



A web-base online GPS processing service for rural cadastral applications

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Outlook

- *Motivation*
- *GNSS possibilities and requirements*
- *Goal*
- *Solution*
- *Other alternatives*
- *How it works*
- *Test and results*
- *Conclusions and future*

Motivation

- *Obligation*
 - *Georeferencing rural lots*
- *Solution*
 - *GNSS positioning techniques*

GNSS possibilities

- *Observable*
 - *Code (C/A or P)*
 - *Carrier phase (L1 or L2)*
- *Processing strategies*
 - *Point positioning*
 - *Differential positioning*
 - *Precise point positioning*

Requirements

- *Types of receivers*
- *Communication devices*
- *Software*
- *Accuracy*
- *Expertise*
- *Budget*

Goal

- *To obtain a few decimeters of accuracy with inexpensive GPS receivers (L1 only) with no processing software or expertise from the user*

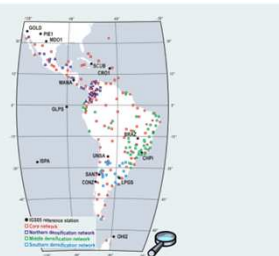
Differential Position GPS Service

Introduction

The positioning systems by satellite (GNSS) have made reality the possibility of the positioning in simple, economic form and on global scale. Nevertheless all user who wishes to position itself with an error below the five meters will have to work with observable the direct ones and to realise on the same some type of processing or correction.

The post-process techniques can be of two types: point precise positioning or differential positioning. Whereas first it present the disadvantage to require all the observable types of possible, leaving outside the solution to the users with less expensive receivers, second it presents the disadvantage to require at least two receivers GPS that they observe in simultaneous form.

The present development uses the processing technique differential, since the same allows to still reach exactitudes of few centimeters with the receivers economic than they observe in a single frequency. As the technical differential demands observed data in at least two receivers at the same time, some is taken like reference receiver of which they integrate a network of permanent stations GNSS of continuous measurement.



How to use this service ?

The way to use the service is simple, you must enter a valid mail address in the first row of the form, load the the observation file made in some of the valid formats and next to press the option SUBMIT.

The supported formats to raise for the processing differential can be in the form of compressed files: .grip, .zip, .Z, with compression hatanaka, .yyd, or RINEX files .yyo.

Once loaded the file and as soon as the service has processed it will send by electronic mail a form to him in format .pdf with the results of this processing similar to which is in the below figure.

Pick your data

Process form

Enter a valid e-mail address

Attach a File to process (< 20Mb)

No se ha seleccionado ningún archivo

Supported formats: grip, zip, Z, yyd, yyo

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Alternatives

- AUSPOS
- SCOUT
- OPUS
- CSRS-PPP
- Auto-GIPSY

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How it works

- Observations are uploaded via a WEB page
 - Different types of compression are accepted (zip, Z, gz, YYd,)
- Data validation
 - TEQC
- Data check
 - Date
 - Types of observations
 - Sampling rate
 - A priori user coordinates
- Nearest available station is selected (and checked)

How it works

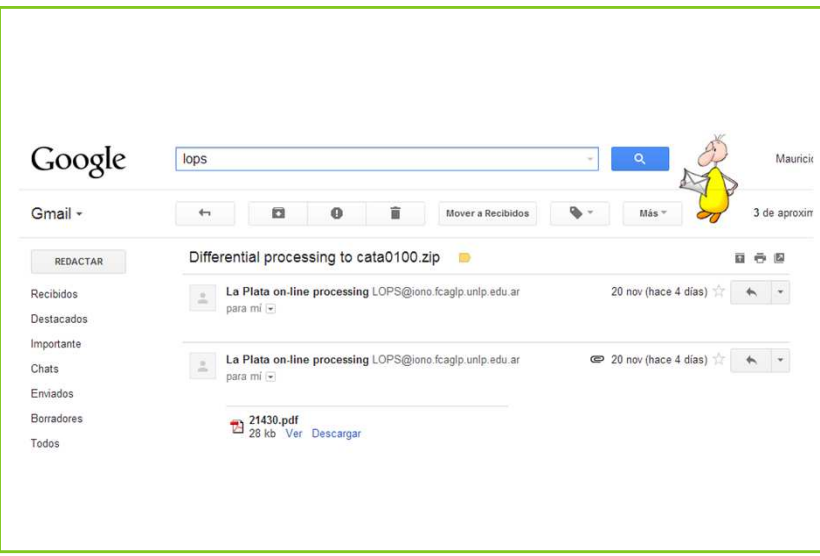
- Best possible ephemerides is selected
- Best processing strategy is selected
 - Types of observables
 - Distance
 - Time window
- Processing engine: RTKLIB
 - An Open Source Program Package for GNSS Positioning
 - Unattended mode
 - <http://www.rtklib.com/>

Delivering results

- Same web page
 - Google maps embedded map
- E-mail
 - PDF report (LaTeX)
 - Map (GMT)

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The screenshot shows the Gmail interface. At the top, the Google logo is on the left, a search bar with the text 'lops' is in the center, and the name 'Mauricio' is on the right. Below the search bar, the Gmail navigation bar includes a 'Gmail' dropdown, a back arrow, icons for mail, a warning sign, and a trash can, followed by 'Mover a Recibidos', a phone icon, and a 'Más' dropdown. A cartoon character is visible on the right side of the navigation bar, and the text '3 de aproxim' is partially visible. The main content area shows an email titled 'Differential processing to cata0100.zip'. The email is from 'La Plata on-line processing LOPS@iono.fcaglp.unlp.edu.ar' and is dated '20 nov (hace 4 días)'. The email body contains a PDF attachment named '21430.pdf' with a size of '28 kb' and a 'Ver Descargar' link. On the left side of the email view, there is a sidebar with a 'REDACTAR' button and a list of categories: 'Recibidos', 'Destacados', 'Importante', 'Chats', 'Enviados', 'Borradores', and 'Todos'.

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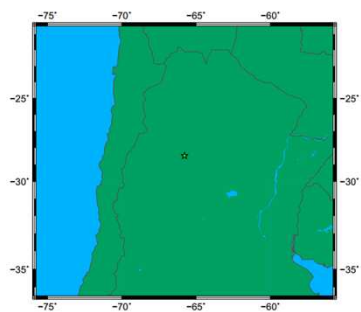
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Automatic GPS Differential Processing Report

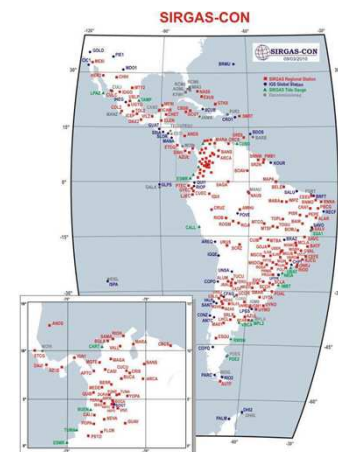
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Processed File: casd0100.zip
Reference Frame: ITRF 2005 (compatible with FORGAR 07)
Reference Station: jbal
Basslength: 99.71 (Km)
Geodetic Coordinate:
Latitude: -28 ° 28 ' 13.5671 "
Longitude: -65 ° 46 ' 26.8567 "
Height: 543.79 (mts)

Warning: Accuracy coordinate is usually not better than a few decimeters



SIRGAS-CON: database



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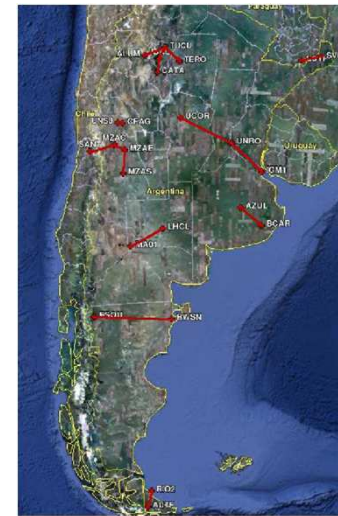
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Baselines Distance # of days # of hours

alum-tucu	145.09	50	100
autf-rio2	122.43	31	62
azul-bcar	178.98	31	62
cata-jbal	99.69	48	96
cfag-unsj	33.31	47	94
ebyp-svic	144.85	41	82
esqu-rwsn	507.97	37	74
jbal-tucu	91.04	33	66
ma01-lhcl	237.59	55	110
mzac-mzae	78.66	46	92
mzas-mzae	152.17	49	98
sant-mzac	169.31	46	92
tero-tucu	142.25	49	98
ucor-unro	362.10	48	96
unro-igm1	271.81	48	96

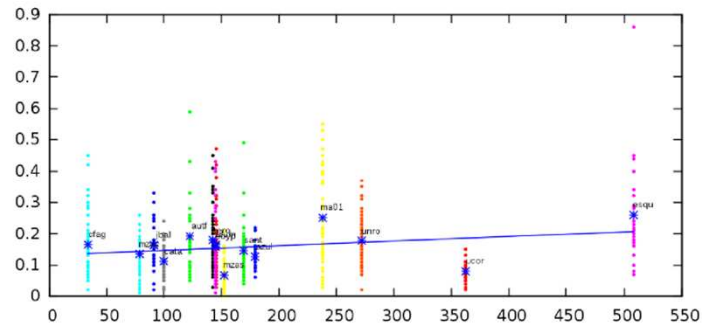
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Conclusions

- *An online web positioning system was developed*
- *A simple way to achieve decimetric accuracy was provided*
- *The system is based on free software (GPL)*
- *The system will improve if:*
 - *RTKLIB improves*
 - *More people use the system (and find some hidden bugs)*

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Future

The complete system is available for free if some institution would like to install it.

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The screenshot shows a web browser window with the following content:

- Page Title:** Servicio de Posicionamiento Diferencial GPS (LOPS)
- Subtitle:** Trabajo de Tesis de grado de la Geof. Romina Galván
- Section: Introducción**
 - Text: Los sistemas de navegación por satélite (GNSS) han hecho realidad la posibilidad del posicionamiento en forma sencilla, económica y a escala global. Sin embargo todo usuario que desee posicionarse con un error por debajo de los cinco metros deberá trabajar con los observables directos y realizar sobre los mismos algún tipo de procesamiento o corrección.
 - Text: Las técnicas de postproceso pueden ser de dos tipos: posicionamiento puntual preciso o posicionamiento diferencial. Mientras que la primera presenta la gran ventaja de requerir todos los tipos de observables posibles, según sea de la solución a los usuarios con receptores menos costosos, la segunda presenta la desventaja de requerir al menos dos receptores GPS que observen en forma simultánea.
 - Text: El presente desarrollo utiliza la técnica de procesamiento diferencial, ya que la misma permite alcanzar exactitudes de pocos centímetros aun con los receptores más económicos que observan en una sola frecuencia. Como la técnica diferencial exige datos observados en al menos dos receptores en forma simultánea, se toma como receptor de referencia alguno de los que integran una red de estaciones GNSS permanente de medición continua.
- Section: ¿Cómo usar el servicio?**
 - Text: La manera de utilizar el servicio es sencilla, usted debe ingresar una dirección de correo válida en la primera fila del formulario, cargar el archivo de la observación efectuada en alguno de los formatos válidos y a continuación presionar la opción ENVIAR.
 - Text: Los formatos soportados a subir para el procesamiento diferencial pueden ser en forma de archivos comprimidos: **gpp.zip**, con compresión **huffman**, **gzip** o archivos **RINEX.gpx**.
 - Text: Una vez cargado el archivo y luego que el servicio ha procesado se le enviará por correo electrónico un formulario en formato **pdf** con los resultados de dicho procesamiento similar al que se muestra en la figura inferior.
- Form: Poner datos**
 - Formulario de procesamiento
 - Input: Ingrese una dirección de correo válida
 - Input: Adjunte el archivo a procesar (< 20MB)
 - Buttons:
 - Button:
- Text:** Formatos soportados: gpp.zip, zip, rar, xls, xml, xls

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<http://lops.fcaglp.unlp.edu.ar/>