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Assessing the GNSS loss of lock (LoL) due to Ionospheric scintillation over Brazil using the GNSS NavAer network

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The GNSS NavAer network (https://inct-gnss-navaer.fct.unesp.br/) is a follow on of the CIGALA/CALIBRA network, which is located inside the Brazilian territory. New GNSS receivers, Septentrio PolaRx5S, were deployed in some new sites and most of the older receivers PolaRxS–PRO were replaced. Data are stored since 2011. Therefore, a huge amount of data is available and a deeply insight on them would be very important to see what we have learned and what could we do in the future to help minimize the problems resulting from ionospheric scintillation. It is also important to say that a tool for helping to explore the data set was developed, which is named ISMR (Ionosphere Scintillation Monitoring Receiver) Query Tool. The tool provides several resources on data visualization and data mining via web (available at is-cigala-calibra.fct.unesp.br) and contributes to several research on ionospheric scintillation all over the world (Vani, Shimabukuro and Monico, 2017). The main aim of this contribution is to provide information from this network associated with ionospheric scintillation occurrence during the period of data collection, mainly concerning the relationship between the occurrence of scintillation and loss of lock (LoL). The data set was explored aiming to relate the amplitude scintillation index S4 and the loss of lock occurrence. Figure 1 shows an example of exploring the dataset using the ISMR Query Tool (http://ismrquerytool.fct.unesp.br/). Data collected at Sao José dos Campos (Station SJCU) shows the S4 index for the satellite GPS PRN 24, as well as the locktime indicator. A reset on the lock time identified the LoL occurrence. In this case, the S4 index reached about 0.8 at the same minute in the time of the LoL. All occurrences of losses of lock were identified and counted (Figure 2).

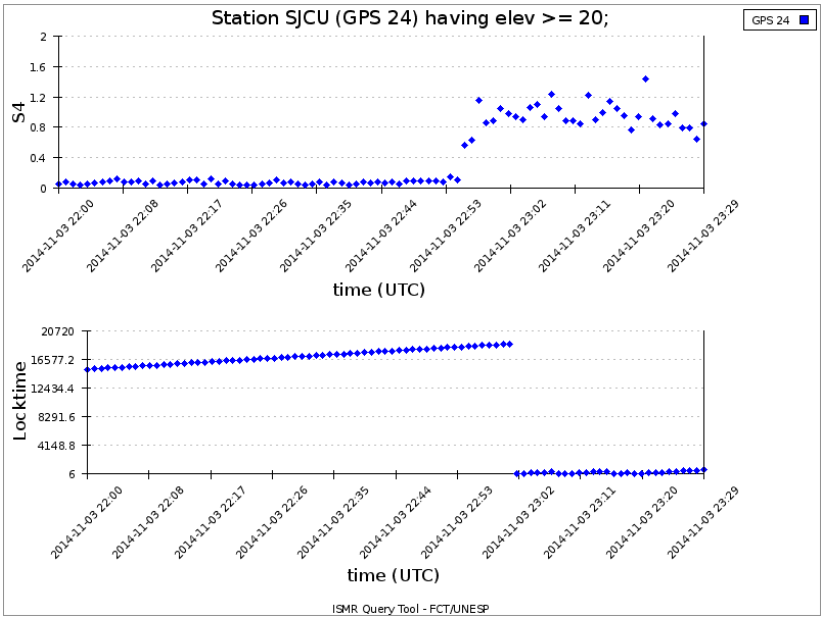

Figure 1. Exploring the ISMR Query Tool

Figure 2 shows the number of LoL occurrences associated with the S4 for SJCE station. So, we can see the strong correlation between ionospheric scintillation and LoL. The analysis will be provided to the other GNSS NavAer network stations together for further

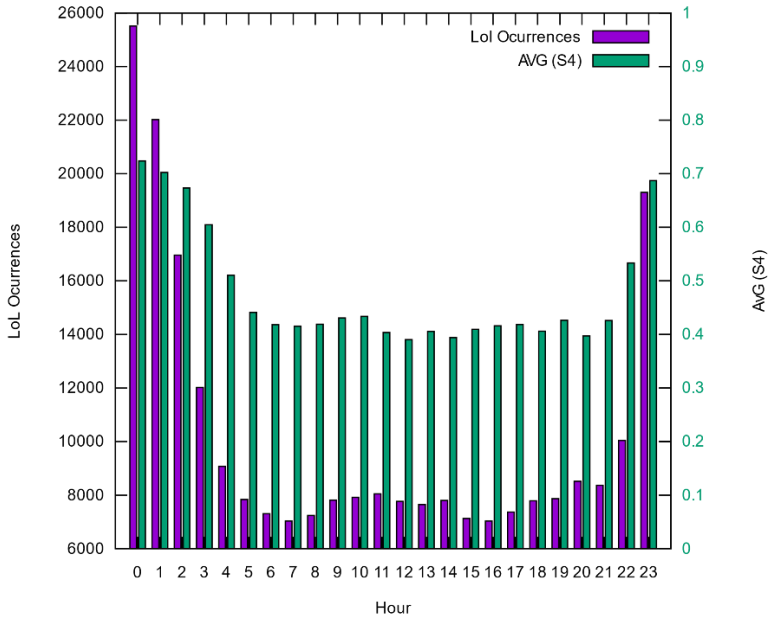

Figure 2. Number of LoL and amplitude IS (S4) occurrences

References

[1] B. C. Vani. M. S. Shimabukuro, J. F. G. Monico, "Visual exploration and analysis of ionospheric scintillation monitoring data: The ISMR Query Tool," *Computers & Geosciences* 2017, http://dx.doi.org/10.1016/j.cageo.2016.08.022