GPS-derived Atmospheric Water Vapour at GFZ: From Near Real-Time to Real-Time Processing

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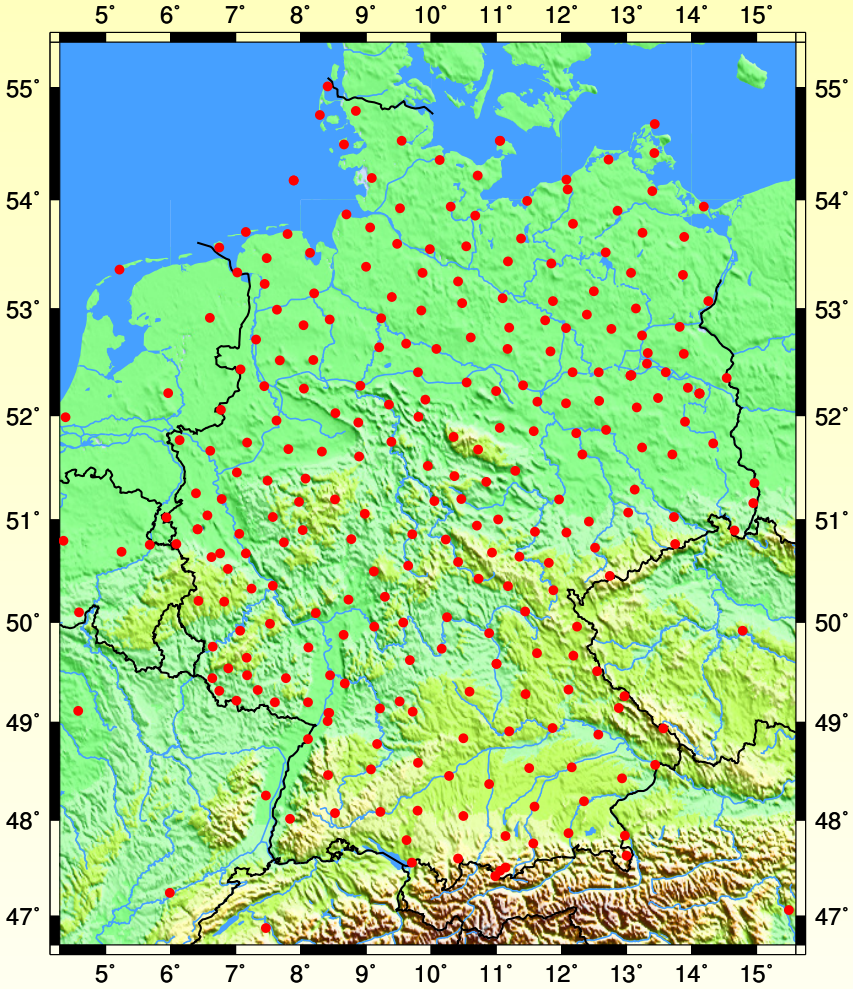
Near Real-Time GPS Processing at GFZ

Currently, the data of > 300 stations are processed in near real-time by the GFZ.

- Provider: SAPOS, EUREF, GFZ, BKG, DLR, ...
- Sampling rate: 2.5 min. products, 30 s raw data
- Near Real-Time processing with a delay of ∼ 1h 30 min.
- Mean station distance ∼ 35 km.
- Products: ZTD, IWV, STD



GPS stations operationally processed by the GFZ.

Improved Near Real-Time Processing: EPOS 8

- Processing of GLONASS observations
- Processing of Galileo observations (currently Giove A/B)
- Improved processing techniques: absolute antenna phase center corrections, advanced mapping functions, ...

$$\Downarrow$$

- More precise ZTD/IWV observations.
- Nearly two times (GLONASS) or three times (GLONASS+Galileo) more slant observations.
- Increasing number of stations ...

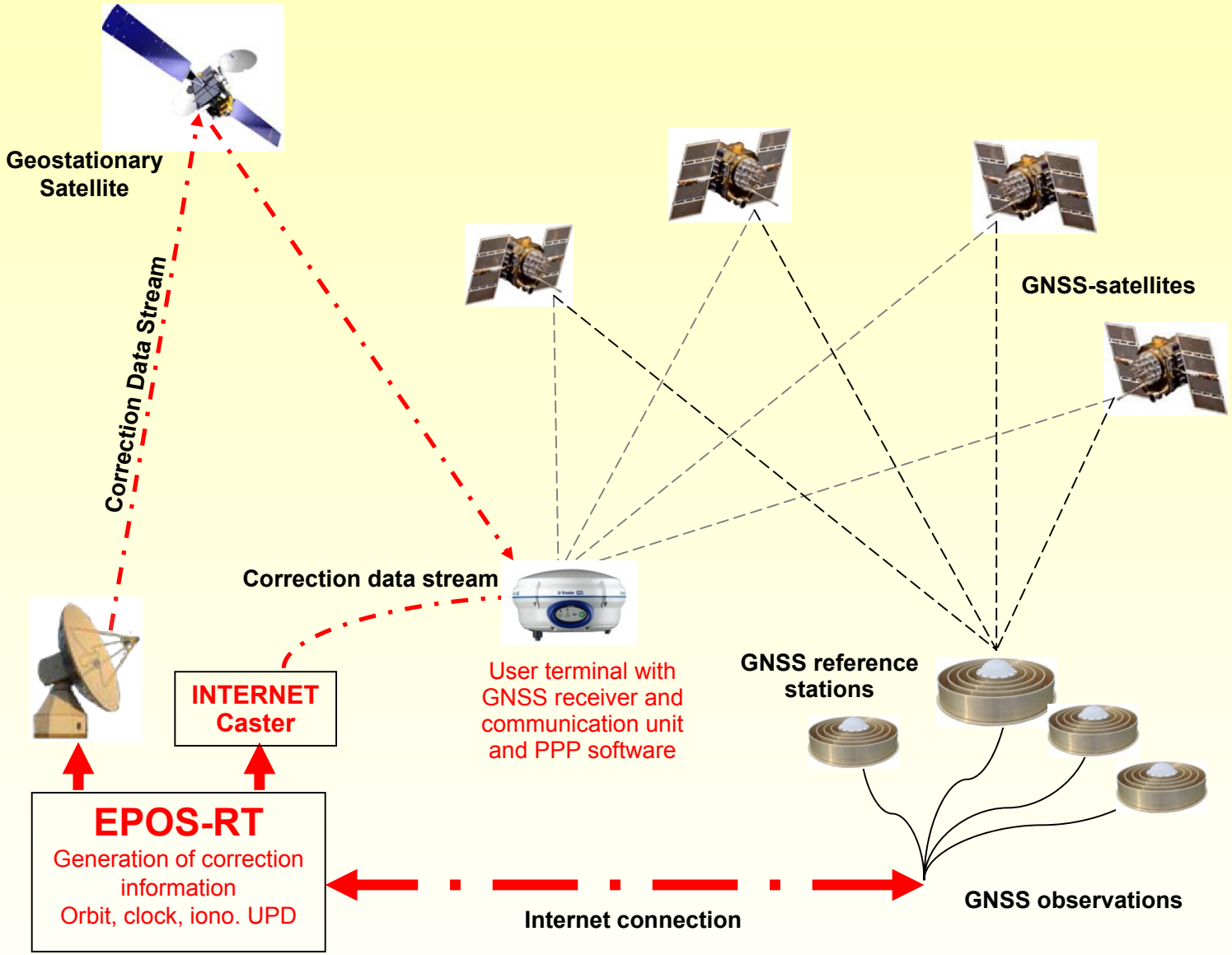
EPOS-RT: Real-Time GNSS Processing

EPOS-RT

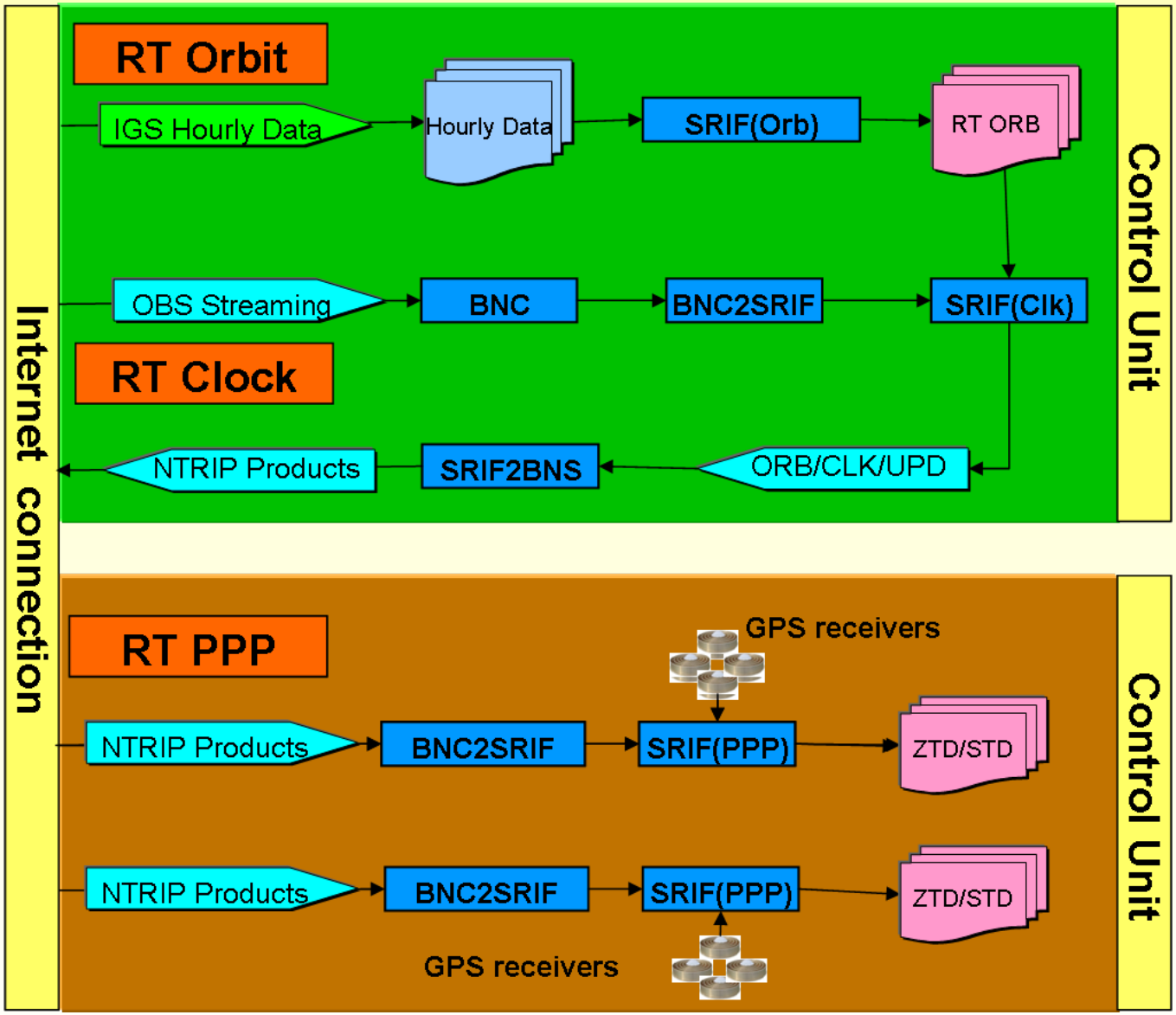
Earth **P**arameter and **O**rbit **S**ystem in **R**eal-**T**ime

- Running in streaming mode, providing results with a delay of only several seconds
- PPP user module runs on any computer with internet connection $\Longrightarrow$ distributed data processing
- Multi-Function approach:
  - Real-time and post-processing mode
  - Static, kinematic and dynamic receivers

Real-Time PPP Service, Infrastructure

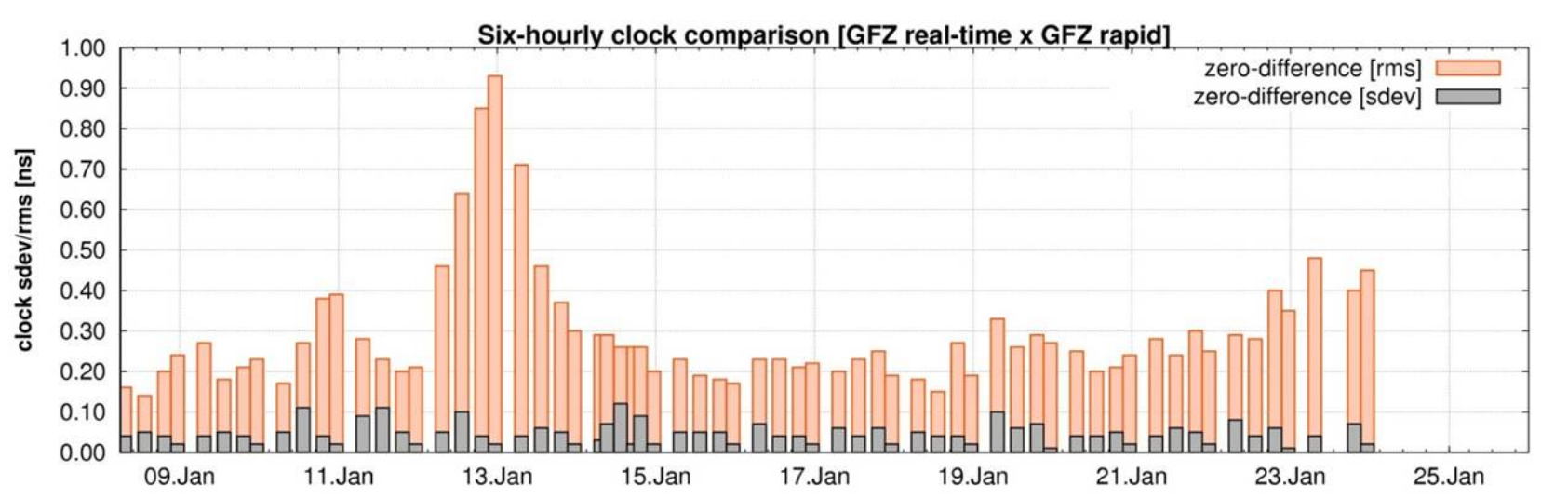


EPOS-RT: Troposphere Processing in PPP Mode



GFZ Real-Time Clocks

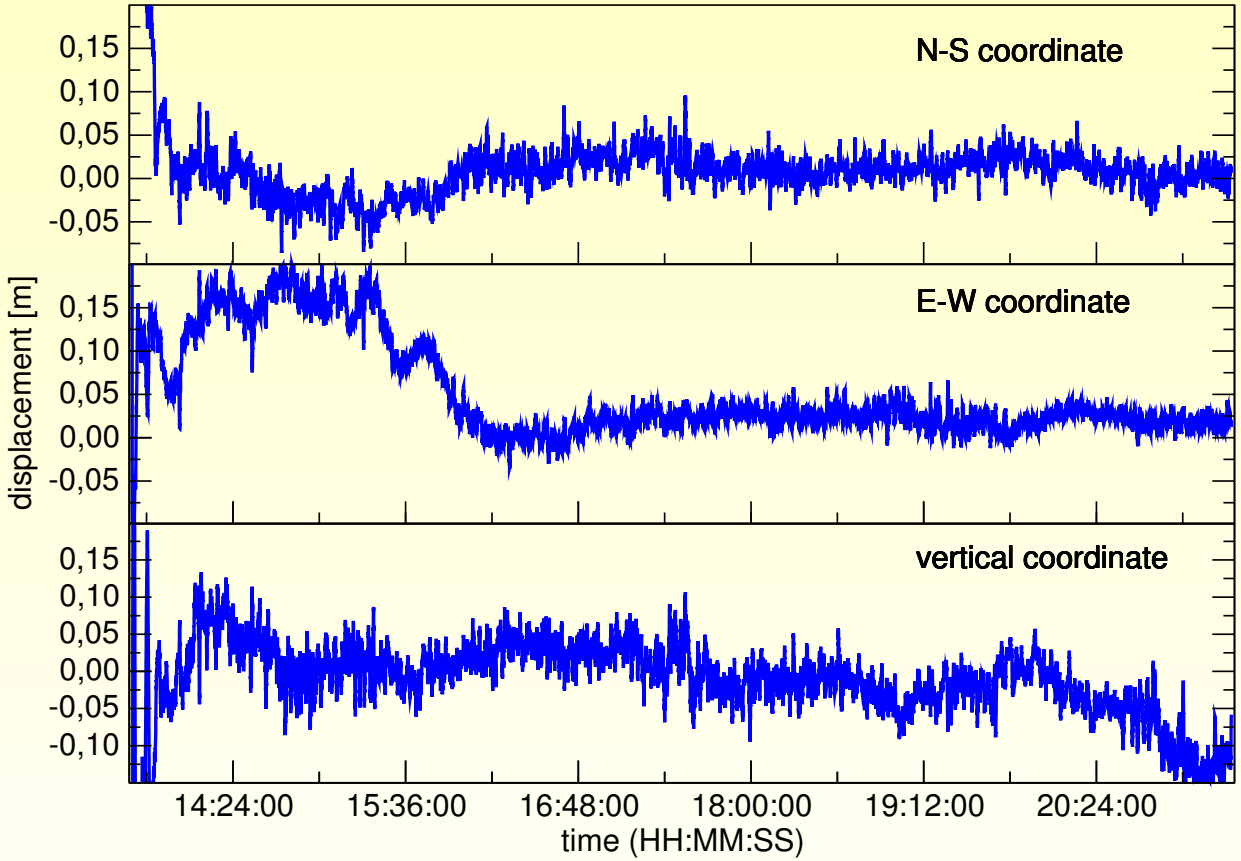
GFZ real-time clocks estimated from
IGS real-time network, about 80 stations worldwide



Comparison
GFZ real-time clock with GFZ rapid clocks provided to IGS:
RMS = 0.3 ns, STD = 0.08 ns

Real-Time Positioning: Coordinates

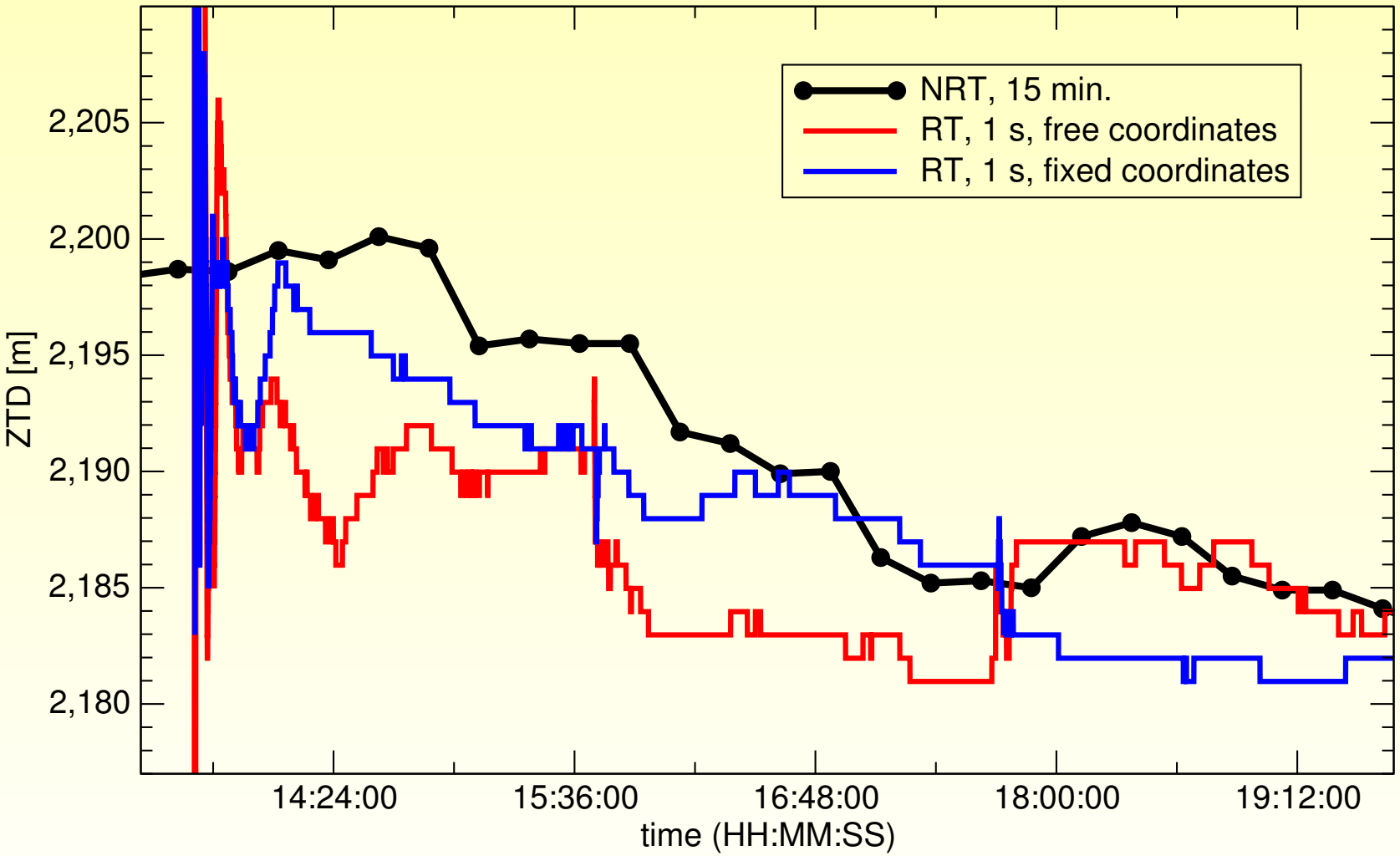
Real-time positioning with a Square Root Information Filter (SRIF)
Processing in streaming mode, sampling rate 1 Hz



STD $<$ 5 cm horizontal
STD $<$ 10 cm vertical

kinematic positioning

Real-Time Positioning: ZTD



The Future of GNSS Atmosphere Sounding

- Real-Time processing with ~ 1 Hz
- Atmospheric RT products: STD, ZTD, IWV
- Processing of all GNSS available: GPS, GLONASS, Galileo, Compass, ...
- Distributed processing at each single station possible, raw data need not to be shared
- Near real-time and post processing for advanced data quality
- Processing of moving platforms
- Increasing number of stations

Talk Maorong Ge: Room 17, Wed. 06 Apr, 15:30–17:15
Poster Xingxing Li: Halls X/Y, XY267, Wed. 06 Apr, 17:30–19:00