TRANSMIT

TRAINING RESEARCH AND APPLICATION NETWORK TO SUPPORT THE MITIGATION OF IONOSPHERIC THREATS

Real time positioning related issues using of specific ionospheric information

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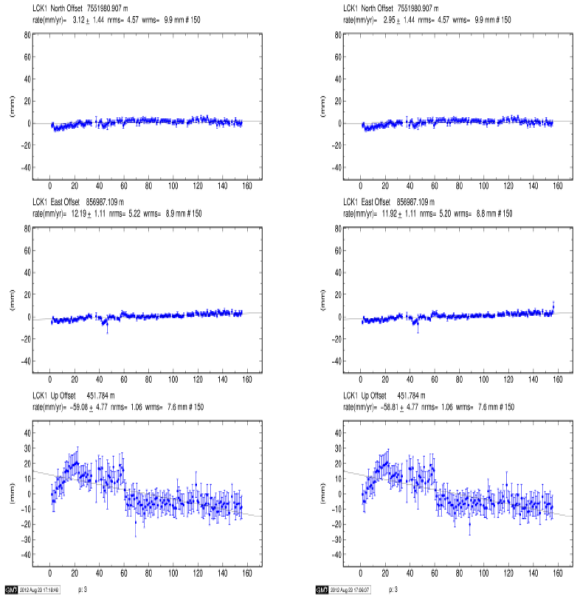


Research project

Main Goal

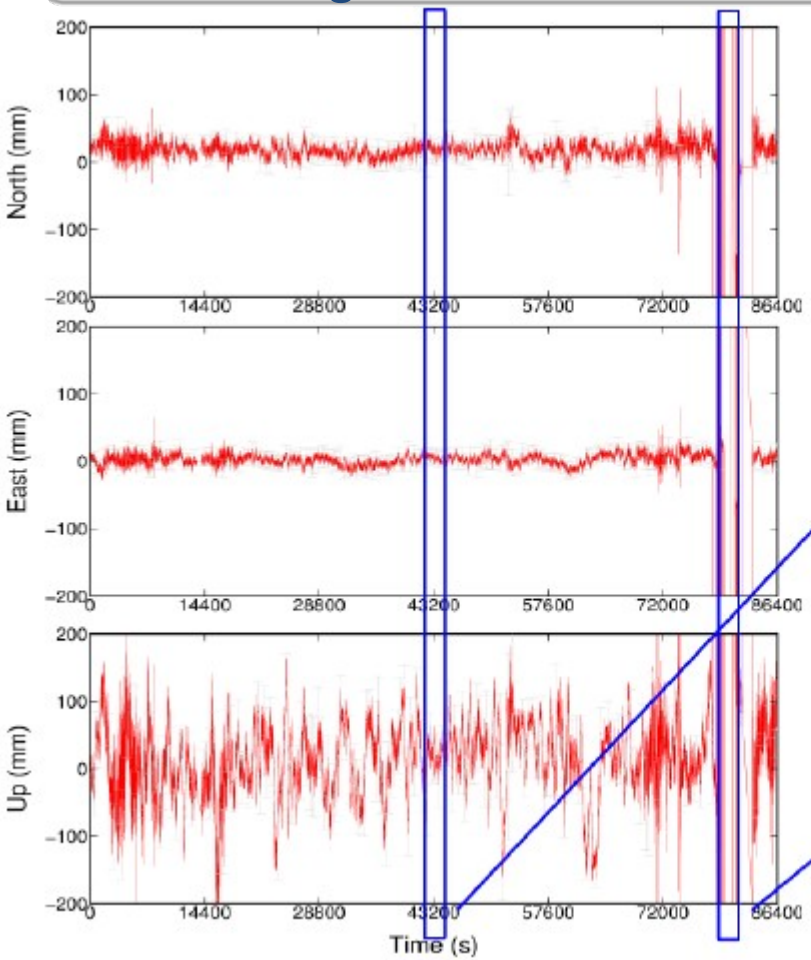
The main goal of this sub-project is improvement of performance of the GNSS **Precise Point Positioning (PPP)** and **Long-Baseline Relative Positioning** in near-real- and in real-time applications under the presence of **strong ionospheric anomalies**

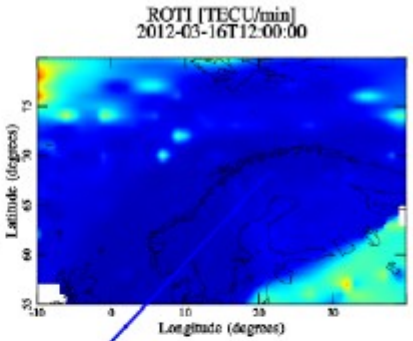
Methodology

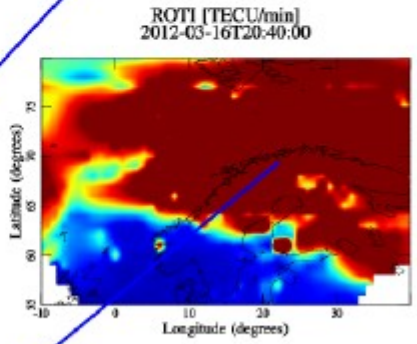
- Various GNSS positioning techniques will be approached by a new novel angle which will account for potential advantages gained by the state of the art ionospheric modelling techniques developed within TRANSMIT (e. g. WP2.2)
- An investigation of the operational applicability of various ionospheric models will be done and their performance will be measured and examined.
- Development and verification of new approach(es) for improving of the performance and of accuracy of the positioning methods, under presence of strong ionospheric anomalies, using an external forecasted information on ionosphere (for example from WP2.2).
- Performance of the new approaches will be examined in a simulated real-time mode with using the data collected under the presence of strong ionospheric disturbances.

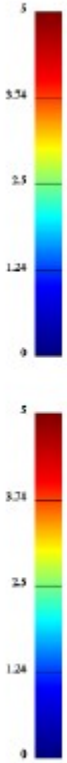
Results & future research

Processing of the static data of rover in kinematic mode









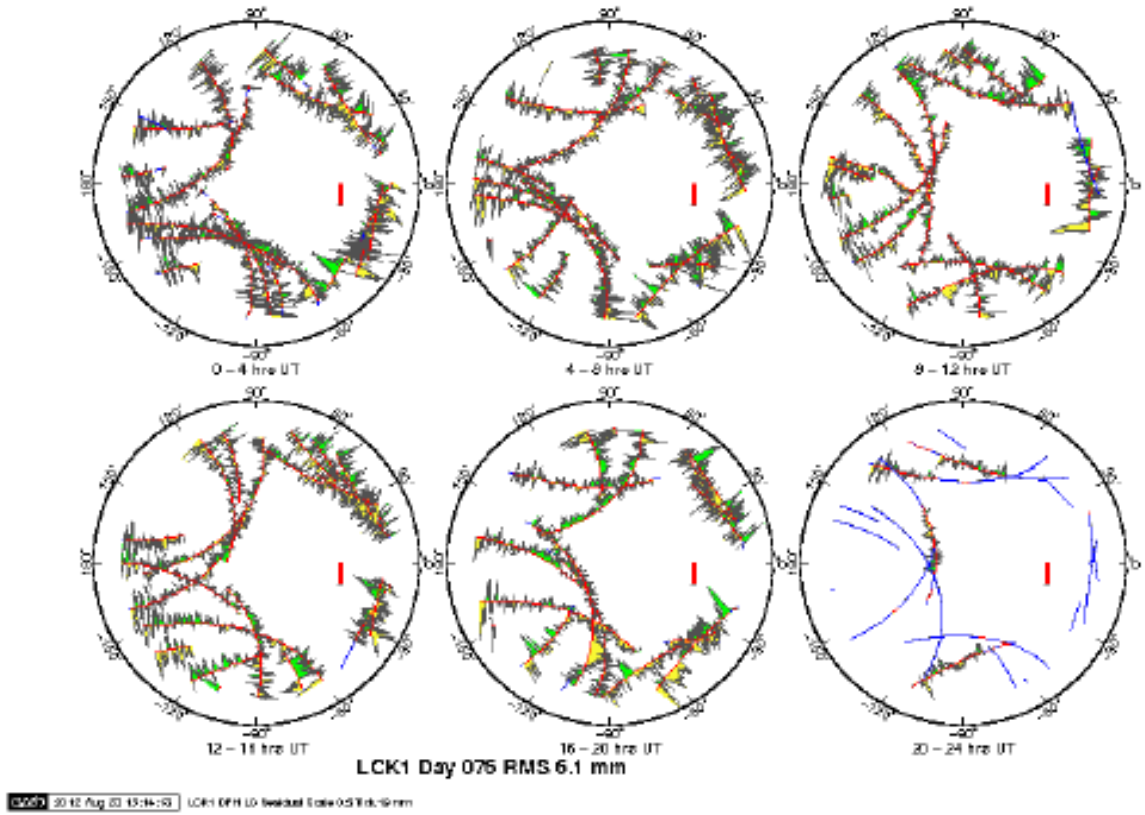
Reference receiver: KIR0 (Kiruna, Sweden)
Rover receiver: LCK1 (Kiruna, Sweden)

Data were sampled to 1 s;
Baseline lenght: ~ 30 km;

Software: GAMIT/GLOBK module TRACK (based on double-difference relative positioning) extra Wide-Lane linear combination (to fix carrier-phase ambiguities regardless the baseline length)
ROTI maps – temporal resolution 5 min

Results & future research

The Carrier Phase Residuals for each satellite



The residuals **"observed-calculated" (o-c)** can be used to analyze observational noise level and to identify outliers in observations.

The values can be used, as the **indicator describing the noise level of the carrier phase observations recorded under strong atmospheric disturbances.**

Results & **future research**

Evaluation of the quality and robustness of novel approaches and models

Parameters describing the quality of raw observations:

- number of cycle slips detected,
- number of not-correctable cycle slips,
- number of loss of locks of signal,
- number of single epoch gaps,
- length of connected carrier phase arcs.

Parameters estimating quality and robustness of the navigation solution and performance of the approach used:

- precision and accuracy,
- integrity,
- availability,
- confidence level and significance level,
- convergence time.

Scientific Training

- International Symposium on Global Navigation Satellite Systems Space Based and Ground-Based Augmentations Systems and Applications (10-11 October 2011, Berlin, Germany);
- GAMIT/GLOBK workshop: (4-5 April 2012, Thessaloniki);
- Participation in Academic Lectures at the Technische Universität Berlin;
  - Methodology of the positioning and navigation with GNSS;
  - GNSS Signal Processing and Real Time Positioning;
  - Geodetic Space Procedure in the Earth System Research;
  - JAVA programming language.
  - Selected section of navigation and positioning.

Complementary Training

- German language course: Goethe-Institute (8 week – intensive course);
- Conduct selected topics and preparation of lecture and instruction materials in frame of the master course at TU Berlin, module elements;
- Co-mentoring of Master's thesis:

  "Applications of GPS and SAR technology for deformation analysis."

  "Monitoring Ionospheric Irregularities in Time Series of GNSS Carrier Phase Observables and Station Coordinates."

Thank you for your attention

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