ABSTRACT

Evaluating The Quality of Trinidad CORS/cGNSS Data
For Geodetic and Geologic Applications

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In today's world, Global Navigation Satellite Systems (GNSS) play an important role in the fields of geodesy and geoscience and is a critical tool in disaster preparedness and management. Continuously Operating Reference Stations (CORS) have become one of the key bases for realizing regional and international terrestrial reference frames which in turn provide the foundation for the robust scientific study of geologic phenomenon as well as giving order to spatial data infrastructure.

Trinidad and Tobago has in place CORS infrastructure and is seeking to augment this in collaboration with other nation-states and stakeholders within the Americas. This research seeks to evaluate the applicability and quality of the existing CORS network on the island of Trinidad and the stations' adherence to international guidelines and conventions established for the successful implementation of CORS networks.

A three-pronged approach is adopted in evaluating the stations and their data. Firstly, the applicability of the data to a real world problem is tested by way of analysing a time-series of unadjusted processed baselines from the four Trinidad stations concurrent to two earthquake events. Fourier transform analyses are undertaken to isolate prevalent frequencies from the signals generated which can be examined and then passed on to seismologists and other earth scientists for further evaluation.

Secondly, to qualify the Fourier Transform output, quality analysis of the RINEX data from the four stations is undertaken. Finally, a physical appraisal of the four stations and their constituent instrumentation and infrastructure is given in terms of international standards and guidelines.

Significant frequencies of long and short periodicity are found in the selected data-set. The reliability of the output is called into question after RINEX data quality tests indicate that the stations were in poor health for the selected time-series. Encouragingly, a change in instrumentation subsequent to this yielded RINEX data which passed the same quality tests. The physical evaluations reveal that two of the four stations adhere sufficiently to the international standards and conventions with some modification required, one station has a positive outlook though its evaluation could not be completed in full, and the fourth station is situated in a problematic location.

The results indicate that the CORS infrastructure and data on the island of Trinidad are approaching the international standards required for its applicability towards key problems in geodesy and geology. Minor modifications to the existing infrastructure in most cases, better

implementation of future stations, and continuous maintenance and application of the data towards scientific endeavours will provide for a better and more reliable CORS infrastructure in Trinidad and by extension Tobago - where the same measures can be implemented - and will lead to positive collaborative efforts within the region.

Keywords: Ijaz Ramsahai; CORS; GNSS; cGNSS; GPS; cGPS; Trinidad; Quality Analysis; Time-Series Analysis; Infrastructural Analysis; Geodesy; Geology; Seismology.