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Development and Availability of a Network-Based Positioning in Brazil

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OUTLINE

INTRODUCTION

GNSS network-based positioning has been widely used by the geodetic community

Several countries have adopted such kind of service

Applying multiple reference station methods one can obtain higher positioning accuracy (cm) in a larger coverage area

In addition to gain in:

Reliability

Availability

Integrity

INTRODUCTION

It can be used in several applications as for example:

| Surveying | Traffic | Precise Agriculture |

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Data from GNSS Active Network of West of São Paulo State (SP/NET) are being used in Brazil to develop the network-based positioning

The idea is to make available a post-processed service at soon – available on the internet

Later a real time service

NETWORK RTK

Using network-based positioning, it is possible to model the distance dependent errors

Ionosphere Effect

Troposphere Refraction

Several methods have been developed to formulate corrections from a network stations data

In this paper it is used the VRS concept

A reference station is generated close to the user

VRS CONCEPT

Reference Station Coordinates	Reference Station Observables	Precise Ephemeris

Network Error Modeling and Ambiguity Resolution

User Coordinates (VRS Coordinates)

Network Correction Parameters

Computing the VRS Observables
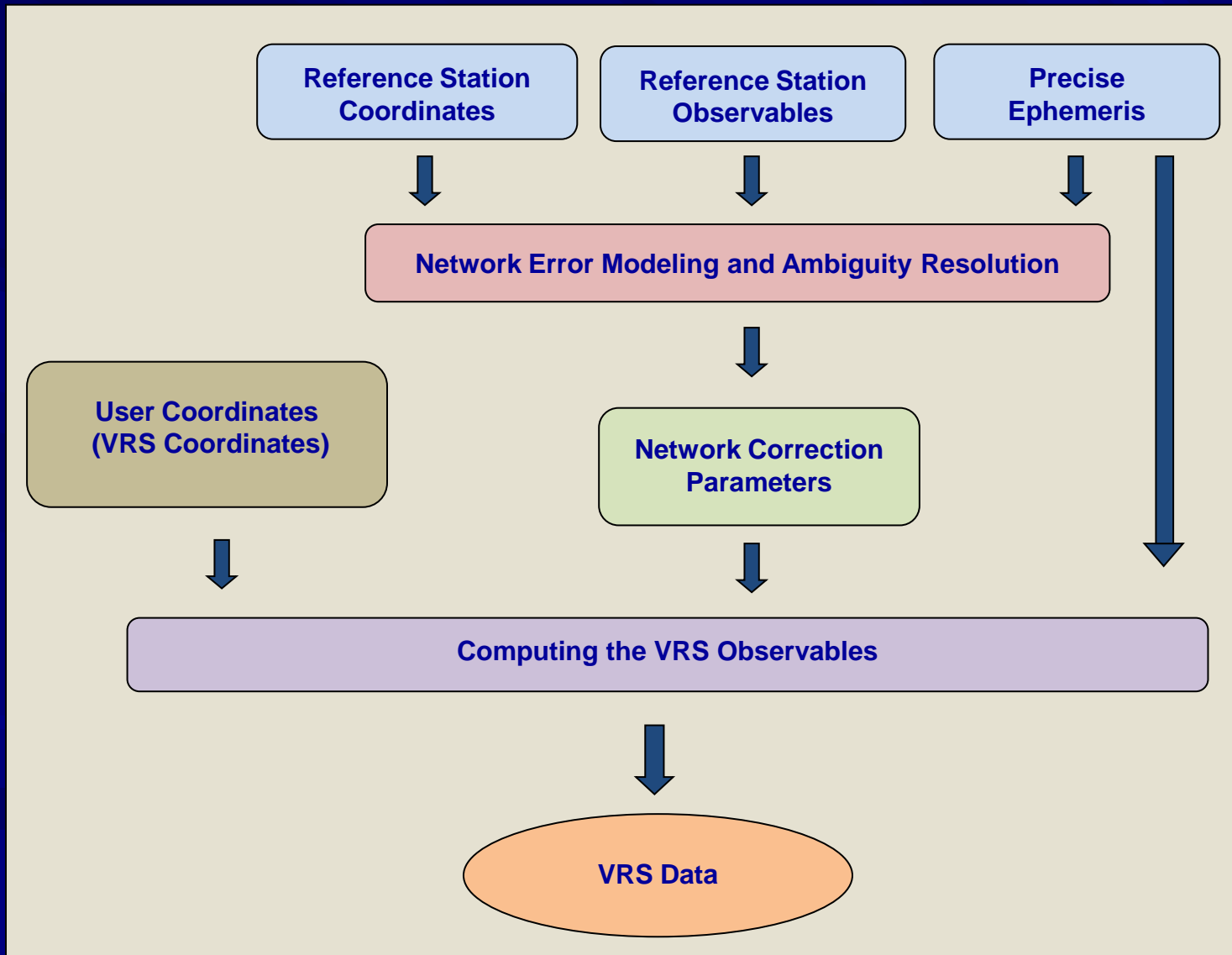
VRS Data

VRS CONCEPT

The VRS data are not provided by a real receiver, but its data are generated from real GPS observations collected by an active multiple reference station network

The idea is that the VRS data resemble as much as possible a real receiver data at the same location

The user has the possibility of using the VRS as if it were a real reference station in your proximities

The user can accomplish the relative positioning using a single frequency receiver

Reference Stations

VRS

Users
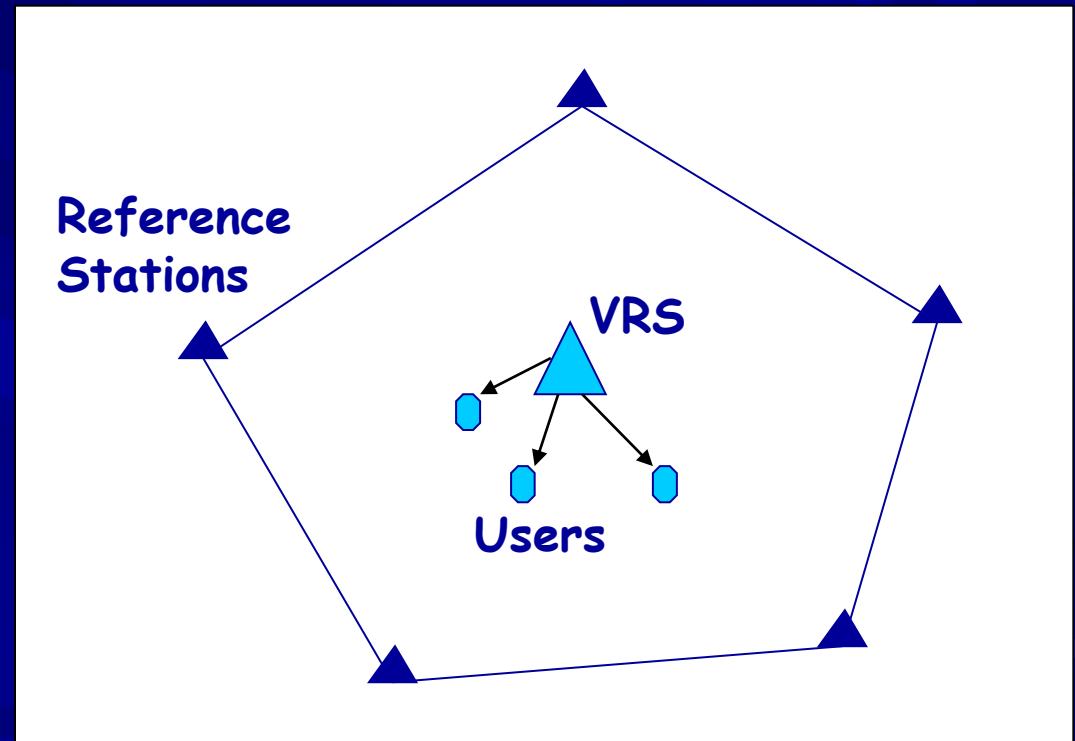
Wanninger (1999)

TROPOSPHERE MODEL

A **NWP** model was used

This kind of troposphere modeling has been very used by the scientific community

The procedure used to compute the ZTD by NWP model was jointly developed by UNESP and CPTEC/INPE - Brazil

This model uses:
- ✓ 20x20 km horizontal resolution
- ✓ 19 levels vertical

http://satelite.cptec.inpe.br/zenital

FORECAST FROM: 2010073000   VALID FOR: 2010073018
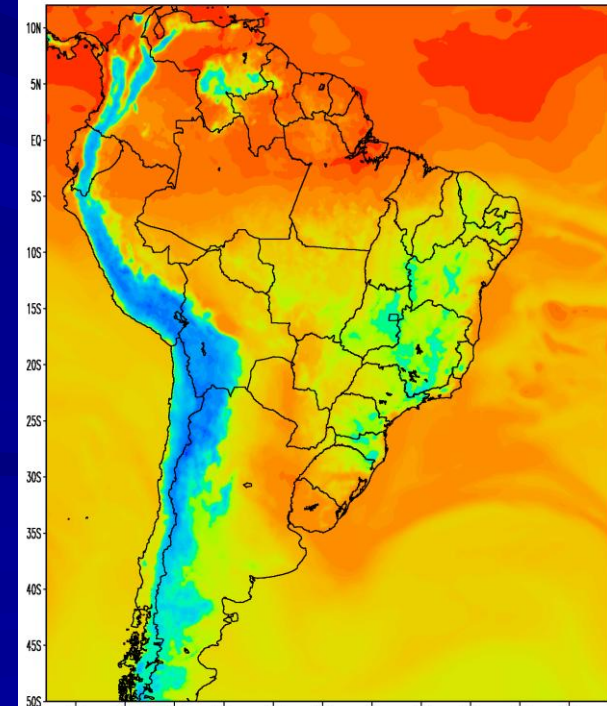
IONOSPHERE MODEL

A regional ionosphere model has been developed at UNESP

The TEC values are computed directly from SP/Net data

Total Electron Contents (TEC) na Ionosfera
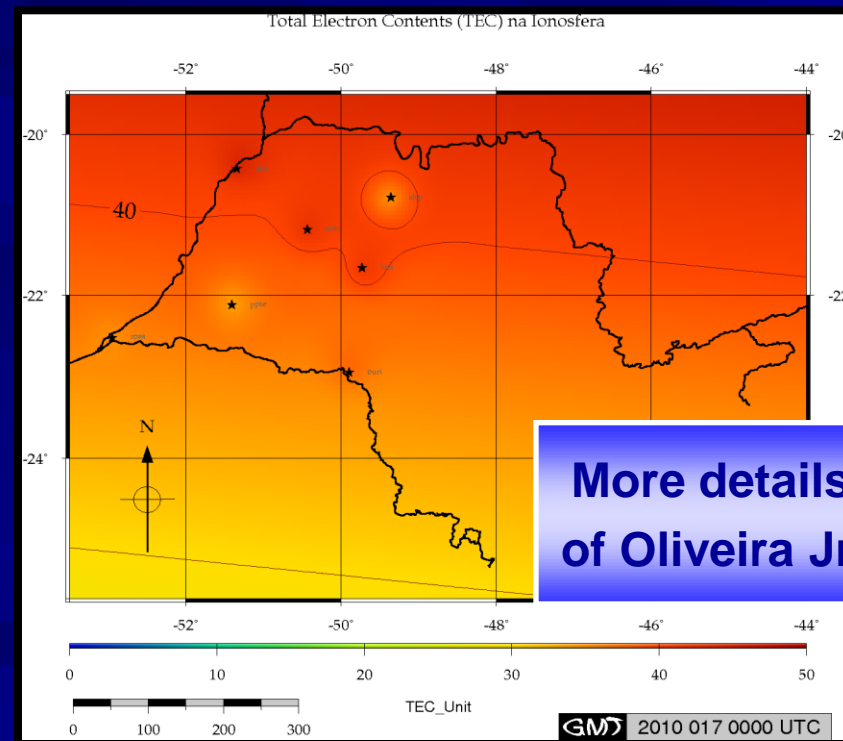
More details in a paper of Oliveira Jr. tomorrow

SÃO PAULO STATE NETWORK

In order to ct.unesp.br>
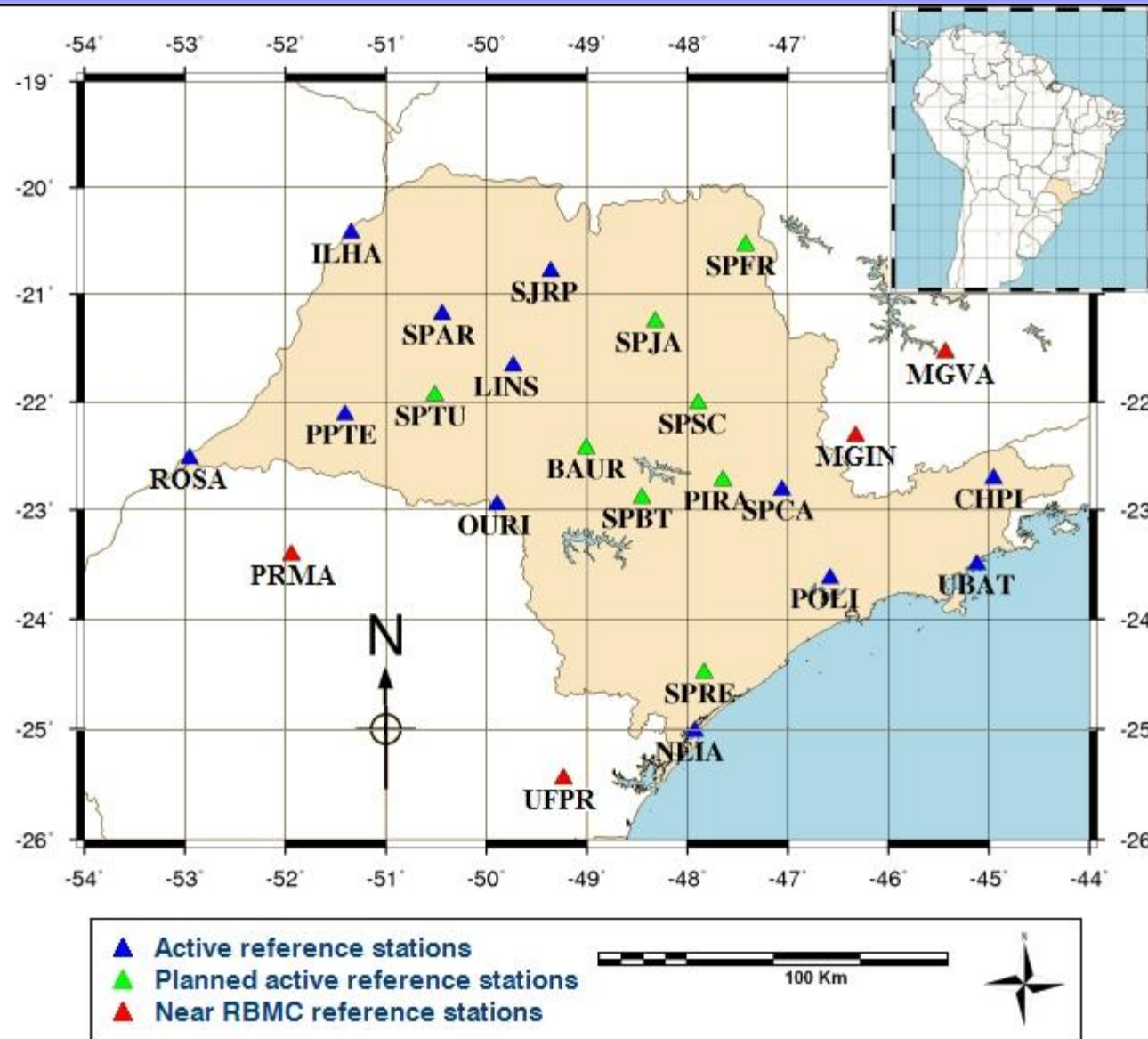
INTERNET PLATAFORM

An Internet plataform has been developed to generate VRS data for users from SP/Net

Post-Processed mode
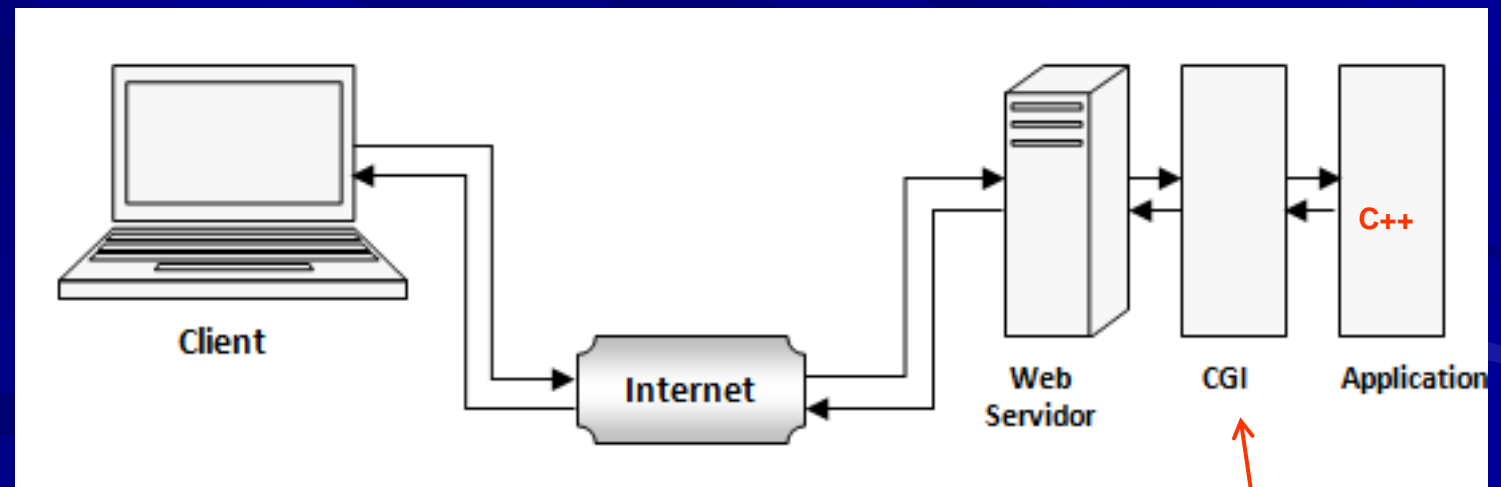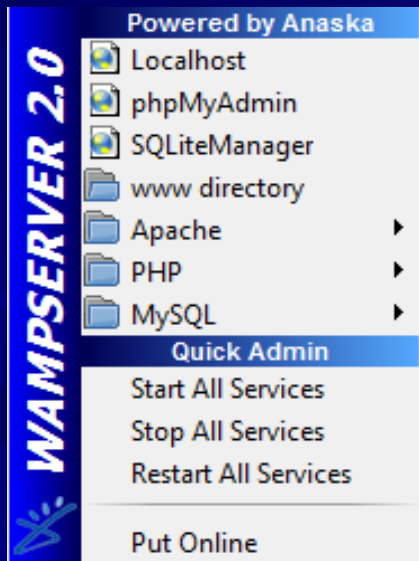
Common Gateway Interface

INTERNET PLATAFORM
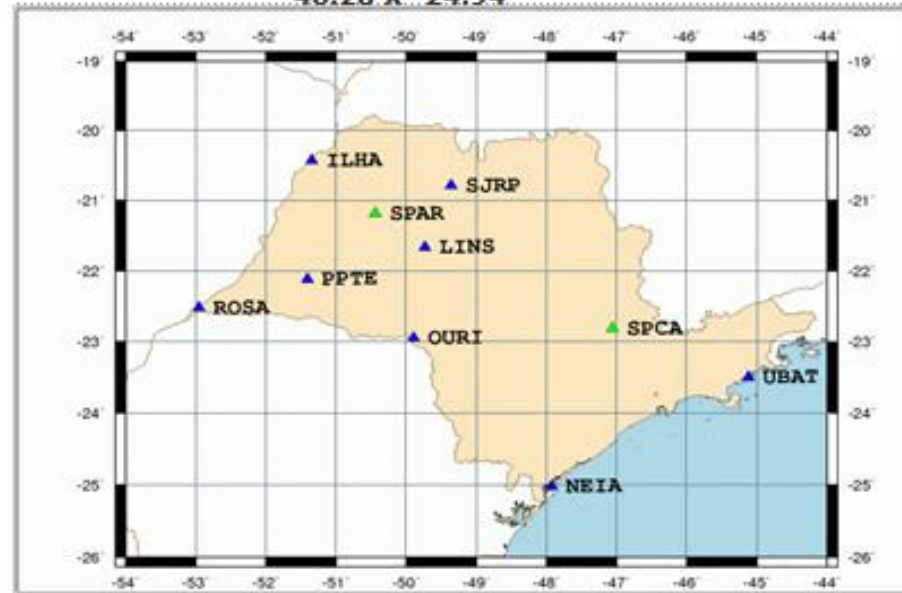
VRS METHODOLOGY

The network-based positioning using the VRS concept was applied using a different methodology

The ambiguity resolution was not performed

Atmospheric models were used to compute the network corrections

The experiments were accomplished simulating the real time

EXPERIMENTS

It was u

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In orde

Network base VRStation

Active Reference Stations
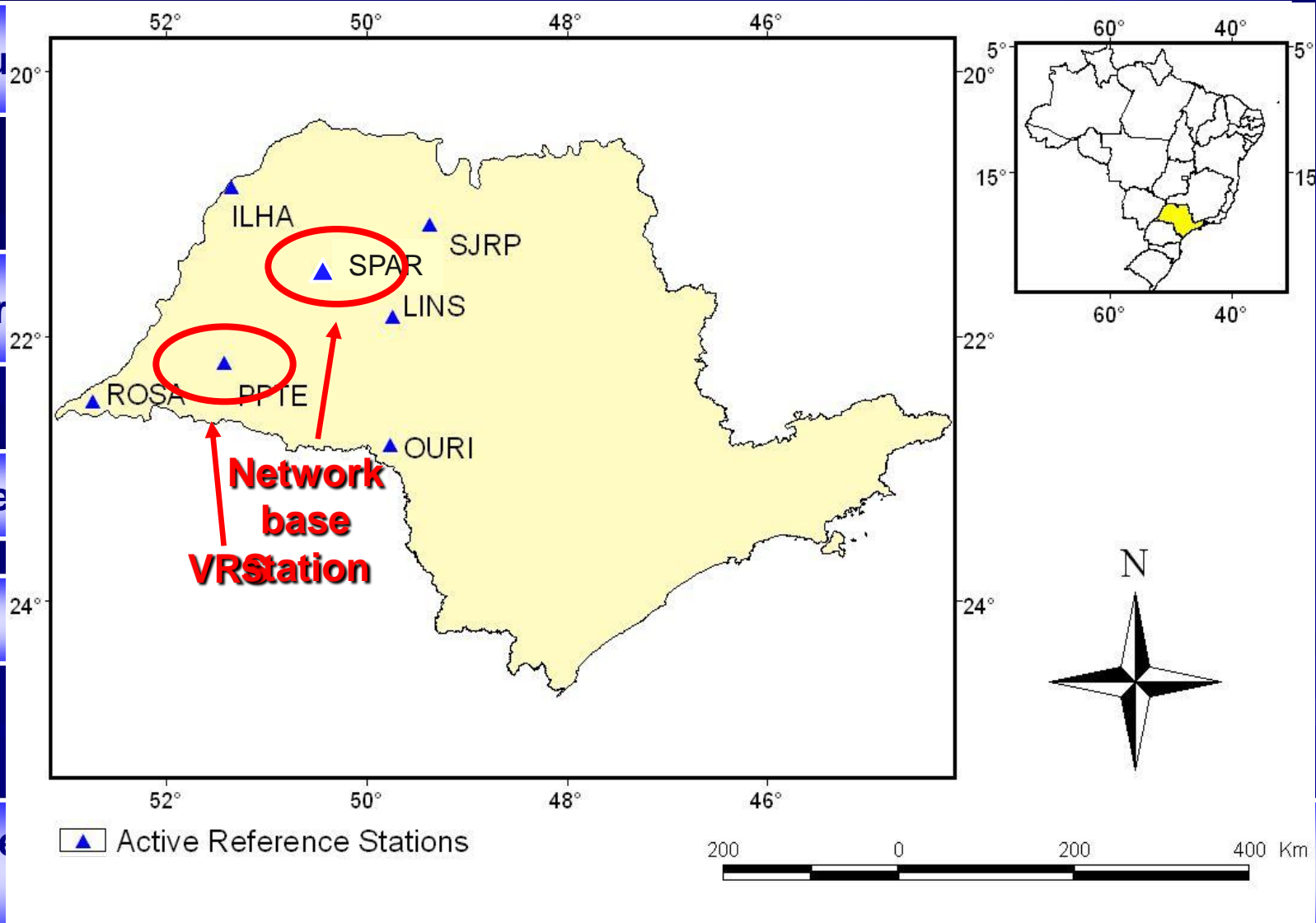
RAW DATA ANALYSIS – C1

The C1 real file observable was compared with VRS one

RMS(cm)	
Day	C1
289	61
290	63
291	62
Average	62

The results agree with the pseudorange accuracy

RELATIVE POSITIONING

Relative positioning VRS-PPTE (real file) and SPAR-PPTE (SPAR is the nearest reference station)
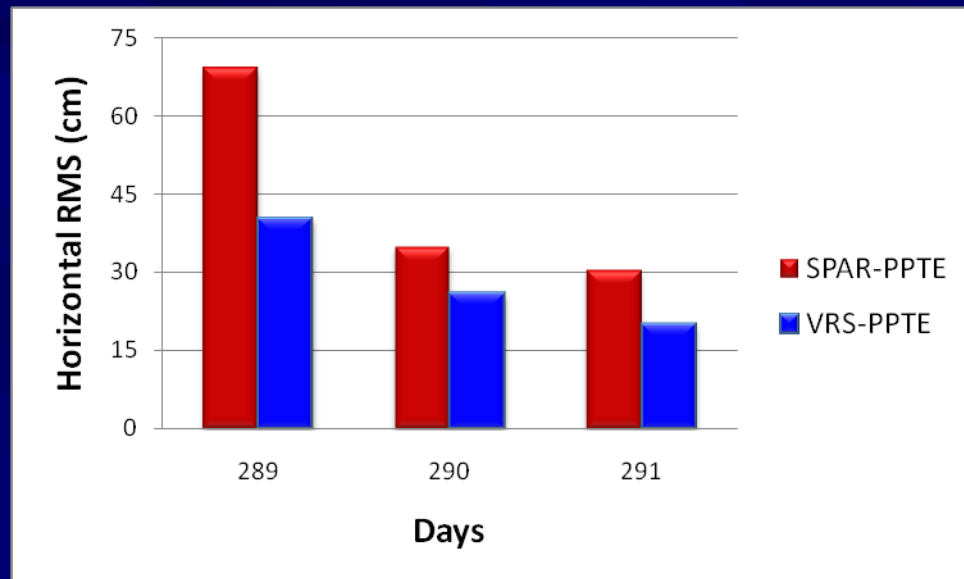
Improvement: 34.2%
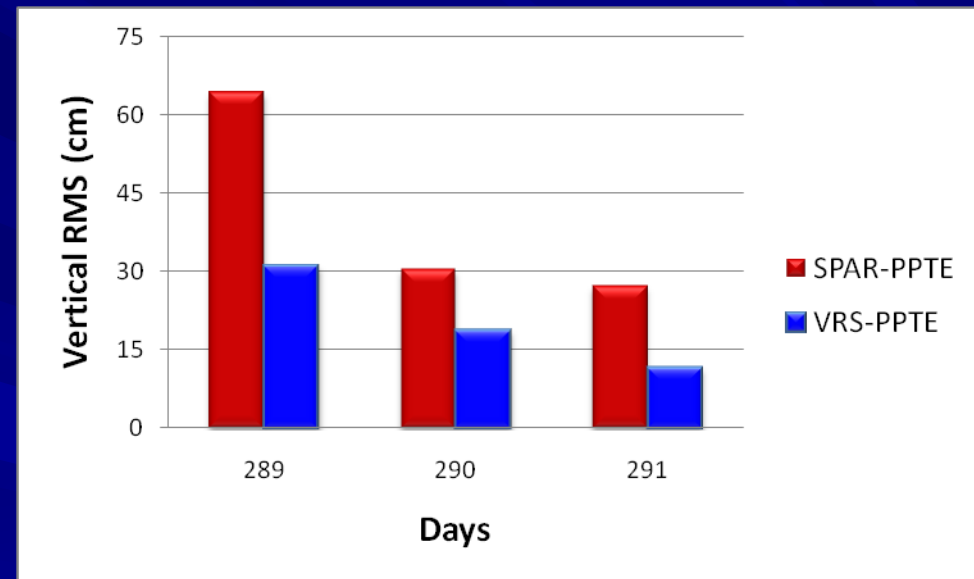
Improvement: 49.5%

TGO software

PP – COORDINATES ANALYSIS

NRCan software

PPP – COORDINATES ANALYSIS
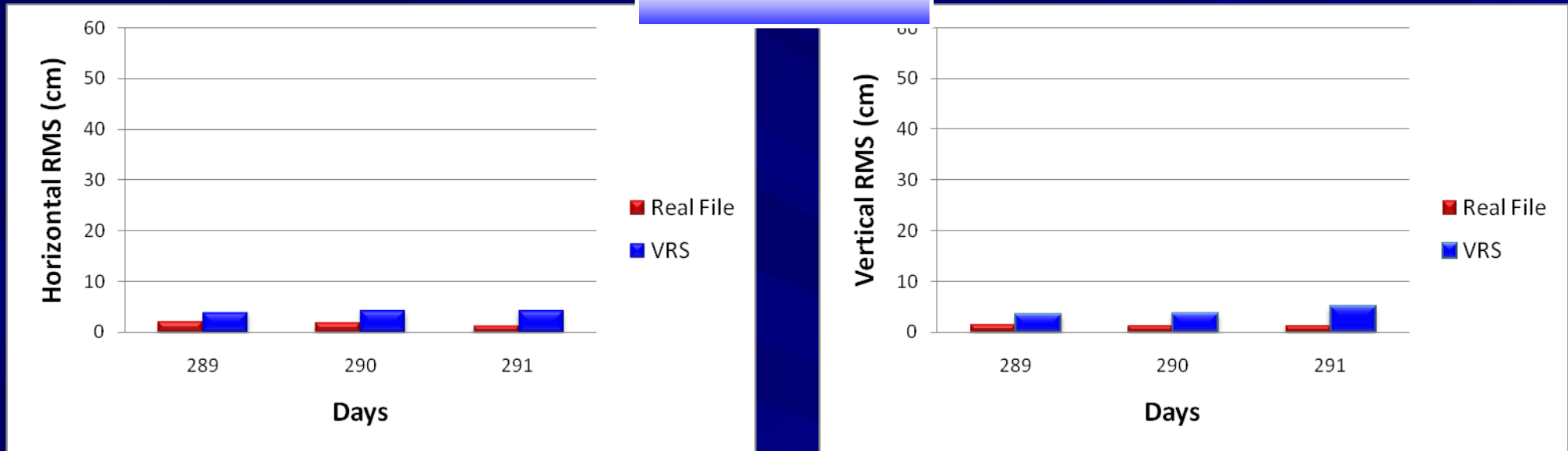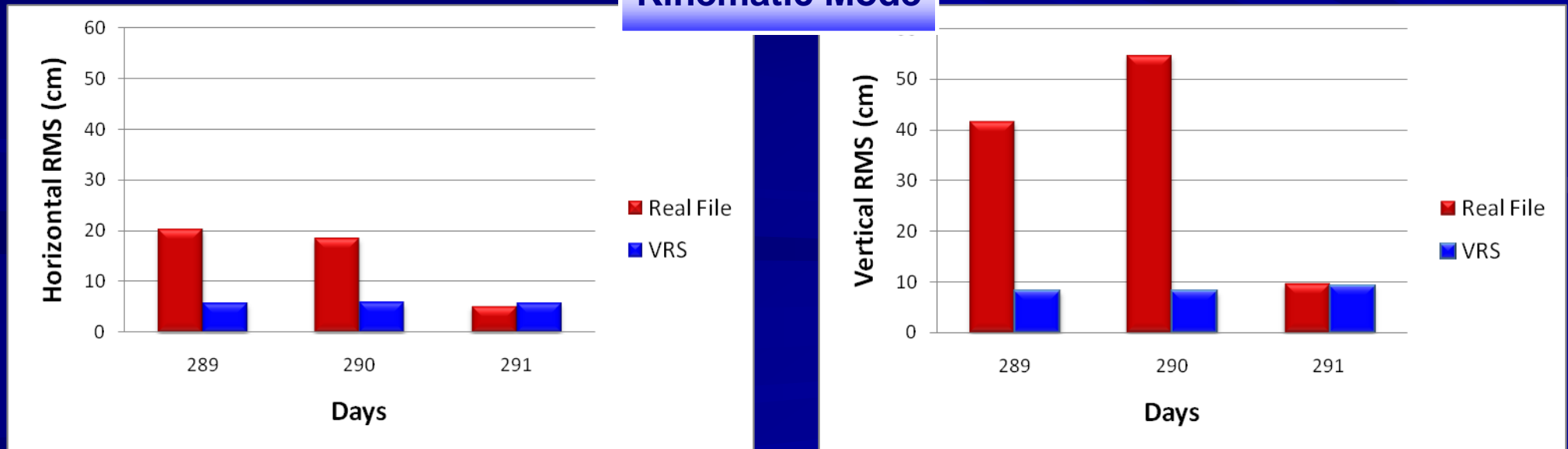
CONCLUSIONS

In this presentation it was showed the performance obtained by a VRS generated using atmospheric models

The system was developed by FCT/UNESP researchers

The results obtained present evidences that the proposed methodology may be quite efficient

The results provided by VRS are similar of those obtained by real data (PPTE)

VRS presented best results than the nearest reference station (SPAR)

CONCLUSIONS

FUTURE works

To make available the post-processed network-based on the internet

To develop the real-time network-based positioning (Network RTK)

Spatial Geodesy Study Group

http://gege.fct.unesp.br/