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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1. Processing of NAVSTAR and GLONASS observations and characteristics of the processed data and comparison results

2. Effects of extreme meteorological conditions on mountain observatories - their monitoring and processing
The processed data

- 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
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
- 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
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
GEONAS mountain observatories
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 cover  
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

antenna cleanup 7.3.2006

antenna and receiver change meteo. + web camera installation 16.3.2006
Conclusions

- Time series of the GNSS antennas show better stability with the use of 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