Accurate deformation monitoring—the era of dual-base station technology

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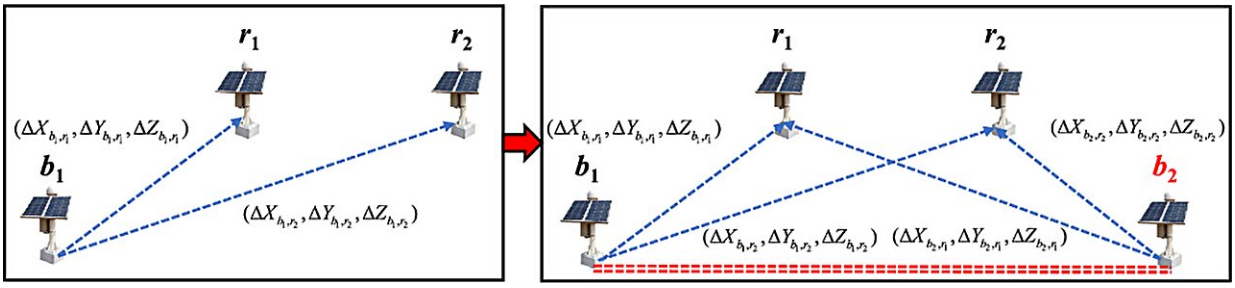

Deformation Monitoring Networks: Single-Base vs. Dual-Base Constraint. Credit: *Satellite Navigation* (2024). DOI: 10.1186/s43020-024-00148-3

Deformation monitoring plays a vital role in geological disaster management, transportation, and engineering maintenance. While Global Navigation Satellite System (GNSS) relative positioning has been the standard for such tasks, its precision often falters in long strip regions due to inconsistent distances between monitoring stations and base stations.

This inconsistency hampers accurate deformation pattern recognition and prediction, highlighting the need for advanced methods to ensure uniform precision across all stations.

A research team from Wuhan University's School of Geodesy and Geomatics, led by Junbo Shi, published a study on August 19, 2024, in

Satellite Navigation, introducing a dual-base station constraint method to address these challenges.

Tested on two case studies with eight monitoring stations, this approach has demonstrated notable improvements in precision consistency, marking a key development in GNSS deformation monitoring.

The study addresses the precision inconsistencies in traditional single-base GNSS monitoring methods, particularly in strip regions. By incorporating a baseline length constraint between two base stations into the relative positioning model, the new method significantly reduces the variability in precision across stations.

Over a 28-day testing period, the method showed a marked reduction in the median values of consistency indicators for East, North, and Up directions. Furthermore, the correlation between precision and station spacing was dramatically lowered, affirming the method's reliability in providing consistent deformation monitoring results.

Dr. Shi, the lead researcher, highlighted the method's impact, stating, "The dual-base station constraint approach enhances GNSS deformation monitoring by ensuring uniform precision across stations, irrespective of their distance from base stations. This improvement is crucial for accurately modeling and predicting deformation patterns, which is vital for effective disaster response and infrastructure maintenance."

The dual-base station constraint method holds promise for a wide range of applications, including landslide prevention, structural health monitoring, and large-scale engineering projects. Its capability to deliver consistent precision across monitoring stations enhances infrastructure safety and reliability in strip regions. The success of this method in resolving precision inconsistencies opens new avenues for more accurate and timely interventions in critical areas.

More information: Cheng Hou et al, A dual-base station constraint method to improve deformation monitoring precision consistency in strip regions, *Satellite Navigation* (2024). DOI: 10.1186/s43020-024-00148-3

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