

PROGRESS TOWARDS A NEW TOOL FOR THE DAY-TO-DAY MANAGEMENT OF A GNSS ANALYSIS CENTRE

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ROBER CONTEXT, MOTIVATION AND GOALS

Context



Most of these products are computed using the Bernese GNSS Software v5.2 and a network approach, even if we have some products that are also computed in PPP.

Changing Landscape

Increased Complexity of the Analysis



Longer time series (20+ years)



Increased variety of equipment (+ changes)



Increasing number of GNSS stations



GNSS Modernization



Operational Aspects (24x365..)

Changing Landscape

To help in the day-to-day management of ROB's analysis centers...

We have a clear need to develop a new tool to extensively monitor our analysis chain, and to detect and correct/mitigate (or at least warn) for any source of performance degradation, as early as possible in the analysis



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Concept Overview



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Concept Overview



Integration in the BPE via PCF specific scripts – offline mode via extended PRC file. Mixed IT technologies: Perl modules and scripts, MySQL DB, HTML, PHP, JavaScript, Google maps, Highcharts...

ROBER DATASETS USED IN THE DEVELOPMENT STAGES

ROBER: Datasets Used for Development

1. CORDEX.be reprocessing – daily processing - Climate oriented dataset



- Length: 1995-2016 (20⁺ years)
- Nb. Stations: 359
- Nb. Of Receivers: 61
 Nb. Of Antennae: 112
 Nb. Of Rec/Ant Comb.: 285

Reprocessing dataset → expected to be quite homogeneous & well performing. 0

ROBER: Datasets Used for Development

2. Daily precise troposphere monitoring – E-GVAP - Operational dataset



- Length: 2010-2016 (6 years)
- Nb. Stations: 1143
- Nb. Of Receivers: 68
 Nb. Of Ant.ennae: 143
 Nb. Of Rec/Ant Comb.: 388

Operational dataset → expected to be more challenging ! 10

ROBER CONTEXTUAL EXAMPLES

Web-based User-Interface – Easy Monitoring and Manual Investigation

> About Us -> Contact Us -> Contact Us -> Centact Us -> Ce	STATION INFORMATION (SHOW HELP)
NOTES SERVICING CAMPAIGNS * TEMPORAL ANALYSIS * SPATIAL ANALYSIS * KPLANALYSIS * REPORTS AND TOOLS * DOCUMENTATION * STATISTICAL ANALYSIS *	Campaign APRINET_OPER_VER1 Station name ONSA 10402M004 Time Period of Processing 1995-01-01 - 2017-10-10
Home / Pages ROBER: TEMPORAL ANALYSIS	Number of Epochs 2760 Friend
HELMERT TRANSFORMATION	Peccher JAVAD TRE_GSTH DELTA Antenna AOAD/M.B OSOD Lat. / Long. / Elev. 57.39530 / 11.92552 / 45.656 Lastest sitelog <i>Riename_A.log Riename_A.log Riename Riename</i>
CORDEX_REPROCESSING_TESTOPER_VER1 ~ HI.MFIN ~ ONSA 10402M004 ~	
Switch to Spatial Analyzis Switch to Previous Analyzis Step Switch to Next Analyzis Step Submit	
	Min Mean Median Max Std. Dev. Residuals (North): -7.32 (mm) -1.11 (mm) -1.34 (mm) 7.59 (mm) 1.46 (mm) Residuals (East): -3.38 (mm) 1.03 (mm) 1.12 (mm) 9.16 (mm) 3.96 (mm) Residuals (Up): -21.67 (mm) -1.35 (mm) 0.83 (mm) 9.9 (mm) 3.96 (mm)
General Statistical Analysis Temporal Analysis Spatial Analysis Detailed Analysis Meta-Data HISTOGRAM OF (N,E,U) RESIDUALS (SHOW MUD)	Statistical Information on HELMERT Residuals
20 10 10 10 10 10 10 10 10 10 1	20 10 10 10 10 10 10 10 10 10 1

ROBER: Temporal Analysis

Very First Stage: Metrics from the Observation Level

Nb. Of Satellites



Nb. Of Measurements

ONSA Number of Observations

Diff. in Nb. Of L1 and L2 Measurements



- > This kind of temporal analysis is done at all steps.
- > Meta-data information (rec. / ant. changes) from STA file TYPE002
- Similar metrics available for code measurements.

ROBER: Spatial Analysis

Discovering Station's Connectivity and Clustering



- Studying station's connectivity (baseline definition) and how they are grouped in clusters helps to find how errors propagates within the network.

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ROBER: Spatial Analysis

Combining Station's Connectivity with Metrics to Study Performance Degradation



- Example: 3D coordinate formal error of each station from the final ADDNEQ2 adjustment (April 15, 2015).
- Highest formal errors are found at stations connected by only one baseline and sometimes propagates to neighboring stations of the same cluster.

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ROBER: Temporal Analysis

Example of Key Performance Indicator (KPI) candidate





► Clear correlation (0.65) between the mean number of arc / satellite (RNXSMT) and the covariance trace of the coordinate of the station MCM4 → Good KPI candidate that can act at the very beginning of the analysis chain.

Once a KPI candidate is found, we need to study its long-term behavior to be able to define properly the critical values that can be associated with a decision model.

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ROBER SUMMARY AND FUTURE STEPS

What is it about?

A tool to extensively monitor our analysis chain, and to detect and correct/mitigate (or at least warn) for any source of performance degradation, as early as possible in the analysis



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ROBER: Metrics and Analysis

At each of the monitoring step – whenever it is possible and when it makes sense –we exploit / analyze the extracted metrics in









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> From all extracted metrics, we could already identify 4 categories of KPIs.

Key Performance Indicators (KPIs) and Decision Models (DMs)

> These KPIs enable the application of decision models.

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> Next step: define critical thresholds for these KPI and develop + implement these decisions models.

Chatzinikos et al. - Eric.Pottiaux@oma.be - EUREF LAC Workshop 2017, Brussels, Belgium - 25-26 October 2017

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ROBER : Summary and Future Steps

Current Development Roadmap



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Thank you...

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Belgium - 25-26 October 2017