COMPARATIVE PERFORMANCE ANALYSIS OF GAGAN AND TRIMBLE RTX SATELLITE BASED AUGMENTATION SYSTEMS OVER SRI LANKA

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Global Navigation Satellite System (GNSS) is providing high accurate positioning, timing and navigation solution around the globe. However, the delay on trans-ionospheric satellite signal propagation diminishes the positional accuracy of GNSS observations. Therefore, the Differential GPS (DGPS) technique is commonly used to minimize the effect of ionospheric delay by providing corrections via radio signals and internet. In addition, Satellite Based Augmentation Systems (SBAS) stream DGPS correction data, through geostationary satellites, on L1 frequency with a unique Pseudo Random Noise (PRN) enabling easy access by any L1 GNSS antenna without additional hardware. There are two SBAS services available for GNSS users in Sri Lanka; (i) Indian SBAS, GPS Aided Geo Augmented Navigation (GAGAN), which is a free service covering the Indian region by three geostationary satellites. (ii) Trimble RTX (Real Time eXtended) is a globally available paid service with a restricted access even for Trimble GNSS users. Considering the given facts, this study aims to analyse the performance and correction stability of GAGAN and RTX services for accuracy enhanced positioning and navigation over Sri Lanka. Accordingly, 24-hour observations were conducted during four (4) conservative days using three Trimble SPS 986 receivers. Two receivers were configured for GAGAN and RTX based DGPS observations, while the third receiver was set to perform standalone GNSS observation. The positional accuracy of the GAGAN and RTX based measurements were tested using predefined distances calculated between the three observation stations. Results indicates a clear positional accuracy improvement for both GAGAN and RTX over standalone observations. The inaccuracy reaches to its maximum around 220 cm during noon time when the Total Electron Content (TEC) reaches its maximum of 38 TECU (TEC Unit). A sudden increment on positional inaccuracy and TEC is noticed around 20:30 hours each day. However, when the TEC variations are quiet, from about 22:00 to 9:00 hours, the positional accuracy was also observed to be stable within 50 cm. Further, the time series positional accuracy variation trend of both SBAS enable observations remained same throughout each day. However, the precision of Trimble RTX was comparatively better than GAGAN based observations.

Keywords: *GNSS, GAGAN, Trimble RTX, Total Electron Content*