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Data processing of the GNSS observations of the GEONAS network - the NAVSTAR and GLONASS satellite systems and the effects of extreme meteorological conditions

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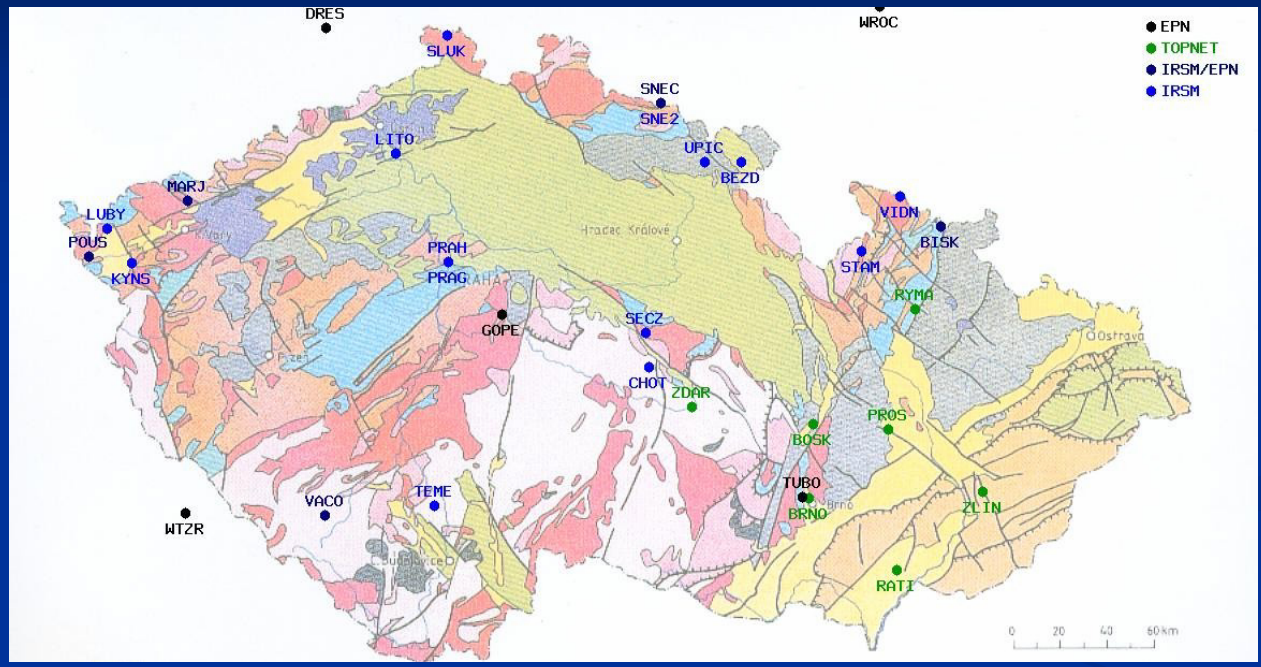
Outline

1. Processing of NAVSTAR and GLONASS observations
   - processed data and characteristics of the processing
   - comparison results
2. Effects of extreme meteorological conditions
   - mountain observatories - their monitoring and processing

The processed data



Schematic map of the processed observatories

- 17 permanent observatories of the GEONAS network
- 6 observatories of the network TopNET
- 6 observatories of the network EUREF– GOPE, TUBO, BOR1, POTS, WTZR and PENC
- processed data: 1.-30. September 2006

Characteristics and proceeding of data processing

Input data:

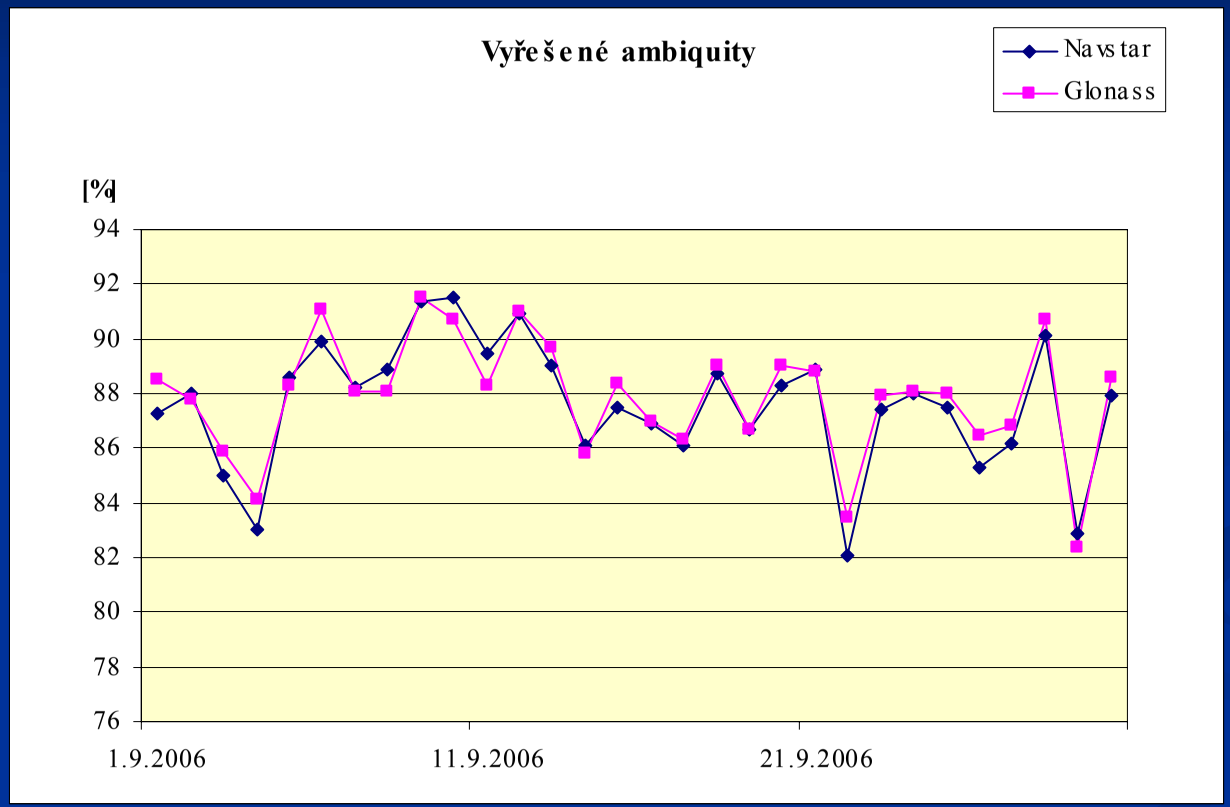
- registered RINEX data with the interval of 30 sec and 5° elevation mask
- CODE precise orbits, ERP, time corrections (NAVSTAR and GLONASS)

Processing procedure:

BERNESE GPS software version 5.0

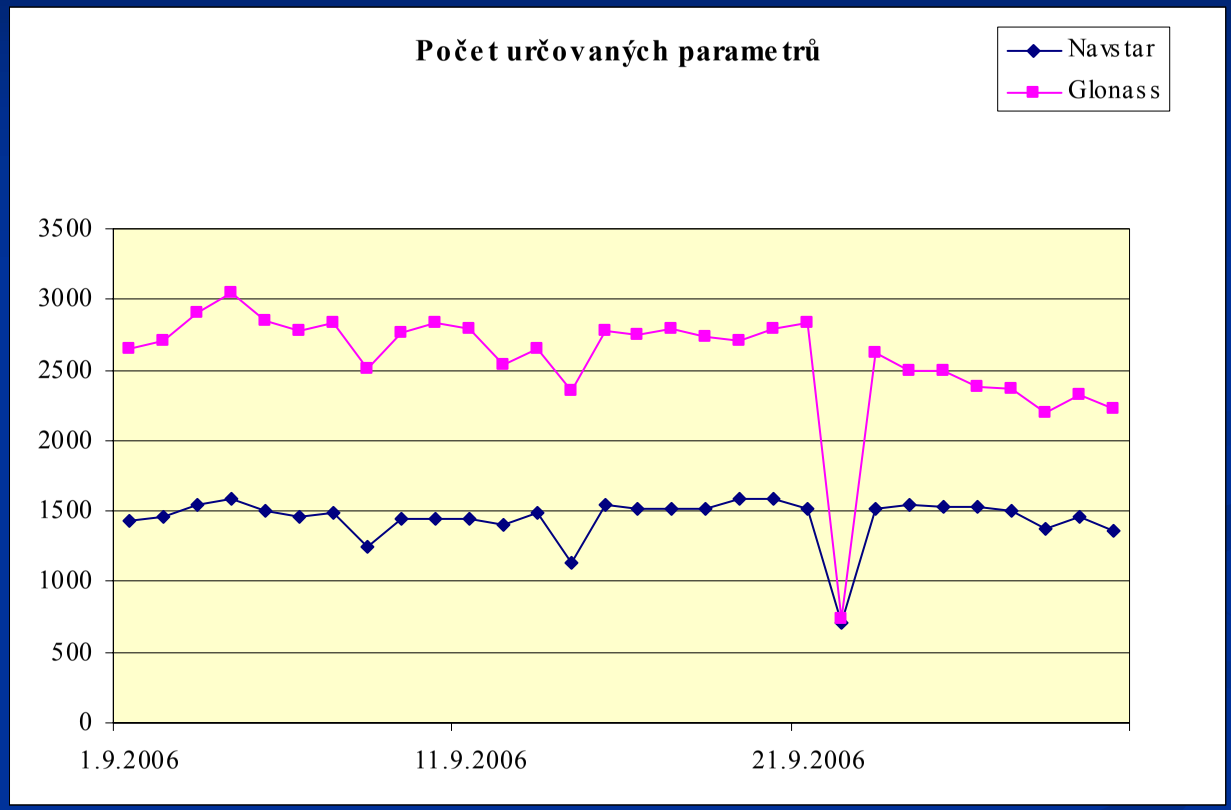
- processing method – double difference
- processing in two passes
  1. NAVSTAR only
  2. NAVSTAR + GLONASS
- processing outcome comparison

Ambiguity fixing



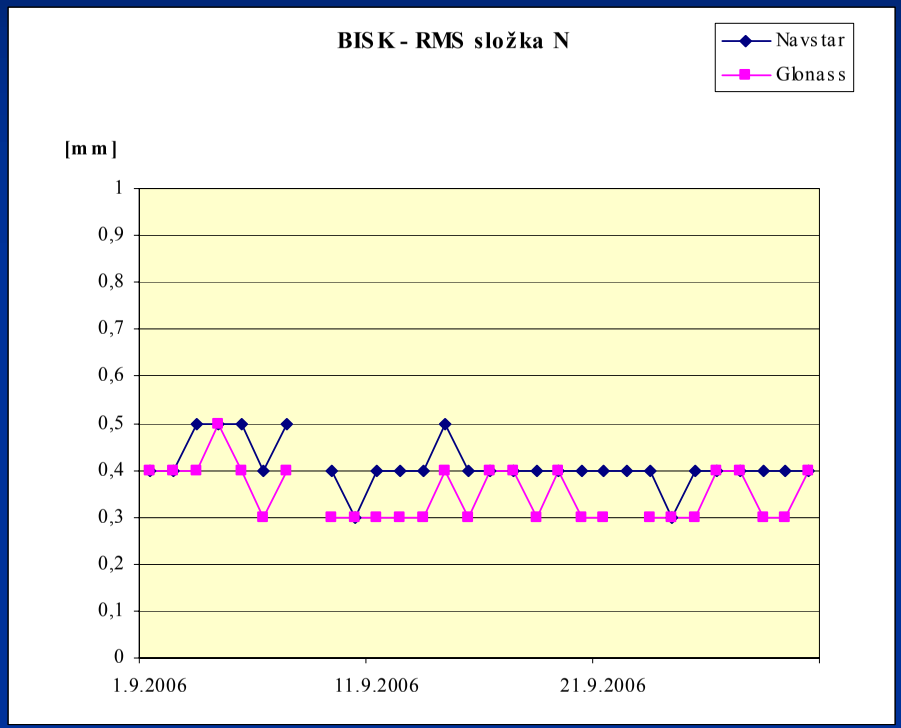
- the percentage of resolved ambiguities is higher in combined solution

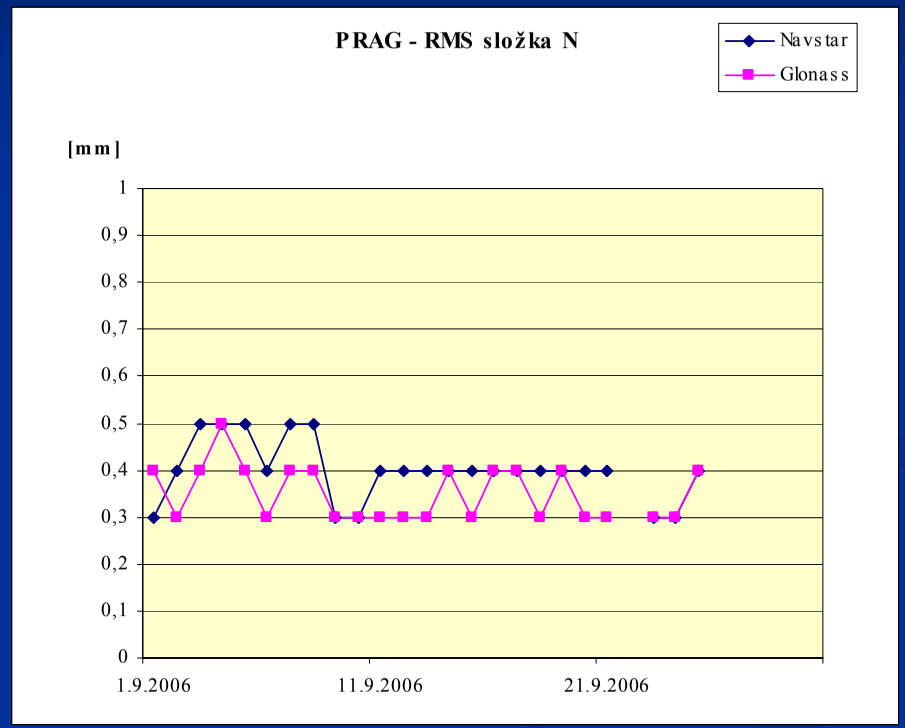
Number of parameters



- the number of parameters double for NAVSTAR + GLONASS solutions

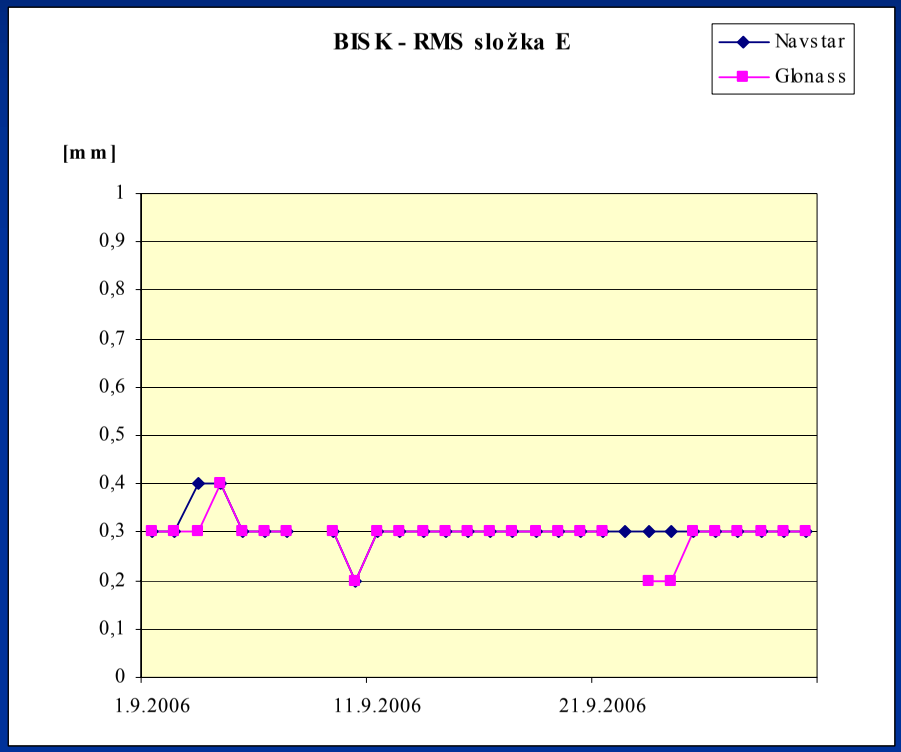
Solution accuracy – N component

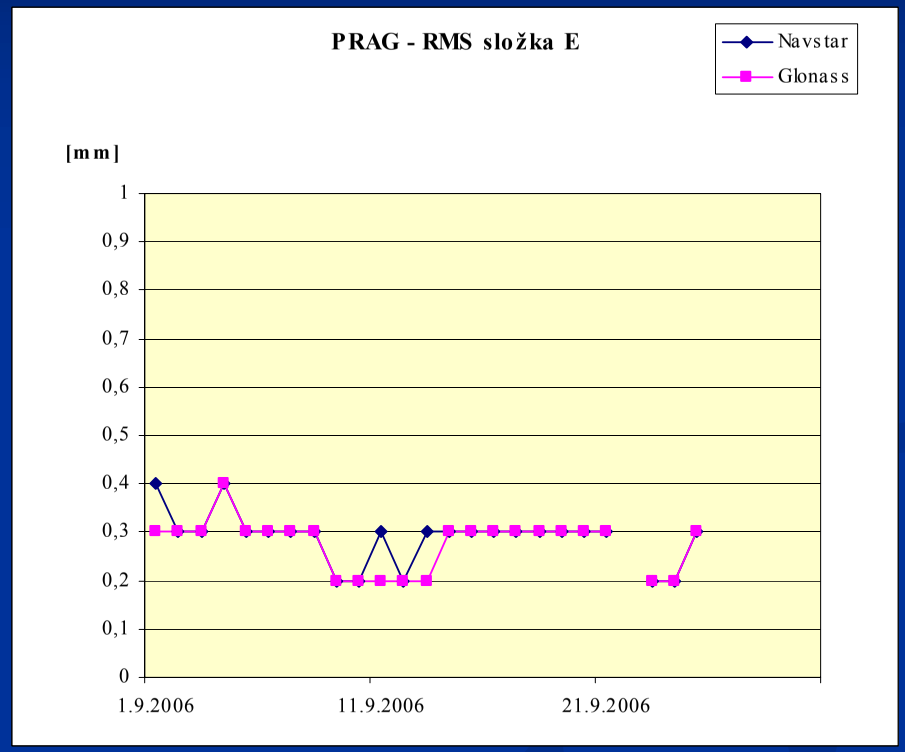




- the combined solution shows lower RMS for most days

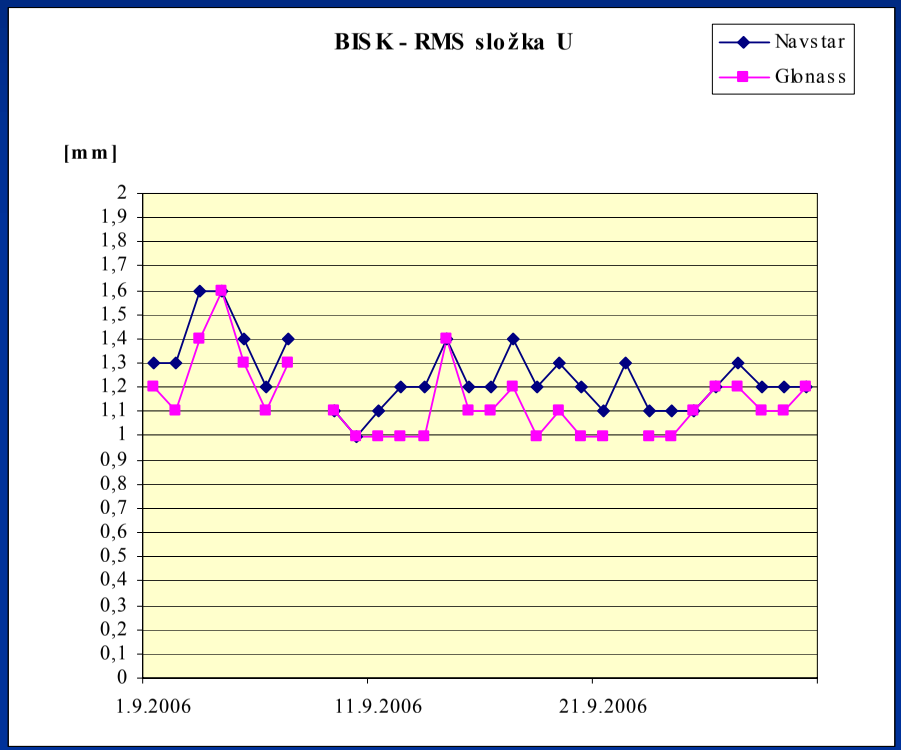
Solution accuracy – E component

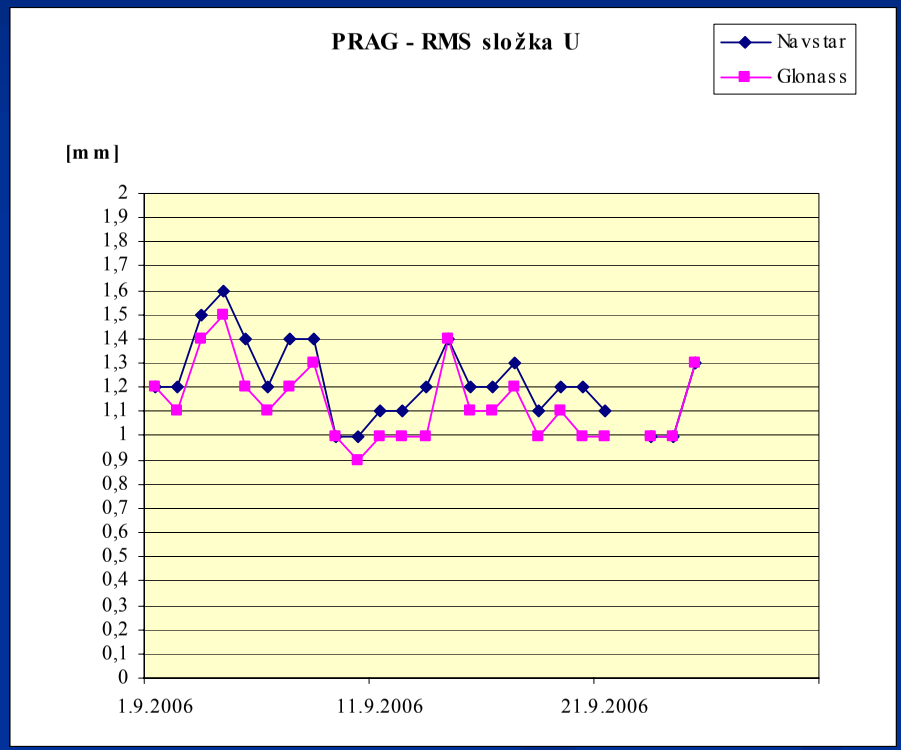




- the combined solution shows lower or equal RMS

Solution accuracy – vertical component

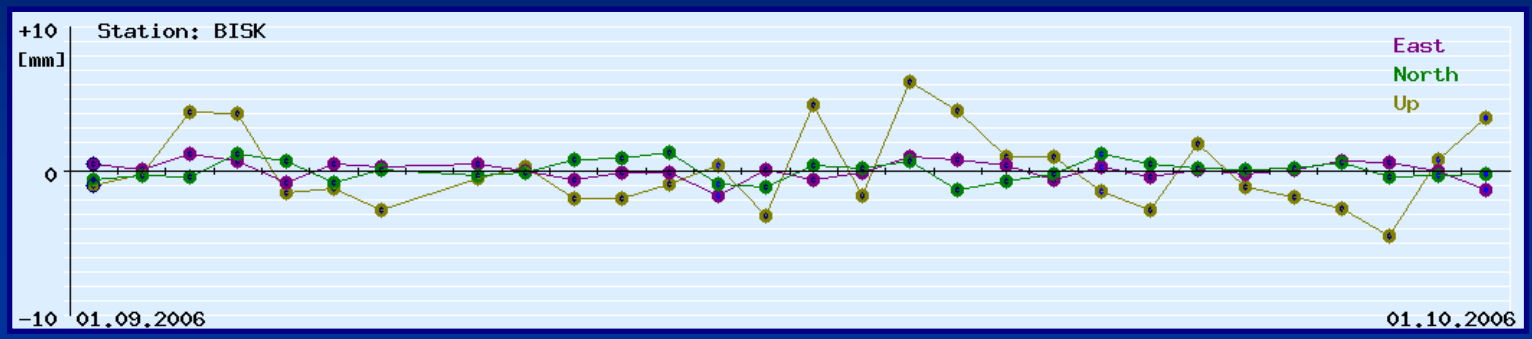




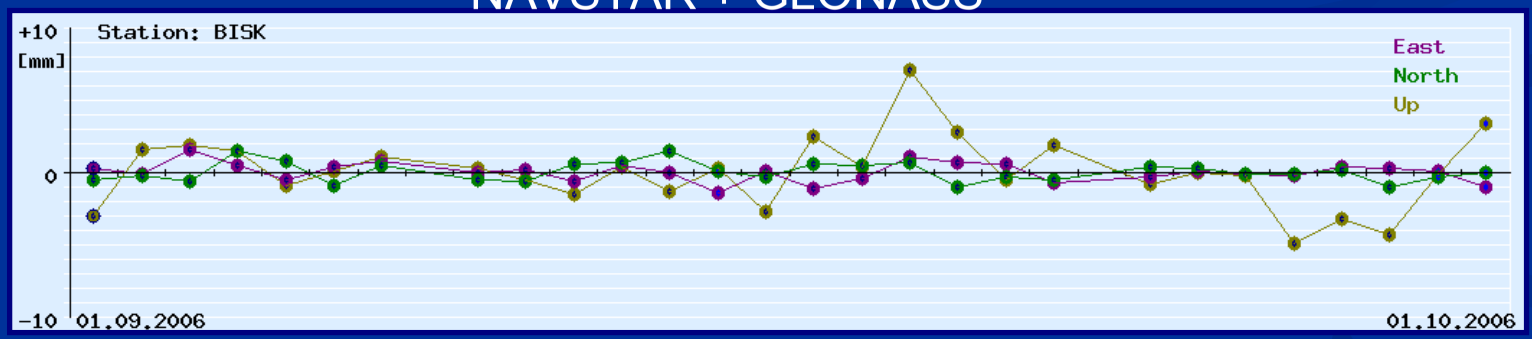
- the combined solution shows lower RMS for most days

Time series comparison

NAVSTAR



NAVSTAR + GLONASS



- the difference in the vertical component is caused by wake determination of the troposphere parameters

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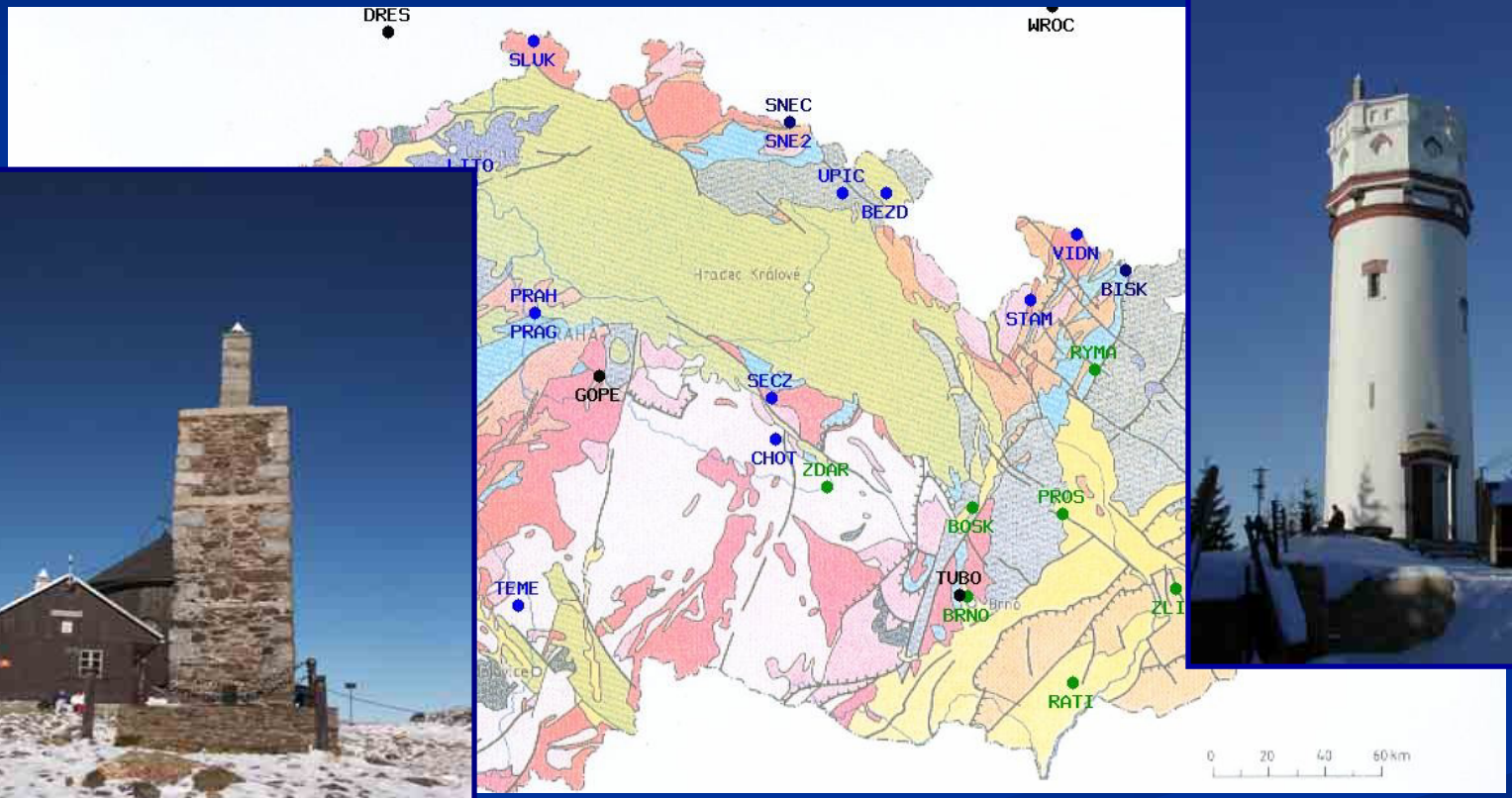
GEONAS mountain observatories

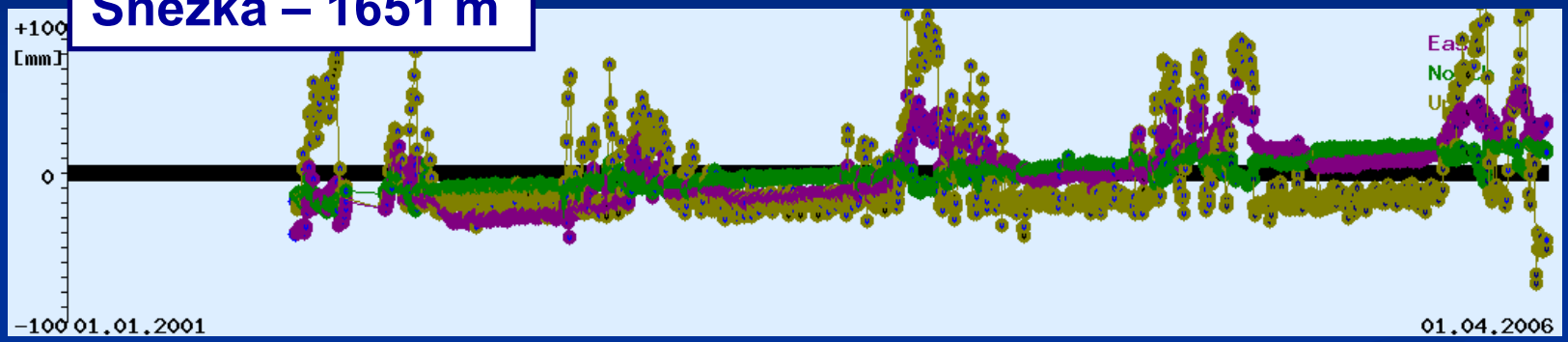
SNEC



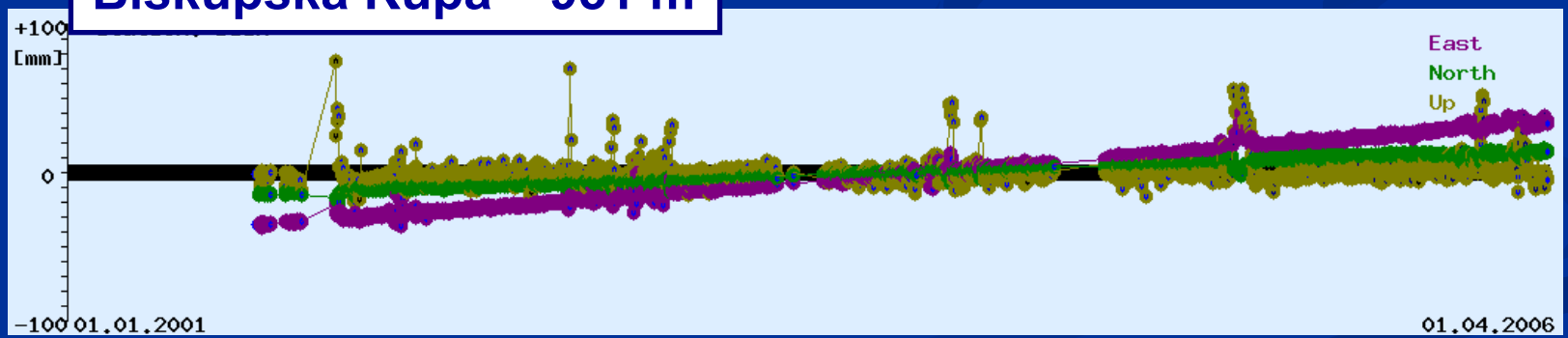
BISK

Time series analysis

Sněžka – 1651 m



Biskupská Kupa – 951 m

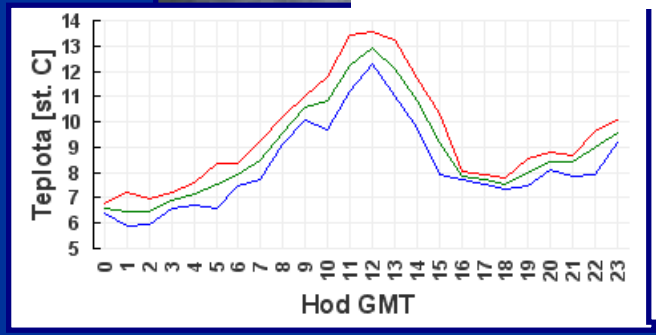


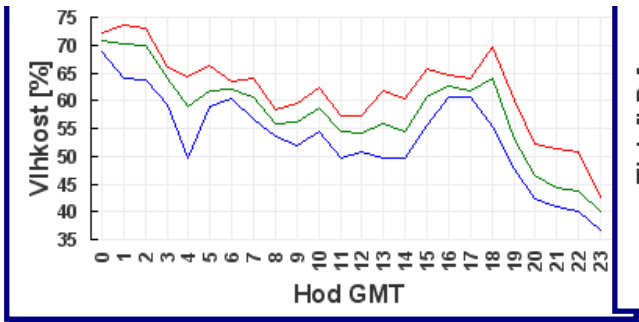
Meteorological data registration

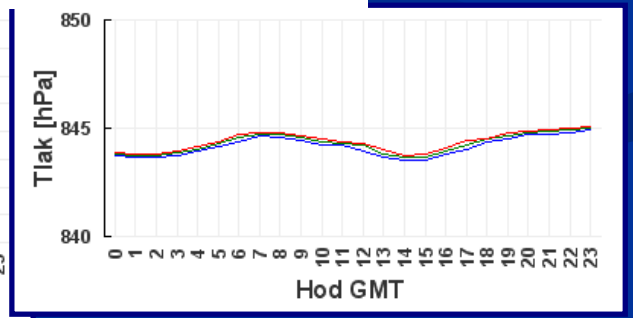
Sněžka – 16.3.2006

Web camera for monitoring of the snow coverage

Meteorological sensors – temperature, humidity, pressure







Antenna snow cover visual evaluation

Classification of the snow cover

0 – no snow cower

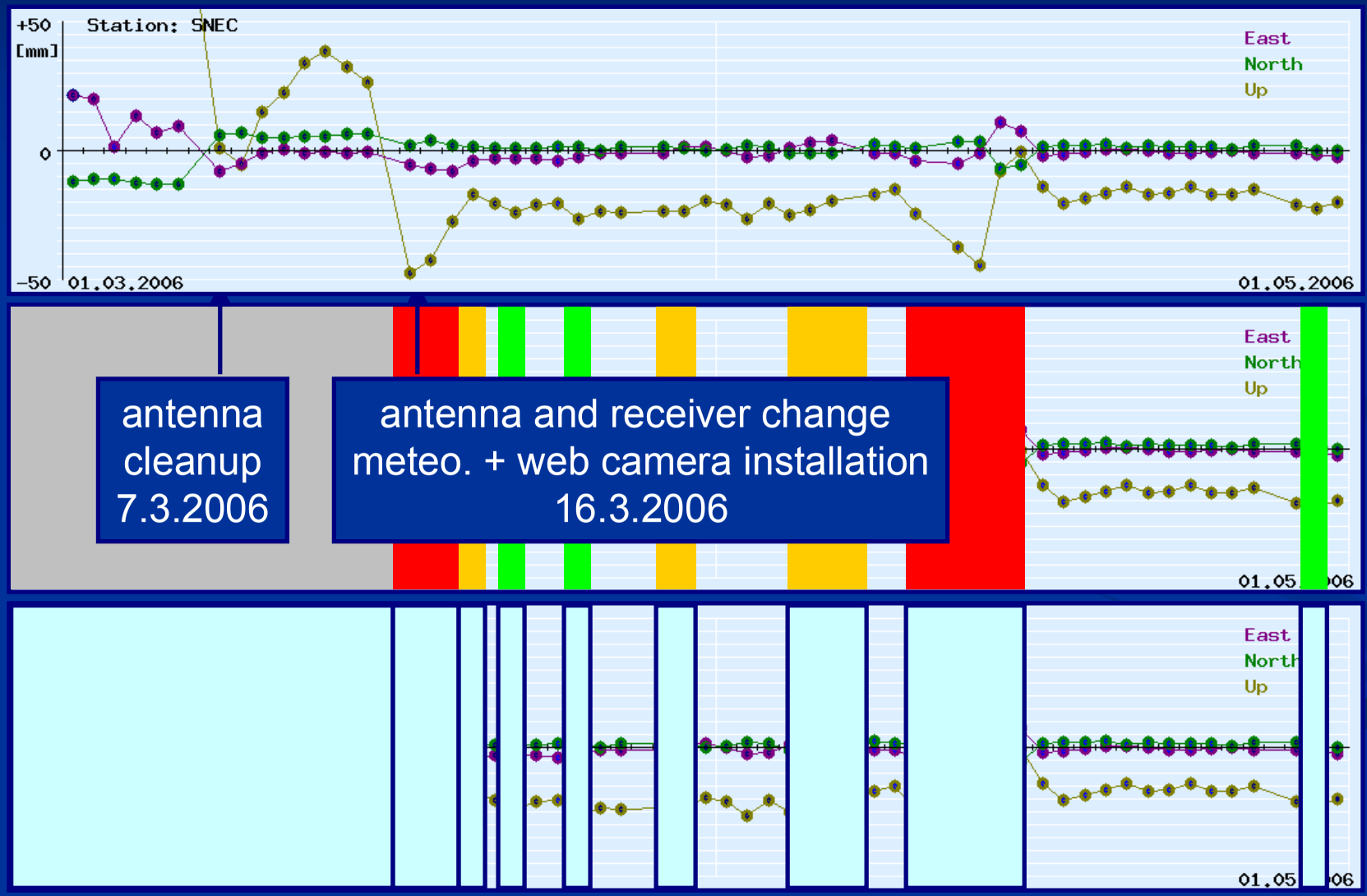
1 – cannot be identified or possible slight cover

2 – low snow cover

3 – thick or asym. snow cover

4 - cannot be identified (usually 1-2 according to temp. and situation of the surrounding days)

Correlation of the snow covered antenna with position anomaly



Conclusions

- time series of the GNSS antennas show better stability with the use of the both satellite systems
- GLONASS signals processing approx. doubles the number of determined parameters

- the observed GPS antenna position anomalies in winter correlate with snow cover of the antenna
- after the removal of the periods with the snow covered antenna time series indicated better repeatability

The end

Thank you for your attention