

TECHNOLOGICAL EVOLUTION OF A GLONASS GROUND SEGMENT STATION LOCATED IN RECIFE-PE, BRAZIL



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INTRODUCTION

The GLONASS ground segment in Brazil was established through Brazil–Russia technical cooperation, with stations installed at the University of Brasília (UnB), the Federal University of Santa Maria (UFSM) and the Institute of Technology of Pernambuco (ITEP). The ITEP station, located in Recife-PE, has operated since 2016 as a One-Way Station (OWS), supporting the GLONASS ground segment through continuous signal tracking.

This work presents the technological evolution of the ITEP GLONASS station from its current OWS configuration to the planned One-Way Measurement Station (OMS/SSI-S) architecture. The modernization will incorporate multi-GNSS tracking, real-time data transmission, integrated meteorological sensors and an atomic rubidium frequency standard.

The transition from OWS to OMS/SSI-S expands the station’s role from operational GLONASS support to advanced GNSS measurement infrastructure, enabling new applications in precise positioning, time and frequency transfer, atmospheric monitoring and multi-constellation data analysis.

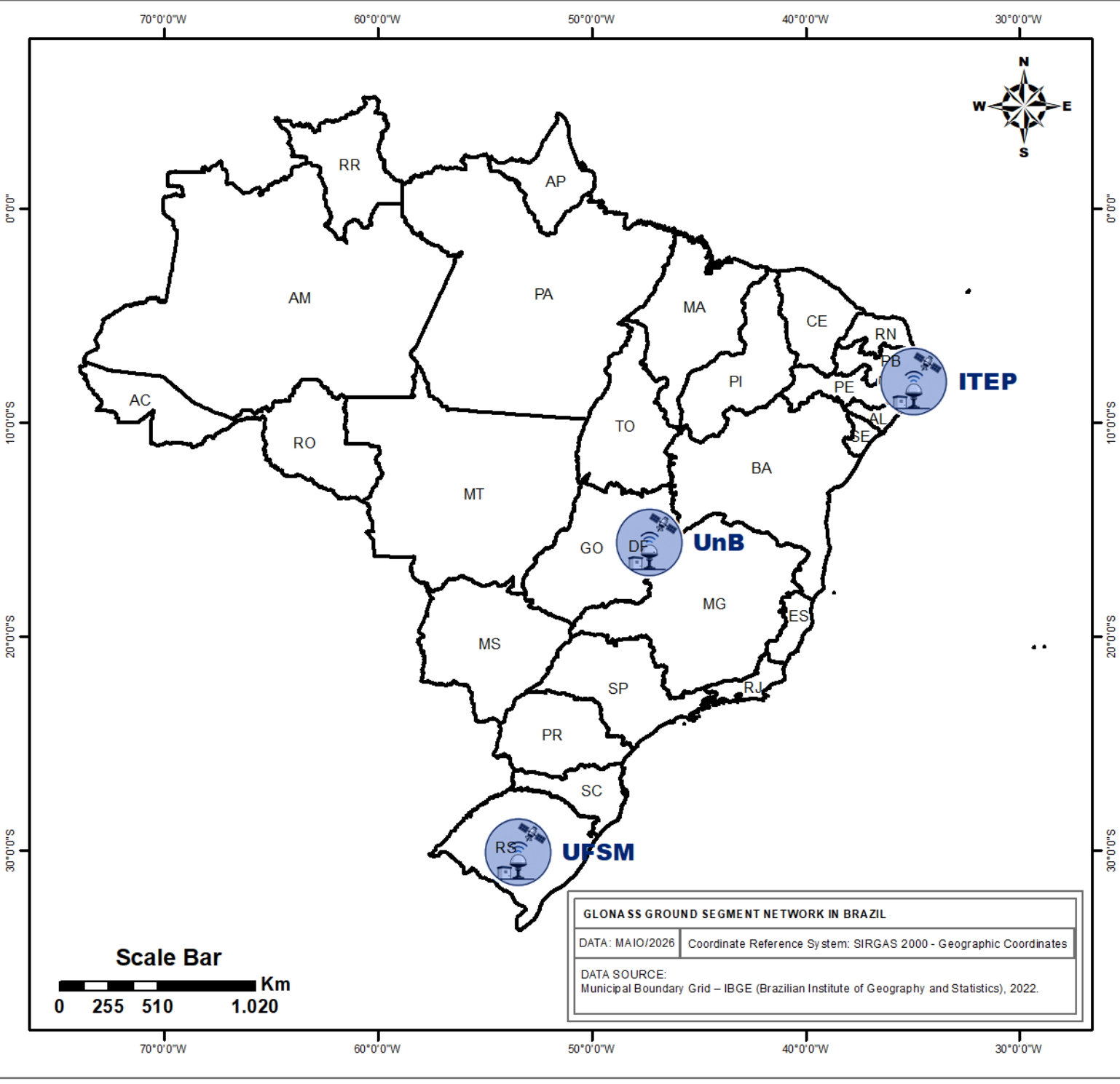
OBJECTIVE

To present the technological evolution of the GLONASS ground station installed at the Institute of Technology of Pernambuco (ITEP), Recife-PE, Brazil, highlighting the transition from the current One-Way Station (OWS) architecture to the planned One-Way Measurement Station (OMS/SSI-S) configuration and its new scientific and operational capabilities for multi-GNSS monitoring and advanced GNSS applications.

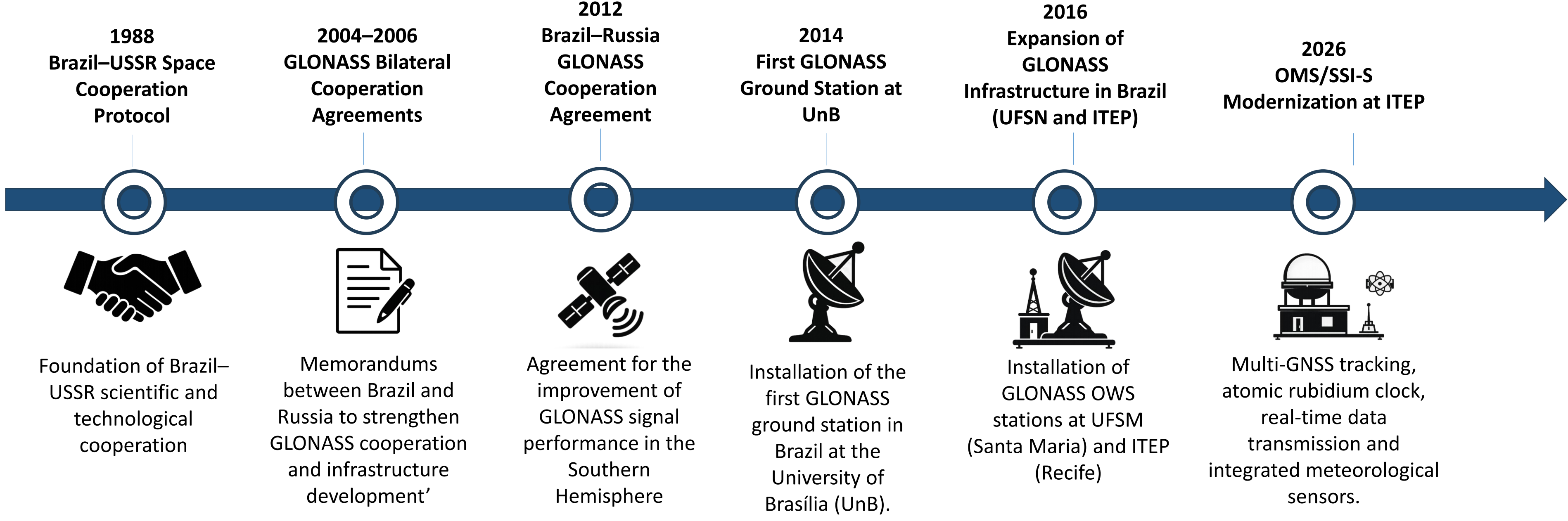
GLONASS GROUND INFRASTRUCTURE IN BRAZIL

HISTORICAL AND TECHNOLOGICAL FRAMEWORK

The technological evolution of the ITEP GLONASS station is associated with the Brazil–Russia cooperation program and the implementation of GLONASS ground infrastructures in Brazil, including stations at UnB, UFSM and ITEP. The framework includes the operational evolution from the current OWS infrastructure toward the planned OMS/SSI-S architecture.



TECHNOLOGICAL EVOLUTION OF THE GLONASS GROUND INFRASTRUCTURE IN BRAZIL



ITEP GLONASS STATION

The ITEP GLONASS station, located in Recife-PE, Brazil, is part of the Brazilian GLONASS ground infrastructure established under the Brazil–Russia cooperation framework coordinated with Roscosmos and JC “RPC “PSI”. Since 2016, the station has operated as a One-Way Station (OWS), supporting continuous GNSS monitoring and operational activities under low-latitude conditions.

The modernization scheduled for the second half of 2026 includes the transition to the OMS/SSI-S architecture, incorporating continuous multi-GNSS tracking (GLONASS, GPS, Galileo, BeiDou and QZSS), real-time data transmission, meteorological sensors and an atomic rubidium frequency standard. The upgraded infrastructure is expected to support advanced GNSS monitoring, PPP-based applications and atmospheric observations.

The Recife infrastructure also integrates complementary GNSS facilities operated by IFPE and UFPE/i-LITPEG, enabling cross-validation of positioning, timing and atmospheric parameters and strengthening multi-GNSS monitoring capabilities in northeastern Brazil.

CURRENT GLONASS OWS STATION (2016–PRESENT)



- Continuous GLONASS L1/L2 observations
- Permanent OWS ground segment operation
- GNSS monitoring and data acquisition

FUTURE OMS/SSI-S CONFIGURATION (2026 MODERNIZATION)



- Multi-GNSS continuous observations
- OMS/SSI-S operational architecture
- Rubidium atomic frequency standard
- Real-time monitoring and data streaming
- Integrated meteorological sensors
- Resilient PNT experimental infrastructure

OPERATIONAL AND SCIENTIFIC PERSPECTIVES

The OMS/SSI-S modernization of the ITEP GLONASS station is expected to expand multi-GNSS monitoring capabilities in northeastern Brazil, supporting continuous low-latitude GNSS observations, PPP applications, atmospheric monitoring and real-time navigation data transmission. The integration of the ITEP, IFPE and UFPE infrastructures may contribute to multi-constellation performance assessment and to the strengthening of scientific and operational GNSS capabilities in the Southern Hemisphere.

CONCLUSIONS

The evolution of GNSS infrastructures over recent decades, transitioning from a scenario predominantly based on GPS to a multi-constellation environment involving GLONASS, Galileo, BeiDou and QZSS, represents a significant advancement for global Positioning, Navigation and Timing (PNT) capabilities. The expansion and modernization of GNSS ground infrastructures in Brazil and across the Southern Hemisphere have contributed to increased observation availability, improved operational redundancy and strengthened scientific, technological and operational applications under low-latitude conditions.

In this context, the modernization scheduled for the ITEP GLONASS station during the second half of 2026 is expected to expand multi-GNSS monitoring capabilities, real-time data transmission, atmospheric monitoring and precise timing applications in a low-latitude environment. The transition from the current OWS infrastructure to the OMS/SSI-S architecture also represents an important advancement for Brazilian GNSS infrastructure, expanding the Recife station from an operational GLONASS support facility into an advanced scientific multi-GNSS monitoring environment.

The integration of complementary infrastructures operated by ITEP, IFPE and UFPE reinforces the strategic role of Recife as an experimental multi-GNSS environment in Brazil, contributing to the strengthening of scientific, operational and technological capabilities associated with continuous GNSS monitoring, multi-constellation integration and GNSS performance assessment in the Southern Hemisphere.

ABSTRACT
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