

Exploration of Semi-CORS application in reference frame realisation

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SUMMARY

The Asia–Pacific Reference Frame (APREF), coordinated by Geoscience Australia (GA), underpins regional geodetic infrastructure consistent with the International Terrestrial Reference Frame (ITRF). However, the APREF network remains comparatively sparse and inhomogeneous in accuracy, and its linkage to the global ITRF is not fully characterised. The Positioning Australia initiative defines Tier 1–3 specifications for GNSS reference stations, with Tier 3 requiring continuous 24-hour operation, RTCM real-time streaming, and geodetic-grade instrumentation. These stringent requirements, while ensuring high reliability, also impose significant cost, power, and maintenance demands that hinder network densification.

This study evaluates the feasibility of a Semi-Continuous Reference Station (Semi-CORS or sCORS) concept based on the Australian-developed Kurloo GNSS-IoT system. Kurloo’s current specifications were assessed against Positioning Australia Tier 3 requirements, showing full compliance except for the absence of 24-hour data streaming and RTCM real-time capability. Through multi-site experiments, we compared 6-hour and 24-hour GNSS observations processed using AUSPOS and RTKLIB for both Kurloo and a geodetic-grade receiver.

Results demonstrate that 6-hour duty-cycled Kurloo observations can achieve coordinate repeatability within 5 mm horizontally and 10 mm vertically over short- to medium-baseline networks. These findings suggest that, while not meeting continuous operation criteria, a Semi-CORS configuration could effectively contribute to reference frame densification and support post-seismic deformation detection and CORS site stability monitoring, offering a cost-efficient trade-off between specification compliance and practical geodetic applications.