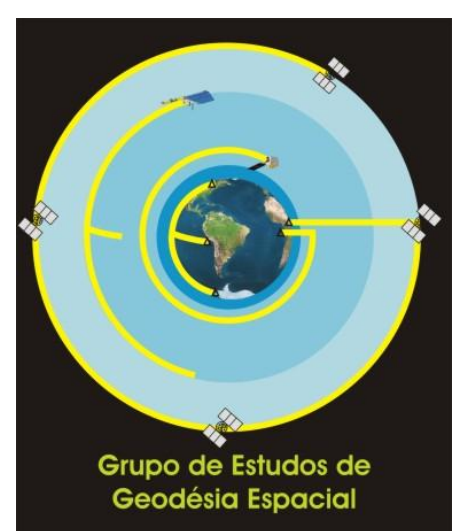




Evaluation of Atmospheric Models using Network-Based Positioning in São Paulo State – Brazil



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NETWORK- BASED POSITIONING

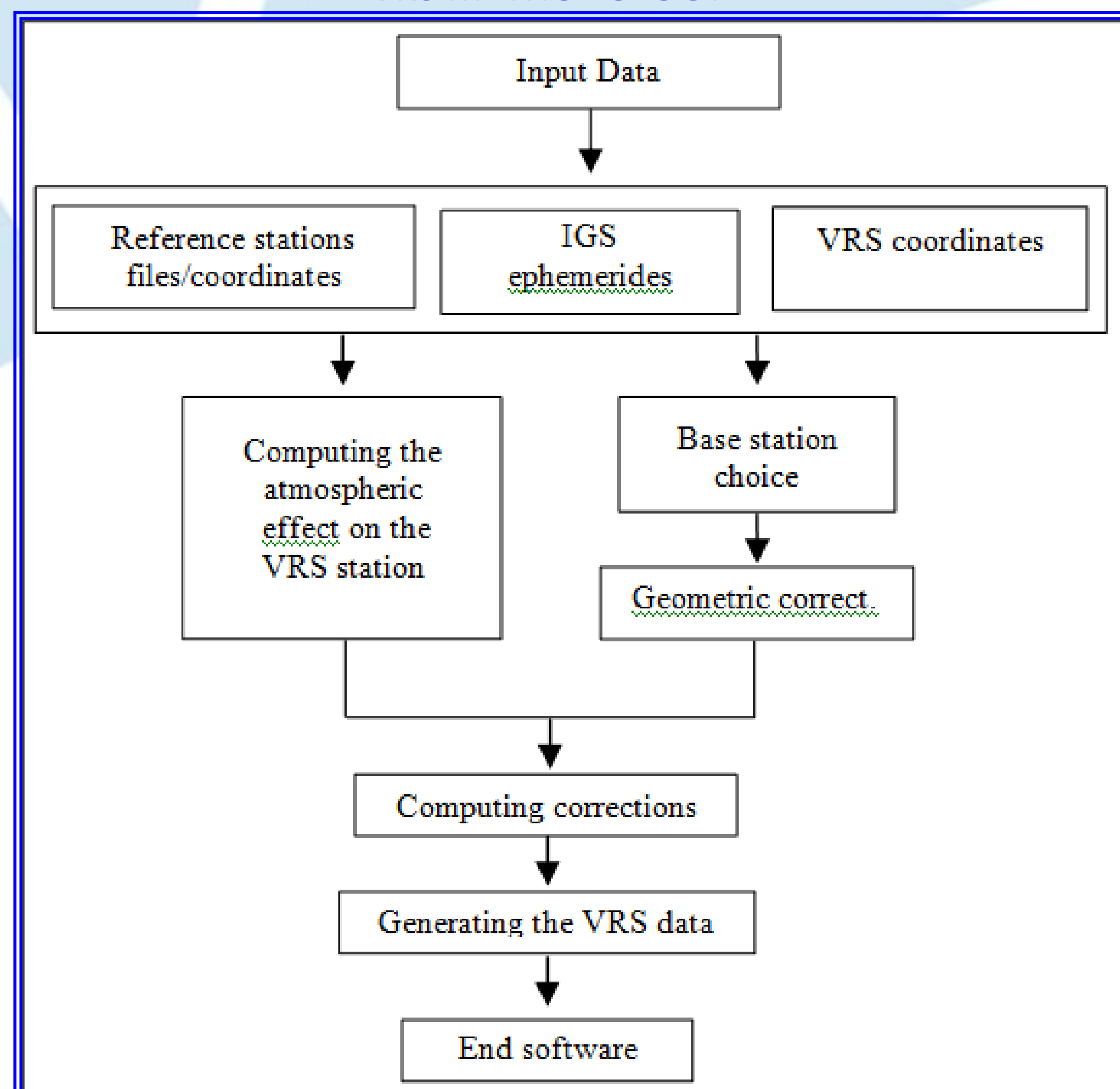
Network-based positioning has been widely applied by the scientific community in the past few years. The existence of real time GNSS network has supported this kind of positioning.

Using data from a reference station network, it is possible to model the distance dependent errors such those due to ionosphere and troposphere in the network coverage area.

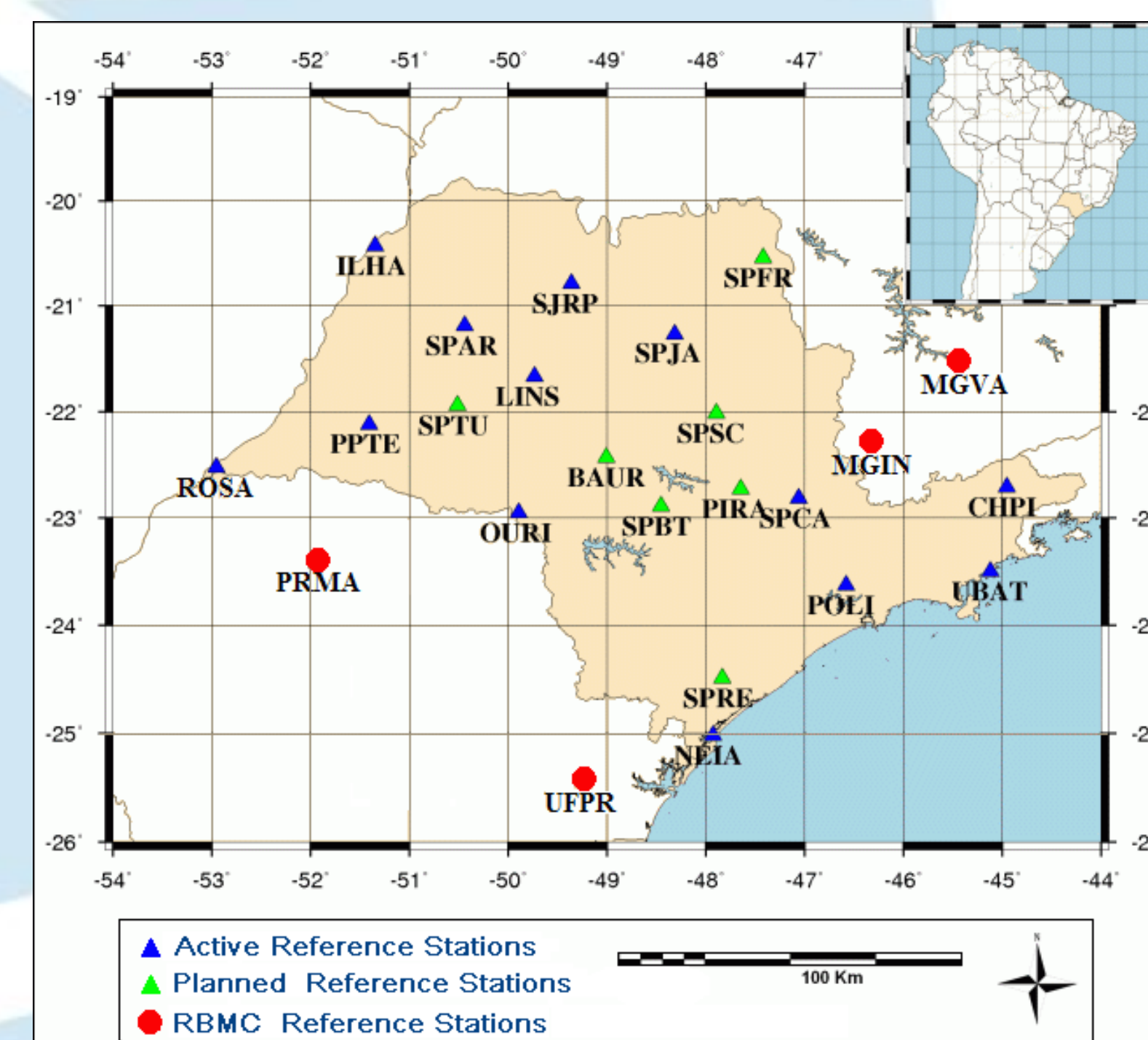
Applying network-based positioning it is possible to obtain centimeter-accurate positioning over a large coverage area, for post-processed or real time applications.

At São Paulo State University (FCT/UNESP), Brazil, an in-house software system is under development with the goal to realize the network-based positioning using the VRS (Virtual Reference Station) concept

VRS METHODOLOGY



GNSS/SP NETWORK



Data from GNSS/SP network are being used as input for the network-based software.

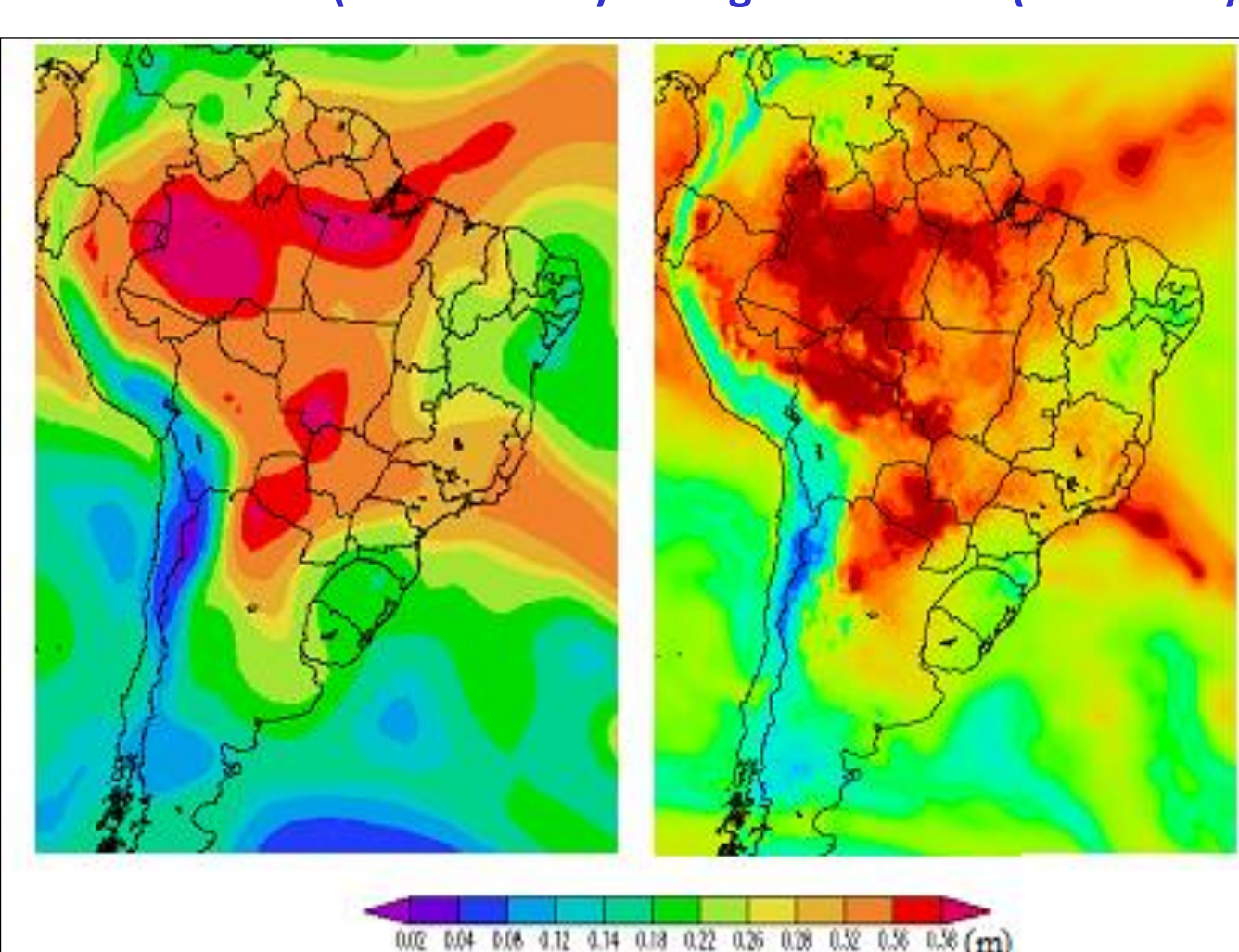
INTERNET APPLICATION

The software developed in this research will be available on the internet, aiming to realize the network-based positioning to the São Paulo State users and/or researchers. An user friendly Internet application that computes the VRS data using the methodology described previously has been developed.



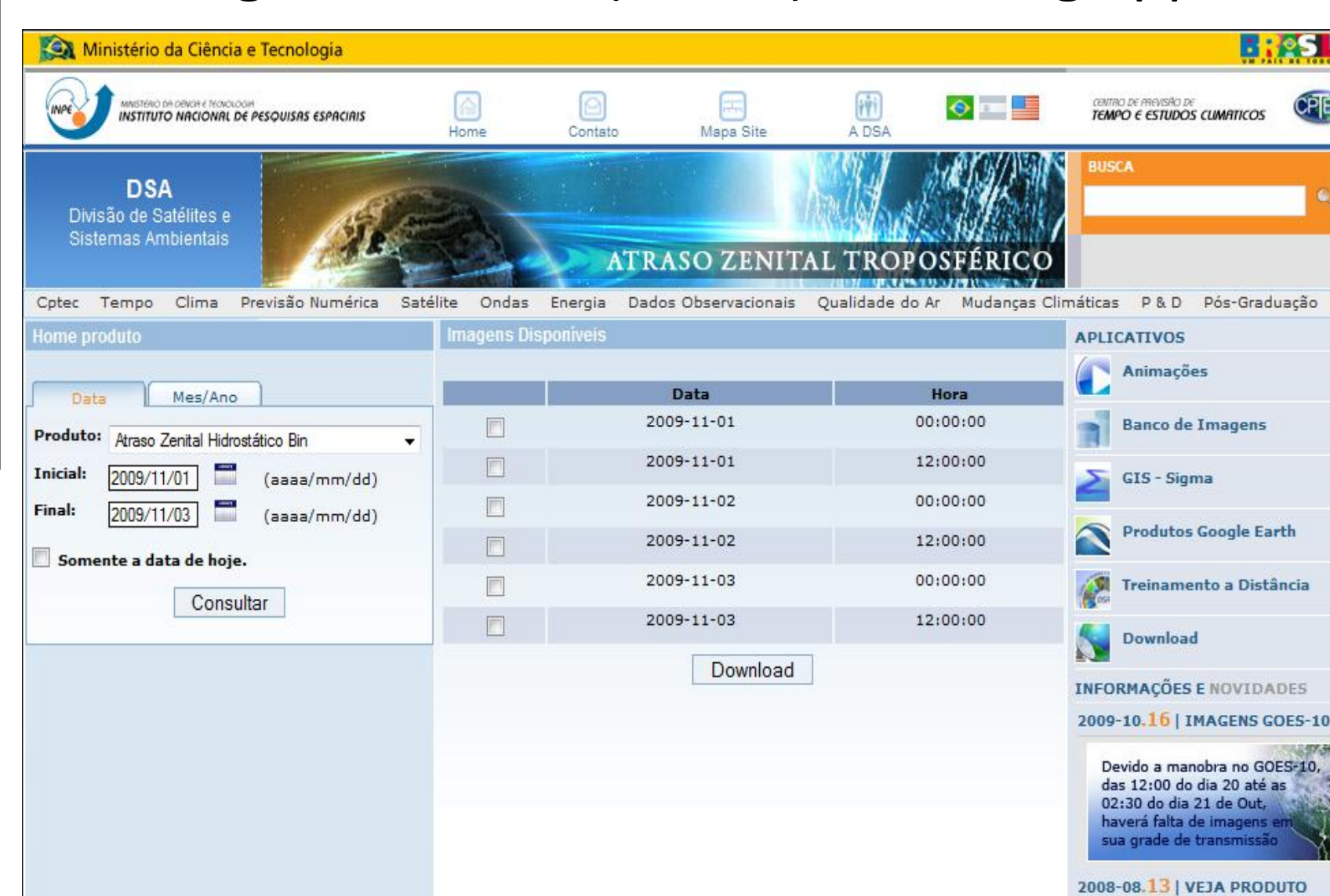
TROPOSPHERE MODEL

Global Model (100x100 km) Regional Model (20x20 km)



The ZTD is predicted from a Numerical Weather Prediction (NWP) model which is available from CPTEC/INPE.

The regional model (ETA20) has being applied.



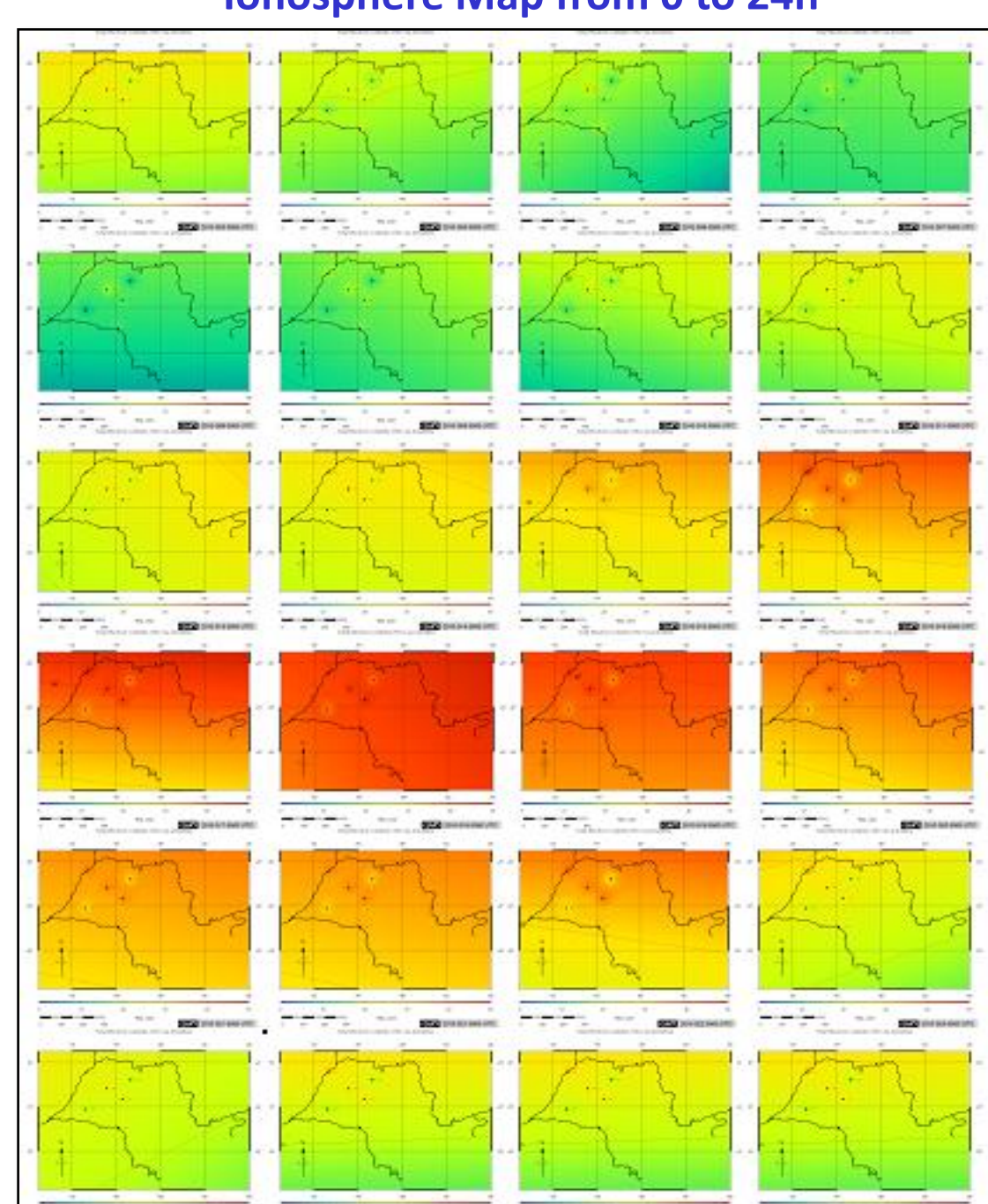
The ZTD values can be get on:
<http://satelite.cptec.inpe.br/>



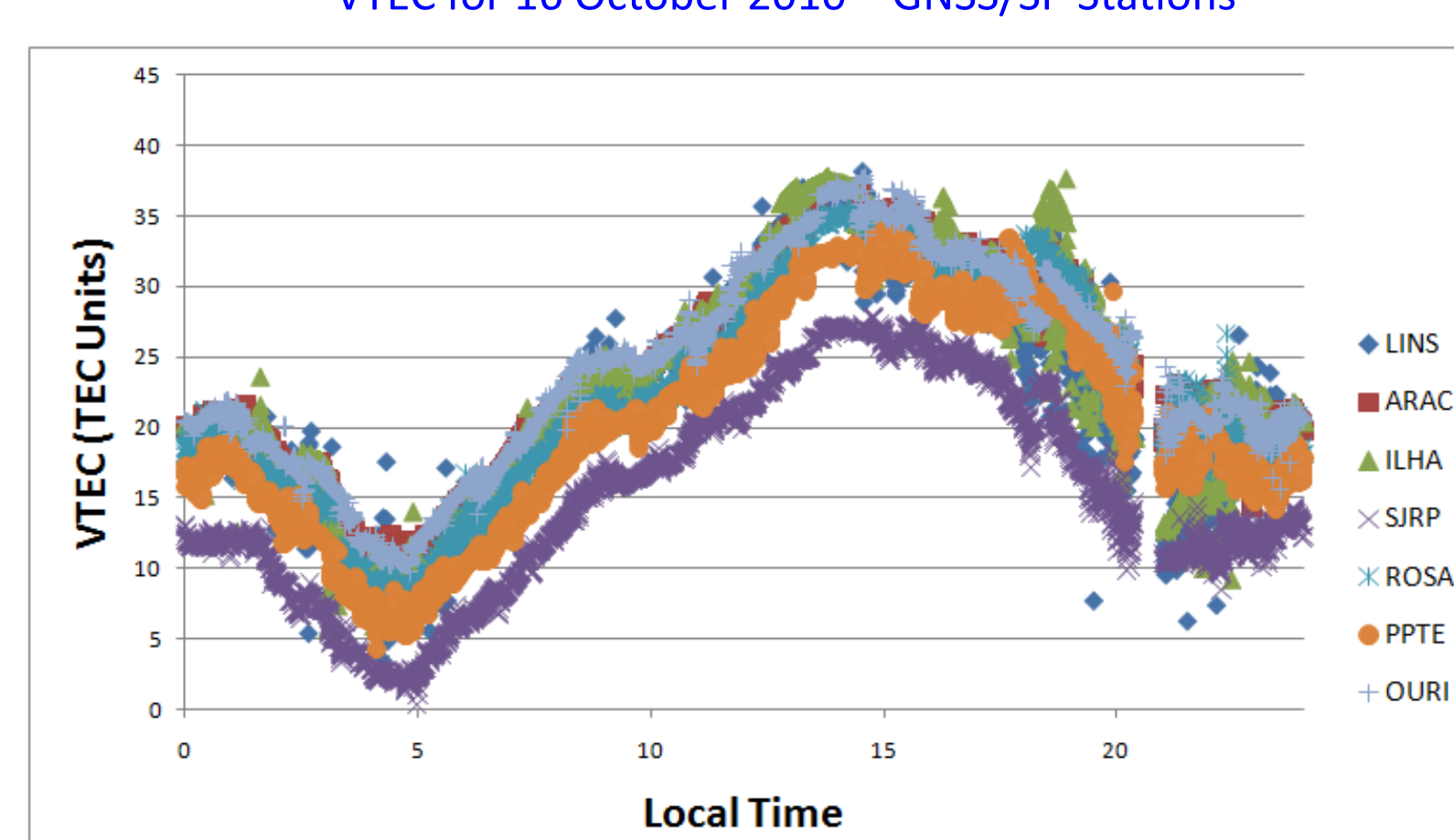
IONOSPHERE

A regional model is being developed to provide TEC (Total Electron Content) values. In this model, the ionosphere effects are computed from the GNSS network and interpolated to the VRS position.

Ionosphere Map from 0 to 24h



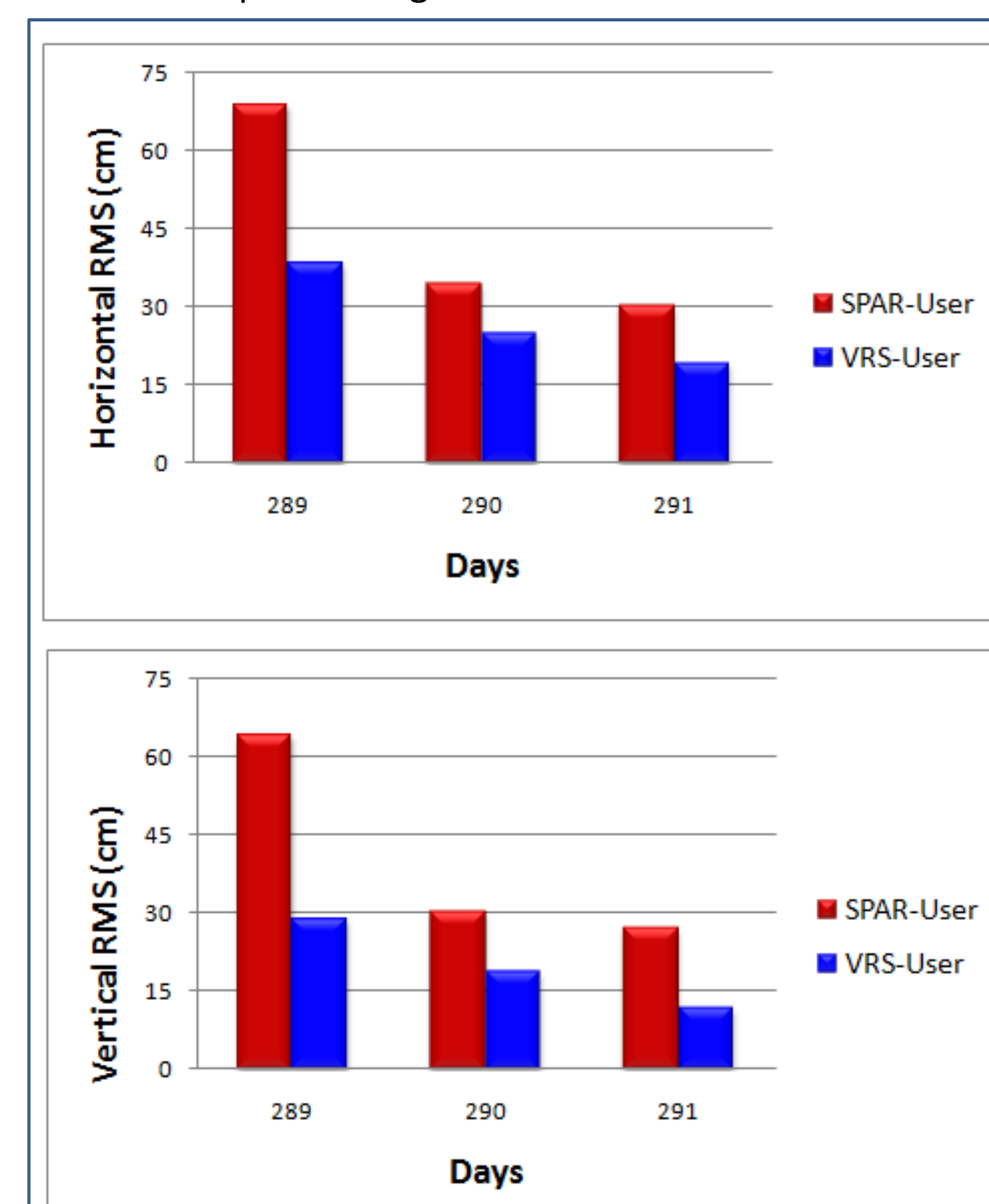
VTEC for 16 October 2010 – GNSS/SP Stations



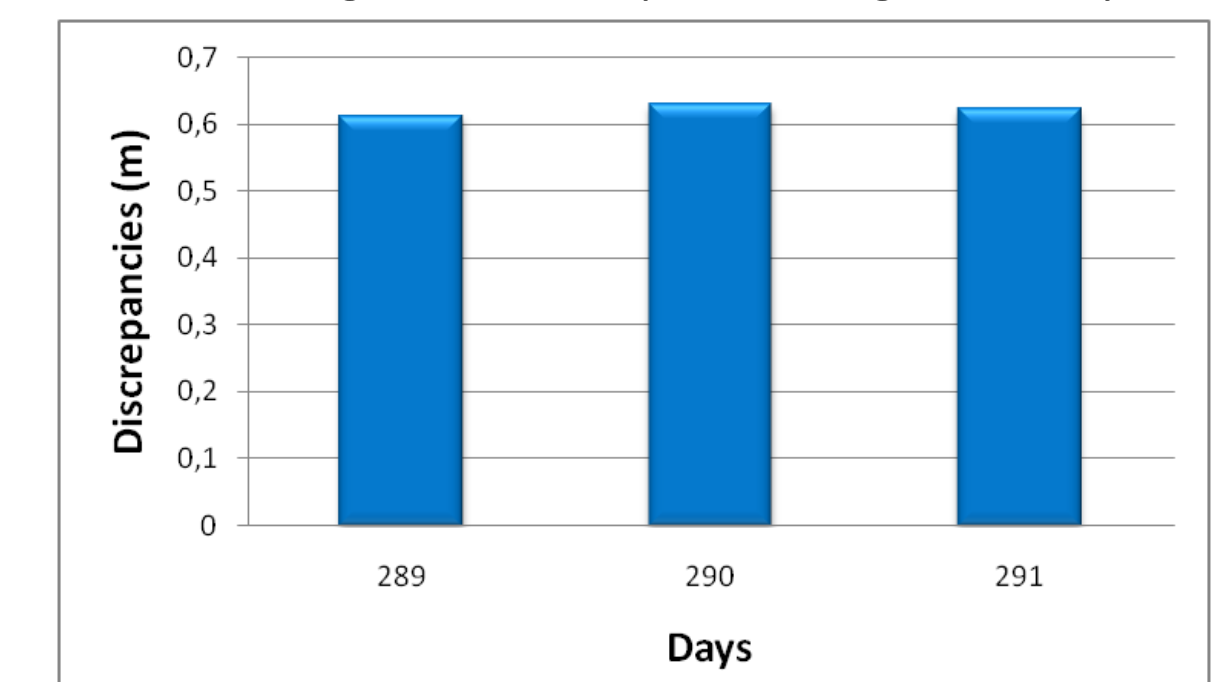
VRS RESULTS

- ✓ Data from SP/Network Days 289, 290, 291 – Oct./10
- ✓ PPTE is the real file
- ✓ SPAR is the network base station and the nearest reference station from the user

Relative positioning SPAR-User and VRS-User



VRS raw data with the real file raw data (C1). The results agree with the pseudorange accuracy.



Improvement of 36% in horizontal component and 50% in vertical one. This fact confirms that the user can get better positioning with VRS instead of using relative positioning to the nearest network reference station.

CONCLUSIONS

We presented an alternative methodology to generate VRS data without performing ambiguity resolution but applying geometric and atmospheric corrections. The methodology makes VRS computations easier and provides accuracy sufficient for various applications.

Considering these results it is possible to conclude that the proposed methodology is very efficient, and that the VRS data were generated with good quality. Consequently, it is possible to develop and use network-based positioning without solving the ambiguities by just applying atmospheric models. Of course, the quality of the results will depend on the quality of the atmospheric model.