FOOTPRINT - NETWORK

GPS - Monitoring of the Fundamental Station Wettzell

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Overview

1. Motivation
2. Description of the Footprint - Network
3. Analysis Strategy
4. Discussion of the Results
5. Conclusion

1. Motivation

Monitoring of the local invironment

of a fundamental station (about 20 km) !

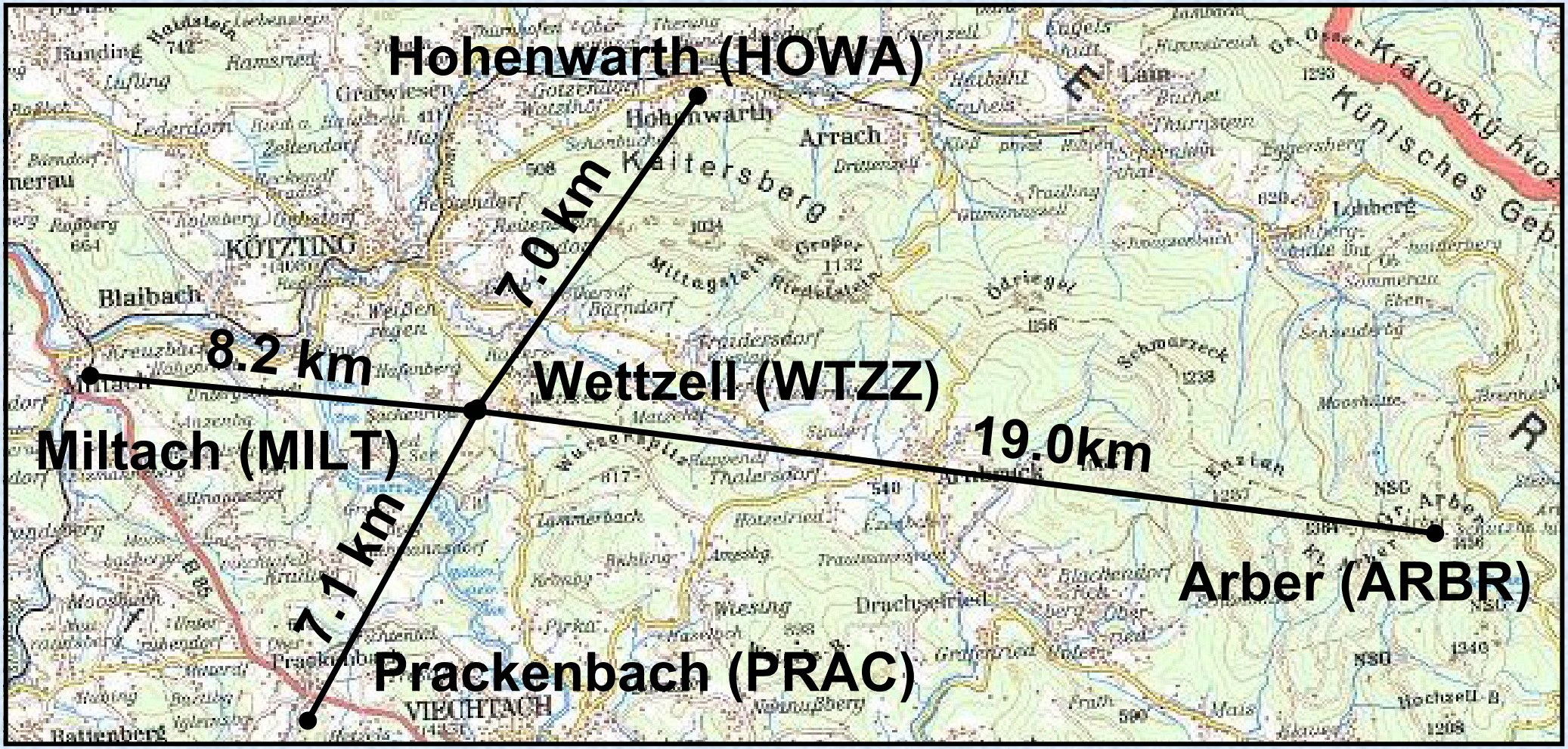
Establish long time series of station coordinates to detect

periodical signals,

significant local movements, ...

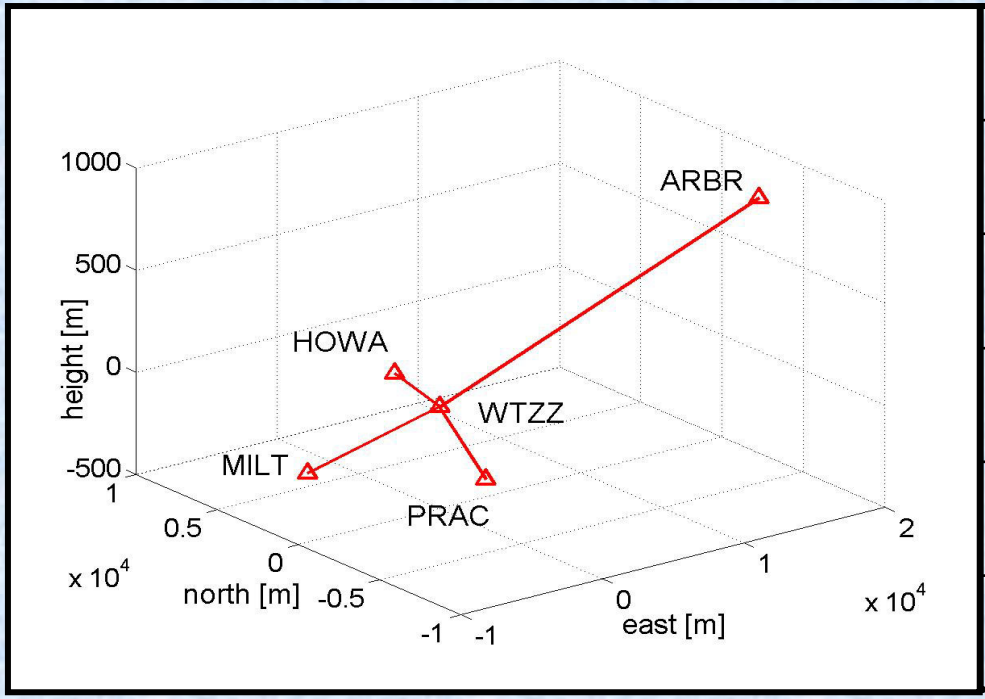
Goal: clear and accurate information about the local stability of fundamental stations

2. The Footprint Network



2. The Footprint Network

Height differences between stations:

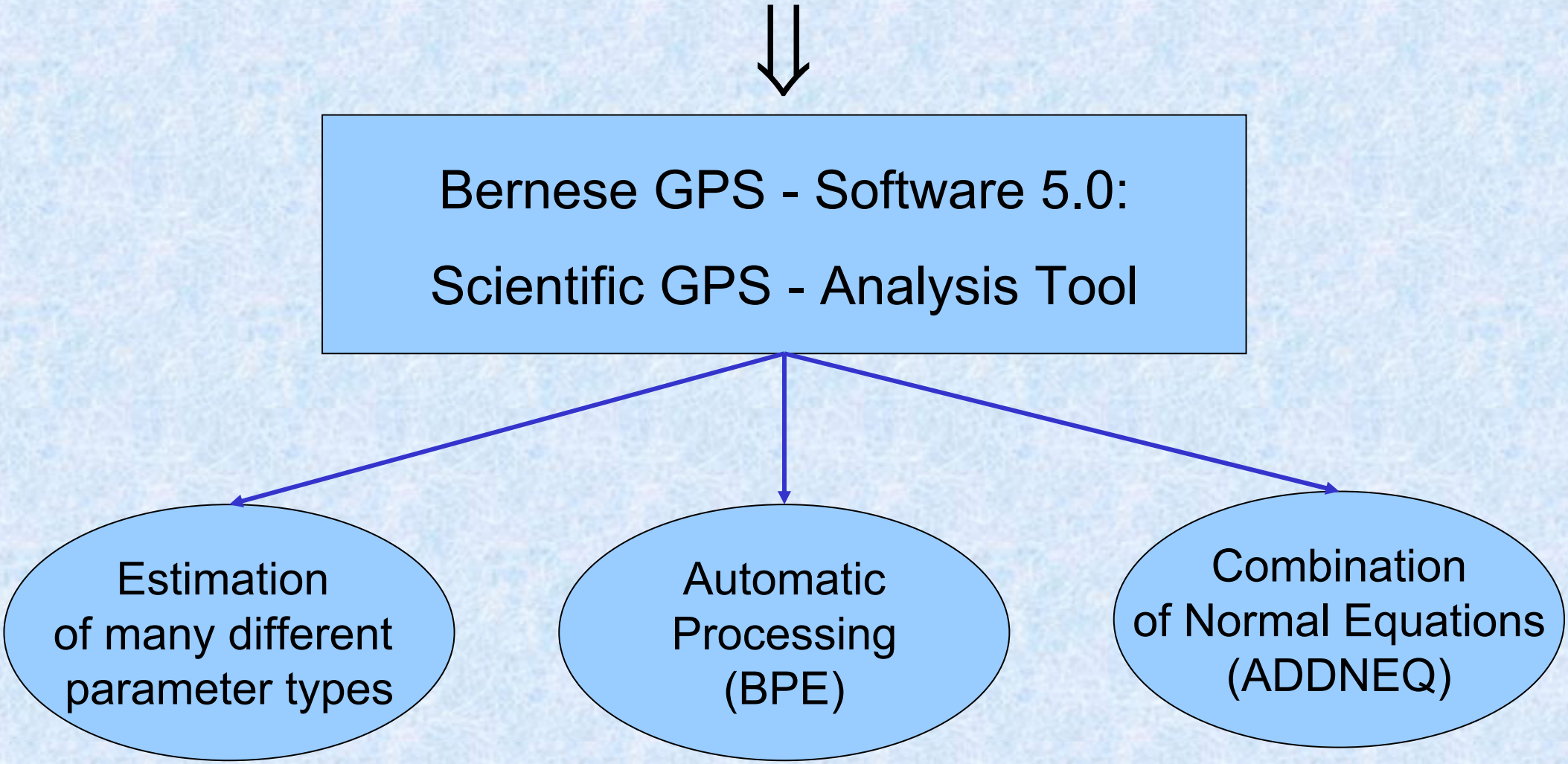


Station	Station Height
ARBR	1505 m
HOWA	562 m
MILT	488 m
PRAC	588 m
WTZZ	665 m

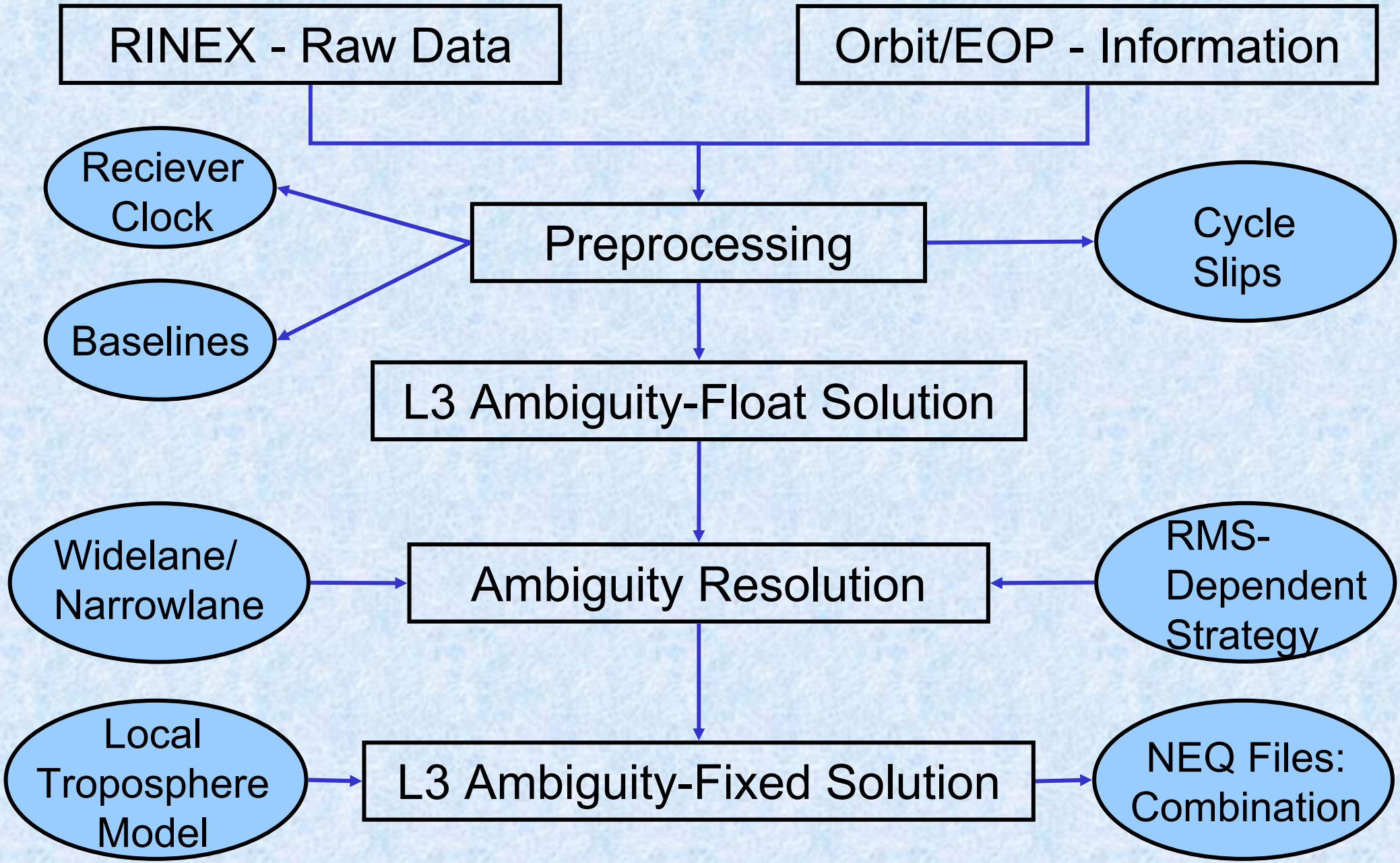
Observation period: 01.01.2001 - 09.08.2003 (2.7 years)

3. Analysis Strategy

Processing goal: station coordinates of highest accuracy



3. Analysis Strategy for Daily Solutions



3. Analysis Strategy: Local Troposphere Model

Estimation of the tropophere path delay $\Delta\rho$

as a function of station height (n = 2):

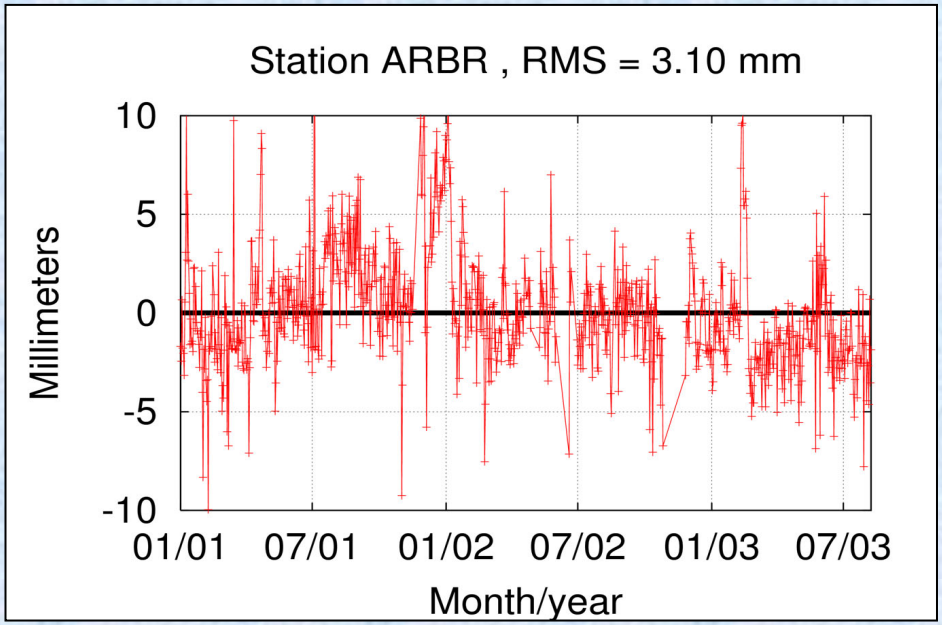
$$\Delta\rho(z,h) = f(z)\sum_{i=0}^{n} k_i \cdot (h - h_r)^i$$

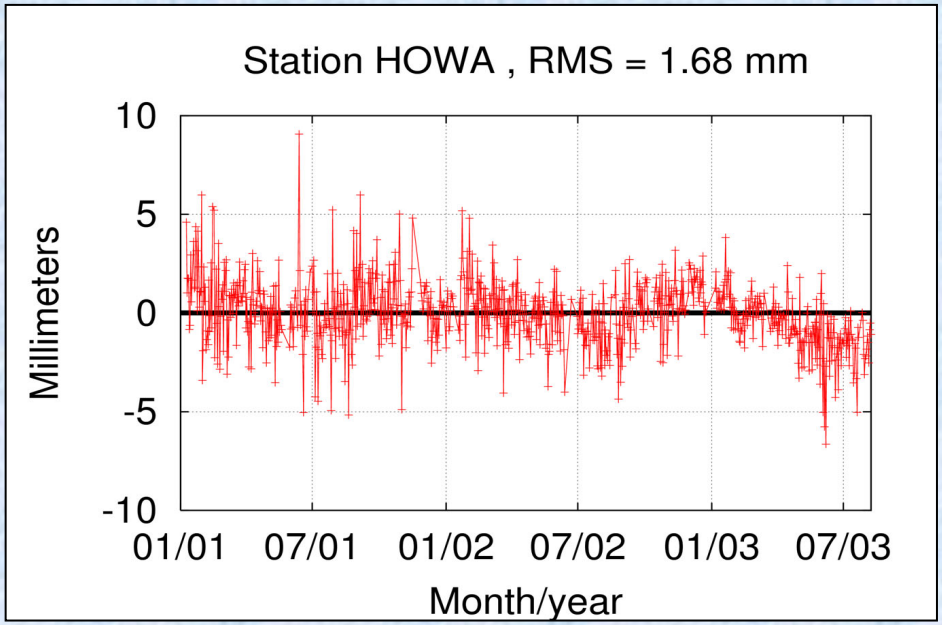
Mapping Function

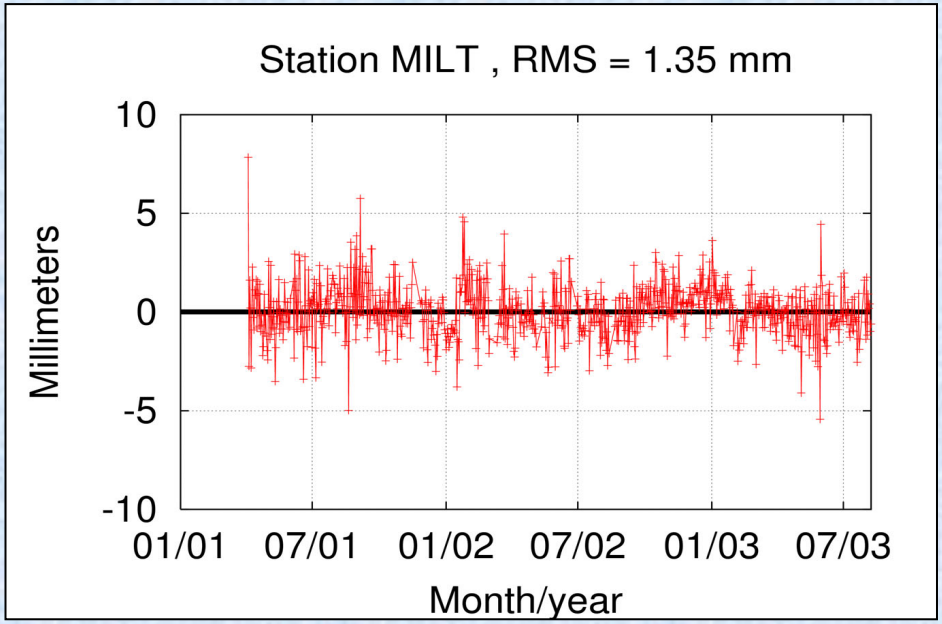
Estimated Coefficients

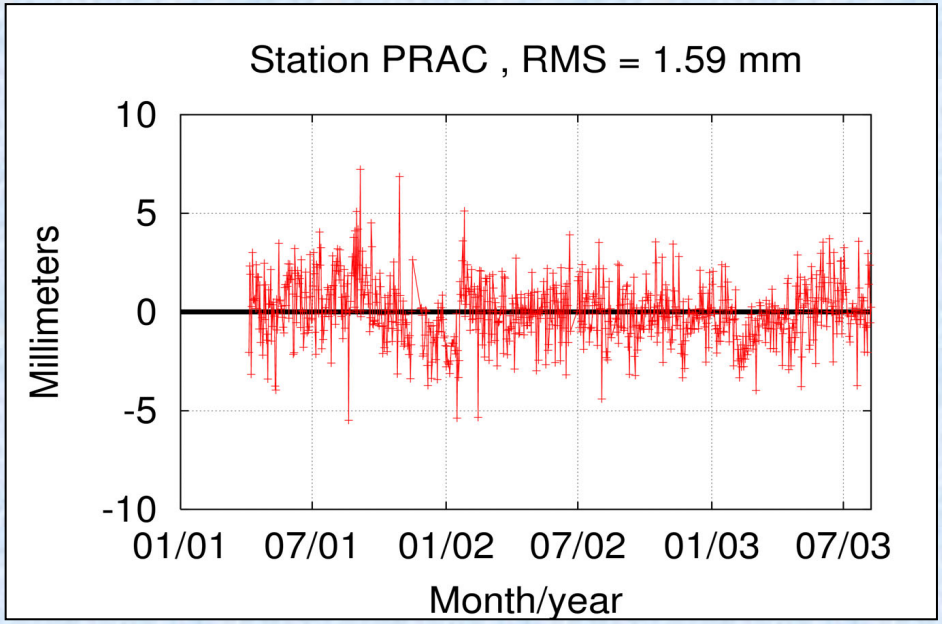
Station Height

4. Results: Repeatability of the North-Component

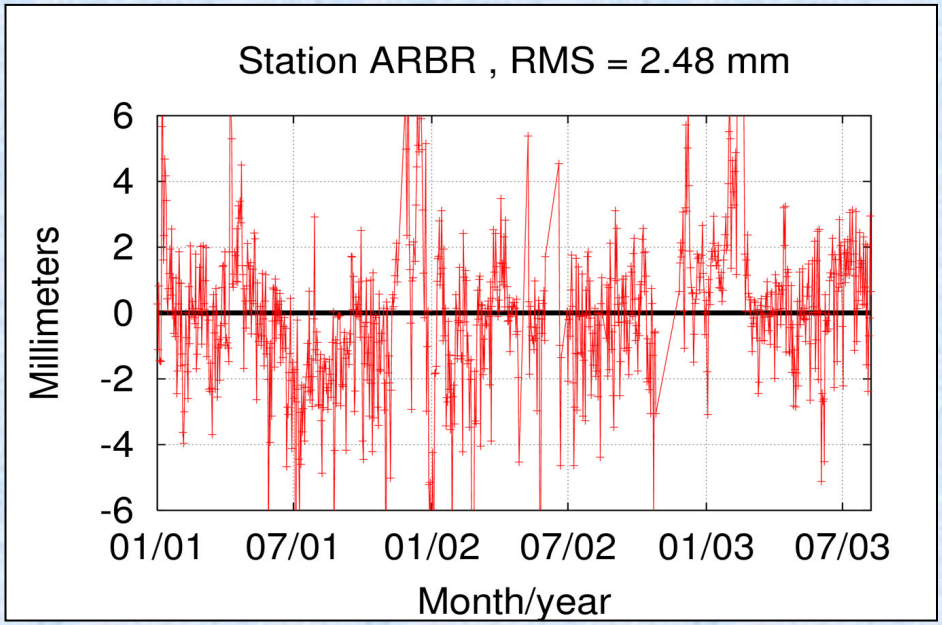


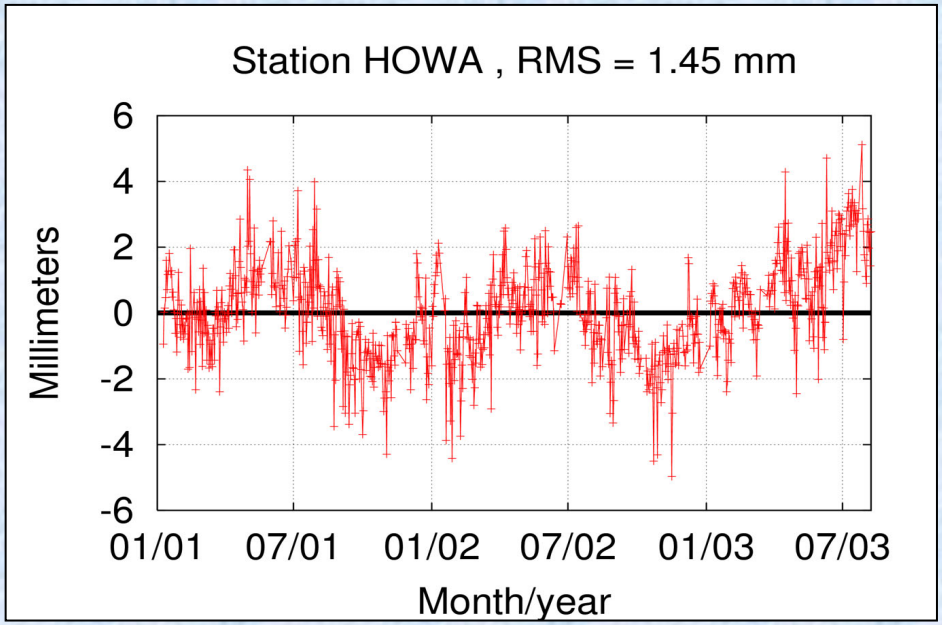


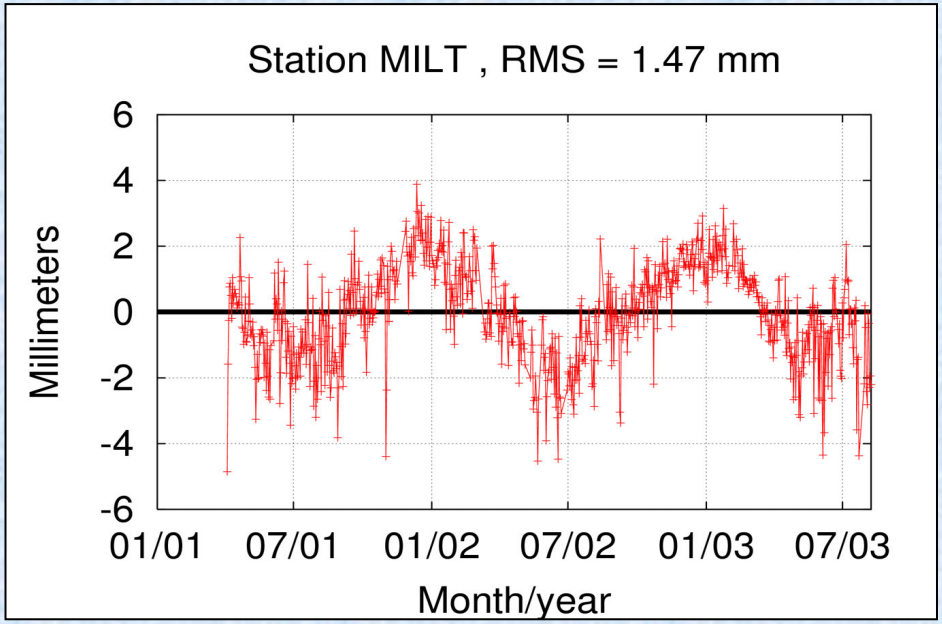


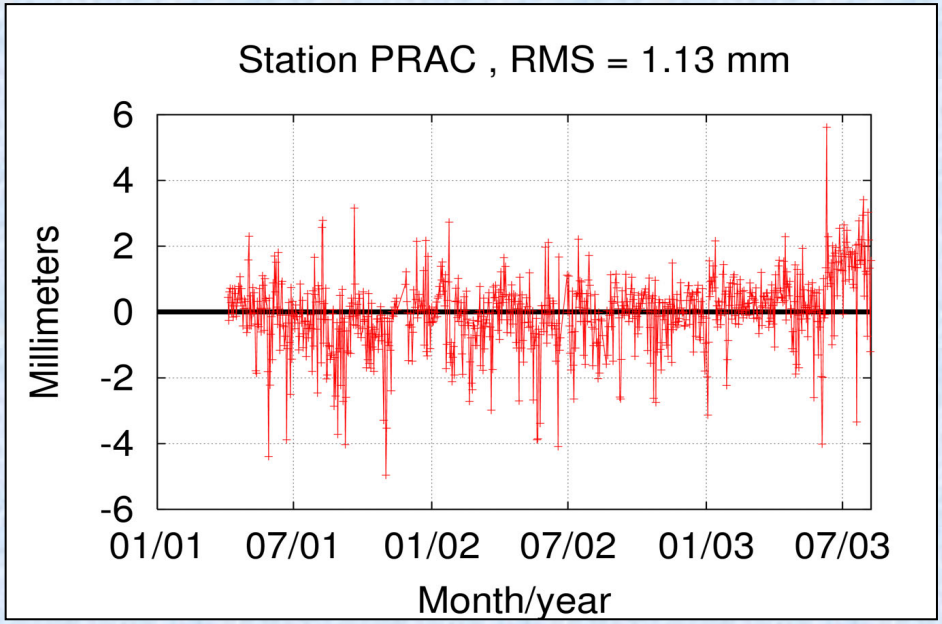


4. Results: Repeatabilty of the East - Component

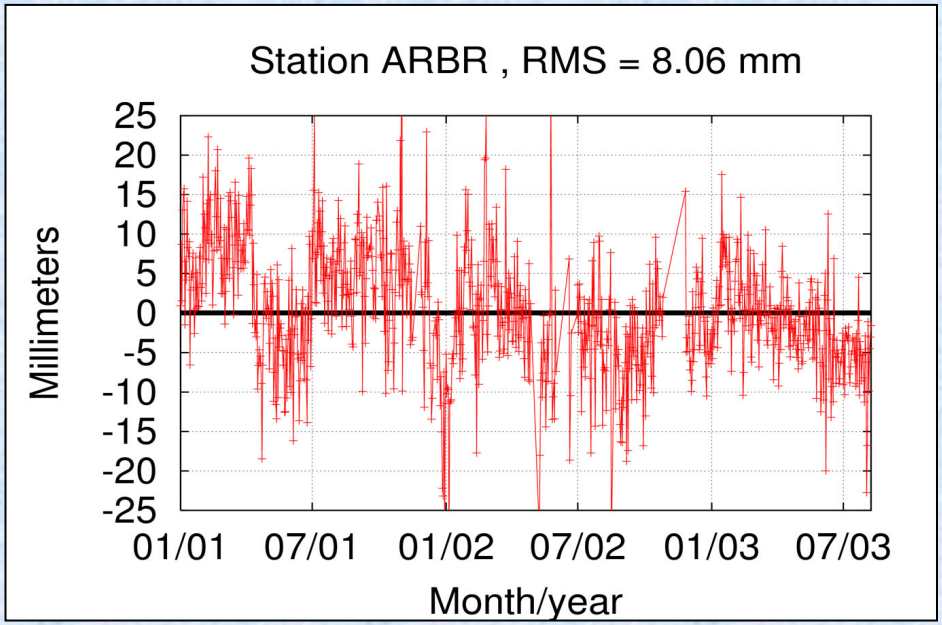


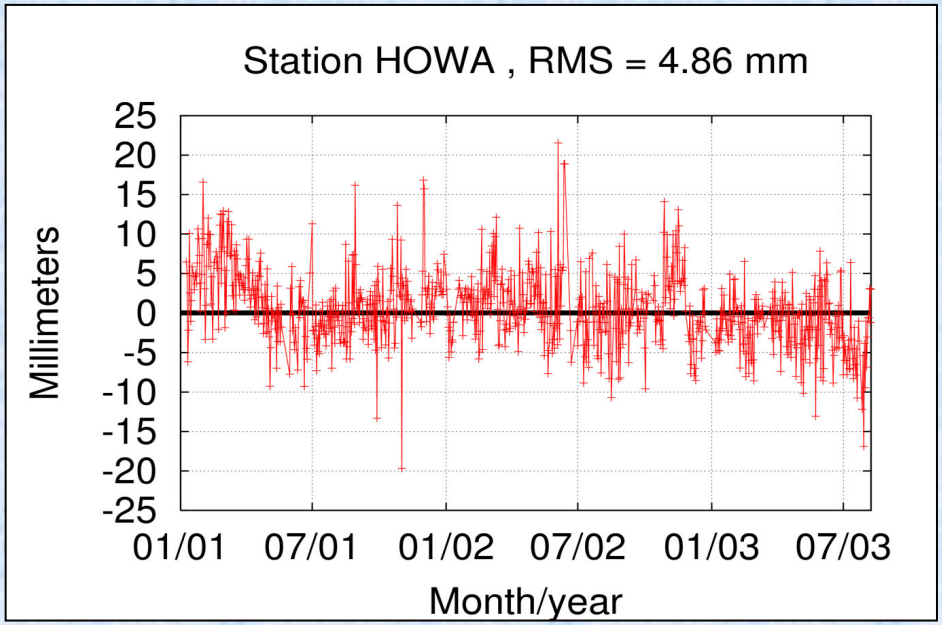


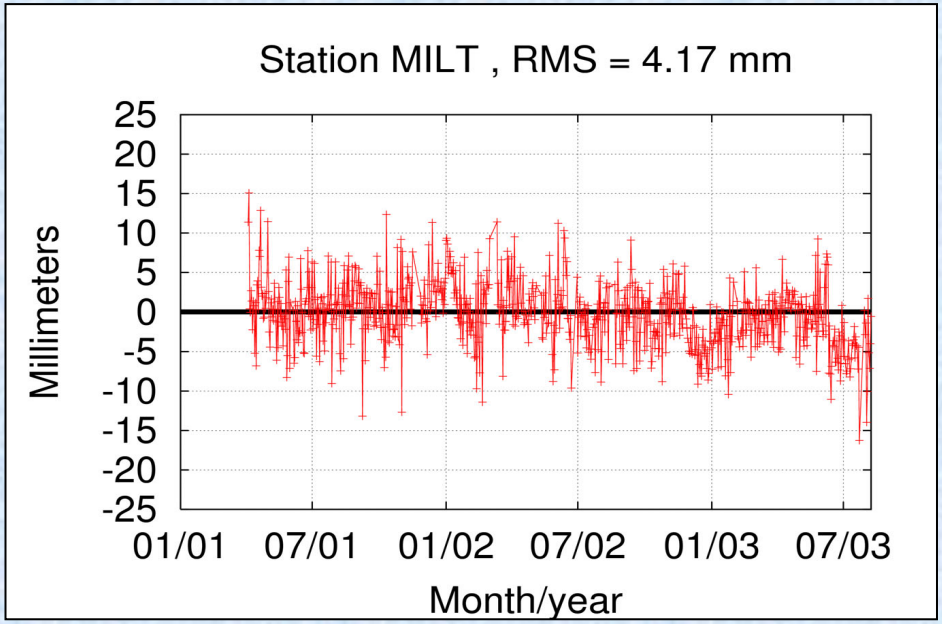


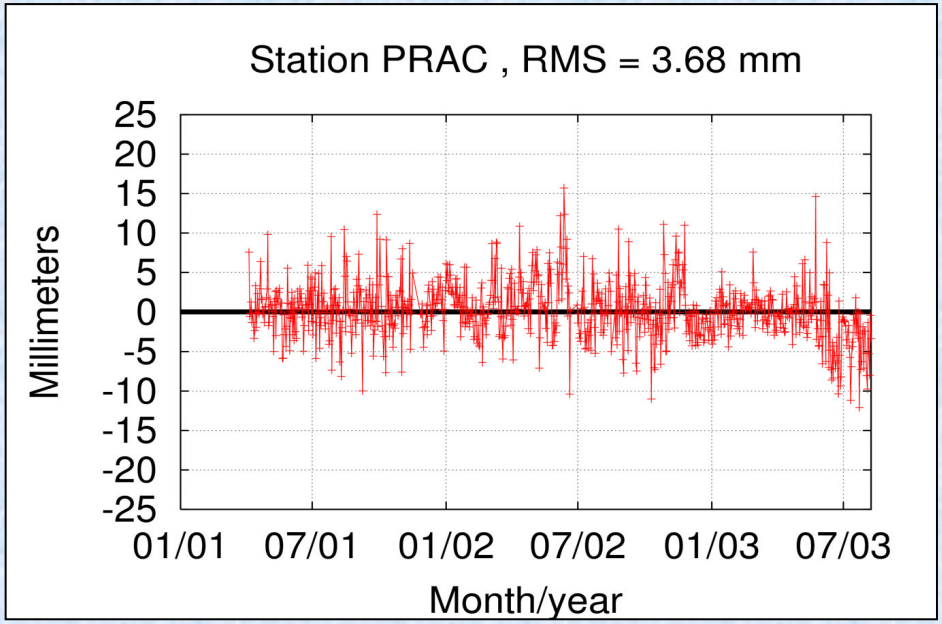


4. Results: Repeatabilty of the Height-Component

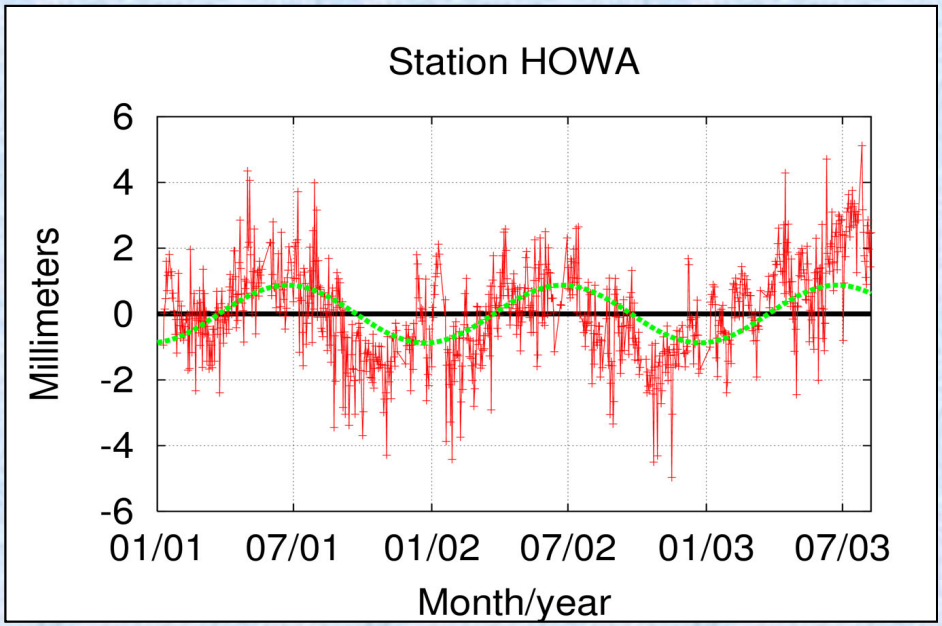


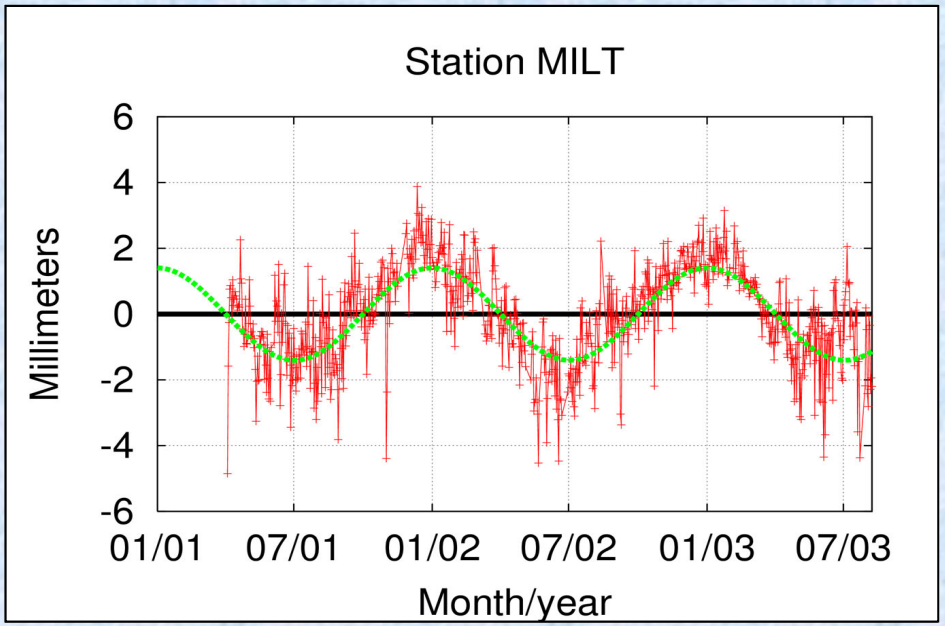






4. Results: Signal in the East-Components (HOWA & MILT)



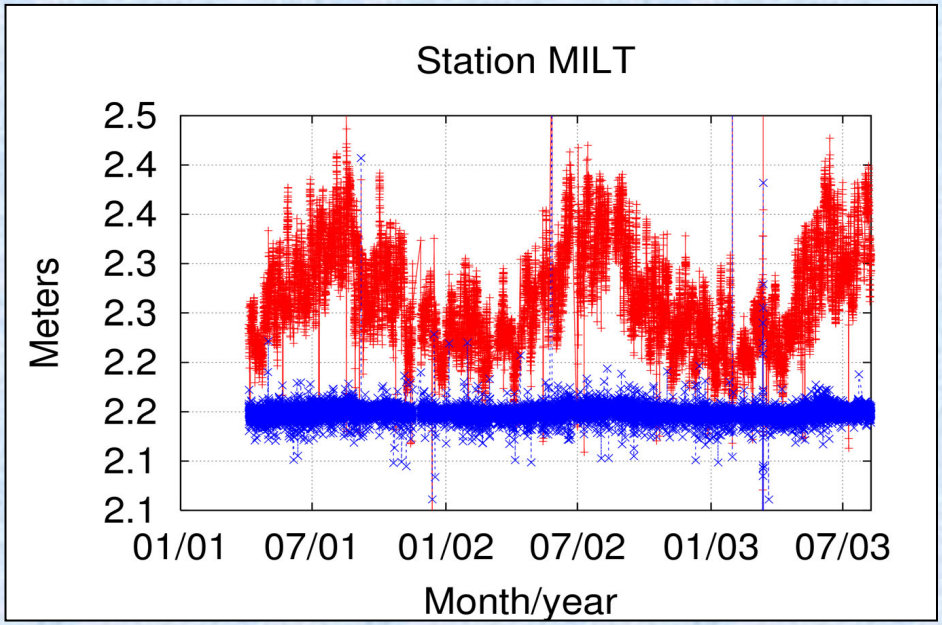


Is the signal caused by neglecting the absolute zenith troposphere delay (ZTD) ?

Scaling of baseline length l (8 km) due to an absolute troposphere error $\Delta\rho$ (20 cm):

$$\Delta l = \frac{\Delta\rho_a^0 \; l}{R_e \cos(z_{max})} \approx 1.4\text{mm}$$

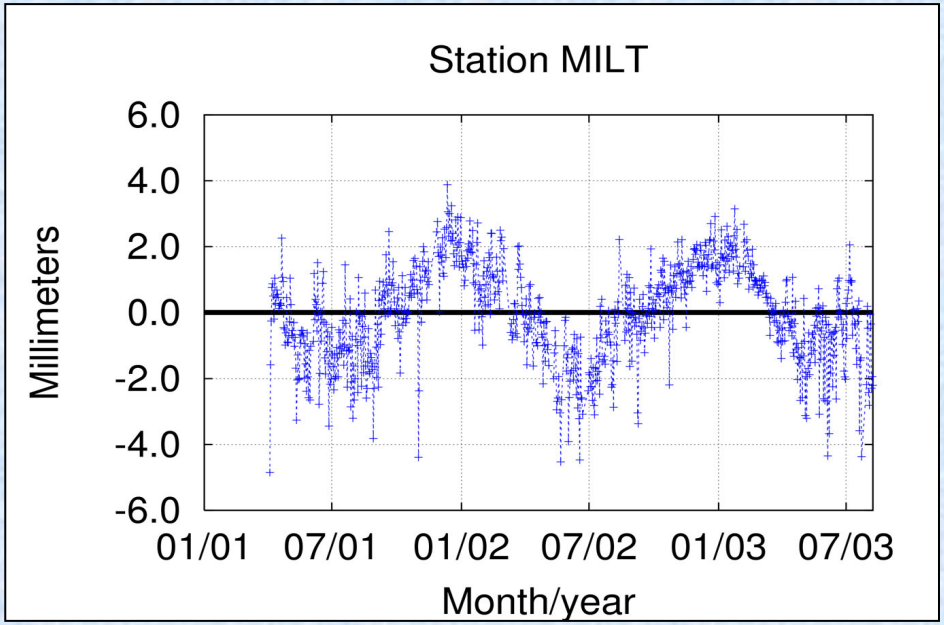
4. Results: Effect of the Absolute Tropospheric Zenit Delay

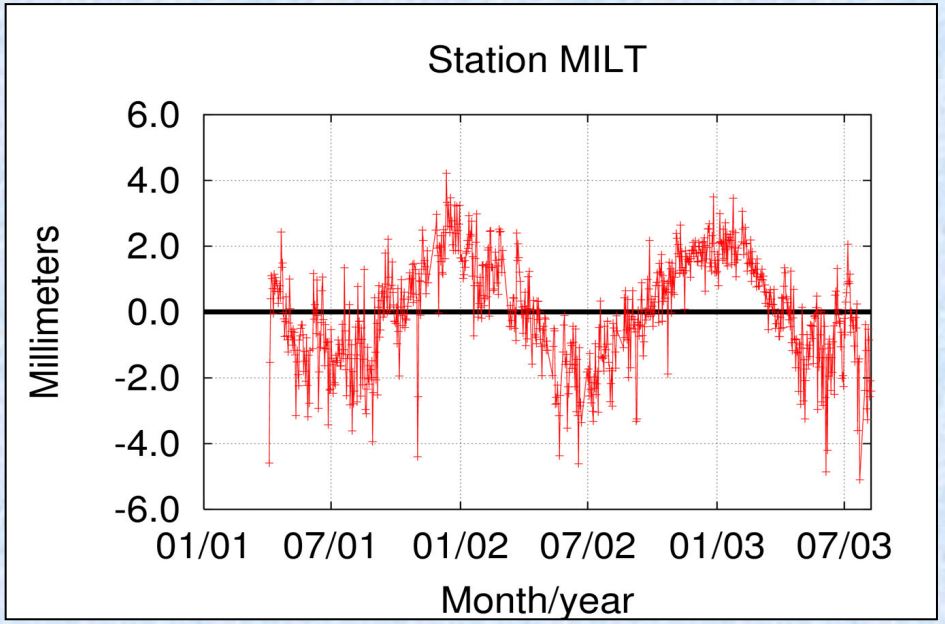


- ZTD estimated with:

-- absolute ZTD introduced for WTZZ

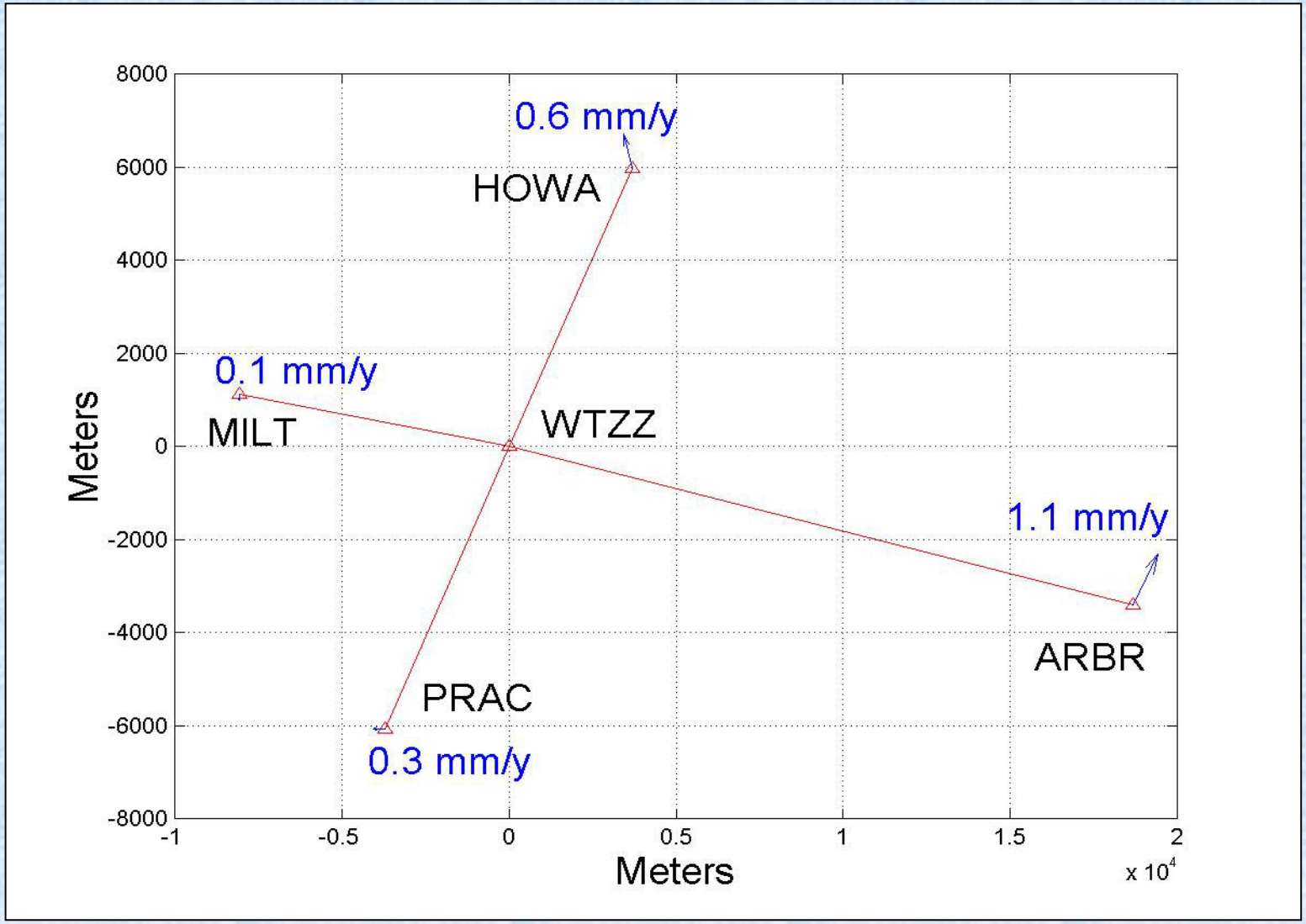
-- no absolute ZTD for WTZZ





4. Results: Estimation of Velocities

Local System of WTZZ



5. Conclusion & Outlook

- Repeatability of local network: 1.5 mm in horizontal, 4 mm in vertical position.

- A strong seasonal signal for HOWA and MILT was detected. (reason unclear; deformation of building?)

- Velocity estimation: There is no significant movement in the vicinity of Wettzell.

- A local permanent GPS network is well-suited to monitor the stability of fundamental stations.