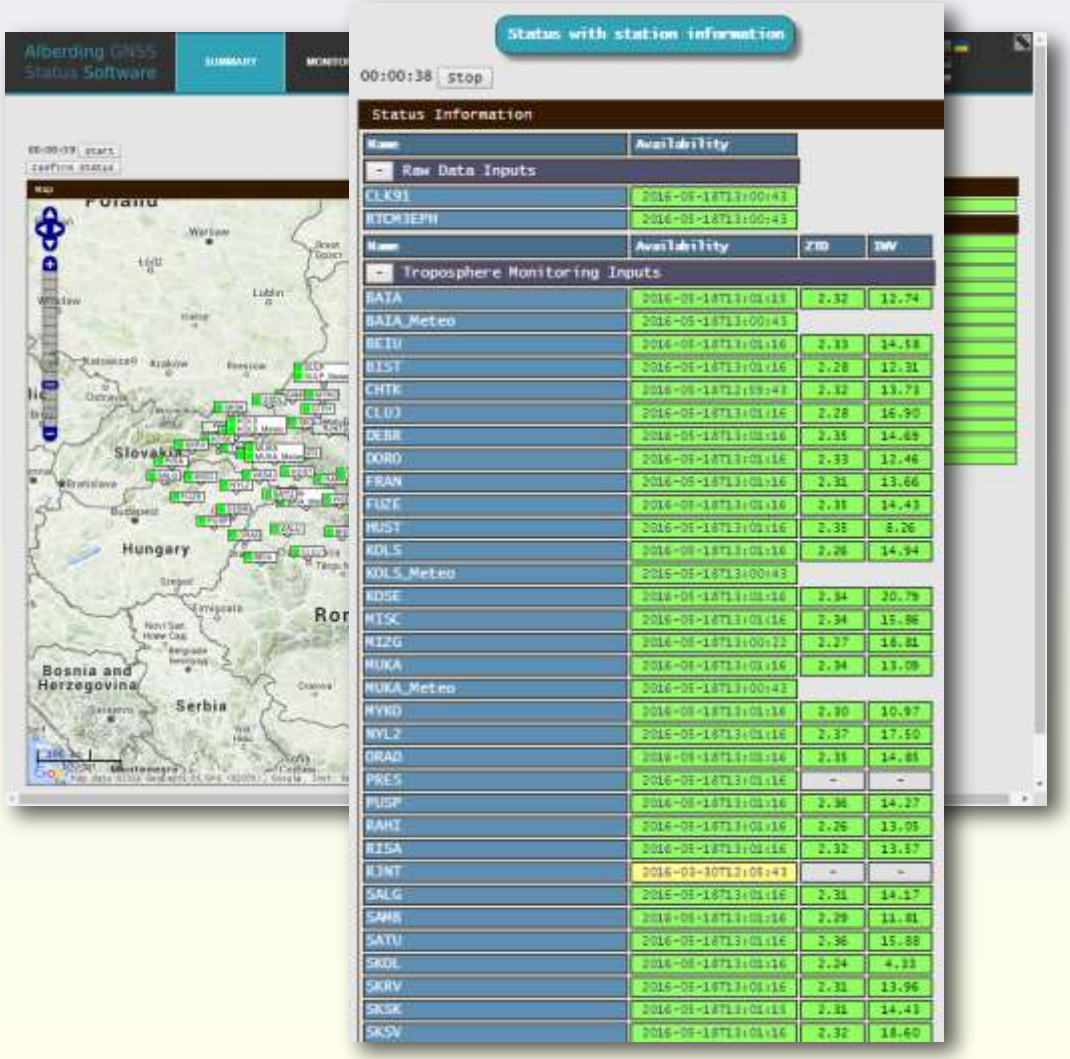
- Reference station coordinates
- Independent from the RTK networking algorithms
- Post processing of 24h RINEX files
- Web based status monitoring
- History data on time series plots
- Comparative analysis, differential plots
- Customisable alarm generation





Troposphere monitoring

- Real-time Precise Point Positioning (PPP) based troposphere estimation
- Tropospheric Zenith Total Delay (ZTD)
- Integrated Water Vapour (IWV)



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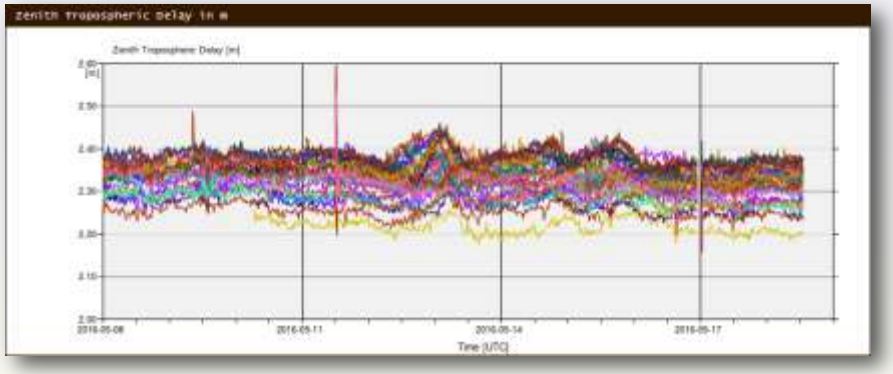
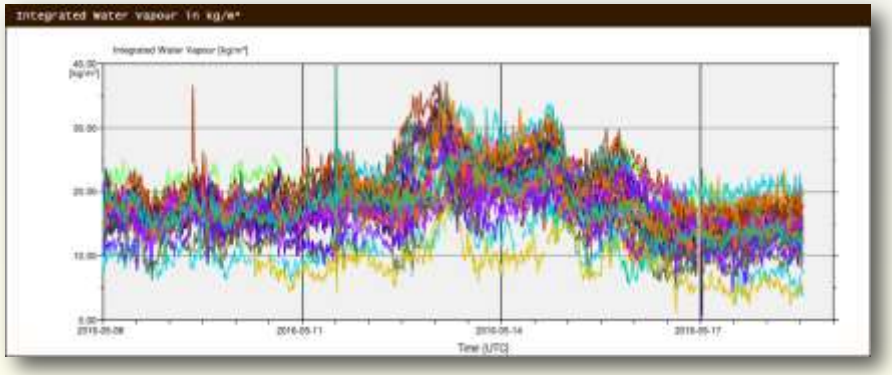
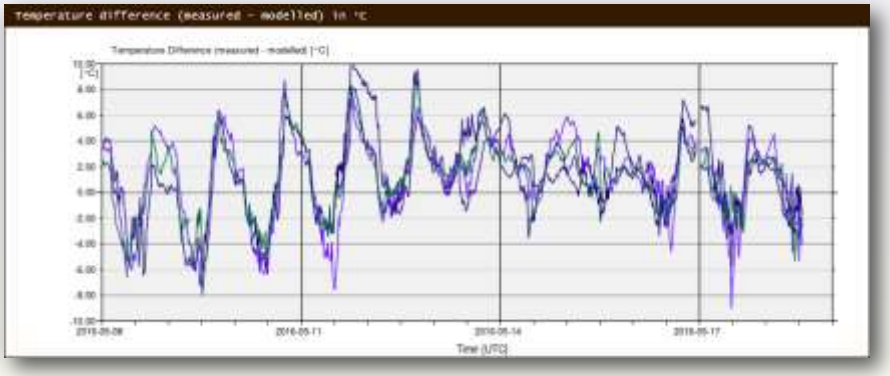
Troposphere monitoring

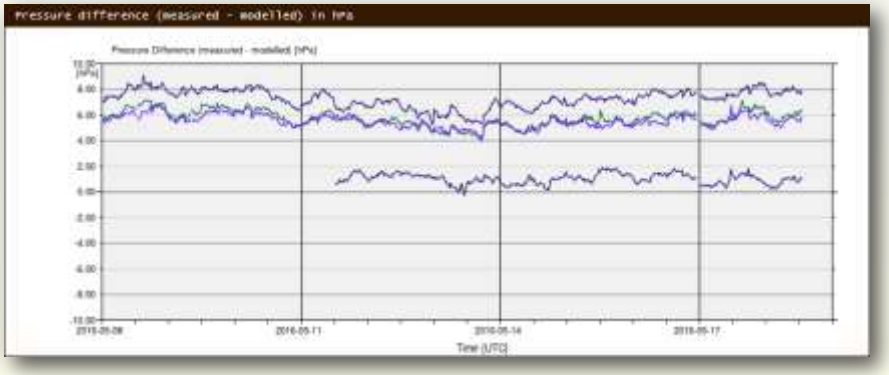
- ZTD and IWV time series plots





- Temperature and pressure differences





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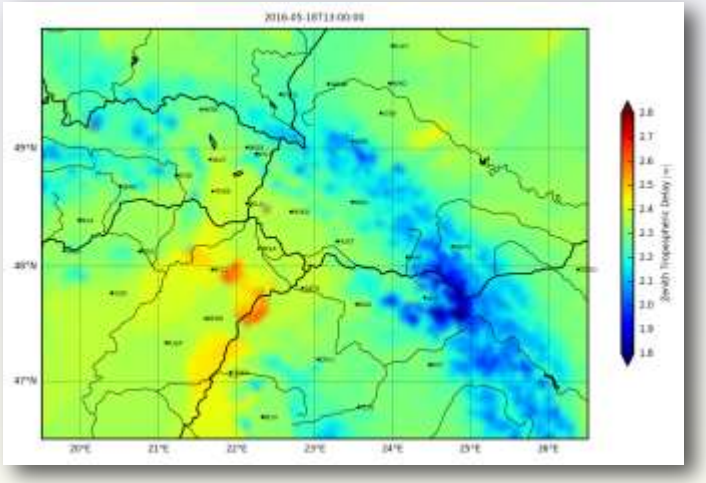
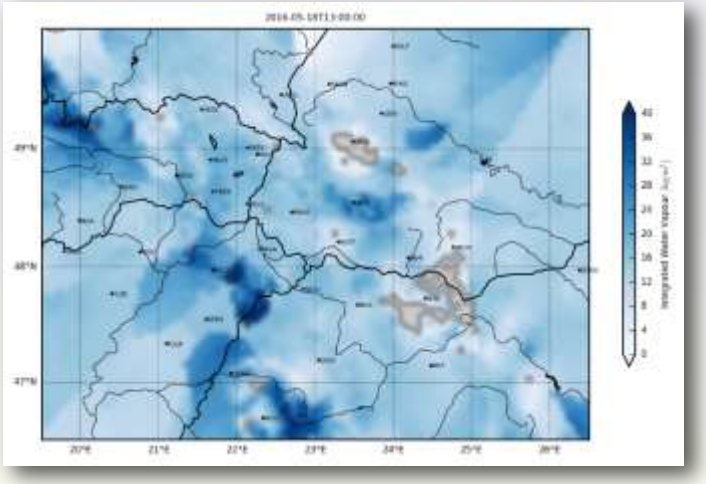
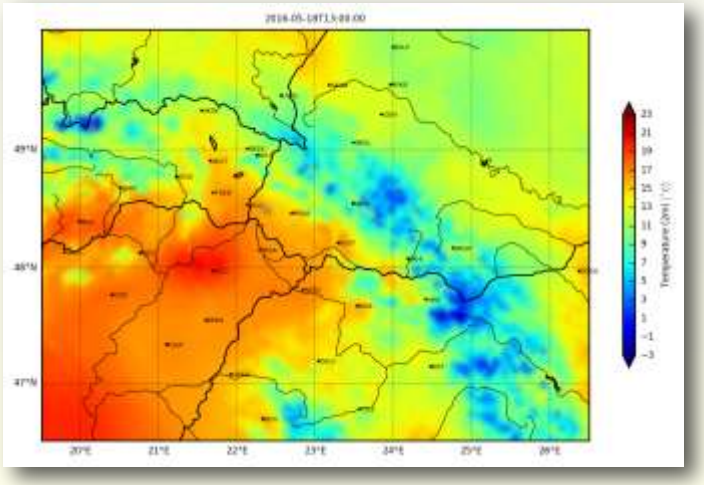
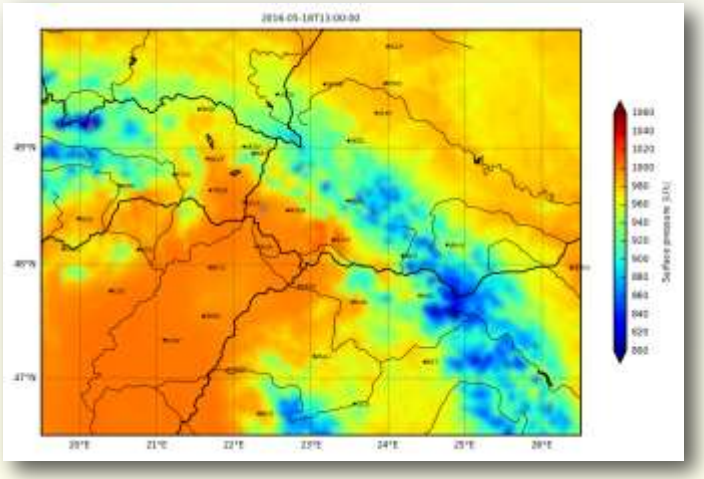
Troposphere monitoring

- Real-time ZTD, IWV, temperature and pressure surface maps









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Alberding Ntrip Caster

Alberding GNSS Status Software

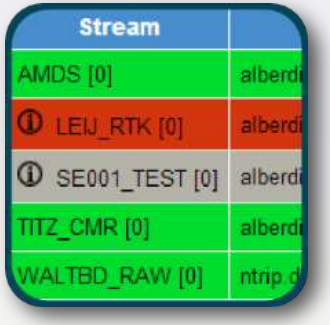
Correction service monitoring

Alberding GNSS receivers

Alberding-QC – service monitoring

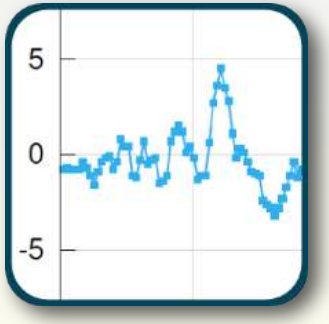
- Quality control software for DGNSS, RTK and PPP service providers
- Multi-purpose tool: 3 modules integrated into a single web interface
- Monitors service availability, accuracy and data contents
- Software licence or service provided by Alberding GmbH

Alberding-QC software modules



Checkstream

- Ntrip stream availability and data consistency



RTK-Check

- Positioning accuracy and ambiguity fixing time

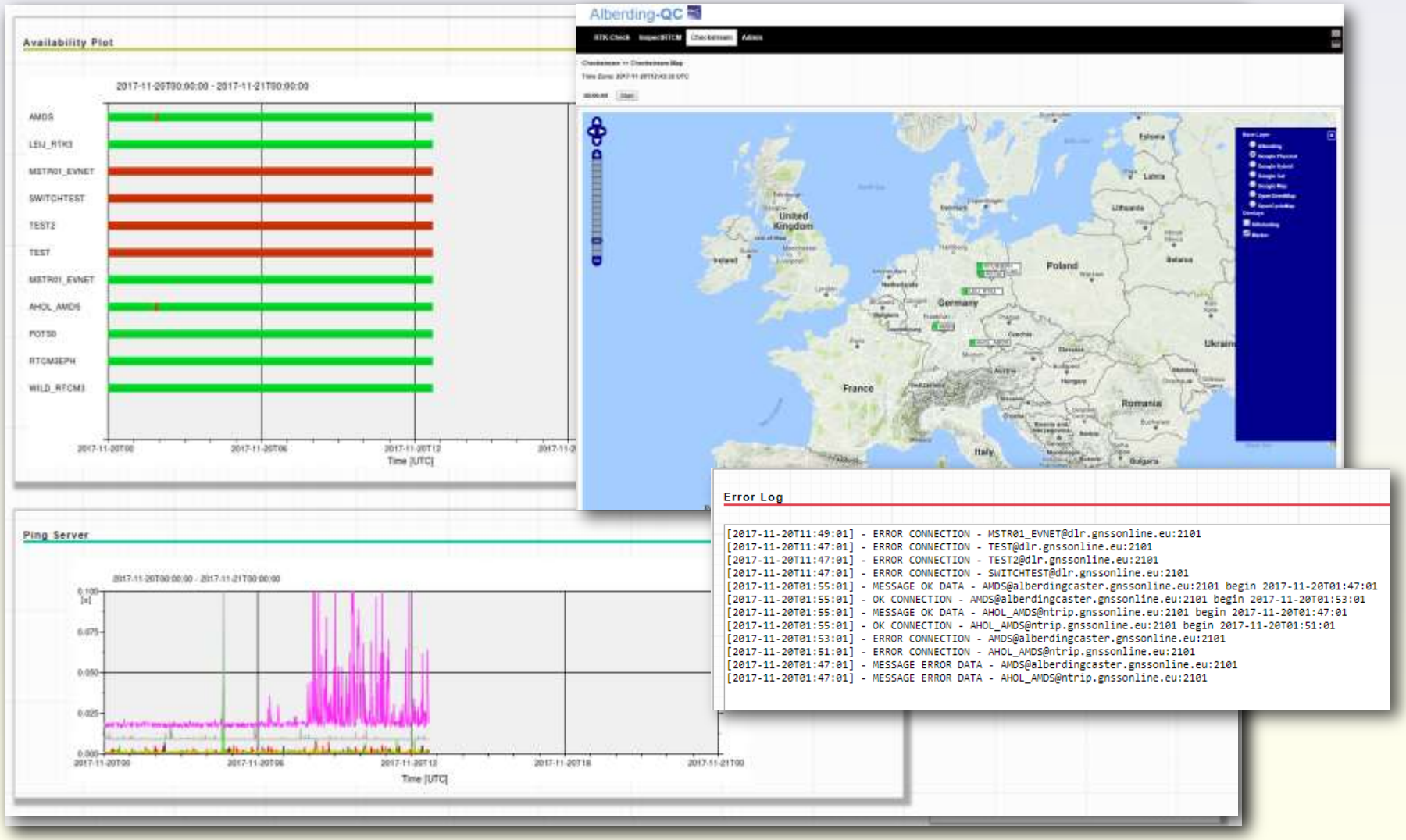
InspectRTCM

- GNSS binary data decoding and visualisation

Checkstream – Ntrip monitoring

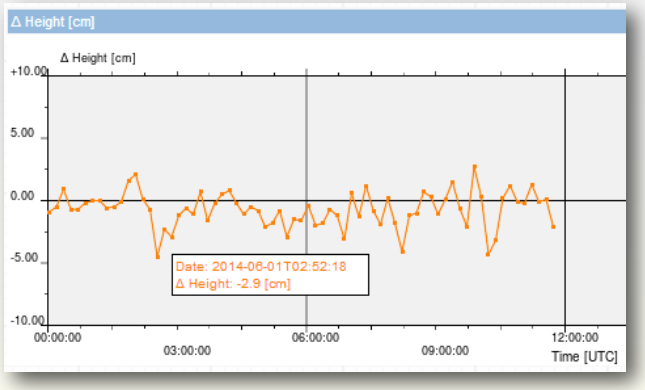
- Ntrip stream availability and Ntrip Caster server accessibility monitoring
- Periodic connections and data sampling
- Data decoding - format verification (RTCM, CMR, raw binary data…)
- Data content analysis – message types (incl. MSM, SSR) and update rates
- Data age analysis
- Monitoring multiple casters from a single website
- Monitoring hundreds of Ntrip mountpoints
- NMEA output for network RTK streams
- Availability statistics for 24/7 and normal working hours
- Automatic email/SMS warnings with flexible settings
- PDF reporting

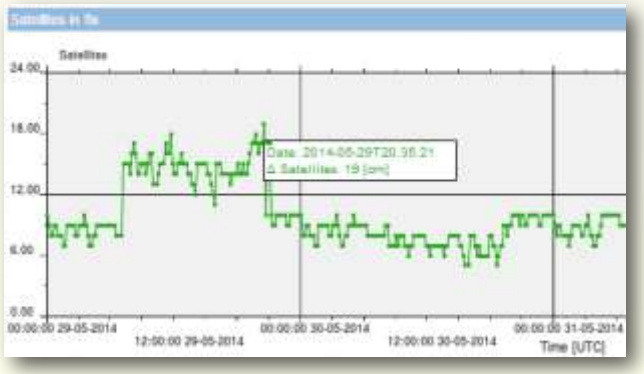
Checkstream – web interface



RTK-Check

- Positioning accuracy and RTK fixing time monitoring
- Physical monitor station receiver (fw solution) → **Alberding A10**
- RTKLIB algorithms (sw solution)
- Periodic connection sessions
- Statistics generation
- Visualisation of the results
- Email warnings with customisable warning thresholds
  - no NMEA data, no RTK Fix, high position error, low number of SVs, high data age
- Multiple position computations
- Supports RTCM 3.x incl. MSM and SSR
- PDF reports , CSV export





RTK-Check web interface

Alberding-QC

RTK-Check | InspectRTCM | Checkstream | Admin

RTK-Check >> Monitoring

Time Zone: 2014-05-30T12:57:33 UTC

Reload in: 00:00:47 Stop

Settings

Begin:	2014-05-30 0 : 0
End:	2014-05-31 0 : 0
Time frame	1.0 [h]
Streams:	WALTBD-POTS0 Real WALTBD-WILD_RTK Real test Real Select all / Invert selection / Remove selection
NE:	10 [cm]
Height:	10 [cm]
Satellites:	24 [#]
Data-Age:	10 [s]
HDOP:	6
TTFA:	8 [s]
Peaks	

CSV PDF Ok

Sessiondata - [WALTBD-WILD_RTK]

Event Time [UTC]	Solution	Epochs	ΔN [cm]	ΔE [cm]	ΔH [cm]	ΔNE [cm]	TTFA [s]	# of Sat.	HDOP	Data-Age [s]	Checktype
2014-05-30 12:53:16	RTK Fixed	298 / 300	0.2	-2.3	-2.7	2.3	3	7	1.0	1.3	Interval Check
2014-05-30 12:46:15	RTK Fixed	299 / 300	0.4	-1.2	-0.7	1.3	1	7	1.0	1.2	Interval Check
2014-05-30 12:39:14	RTK Fixed	300 / 300	0.3	-1.8	-2.3	1.8	1	7	1.0	1.2	Interval Check
2014-05-30 12:32:13	RTK Fixed	300 / 300	-0.8	-2.1	-2.1	2.3	1	7	1.0	1.2	Interval Check
2014-05-30 12:25:12	RTK Fixed	300 / 300	-0.7	-2.5	-1.6	2.6	1	7	1.2	1.2	Interval Check
2014-05-30 12:18:11	RTK Fixed	300 / 300	-1.8	-1.3	-4.7	2.2	1	7	1.2	1.2	Interval Check
2014-05-30 12:11:10	RTK Fixed	300 / 300	-0.9	-0.4	-1.2	0.9	1	7	1.2	1.2	Interval Check
2014-05-30 12:04:09	RTK Fixed	300 / 300	-0.7	1.1	-3.3	1.4	1	7	1.3	1.2	Interval Check
2014-05-30 11:57:08	RTK Fixed	300 / 300	0.1	3.0	-5.6	3.0	1	8	1.0	1.3	Interval Check
2014-05-30 11:50:07	RTK Fixed	300 / 300	0.5	-0.1	-4.1	0.5	1	8	0.9	1.2	Interval Check
2014-05-30 11:43:06	RTK Fixed	300 / 300	-0.8	0.5	-3.3	0.9	1	8	0.9	1.2	Interval Check
2014-05-30 11:36:05											eck
2014-05-30 11:29:04											eck
2014-05-30 11:22:03											eck
2014-05-30 11:15:02											eck

Statistics

	RTKLIBTEST - 89 records				WALT-POTS_RTKLIB - 89 records			
	Min.	Max.	Mean	σ	Min.	Max.	Mean	σ
Δ North [cm]	-43.3	22.2	-0.9	6.8	-18.0	22.4	1.0	7.4
Δ East [cm]	-71.1	18.2	-1.7	11.1	-80.2	76.3	4.2	17.1
Δ Height [cm]	-51.1	48.0	-0.7	11.3	-61.2	41.9	-8.1	15.0
Δ Horizontal [cm]	0.1	71.2	4.7	12.3	1.1	82.9	11.0	15.6
TTFA [s]	1.0	540.0	134.9	226.9	-	540.0	98.0	188.4
# of Sat.	6.0	10.0	8.3	1.1	6.0	10.0	8.3	1.1
HDOP	-	1.5	1.0	0.3	-	1.5	0.9	0.4
Data-Age [s]	0.0	1.8	1.0	0.2	1.0	4.0	2.5	0.6

RTK-Check history data analysis

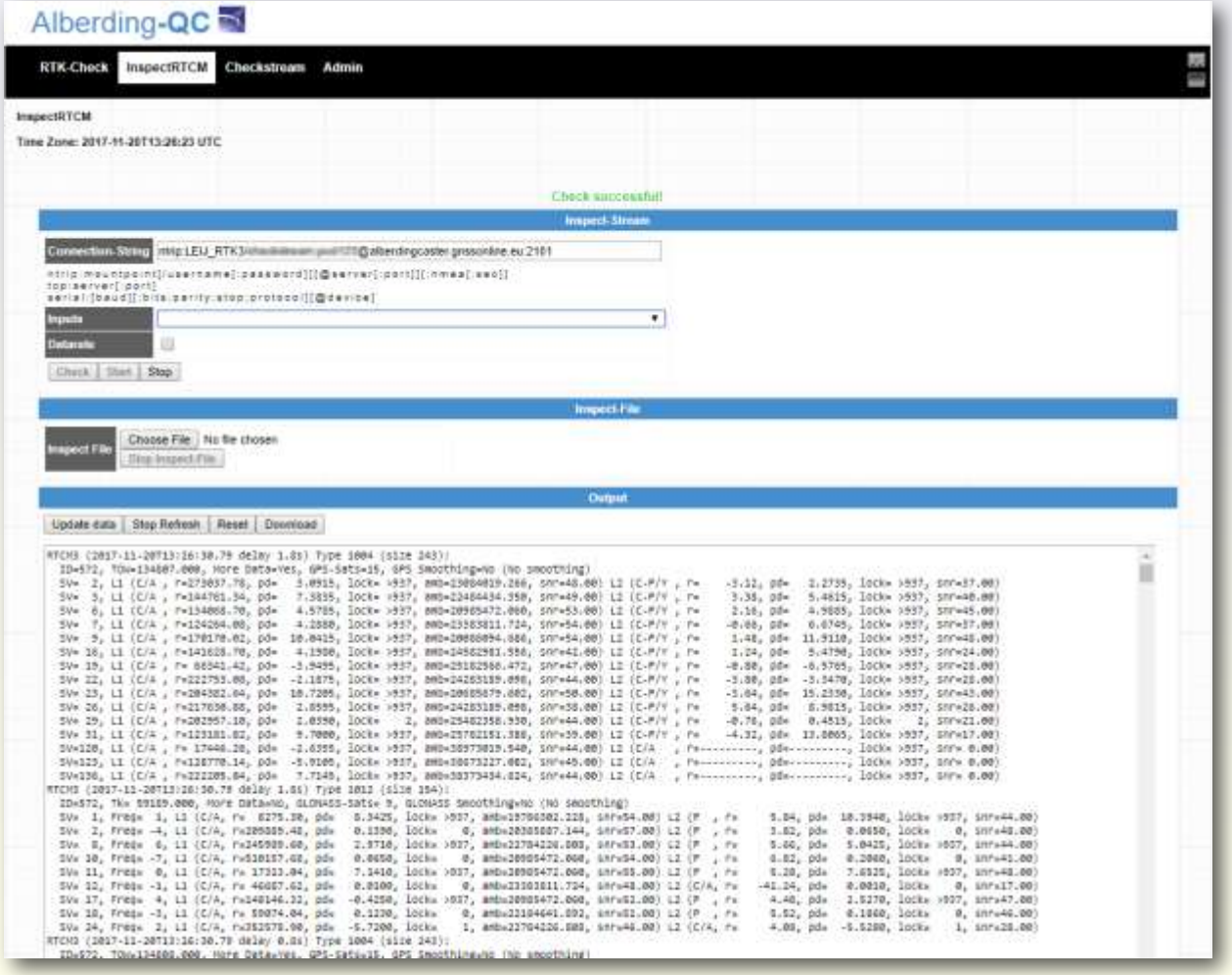
InspectRTCM

- GNSS binary data decoder software for detailed data content analysis

- Real-time visualisation
- RTCM (incl. MSM, SSR, etc.), CMR, RTCA, raw binary input
- NMEA GGA output for network RTK streams
- Transmission delay analysis
- Data rate analysis of individual message types

- **Real-time streams (TCP/UDP/Ntrip/serial) and file input**

InspectRTCM web interface



Alberding DataConv

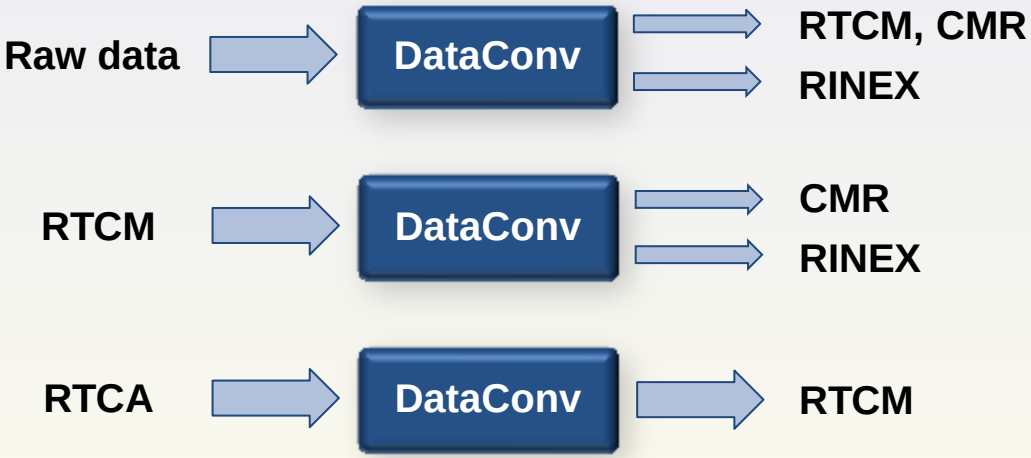
- **Real-time GNSS data translation**

- Leica
- Trimble
- Topcon
- Ashtech
- Septentrio
- Javad
- NovAtel
- Hemisphere GPS
- U-blox
- NVS
- etc.

- RTCM 2.x
- RTCM 3.x
- CMR
- CMR+
- RINEX 2.11
- RINEX 3.0x

Alberding DataConv

- **Real-time GNSS data translation**



Alberding Ntrip Caster

Alberding GNSS Status Software

Correction service monitoring

Alberding GNSS receivers

Alberding A07-RTK

- Low-cost L1 GNSS RTK receiver
- Multi-constellation (GPS, GLONASS, BeiDou)
- Centimetre accuracy
- Integrated GPRS modem, Bluetooth module
- Integrated processor for data management
- Data storage (32 GB memory card)
- RS232 serial port
- Li-Po battery
- Available in 2 different housings:
  A07-RTK Standard and A07-RTK Robust
- Alberding AGIS software (Android) for field data collection
- Applications: GIS / surveying, machine positioning, wireless data transfer, geo-monitoring

GIS data collection

- Effective **geo data capture** in the field
- Simple, lightweight and productive
- The A07-RTK receives corrections via **Ntrip**
- **RTK position** solution
- Position transmission via **Bluetooth**

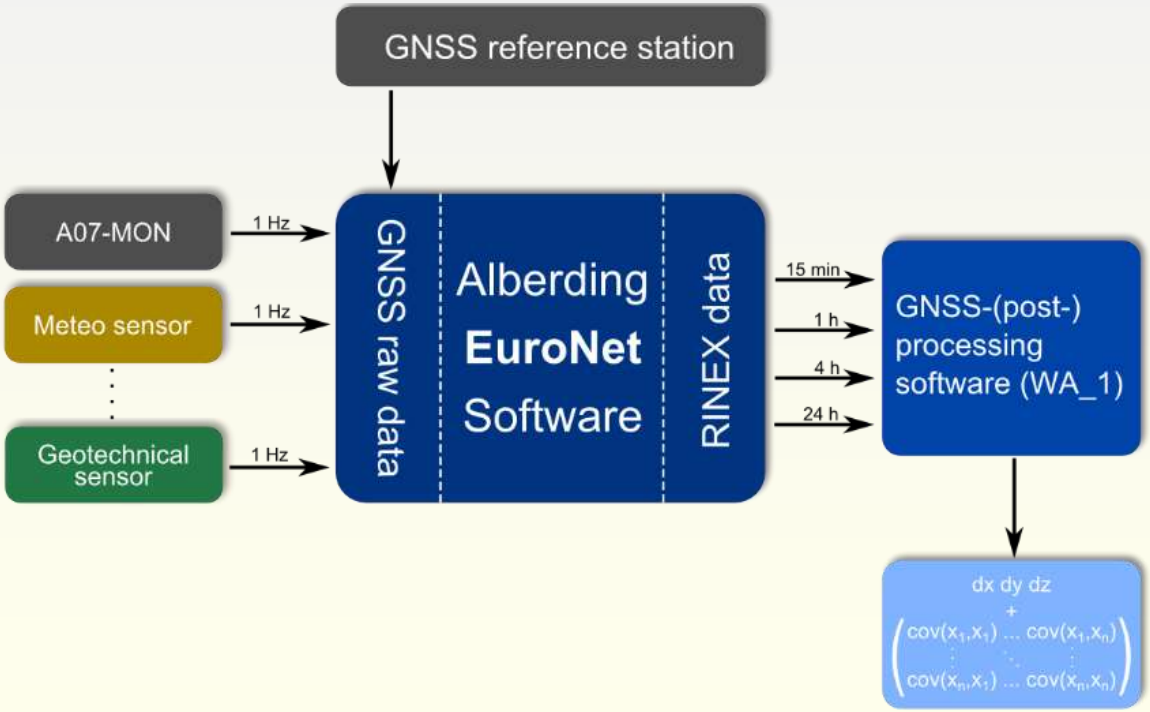
A07-RTK + **AGIS Mapping Software**

Low-cost L1 GNSS multi-constellation receiver

GIS field software for Android

Geo-monitoring with Alberding A07

- A07-MON: GNSS measurements and telemetry
- On the server: automatic processing
- Sub-cm level displacement monitoring
- Alarming – email/ SMS



- Visualisation of time series plots, PDF reports, CSV output

Alberding A10

- Multi-constellation, dual-frequency RTK GNSS receiver with telemetry functionality
- Different compatible GNSS OEM boards
- Integrated 4G LTE modem
- Bluetooth module with antenna
- Cortex M3 processor with Alberding GNSS data management software
- 26-pin multi-port connector
- **Embedded PC with Linux OS**
- Applications:
  - RTK surveying
  - GNSS monitor station
  - Machine auto-steering
  - Service development and testing

Alberding A10 – PPP-RTK test

- SAPOS SSR performance test in Germany
- SSR data generated and broadcast by SAPOS Bavaria
- SSR2OSR conversion on board A10
- Geo++ SSR2OSR algorithm installed on the embedded Linux computer
- PPP-RTK position computation directly on the receiver

Thank you for your attention!

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