

# ABSTRACT

The ionosphere plays a crucial role in the propagation of radio signals, and its characteristics are vital for various applications such as satellite communication and navigation systems. Total Electron Content (TEC) is a significant parameter in ionospheric studies, representing the total number of free electrons along the path between a satellite and a receiver. Understanding TEC variations is essential to mitigate ionospheric effects on radio signals.

This study presents a comprehensive statistical analysis of the variations in total electron content (TEC) and ionospheric irregularities using the Rate of TEC Index (ROTI) between Bandung City, Indonesia and Guilin City, China, during the period 2021-2022. Utilizing data collected from the GNSS Ionospheric Monitor device positioned at INTU Station (Telkom University) precisely located at coordinates -6.98N and 107.63E and GXGN Station (IGGCAS) located at coordinates 25.35N and 110.35E, the research explores the hypothesis of a magnetic conjugate relationship between the two cities, both situated at low latitudes representing both Northern and Southern hemispheres. The analysis includes a detailed examination of TEC variations across different satellite systems (GPS, Glonass, Galileo, SBAS, COMPASS, QZSS) and the phenomenon of GPS ionospheric irregularities during the 2022 equinox season. The study found that the GXGN station recorded a higher overall mean TEC value of 45.38 TECU compared to INTU's 28.64 TECU. The study also highlights anomalies in daily ROTI values, with INTU having anomalous days on Day 52 and Day 93, and GXGN on Day 77. These findings suggest that the magnetic conjugate relationship needs further investigation. This research underscores the significance of ionospheric monitoring for GNSS systems and advocates for the inclusion of geographical and seasonal factors in telecommunication and navigation applications.

**Keywords:** Total electron content (TEC), Ionospheric irregularities, Bandung, Guilin, Indonesia, China, Statistical Analysis, GNSS Ionospheric Monitor