

IGS 2026
WORKSHOP
SANTIAGO DE CHILE
33°26' S 70°39' O

^{4 5} Fundação de Apoio à Pesquisa, ao Ensino e a Cultura - FAPEC, Campo Grande, Mato Grosso do Sul, Brasil;

In the relationship between agrarian reform and georeferencing of rural properties, the installation of cadastral reference networks in Settlement Projects is extremely important for validating the data obtained in situ. This ensures that geodetic data meet quality standards for demarcation of rural parcels.

The objective is to consolidate a geodetic network according to the guidelines of ABNT NBR 14166/2022 and to compare the discrepancies between the precise point positioning and static relative positioning methods in order to identify the best accuracy and its influencing factors. The Jacaré Settlement Project, located in the municipality of Jacareacanga, in the western region of the state of Pará, was selected for development. This study aims to present the results of the data analysis obtained from the execution of TED No. 17/2021.

The Jacaré Settlement Project is located in the municipality of Jacareacanga, state of Pará, northern region of Brazil, and has 280 (two hundred and eighty) plots (Figure 1) intended for agrarian reform of approximately 100 (one hundred) hectares each, according to the Land Management System SIGEF/INCRA (2026). The data provided by TED 017/2021 were used, containing: raw files, and rinx of 3 (three) tracking sessions at least 4 hours for each of the 7 (seven) base support vertices (figure 2), using the GNSS CHC I73+ receiver (figure 3). The procedure was executed according to the specifications of ABNT NBR 14166 (2022) and MTGIR/INCRA/2022. Also, the CGO 2.3.2.6 software was used for post-processing of the vertices and adjustment of the GNSS network: Relative positioning was performed using three RBMC stations (PAIT, AMPT, PASM). The analyses and calculations were carried out using Excel. For the validation of the survey, a comparison was made between the processing by the relative (RBMC/IBGE) and precise point positioning (PPP/IBGE) methods, obtaining the discrepancies, means, medians, standard deviation and RSM-Root Mean Square.

The results showed small discrepancies between the relative and precise point positioning GNSS positioning methods, with centimeter-level accuracy for the analyzed vertices. The horizontal components presented greater stability, while the vertical component showed slightly higher differences. Overall, the data confirm the reliability of the methods and demonstrate that precise point positioning can be a viable alternative in areas with difficulties for relative GNSS positioning. Therefore, the resulting coordinates used for validation of the geodetic network in the settlement project were those processed by the precise point positioning (PPP/IBGE), calculated from the average of the three tracking sessions of the implemented vertices, in UTM coordinates associated with the SIRGAS2000 datum, Zone 21 South, epoch 2000.4, Height conversion model hgeoHNOR IMBITUBA .

VERTICES DE APOIO BASES - PROJETO DE ASSENTAMENTO JACARÉ, PARÁ, BRASIL

ESTACÕES RBMC

AMPT

BASM

PAUT

DENIT-M-1812

GOJ-M-8902

GOJ-M-10210

0 25 50 km

PROJETO DE ASSENTAMENTO JACARÉ

GOJ-M-9215

DENIT-M-1812

GOJ-M-10887

GOJ-M-8665

GOJ-M-8902

GOJ-M-12209

GOJ-M-10210

0 2,5 5 km

LEGENDA

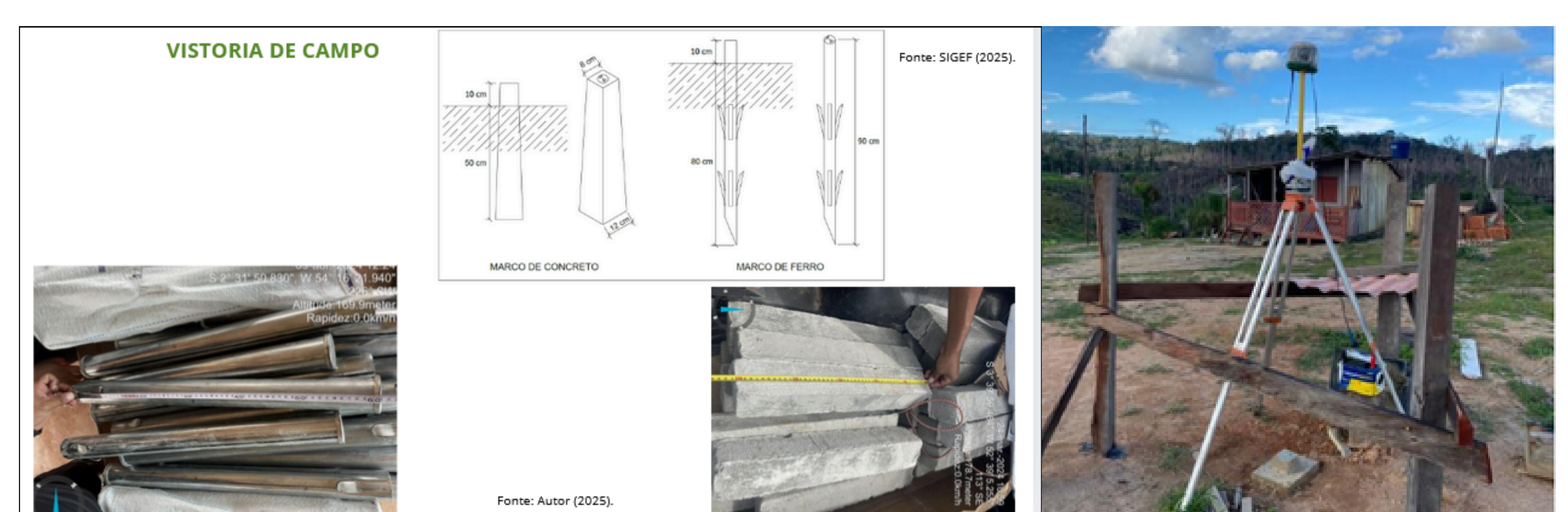
- ▲ VERTICES BASE
- RBMC
- LIMITE MUNICIPAL
- LIMITE ESTADUAL

Percentual de Entrega do PA: 100%
 Quilometragem: 617,058 km
 Lotes: 290
 Dias de execução: 314 dias

Sistema de Coordenadas: Projeção UTM
 Datum: SIRGAS 2000 ZONA 21 S
 DATA: 26/05/2025
 Base de Dados:
 INCRA (2026); IBGE (2020); RBMC (2025);
 SICEP (2026); FAPUC (2026); IMG: Sadtite
 BING/2026.

Responsável Técnica: Beatriz Ramos Barbosa
 Fiscal de Georreferenciamento: FAPEC

Figure 3: Tracing the base support vertices.



Graph 2: Statistical analysis of the comparisons between GNSS positioning methods.

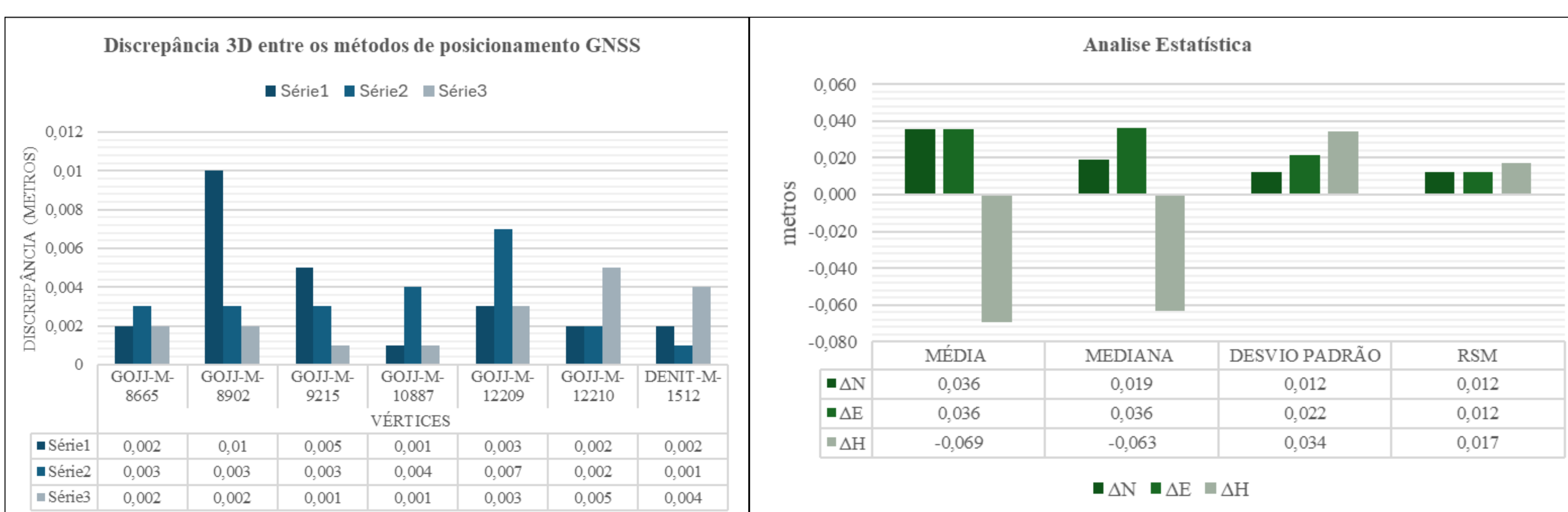


Table 1: Coordinates resulting from processing by the precise point positioning (PPP/IBGE), based on the average of the three tracking sessions of the implemented vertices, in UTM coordinates associated with the SIRGAS2000 datum, Zone 21 South, epoch 2000.4.

Vértice	N	E	H	σN	σE	σH
GOJJ-M-8665	9321718,520	408531,815	167,480	0,001	0,002	0,003
GOJJ-M-8902	9320303,333	420157,691	103,270	0,001	0,002	0,003
GOJJ-M-9215	9329966,631	407483,510	122,690	0,001	0,003	0,004
GOJJ-M-10887	9321445,518	405771,132	146,090	0,001	0,002	0,004
GOJJ-M-12209	9321546,051	425225,062	77,830	0,001	0,002	0,005
GOJJ-M-12210	9316731,455	414837,657	153,150	0,002	0,006	0,008
DENIT-M-1512	9328086,829	412574,112	151,970	0,001	0,002	0,004

Geodetic networks play a fundamental role in establishing a municipal cadastral reference network, especially in remote municipalities such as Jacareacanga, where the long distance from RBMC stations makes relative GNSS processing more difficult. The work carried out provides a precise and reliable reference base that will support future topographic, geodetic, and other geoscience-related surveys, contributing to territorial planning and land regularization in the region.

ABSTRACT
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