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Your World, Our World: Resilient Environment and Sustainable Resource Management for All

Ground-based GNSS for Meteorological Applications in Ghana

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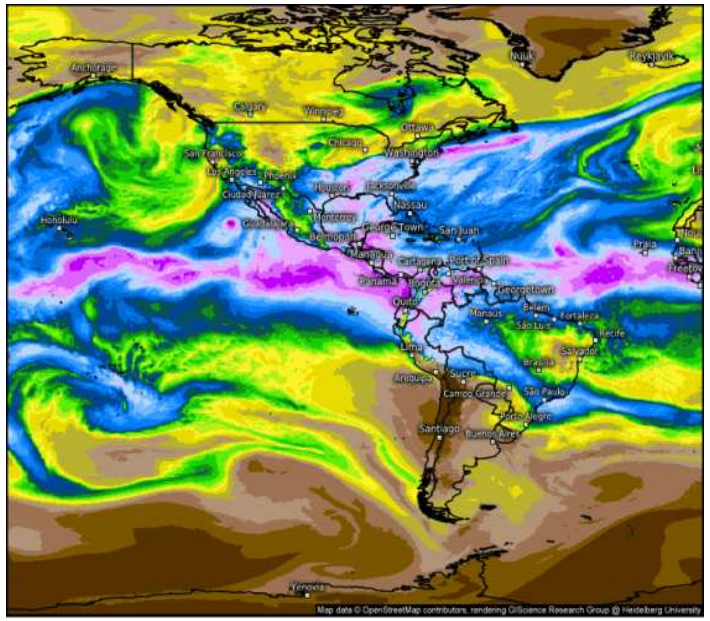
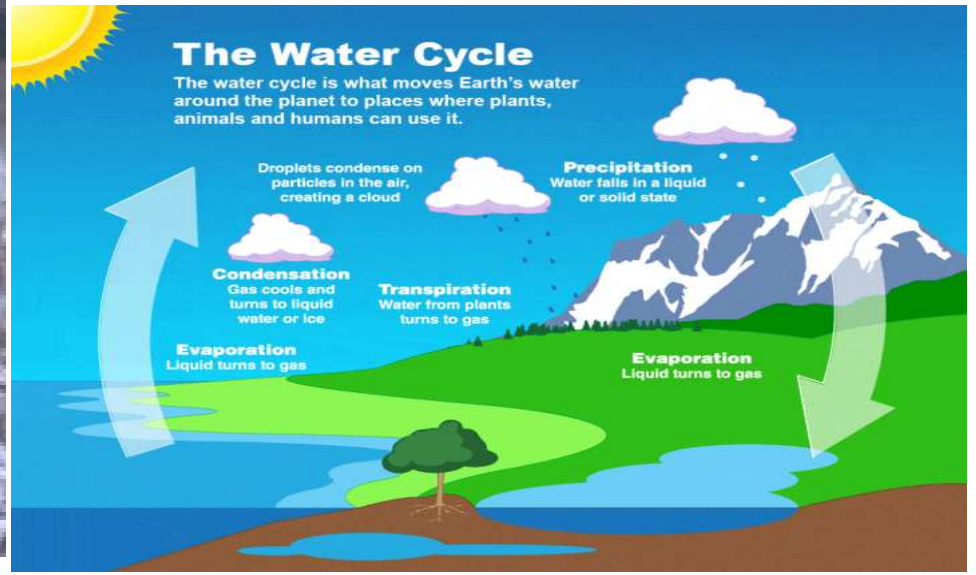
Introduction 1/3

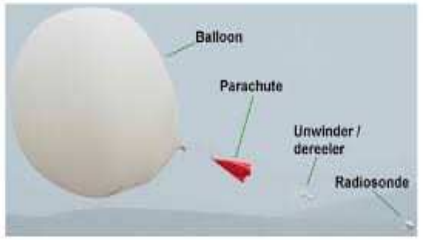
- Atmospheric Water Vapour (WV): A Key Component of Earth's Atmosphere.





Introduction 2/3

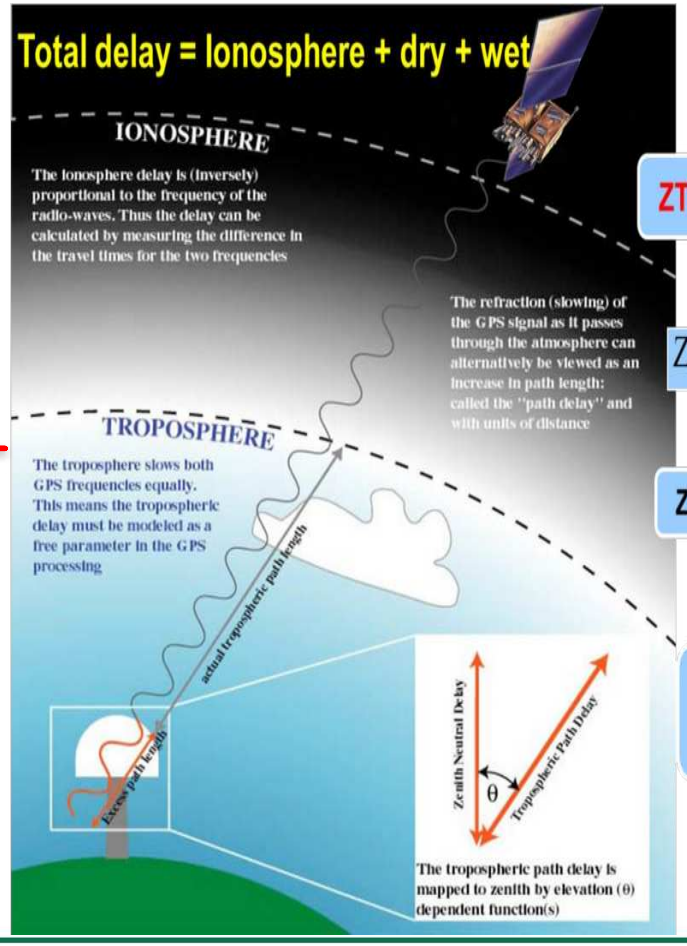
Challenges in Water Vapour Monitoring



Radiosonde

WVR

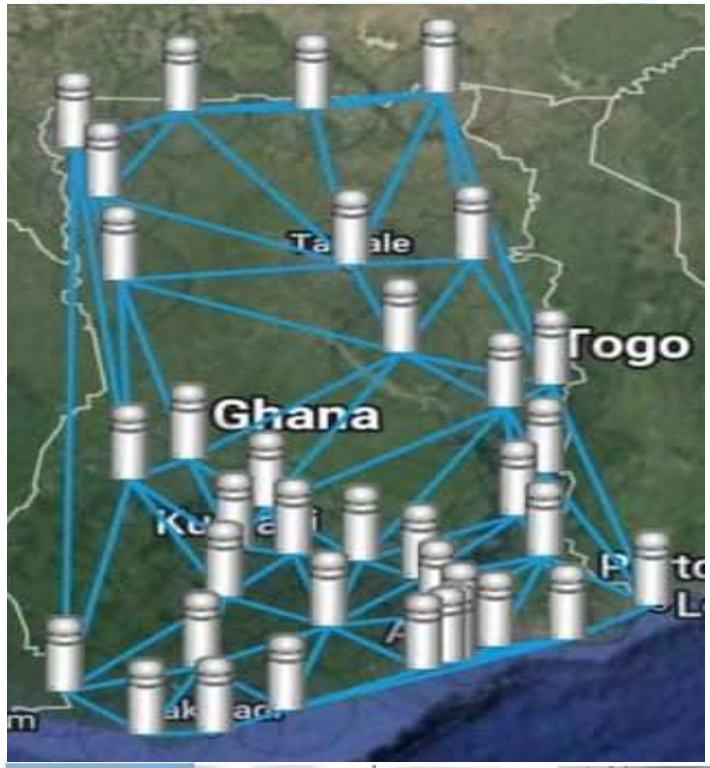
GNSS



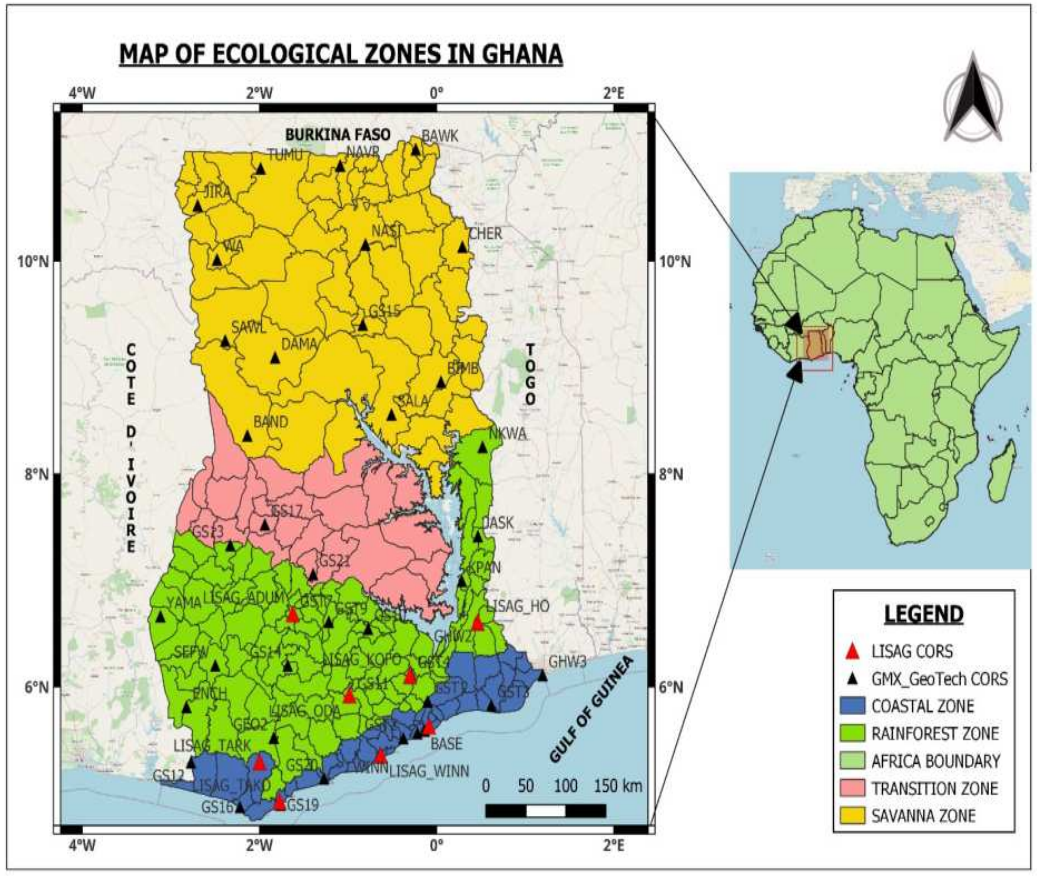
Introduction 3/3

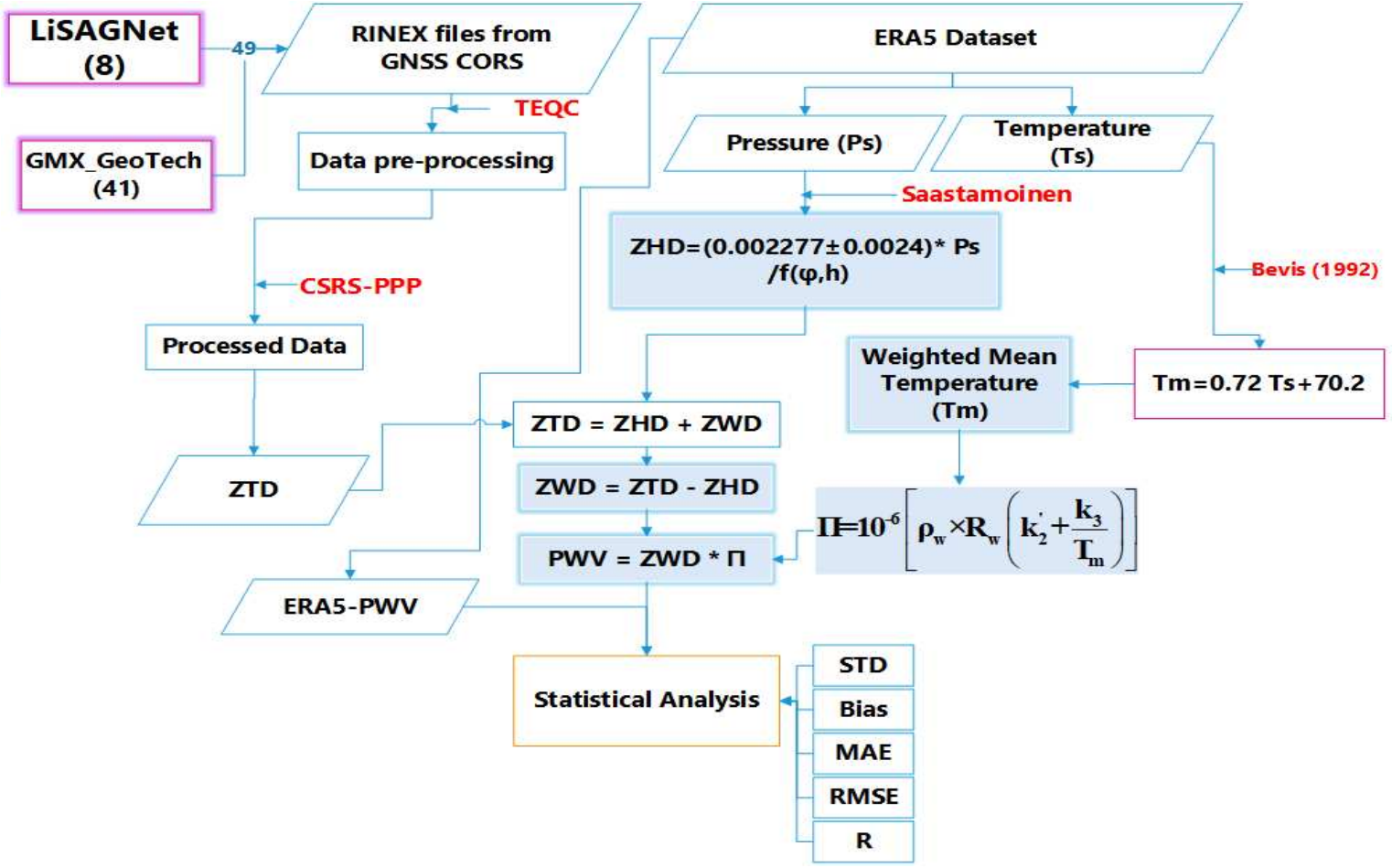
Despite global exploration of GNSS technology for meteorological applications, its potential remains largely unexplored/untapped in Ghana.

- Pioneering studies by Acheampong et al. (2015, 2017) used a single ground-based GNSS station at KNUST, Kumasi to estimate PWV.
- Recently, a nationwide network of **49** GNSS CORS has been established by the LISAG **(8)** and collaboration between GMX Systems (Israel) and Geo-Tech Systems (Ghana) **(41)**.
- **This study investigates the accuracy and reliability of ground-based GNSS-derived PWV across the 49 GNSS CORS network in Ghana for meteorological applications.**



Methodology:





Results and Discussion 1/2

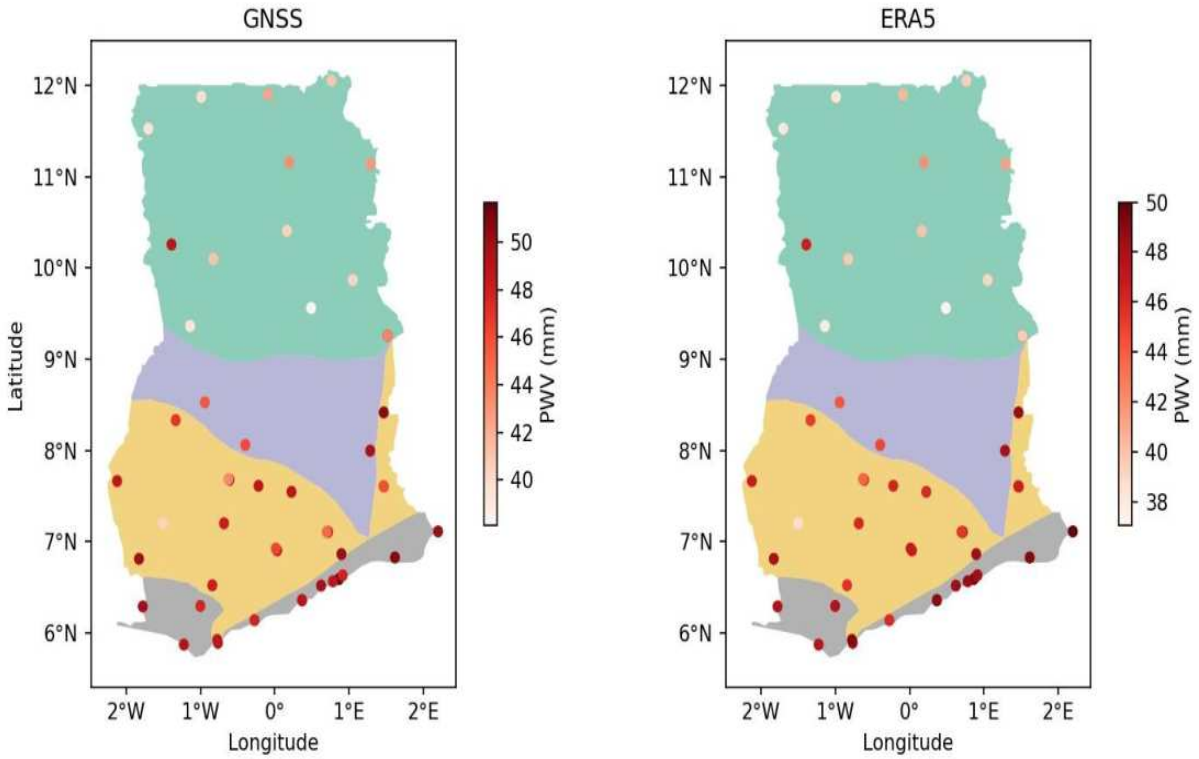


Fig 1: Spatial variability of PWV

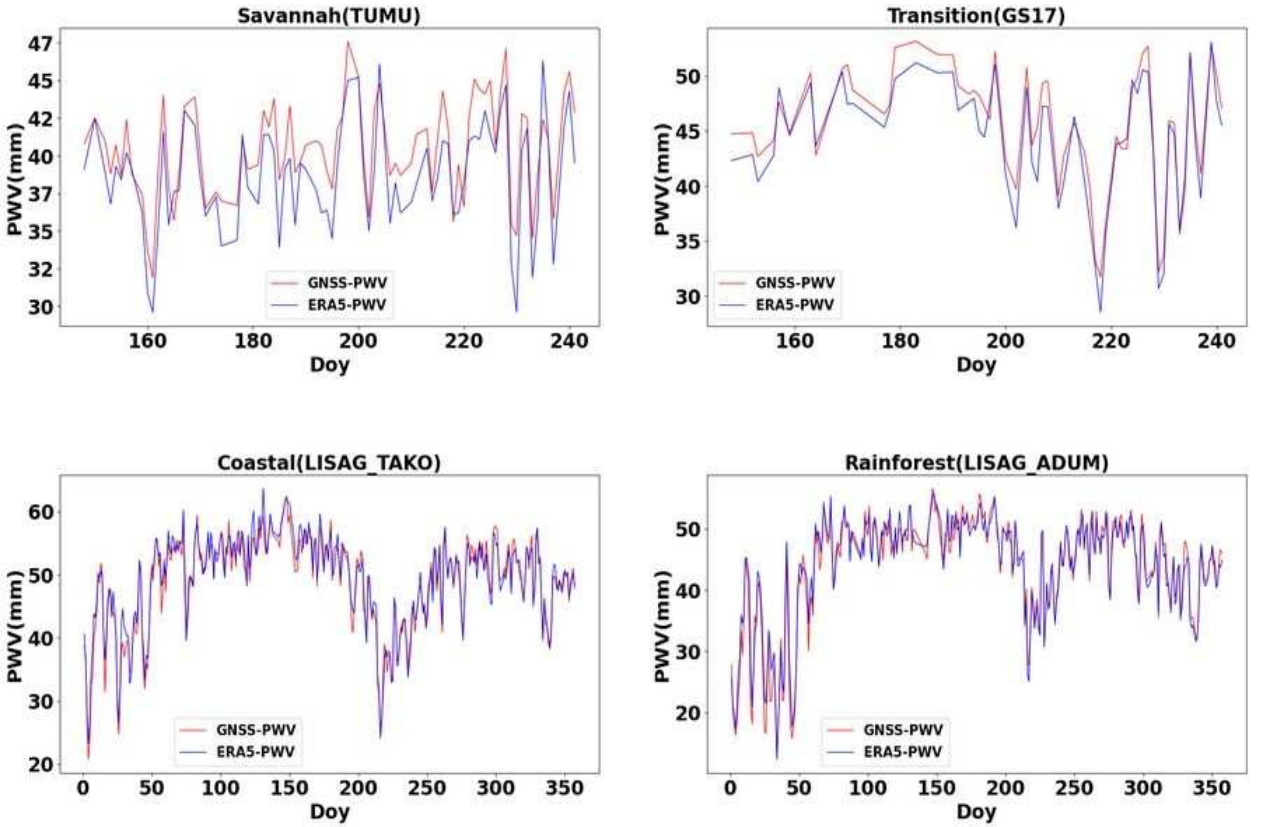


Fig 2: Temporal variation of PWV

Results and Discussion 2/2

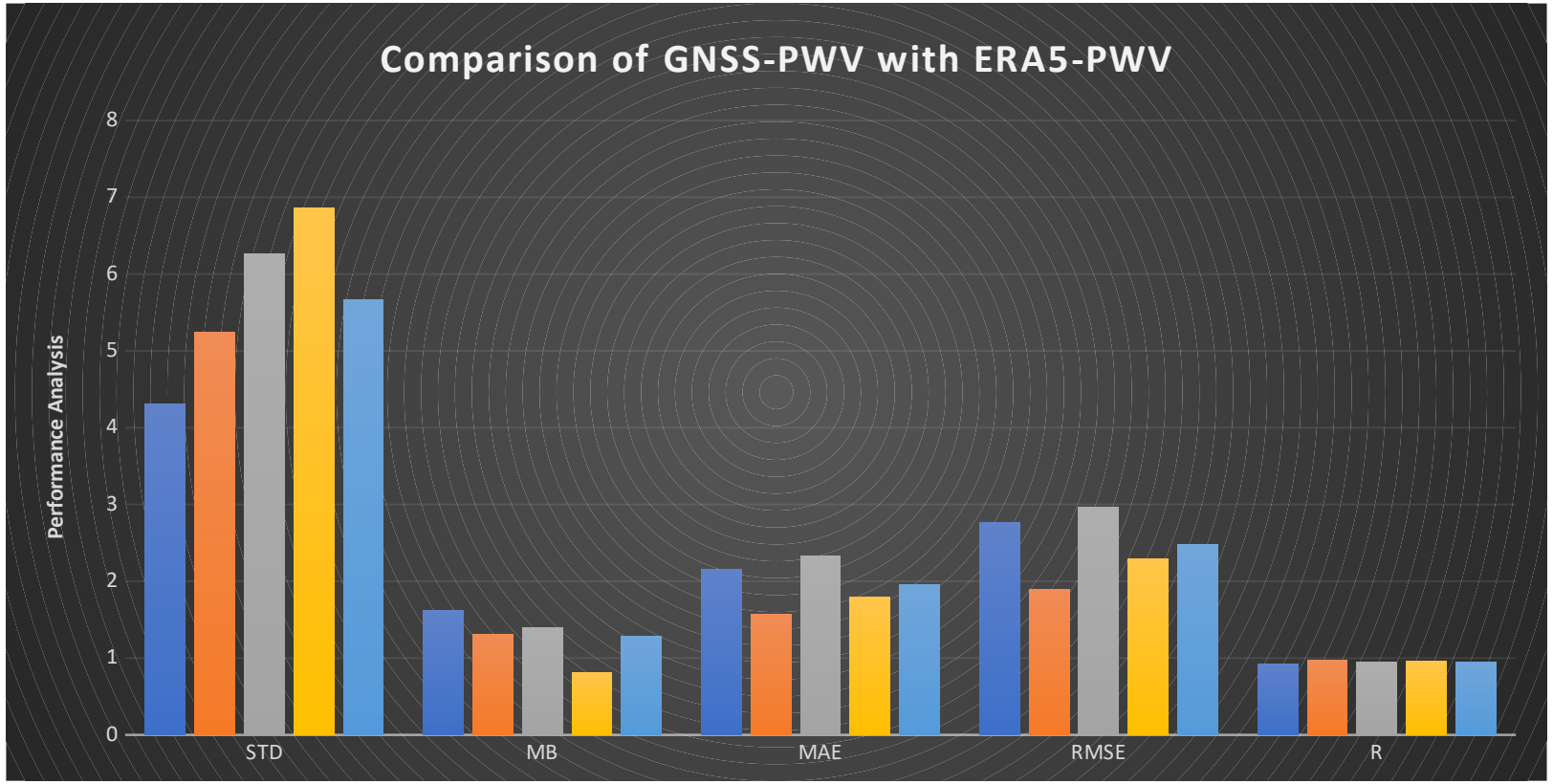


Fig 3: Accuracy assessment of GNSS-PWV

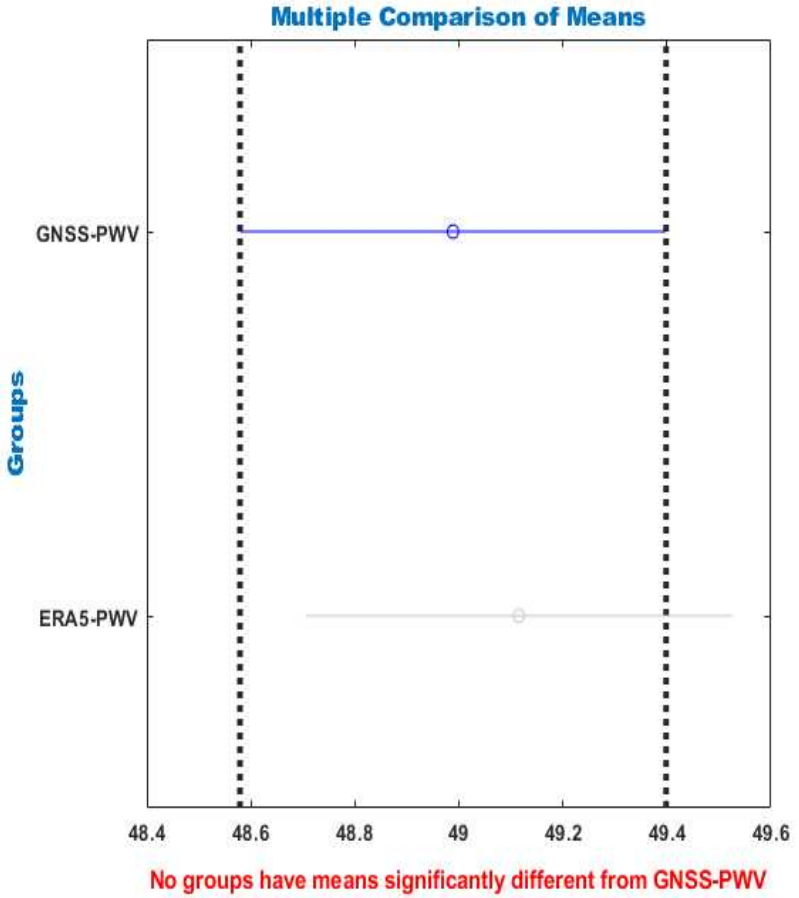


Fig 4: Multiple Comparision Test (MCT)

Conclusions

This study has comprehensively evaluated the accuracy and reliability of ground-based GNSS for PWV estimation across various ecological zones in Ghana.

We found strong agreement between GNSS-derived PWV and ERA5-derived PWV with minimal systematic overestimation across all the zones.

The statistical analysis revealed high precision and accuracy of GNSS-derived PWV with an overall mean STD, bias, MAE, RMSE, and R of 5.67 mm, 1.29 mm, 1.96 mm, 2.48 mm, and 0.948 respectively, over Ghana.

The low mean bias, MAE, and RMSE values, along with the strong positive correlation coefficient, indicate the reliability and consistency of GNSS as a valuable tool for meteorological applications in Ghana.

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Commission #: 5

Commission's name: Positioning and Measurement

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