GNSS DATA CHECK AND EVALUATION USING FREE SOFTWARE

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CONTEXT

The GNSS Data centers of continuous operating networks are responsible for data collection, checking, evaluation and publishing.

These three steps before data publishing are important in order to provide data quality to processing centers and to users as well.

These tasks can be done using free software developed by research groups. To perform these tasks it is necessary develop an automatization process in order to correct data as soon as possible. For example: verify data integrity and obtain data statistical information. Regarding data quality check, daily plots are generated and updated with the following informations: the number of complete observations, RMS MP1 (L1 Multipath) and MP2 (L2 Multipath), and observations per slip (inverted and multiplied by 1000).

This work identifies common problems in GNSS data that should be checked and evaluated under data center operations.

The proposal is use and compare three free softwares TEQC, GFZRNX and BNC to perform these tasks.

Use data from different receiver manufacturers.

GOALS

- Data evaluation in order to support activities of GNSS data centers;
- Apply free software in daily GNSS data of RBMC stations;
- Commom problems to be detected:
- Receiver´s wrong configuration;
- Receiver malfunctioning due to eletrical discharge;
- Receiver and antenna problems;
- Plots comparing informations provided by software :TEQC and BNC
- Informations: number of observations, cicle slips, RMS MP1 / MP2, RMS SNR1 /SNR2 and number of observations p/ satellite

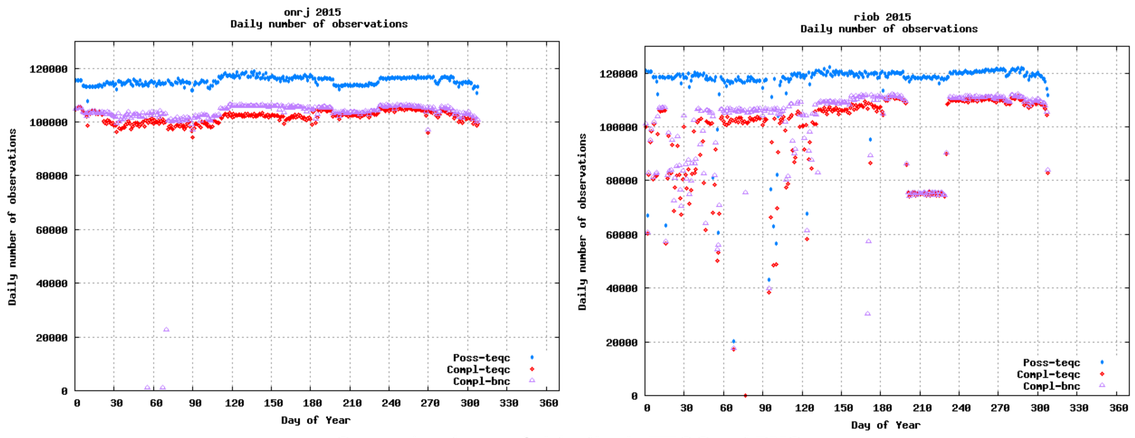
SOFTWARE CHARACTERISTICS

The main caracteristics of softwares used in this evaluation are:

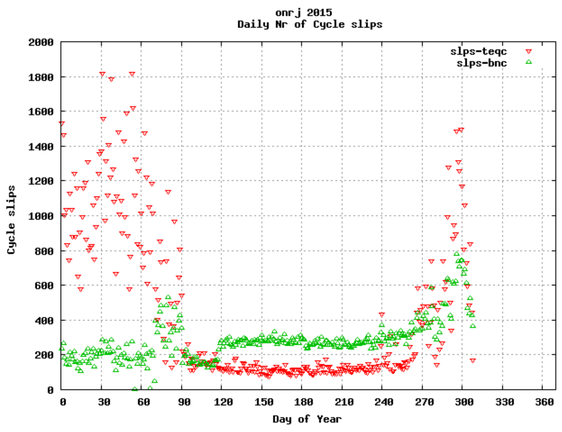
Software:	**TEQC**	**BNC**	**GFZRNX**
Developed by	UNAVCO	BKG	GFZ
Editing / Data obs. and nav. in RINEX	YES	YES	YES
Editing/conversion 3.0 > 2.??	NO	YES	YES
Editing/ concatenate and split	YES	YES	YES
Editing / sampling	YES	YES	YES
Editing / Header change	YES	YES	YES
Editing / SV sellection	YES	NO	YES
Editing / elevation mask	YES	NO	NO
QC / constelations	GPS, GLONASS, Galileo and Beidou	GPS, GLONASS and Galileo	GPS, GLONASS, Galileo and Beidou
QC / no. of observations	YES	YES	NO
QC / cicle slips	YES	YES	NO
QC/ RMS MP2 and MP1	YES	YES	NO
QC/ RMS SNR2 and SNR1	YES	YES	NO
QC/ Timeplot per SV	YES	YES	NO
QC/ no. of obs. in each satellite	YES	NO	YES

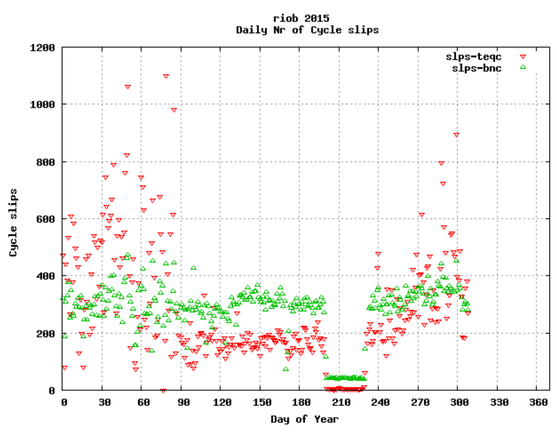
PLOTS

Comparing the nr. of observations in TEQC and BNC

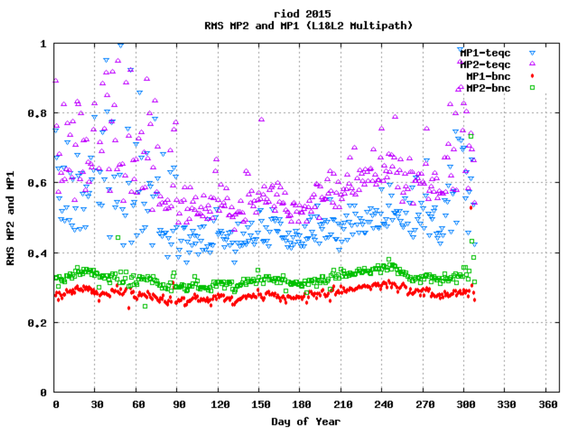


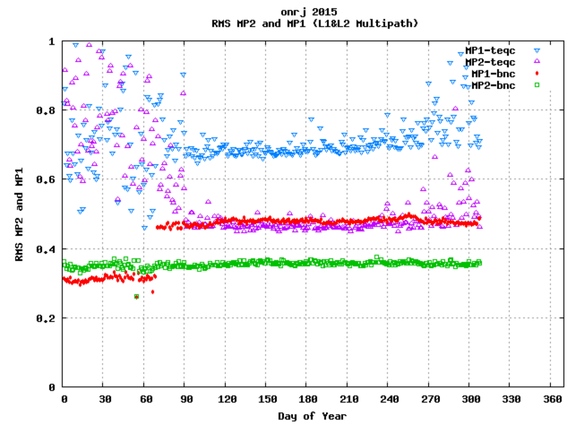
Comparing the nr. of cicle slips in TEQC and BNC





Comparing RMS MP1 / MP2 from TEQC and BNC

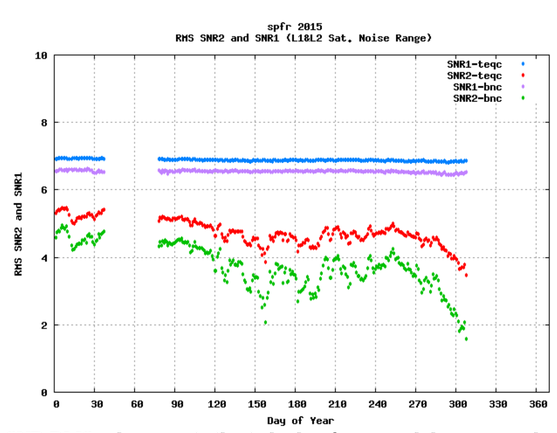




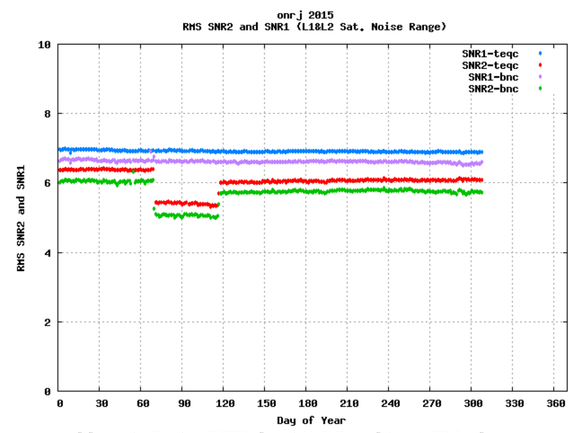
Multipath RMS, in both TEQC and BNC, present different results. In the case of BNC, L1 values of ONRJ changed with receiver change.

Comparing RMS SNR1 / SNR2 from TEQC and BNC

SPFR - NETR8

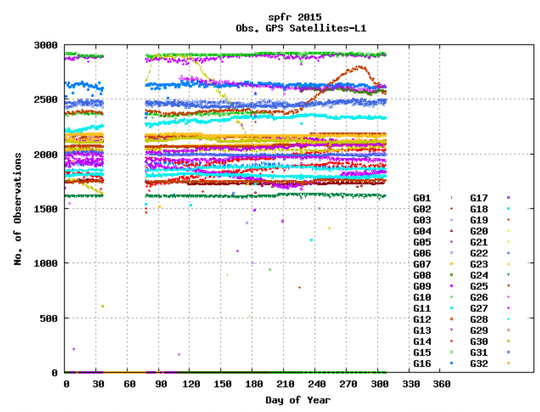


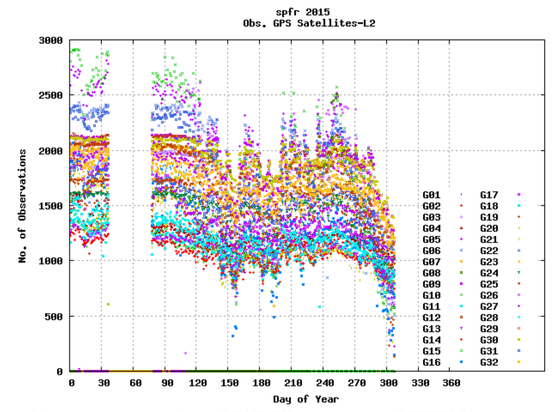
ONRJ - NETR8



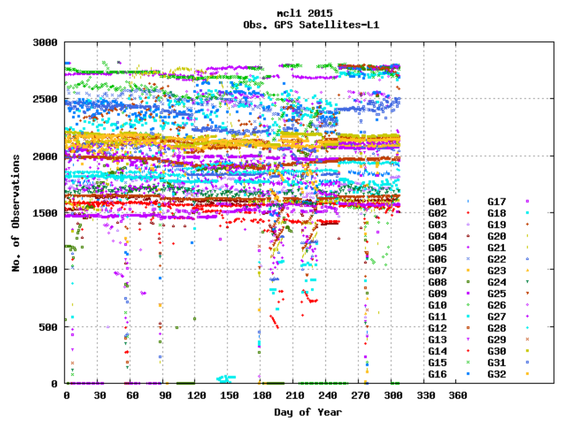
SNR RMS values are similar in both software and they report the same problems in L2 in SPFR, loosing L2 and in ONRJ when receiver was changed and presented configuration problems

Number of satellite obs. in SPFR station (NETR8)

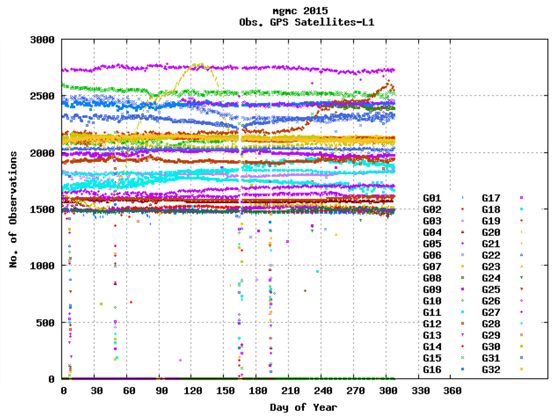


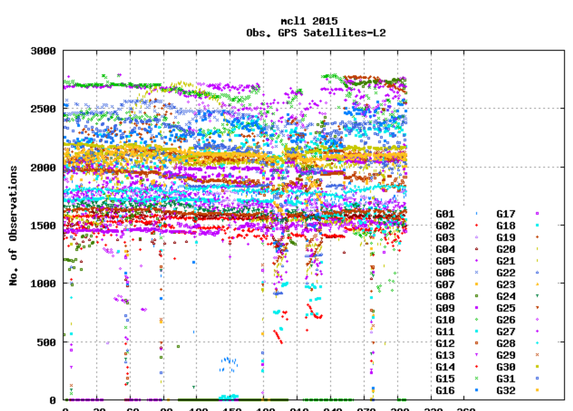


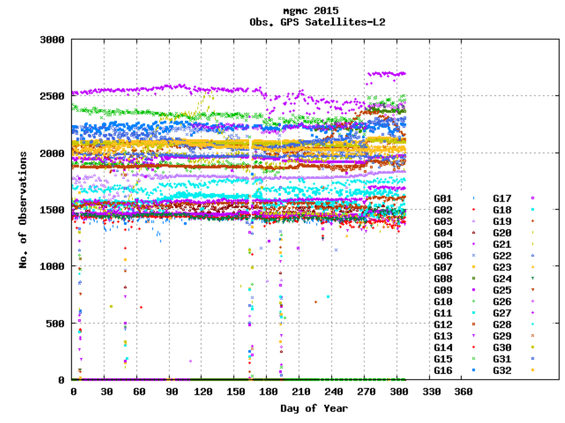
Number of satellite obs. MCL1 in station (SP800)

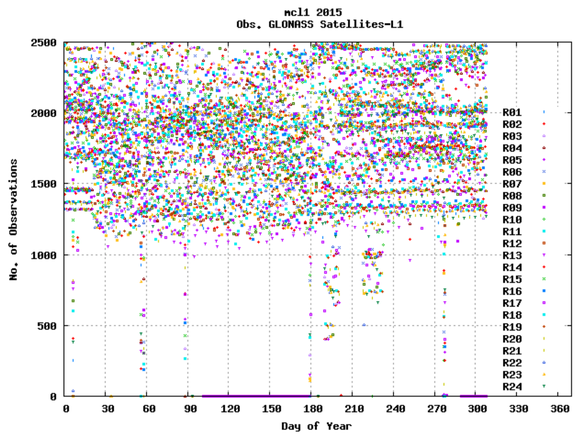


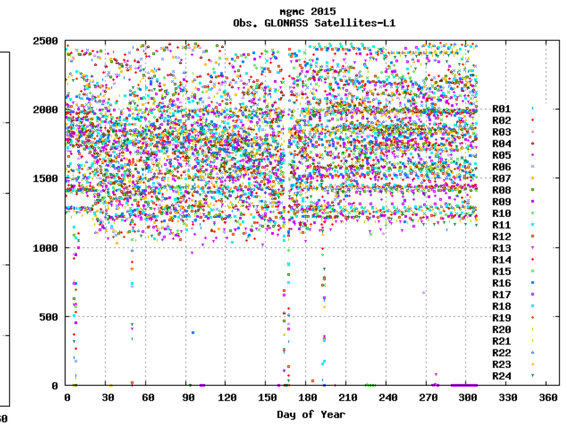
Number of satellites MGMC in station (NETR5)

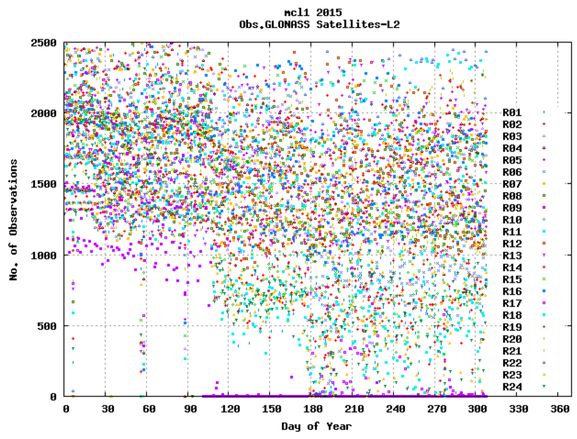


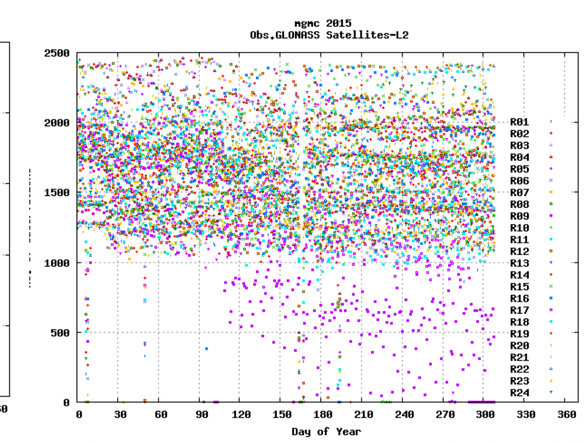












Stations MCL1 and MGMC are less than 1 km far from each other but MCL1 has wrong configuration as can be seen in the plots of GPS observations L1 and L2 of both stations. MCL1 is not colltecting block. In All stations can be seen a different behavior of GLONASS satellites after day 180 of 2015

RBMC data analysis can be found at:

ftp://geoftp.ibge.gov.br/http://www.ibge.gov.br/home/geociencias/geodesia/rbmc/analise.shtm

http://www.ibge.gov.br/home/geociencias/geodesia/rbmc/analise.