WEBINAR: Procesamiento de datos GNSS con software libre, a partir de estaciones SIRGAS

Expositores: Bernardo Barraza y José Antonio Tarrío

Procesamiento de datos GNSS con software libre, a partir de estaciones SIRGAS

GNSS data processing with open source software, from SIRGAS stations

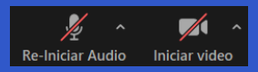
Organizan:
SIRGAS
Universidad de Santiago de Chile

Expositores: Bernardo Barraza y José Antonio Tarrío

29 de mayo, Santiago de Chile, Chile

Formato Webinar:

- *Exposición 40 minutos y 15-20 minutos de preguntas*
- *Se solicita silenciar y apagar cámara*
- *Se grabará y compartirá presentación*
- *Presentadores: Bernardo Barraza y José Antonio Tarrío*



www.sirgas.org

centro.usc@usach.cl

Organizan:
SIRGAS
Universidad de Santiago de Chile

29 de mayo, Santiago de Chile, Chile

UNIVERSIDAD
DE SANTIAGO
DE CHILE

RECTORÍA

A todas y todos los participantes:

Les saludo afectuosamente en esta jornada dedicada al procesamiento de datos, los que en el marco de la actual emergencia sanitaria a nivel global, han alcanzado una significativa relevancia. Esto, porque la labor de georreferenciación es clave para la elaboración de los mapas que permiten analizar la dinámica de la pandemia de Covid-19 en base a los datos del "Sistema de Referencia Geocéntrico para las Américas", SIRGAS.

Agradezco el amplio y masivo interés de las y los participantes en este webinar del Departamento de Ingeniería Geográfica, convencido de que ampliarán sus conocimientos, aporte que se suma a las diversas iniciativas impulsadas por la Universidad de Santiago de Chile.

Vaya para ustedes mis mejores deseos de éxito, atentamente,

Dr. Juan Manuel Zolezzi Cid
Rector
Universidad de Santiago de Chile

Juan Manuel Zolezzi Cid es Ingeniero Civil Electricista por la Universidad Técnica del Estado, Magíster en Ciencias de la Ingeniería por la Universidad de Chile, y Doctor en Ciencias de la Ingeniería por la Pontificia Universidad Católica de Chile

Fuente: https://www.usach.cl/universidad/rectoria

Contenidos

- Introducción
- Mapa conceptual del proceso
- Descarga de datos y metadatos
- Análisis de datos previos al procesado
- Procesamiento de observables: RTKlib
- Resultados y verificación

Objetivo del Webinar

Acercar a la comunidad relacionada con las geociencias los productos SIRGAS y su empleo en herramientas de software libre para georreferenciación

Al finalizar el webinar seremos capaces

Acceder a metadatos de distintos organismos

Descargar datos RINEX de diferentes servidores

Analizar y editar RINEX

Descargar coordenadas de las soluciones SIRGAS

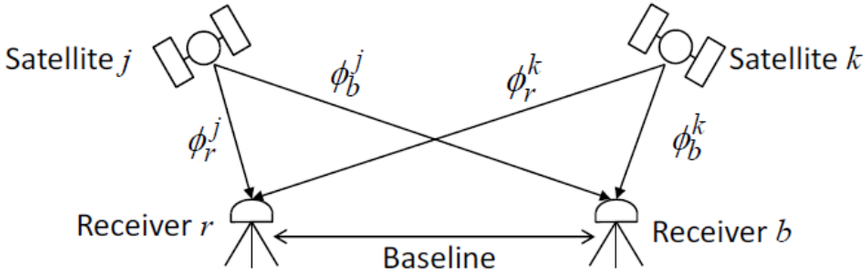
Realizar procesamientos GNSS en software libre: RTKlib

Técnica GNSS

Posicionamiento: estático relativo
Observable fase de la portadora
Solución: postproceso

Se busca la determinación de la posición (coordenadas geocéntricas $[X, Y, Z]_R$) de un receptor estático sobre o en la cercanía de la superficie terrestre a partir de:

1. La posición del satélite (coordenadas geocéntricas $[X, Y, Z]_S$ conocidas) y
2. La distancia entre el satélite y el receptor (medida a través de los observables GNSS)
3. Se emplean DD y TD de fase para la realización del procesamiento



Fuente:RTKLIB ver. 2.4.2 Manual, abril 2013

$$\Phi_r^j(t) + f^j\delta^j(t) = \frac{\rho_r^j}{\lambda} + N_r^j + f^j\delta_r(t)$$

$$\Phi_r^k(t) + f^k\delta^k(t) = \frac{\rho_r^k}{\lambda} + N_r^k + f^k\delta_k(t)$$

$$\Phi_b^j(t) + f^j\delta^j(t) = \frac{\rho_b^j}{\lambda} + N_b^j + f^j\delta_b(t)$$

$$\Phi_b^k(t) + f^k\delta^k(t) = \frac{\rho_b^k}{\lambda} + N_b^k + f^k\delta_b(t)$$

$$\Phi_{rb}^j(t) = \frac{\rho_{rb}^j}{\lambda} + N_{rb}^j - f^j\delta_{rb}(t)$$

$$\Phi_{rb}^{jk}(t) = \frac{\rho_{rb}^{jk}(t)}{\lambda} + N_{rb}^{jk}$$

$$\Phi_{rb}^k(t) = \frac{\rho_{rb}^k}{\lambda} + N_{rb}^k - f^k\delta_{rb}(t)$$

Mapa conceptual del proceso

Premisas Iniciales → Metadatos → Procesado

GNSS se refiere a IGb14 ≡ ITRF2014 → *GPS: WGS84*, *GLONASS: PZ90*

Las observaciones deben tener necesariamente un punto fiducial → *Navegación: exacto, no preciso*; *Marco Geodésico Oficial: exacto y preciso*

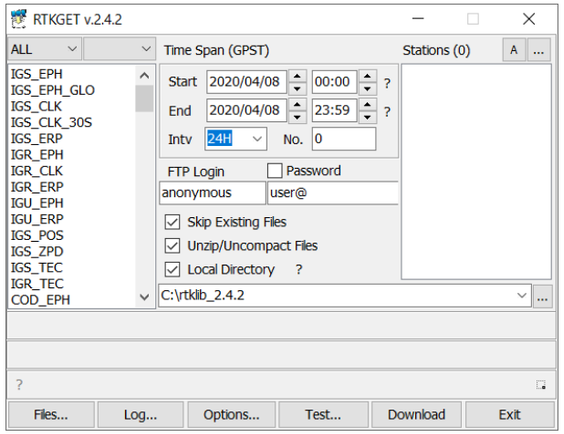
Siempre se necesitan efemérides:
- Transmitidas

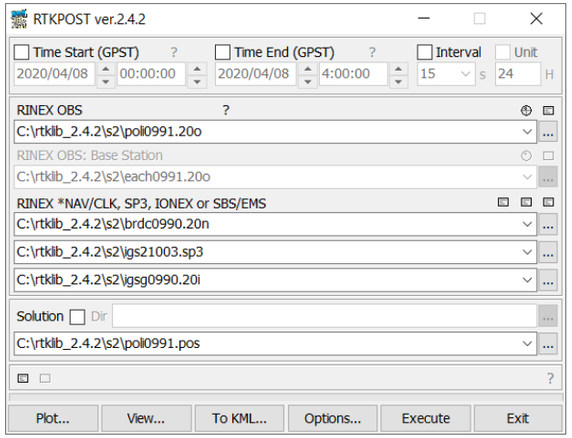
o
- Precisas

a partir del 14 de mayo de 2020 en IGb14 → *Una por día*

Sin altura de antena clara, no existe solución → *Logfile o archivo de estación*

https://youtu.be/68YxpzMpNWQ





Mas información acerca de la descarga:
https://youtu.be/QuhuBKCmnFc
https://youtu.be/Gx9g-DVVL64

Descarga de datos y metadatos

1. FIDUCIAL
   I. FTP://FTP.SIRGAS.ORG/PUB/GPS/SIRGAS/
2. RINEX
   I. HTTPS://CDDIS.NASA.GOV/DATA_AND_DERIVED_PRODUCTS/GNSS/DAILY_30SECOND_DATA.HTML
   II. HTTP://WWW.IGM.GUB.UY/GEOPORTAL/ESTACIONES/
   III. HTTPS://WWW.IGN.GOB.AR/NUESTRASACTIVIDADES/GEODESIA/RAMSAC/DESCARGARINEX
   IV. HTTP://WWW.GEOPORTALIGM.GOB.EC/PORTAL_GEODESIA/INDEX.HTML
   V. HTTP://GEOMENSURA.USACH.CL/CENTRO-DE-PROCESAMIENTO-Y-ANALISIS-GEODESICO-USC
   VI. HTTPS://WWW.IBGE.GOV.BR/GEOCIENCIAS/INFORMACOES-SOBRE-POSICIONAMENTO-GEODESICO/REDE-GEODESICA/16258-REDE-BRASILEIRA-DE-MONITORAMENTO-CONTINUO-DOS-SISTEMAS-GNSS-RBMC.HTML?=&T=DOWNLOADS
3. ANTEX
   I. FTP://WWW.IGS.ORG/PUB/STATION/GENERAL/
4. EFEMÉRIDES, CLK, ERP
   I. FTP://CDDIS.GSFC.NASA.GOV/GNSS/DATA/DAILY/2020/BRDC/
   II. FTP://CDDIS.GSFC.NASA.GOV/GNSS/PRODUCTS/2100/
5. ARCHIVO IONEX
   I. FTP://CDDIS.GSFC.NASA.GOV/PUB/GPS/PRODUCTS/IONEX/
6. MAREAS OCEÁNICAS
   I. HTTP://HOLT.OSO.CHALMERS.SE/LOADING/

TIPO DE ARCHIVO	PAÍS U ORGANIZACIÓN	FTP/WEB/SFTP	USUARIO	CLAVE	EXT.	NOM.
RINEX	VARIOS	VARIOS	XXXXX-XXXX		*.YYO	
PARÁMETROS IONOSFÉRICOS	CENTER FOR ORBIT DETERMINATION IN EUROPE (CODE)	HTTP://FTP.AIUB.UNIBE.CH/CODE/2018/	LIBRE	LIBRE	*.ION	CODWWWWD.ION
EFEMÉRIDES PRECISAS	IGS	FTP://CDDIS.GSFC.NASA.GOV/	LIBRE	LIBRE	*.SP3	IGSWWWWD.SP3/ IGLWWWWD.SP3
PARÁMETROS DE ROTACIÓN DE LA TIERRA	IGS	FTP://CDDIS.GSFC.NASA.GOV/	LIBRE	LIBRE	*.IEP	IGSWWWW7.IEP
CARGAS ATMOSFÉRICAS	HTTPS://GEOPHY.UNI.LU/ATMOSPHERE/TIDE-LOADING-CALCULATOR/ATM1ONLINECALCULATOR/		LIBRE	LIBRE	*ATL	*.ATL
CARGAS OCEÁNICAS	CHALMERS UNIVERSITY OF TECHNOLOGY	HTTP://HOLT.OSO.CHALMERS.SE/LOADING/	LIBRE	LIBRE	*.BLQ	*.BLQ
PCV	IGS	FTP://FTP.IGS.ORG/PUB/STATION/GENERAL/	LIBRE	LIBRE	*.ATX	IgsYY_wwww.atx

http://www.rtklib.com/

Overview | Release Notes | Support | Documents | References | Porting to BB | To Do | Statistics | SDR Receiver

RTKLIB: An Open Source Program Package for GNSS Positioning

Download

Version	Date	Binary AP Package for Windows	Full Package with Source Programs
0.2.0	2006/12/16	-	rtklib_0.2.0.zip (2.8MB)
1.0.0	2007/01/25	-	rtklib_1.0.0.zip (10.5MB)
1.1.0	2007/03/20	-	rtklib_1.1.0.zip (6.2MB)
2.1.0	2008/07/15	-	rtklib_2.1.0.zip (22.9MB)
2.2.0	2009/01/31	rtklib_2.2.0_bin.zip (10.7MB)	rtklib_2.2.0.zip (23.4MB)
2.2.1	2009/05/17	rtklib_2.2.1_bin.zip (15.3MB)	rtklib_2.2.1.zip (30.6MB)
2.2.2	2009/09/07	rtklib_2.2.2_bin.zip (21.4MB)	rtklib_2.2.2.zip (33.8MB)
2.3.0	2009/12/17	rtklib_2.3.0_bin.zip (26.7MB)	rtklib_2.3.0.zip (35.8MB)
2.4.0	2010/08/08	rtklib_2.4.0_bin.zip (17.4MB)	rtklib_2.4.0.zip (26.5MB)
2.4.1	2011/06/11	rtklib_2.4.1_bin.zip (16.5MB)	rtklib_2.4.1.zip (26.4MB)
2.4.2	2013/04/29	rtklib_2.4.2_bin.zip (30.4MB)	rtklib_2.4.2.zip (55.2MB)

These are just old archives for recording. To download of the newest version, please visit the following GitHub links.

Version	Date	Binary APs for Windows	Source Programs and Data
2.4.2 p13	2018/01/29	GitHub	GitHub
2.4.3 b33	2019/08/19	GitHub	GitHub

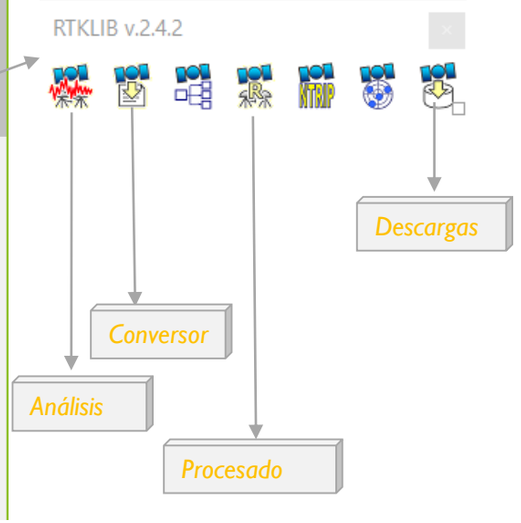
The 2.4.2 pXX is the stable version with the newest patches. The 2.4.3 bXX is the development or beta version with experimental implementations. Please refer the support information for bug and known problem list.

Tutorial and Demonstration

GNSS-SDRLIB: Open Source GNSS Software Defined Radio Library (SDR working with RTKLIB)

www.rtklib.com/prog/rtklib_2.2.0_bin.zip

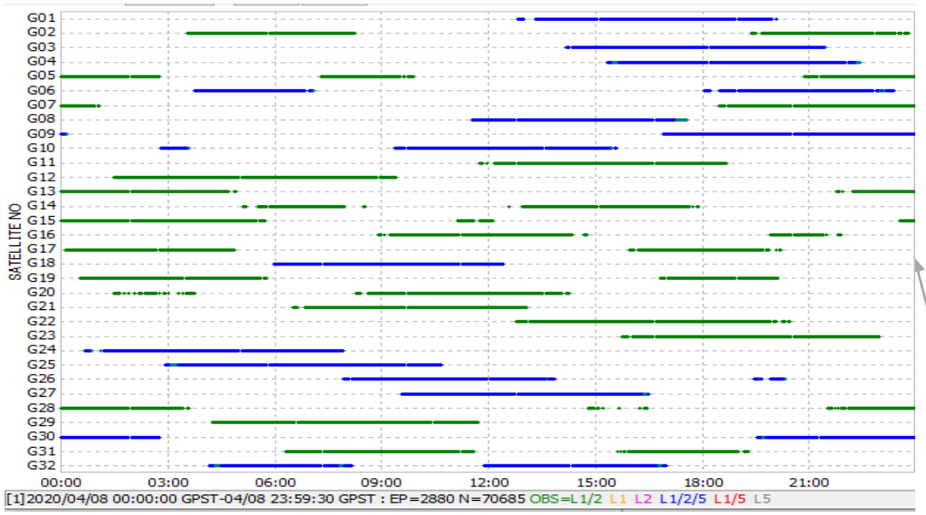
roid frontend of RTKLIB)

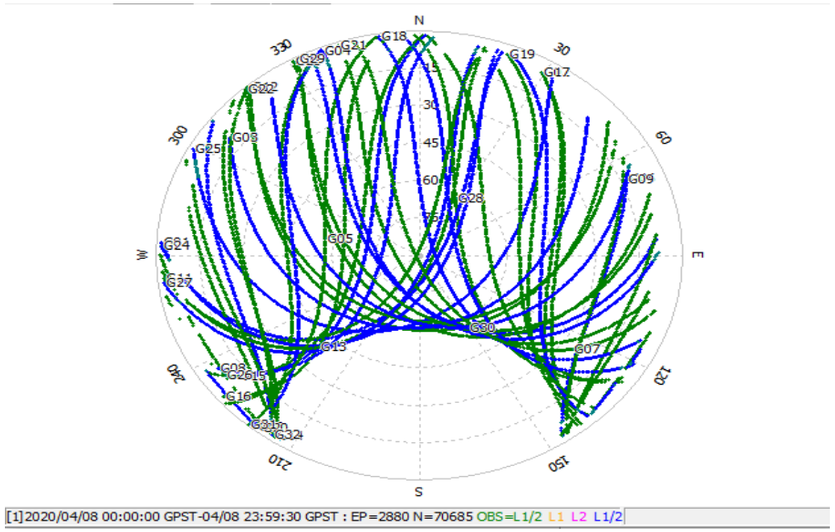


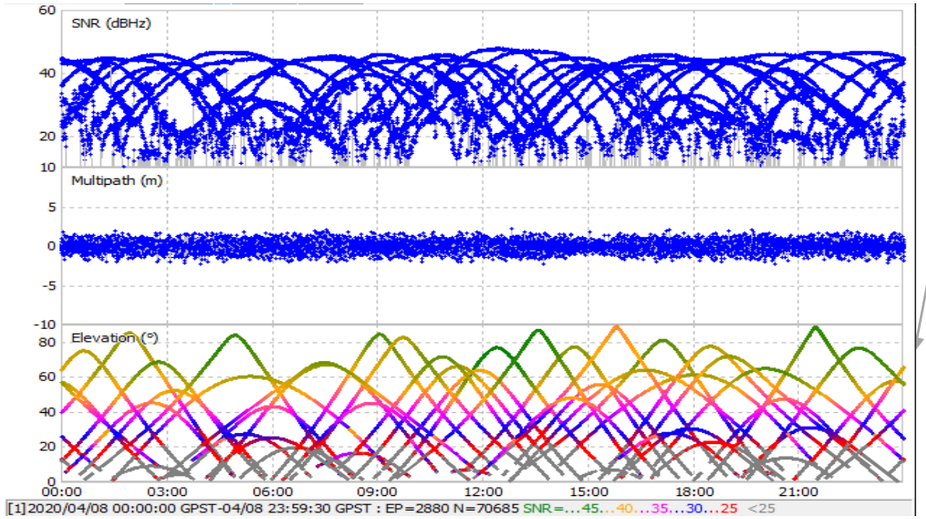
	Function	GUI AP	CUI AP	Notes
(a)	AP Launcher	RTKLAUNCH (3.1)	-	
(b)	Real-Time Positioning	RTKNAVI (3.2, 3.3, 3.5)	RTKRCV (3.11, A.1)	
(c)	Communication Server	STRSVR, (3.3)	STR2STR (3.11, A.5)	
(d)	Post-Processing Analysis	RTKPOST (3.4, 3.5)	RNX2RTKP (3.11, A.2)	
(e)	RINEX Converter	RTKCONV (3.6)	CONVBIN (3.11, A.4)	
(f)	Plot Solutions and Observation Data	RTKPLOT (3.7, 3.8)	-	
(g)	Downloader for GNSS Products and Data	RTKGET (3.9)	-	
(h)	NTRIP Browser	SRCTBLBROWS (3.10)	-	

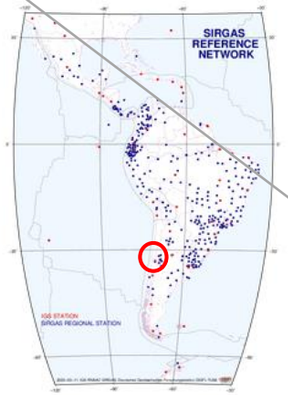
Análisis de datos previos

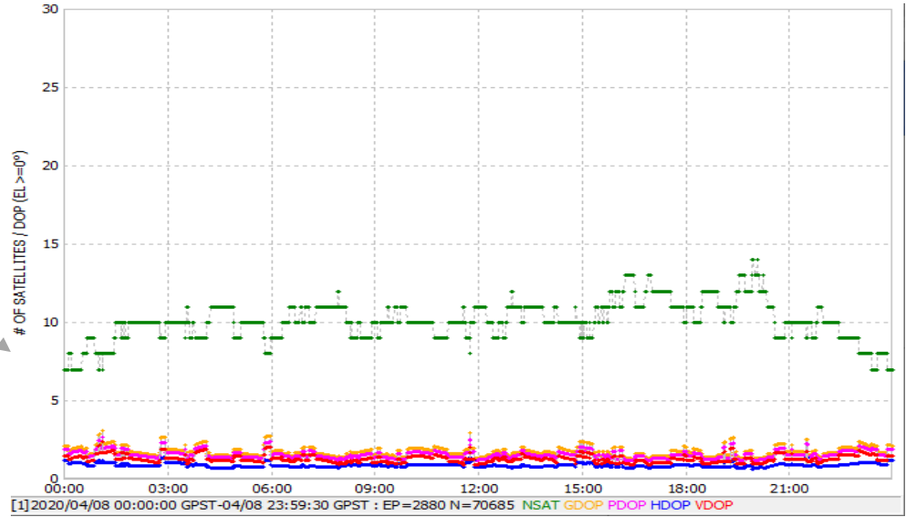
SANT





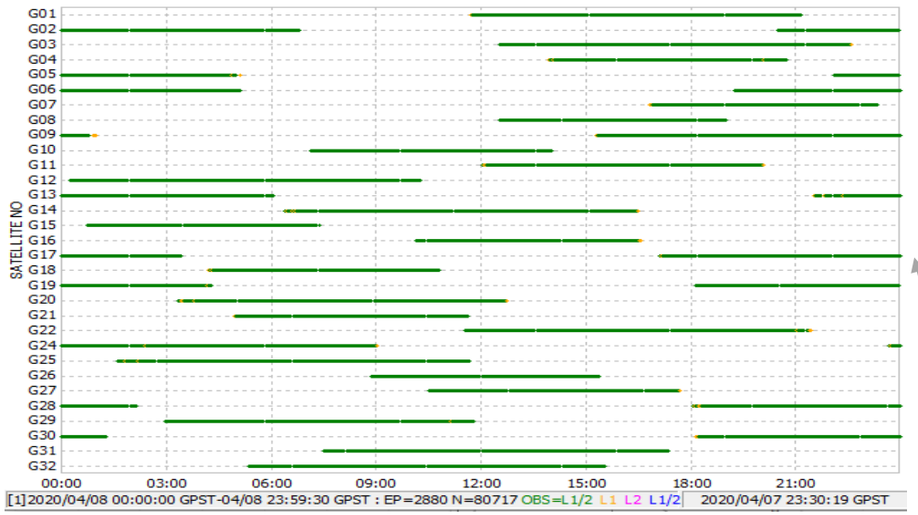


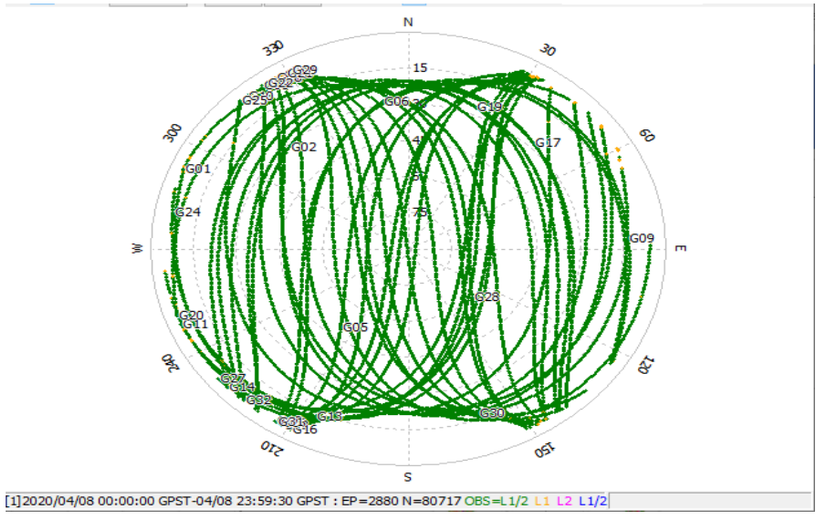


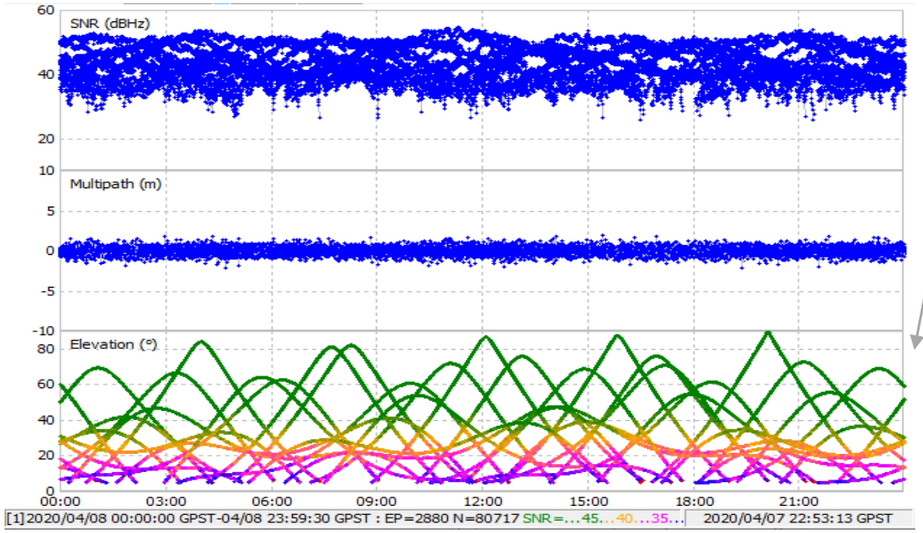


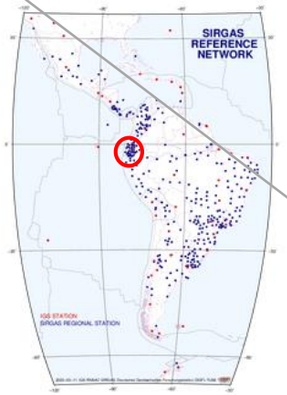
Análisis de datos previos

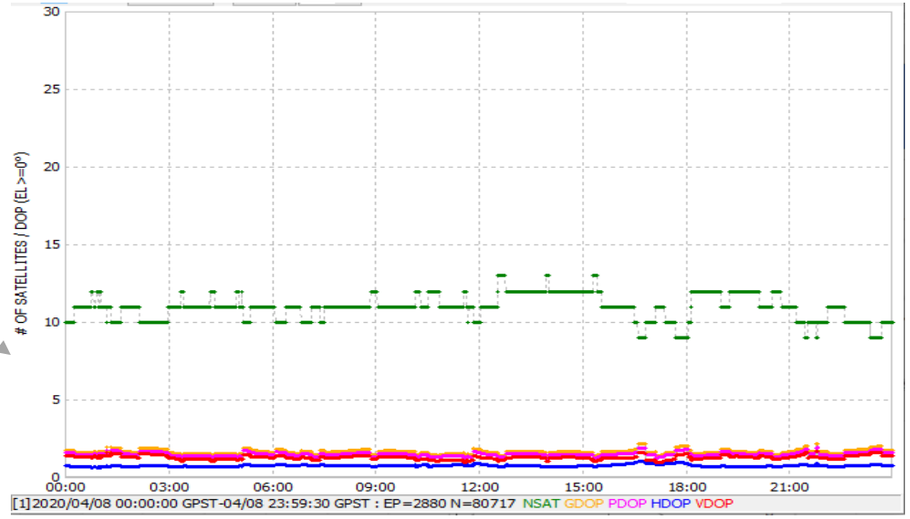
EPEC





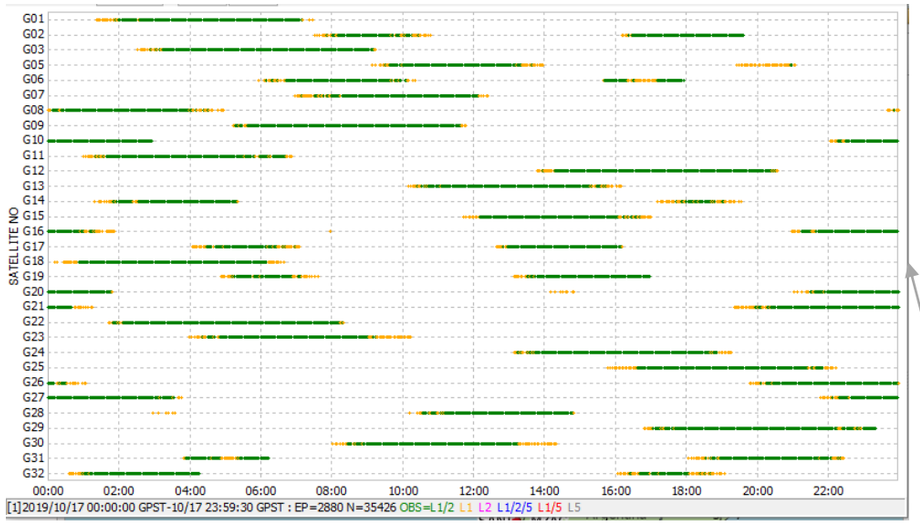


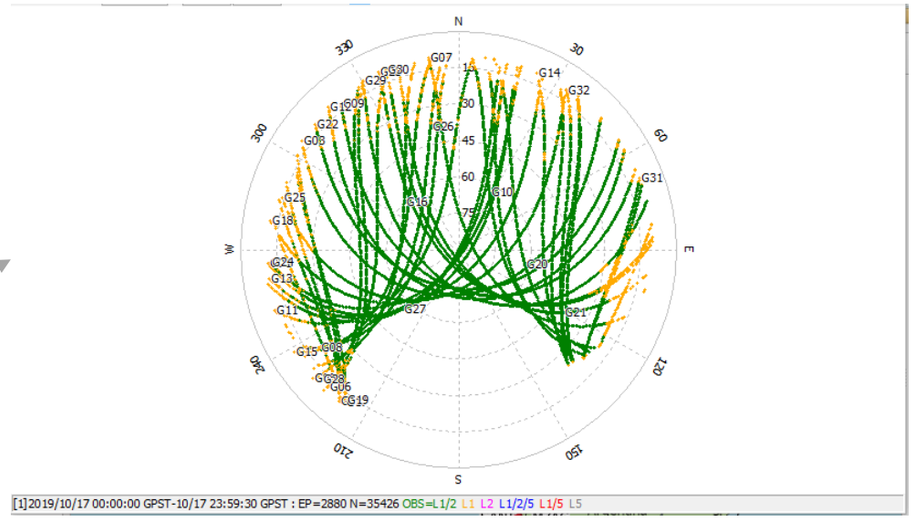


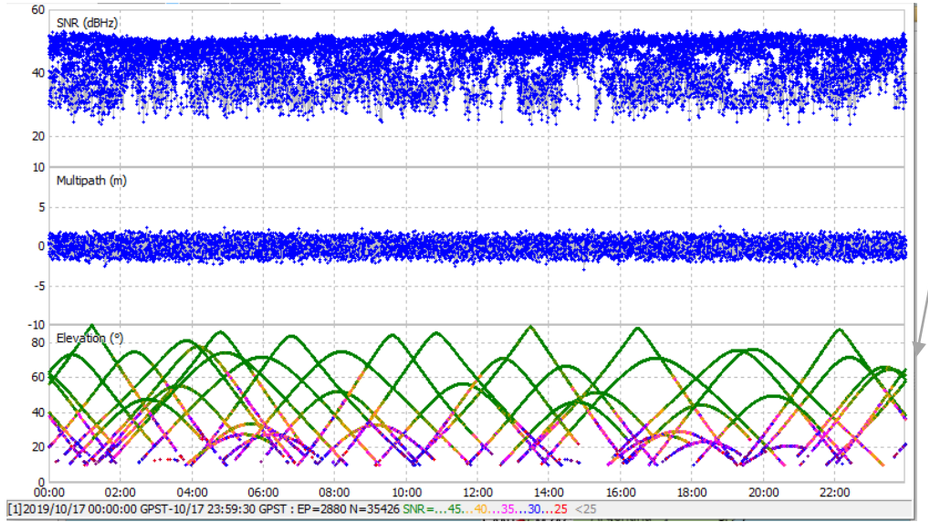


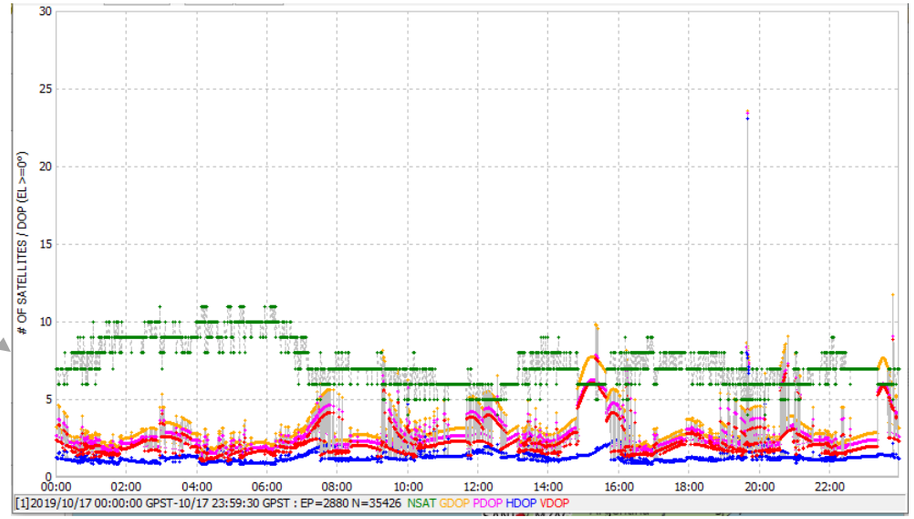
Análisis de datos previos

PTRO









Análisis de datos previos al procesado TEQC o GFZ2RNX

HELMHOLTZ CENTRE POTSDAM
GFZ GERMAN RESEARCH CENTRE FOR GEOSCIENCES

ENTRADA

SALIDA

```
gfzrnx64 -finp pots0070.15o -fout pots0070.15o_chk -chk -kv
```

ORDEN

```
R   13 C1C C1P C2C C2P D1C L1C L1P L2C L2P S1C S1P S2C S2P  SYS / # / OBS TYPE
S    4 C1C D1C L1C S1C                                      SYS / # / OBS TYPE
    76                                                      # OF SATELLITES
   C01  2863  2863  2863  2863  2863  2863  2863  2863  2863PRN / # OF OBS
        2863                                                PRN / # OF OBS
...
   C14  1365  1363  1363  1365  1365  1363  1363  1365  1363PRN / # OF OBS
        1363                                                PRN / # OF OBS
   E11   900   895   893   899   900   900   895   893   899PRN / # OF OBS
         900   895   893   899                              PRN / # OF OBS
   E19  1605  1601  1601  1603  1605  1605  1601  1601  1603PRN / # OF OBS
        1605  1601  1601  1603                              PRN / # OF OBS
   G01  1189  1148  1181  1181  1189                       1189PRN / # OF OBS
                    1148  1181  1181  1189        1181  1148PRN / # OF OBS
        1181  1181                                          PRN / # OF OBS
...
   G32  1247  1241
   J01  2863  2863
        2863  2863
        2863
   R01   713   713
         713   713
...
   R24   695   695
         695   695
   S26  1973  1973
...
   S37  2863  2863
    30.000
  2014     8    17
  2014     8    17
...
```

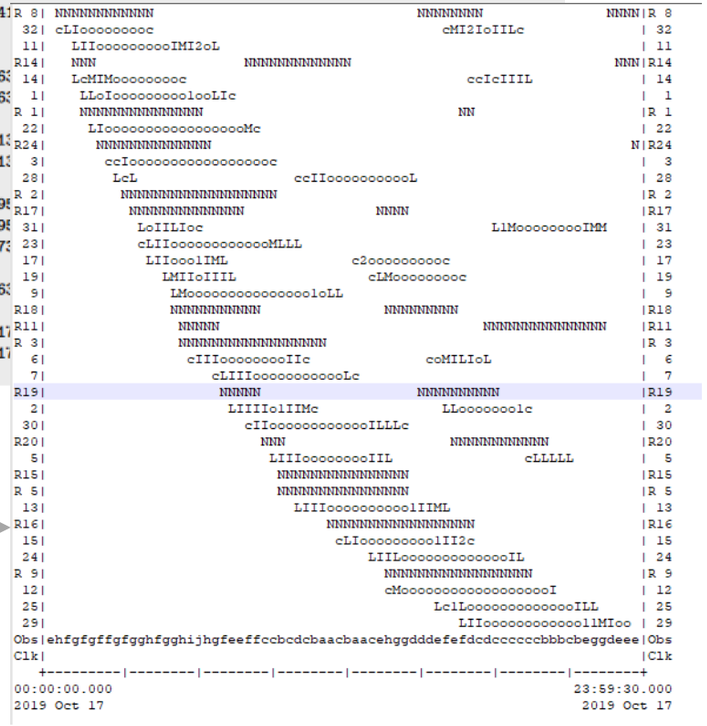
UNAVCO

ENTRADA

SALIDA

```
teqc +qcq +sym _1_ptro2900.19o > _1_ptro2900.txt
```

ORDEN

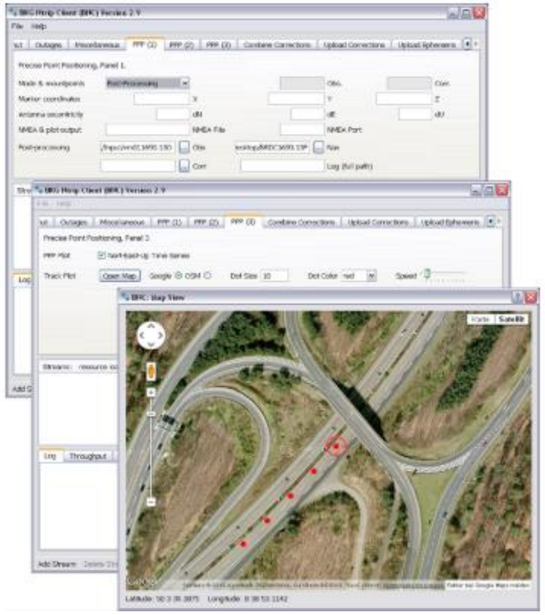


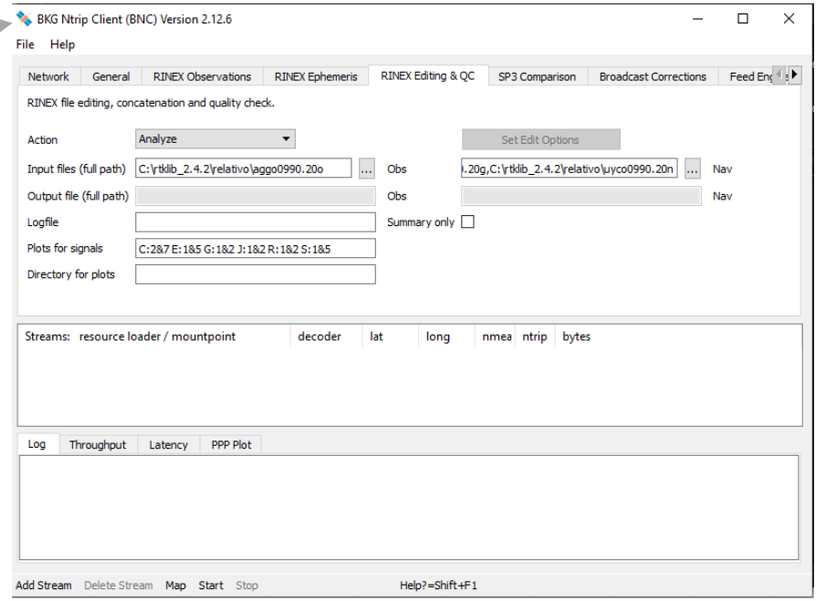
Análisis de datos previos al procesado BNC

BKG GNSS DATA CENTER

BKG Ntrip Client (BNC)

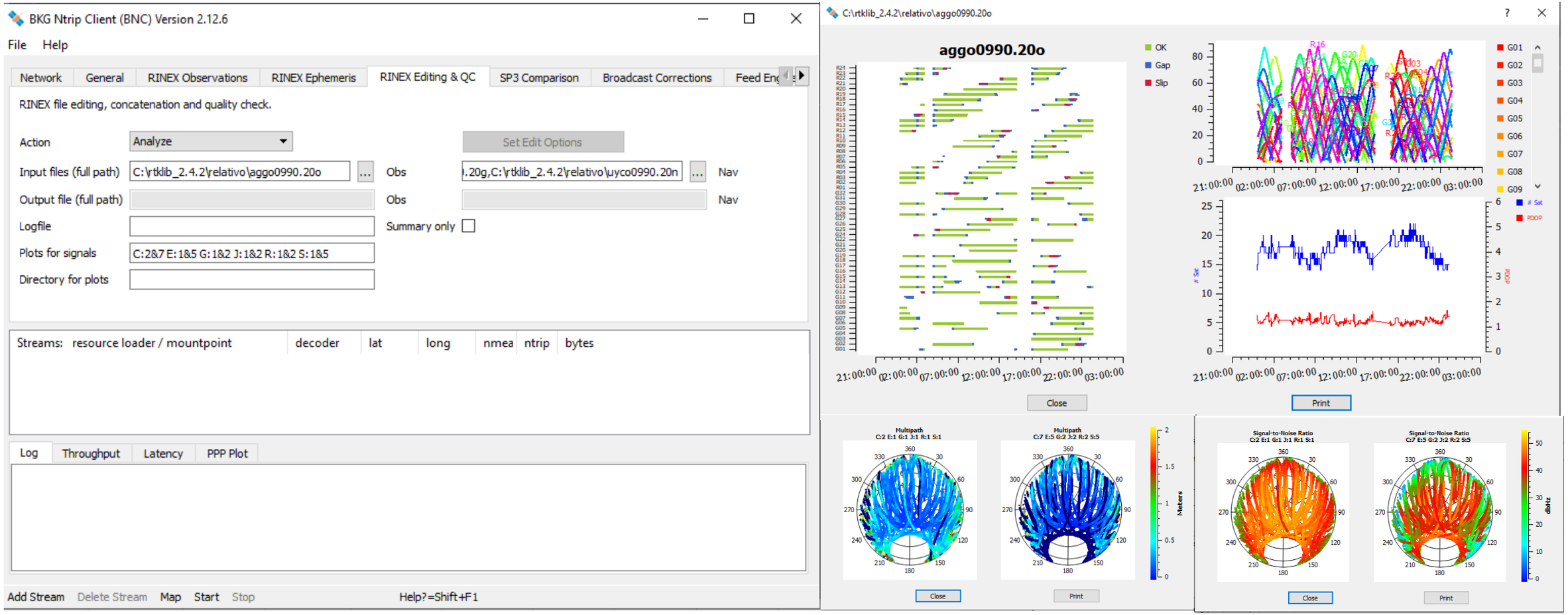
The BKG Ntrip Client (BNC) is an Open Source multi-stream client program designed for a variety of real-time GNSS applications. It was primarily designed for receiving data streams from any Ntrip supporting Broadcaster. The program handles the HTTP communication and transfers received GNSS data to a serial or IP port feeding networking software or a DGPS/RTK application. It can compute a real-time Precise Point Positioning (PPP) solution from RTCM streams or RINEX files.
During the last years BNC has been enriched with RINEX quality and editing functions. You can run BNC with GUI as well as in batch processing mode.





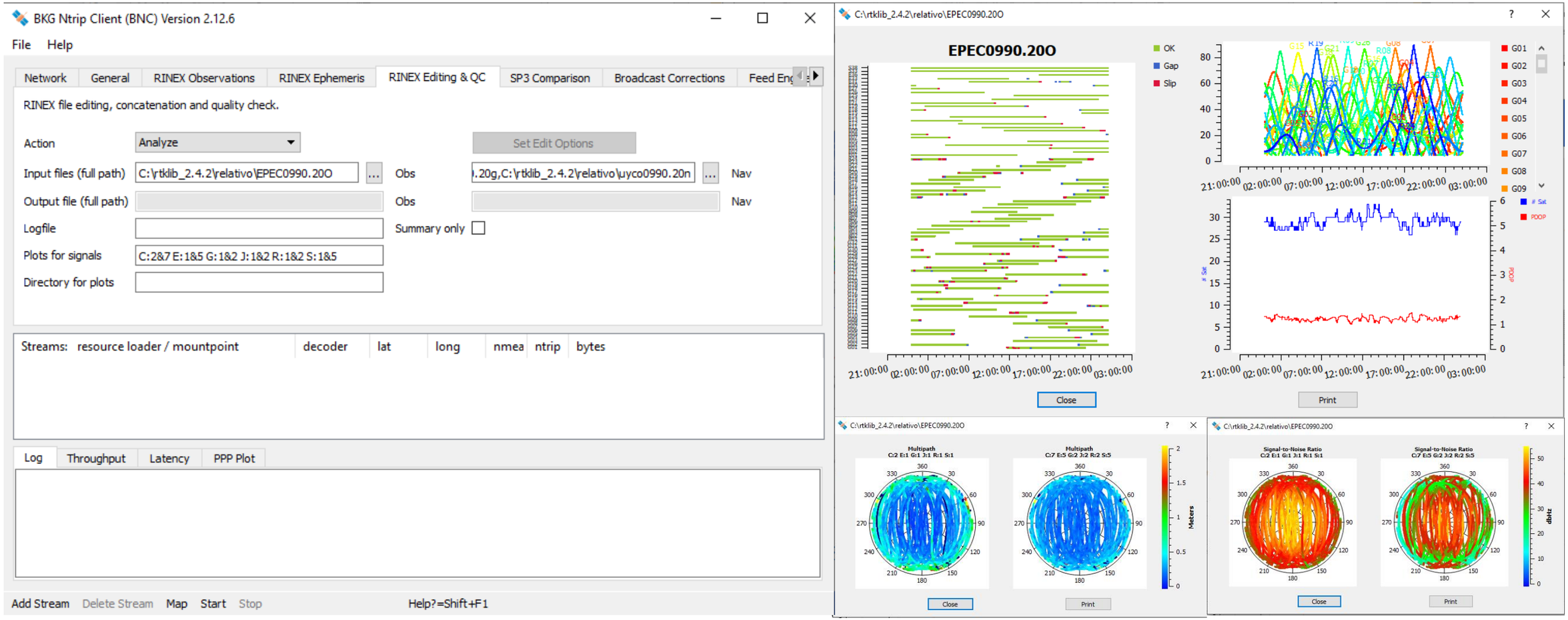
https://igs.bkg.bund.de/ntrip/download

Análisis de datos previos al procesado BNC



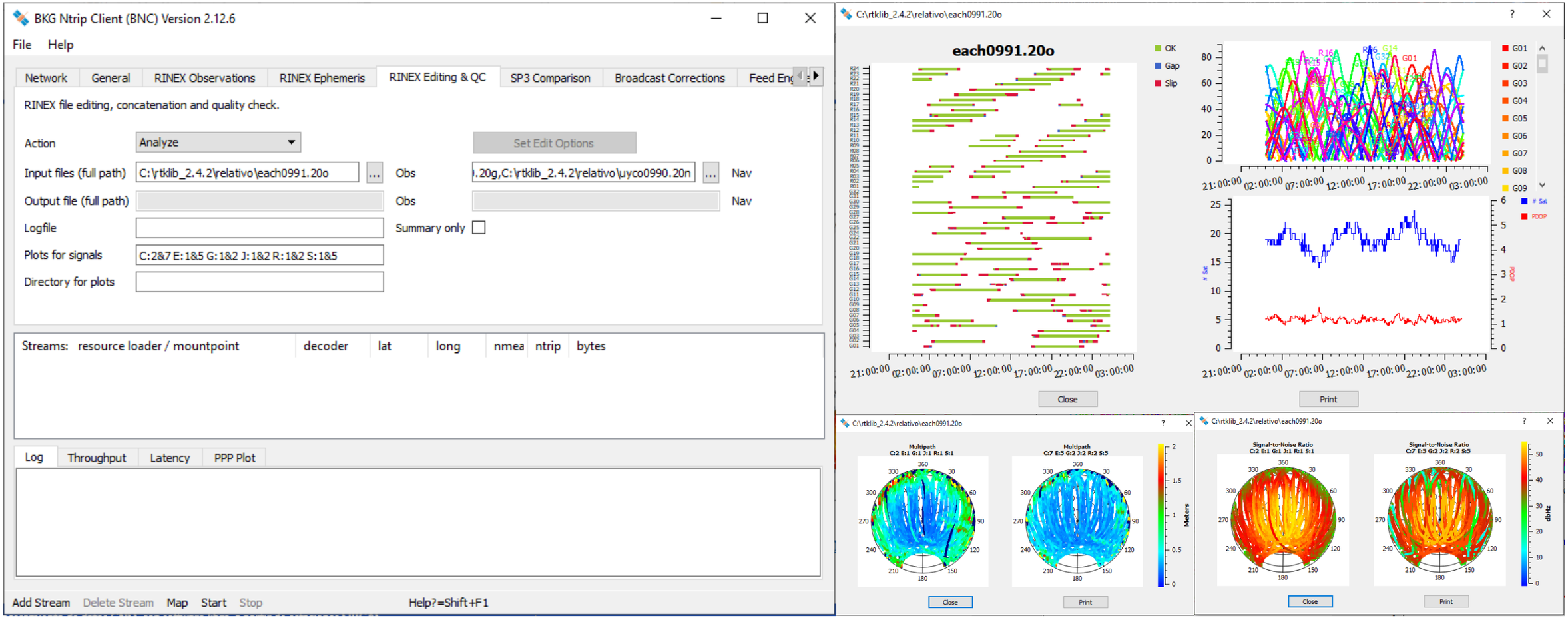
https://igs.bkg.bund.de/ntrip/download
https://www.ign.gob.ar/NuestrasActividades/Geodesia/Ramsac/DescargaRinex

Análisis de datos previos al procesado BNC



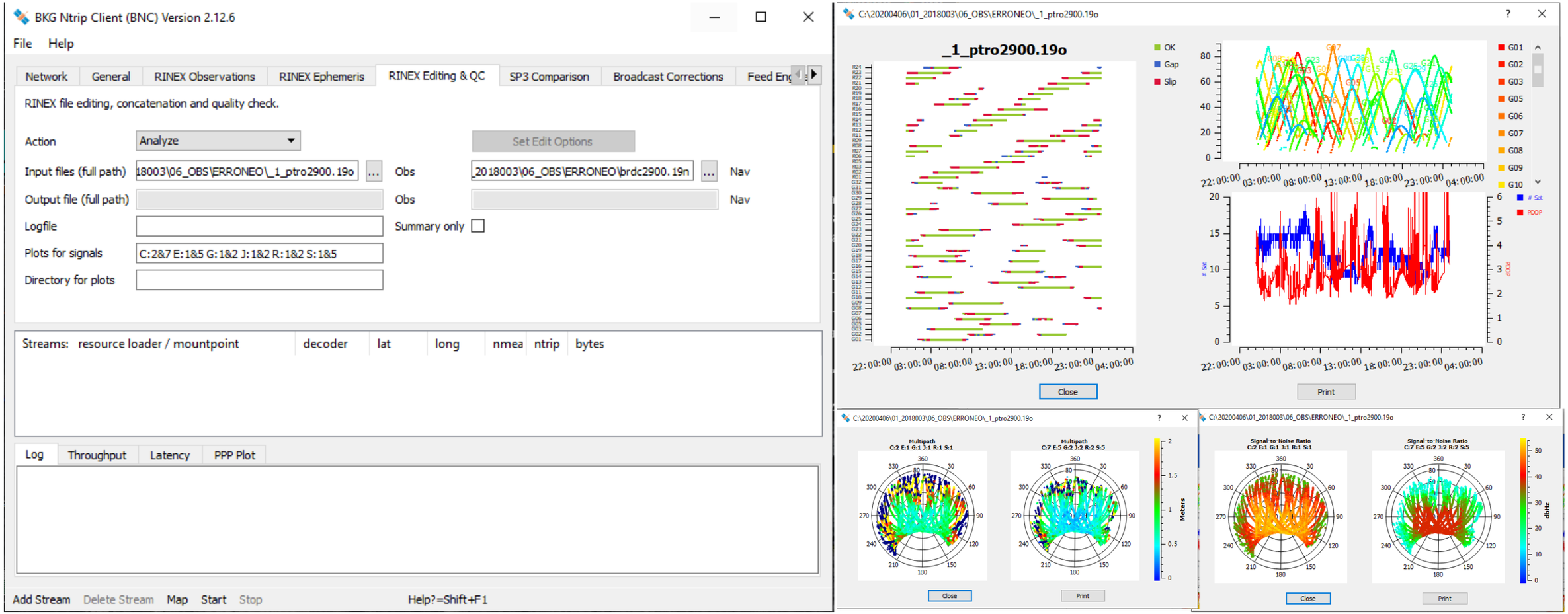
https://igs.bkg.bund.de/ntrip/download
http://www.geoportaligm.gob.ec/portal_geodesia/index.html

Análisis de datos previos al procesado BNC



https://igs.bkg.bund.de/ntrip/download
https://www.ibge.gov.br/geociencias/informacoes-sobre-posicionamento-geodesico/rede-geodesica/16258-rede-brasileira-de-monitoramento-continuo-dos-sistemas-gnss-rbmc.html?=&t=downloads

Análisis de datos previos al procesado



https://igs.bkg.bund.de/ntrip/download

http://www.rtklib.com/

Overview | Release Notes | Support | Documents | References | Porting to BB | To Do | Statistics | SDR Receiver

RTKLIB: An Open Source Program Package for GNSS Positioning

Download

Version	Date	Binary AP Package for Windows	Full Package with Source Programs
0.2.0	2006/12/16	-	rtklib_0.2.0.zip (2.8MB)
1.0.0	2007/01/25	-	rtklib_1.0.0.zip (10.5MB)
1.1.0	2007/03/20	-	rtklib_1.1.0.zip (6.2MB)
2.1.0	2008/07/15	-	rtklib_2.1.0.zip (22.9MB)
2.2.0	2009/01/31	rtklib_2.2.0_bin.zip (10.7MB)	rtklib_2.2.0.zip (23.4MB)
2.2.1	2009/05/17	rtklib_2.2.1_bin.zip (15.3MB)	rtklib_2.2.1.zip (30.6MB)
2.2.2	2009/09/07	rtklib_2.2.2_bin.zip (21.4MB)	rtklib_2.2.2.zip (33.8MB)
2.3.0	2009/12/17	rtklib_2.3.0_bin.zip (26.7MB)	rtklib_2.3.0.zip (35.8MB)
2.4.0	2010/08/08	rtklib_2.4.0_bin.zip (17.4MB)	rtklib_2.4.0.zip (26.5MB)
2.4.1	2011/06/11	rtklib_2.4.1_bin.zip (16.5MB)	rtklib_2.4.1.zip (26.4MB)
2.4.2	2013/04/29	rtklib_2.4.2_bin.zip (30.4MB)	rtklib_2.4.2.zip (55.2MB)

These are just old archives for recording. To download of the newest version, please visit the following GitHub links.

Version	Date	Binary APs for Windows	Source Programs and Data
2.4.2 p13	2018/01/29	GitHub	GitHub
2.4.3 b33	2019/08/19	GitHub	GitHub

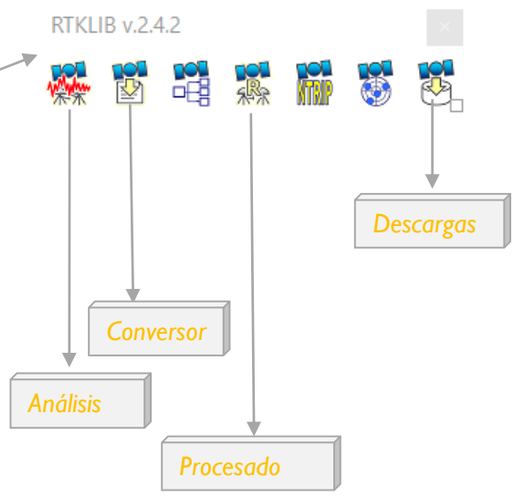
The 2.4.2 pXX is the stable version with the newest patches. The 2.4.3 bXX is the development or beta version with experimental implementations. Please refer the support information for bug and known problem list.

Tutorial and Demonstration

GNSS-SDRLIB: Open Source GNSS Software Defined Radio Library (SDR working with RTKLIB)

www.rtklib.com/prog/rtklib_2.2.0_bin.zip

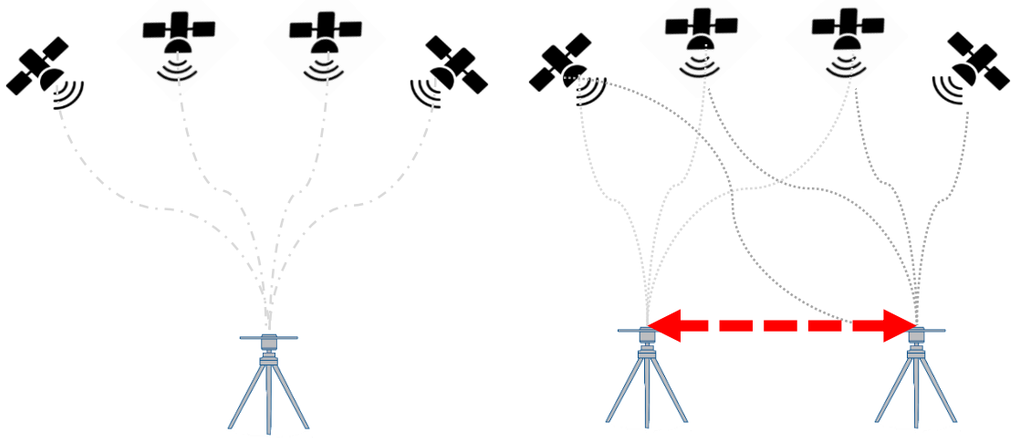
roid frontend of RTKLIB)



	Function	GUI AP	CUI AP	Notes
(a)	AP Launcher	RTKLAUNCH (3.1)	-	
(b)	Real-Time Positioning	RTKNAVI (3.2, 3.3, 3.5)	RTKRCV (3.11, A.1)	
(c)	Communication Server	STRSVR, (3.3)	STR2STR (3.11, A.5)	
(d)	Post-Processing Analysis	RTKPOST (3.4, 3.5)	RNX2RTKP (3.11, A.2)	
(e)	RINEX Converter	RTKCONV (3.6)	CONVBIN (3.11, A.4)	
(f)	Plot Solutions and Observation Data	RTKPLOT (3.7, 3.8)	-	
(g)	Downloader for GNSS Products and Data	RTKGET (3.9)	-	
(h)	NTRIP Browser	SRCTBLBROWS (3.10)	-	

Procesamiento de observables: RTKlib

Item	Descriptions	Configuration File	Notes
Positioning Mode	Set positioning mode - Single : Single point positioning or SBAS DGPS - DGPS/DGNSS : Code-based differential GPS - Static : Carrier-based Static positioning - Kinematic: Carrier-based Kinematic positioning - Moving-Base: Moving baseline - Fixed: Rover receiver position is fixed * - PPP Kinematic: Precise Point Positioning with kinematic mode - PPP Static: Precise Point Positioning with static mode - PPP Fixed: Rover receiver position is fixed with PPP mode *	`pos1-posmode`	* For residuals analysis

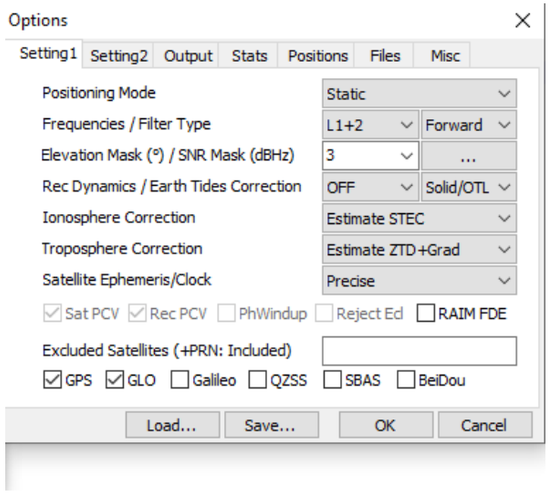


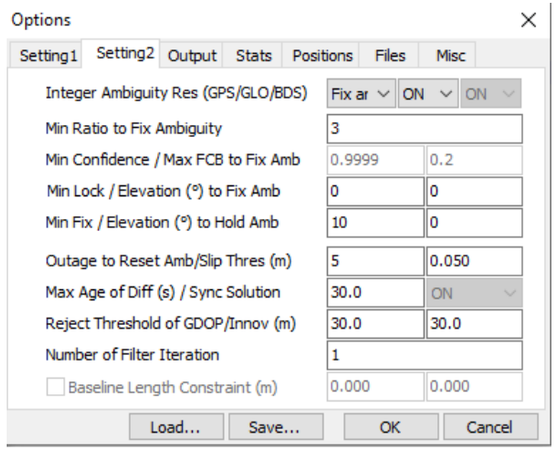
Absoluto
No se genera líneabase

Relativo
Se genera líneabase

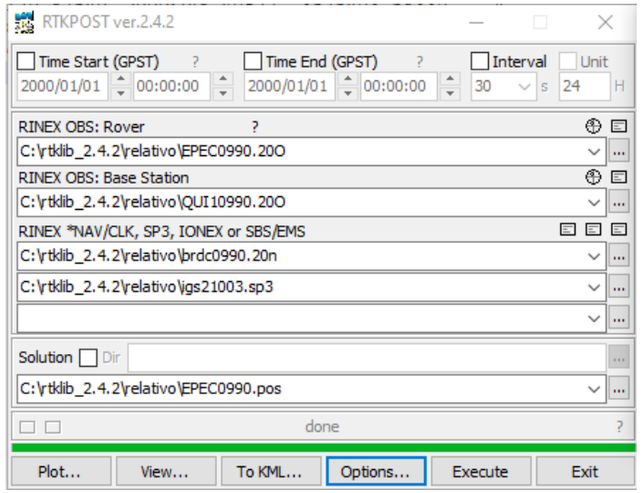
Item	Descriptions	Configuration File	Notes
Integer Ambiguity Resolution (GPS)	Set the strategy of integer ambiguity resolution for GPS - OFF : No ambiguity resolution - Continuous : Continuously static integer ambiguities are estimated and resolved * - Instantaneous : Integer ambiguity is estimated and resolved by epoch-by-epoch basis * - Fix and Hold : Continuously static integer ambiguities are estimated and resolved. If the validation OK, the ambiguities are tightly constrained to the resolved values. * - PPP-AR : Ambiguity resolution in PPP (Experimental) **	`pos2-armode`	Default: Continuous Not applicable to Single mode. * Only applicable to Kinematic, Static, Moving-baseline and Fixed modes. ** Only applicable to PPP-* modes and RTKPOST

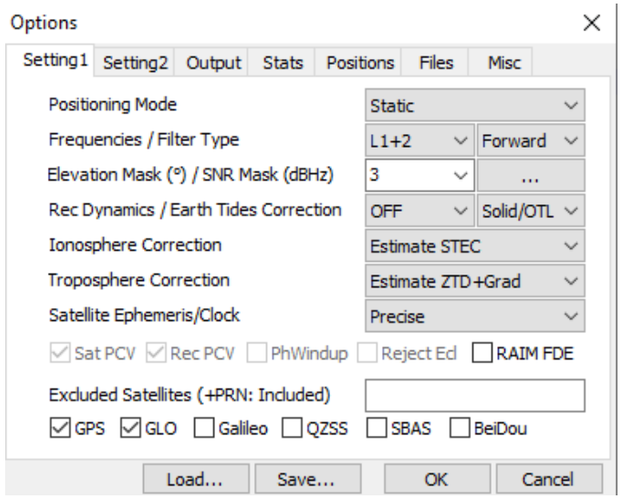
PPP-AR(solo GNSS):
https://www.ion.org/publications/abstract.cfm?articleID=11187

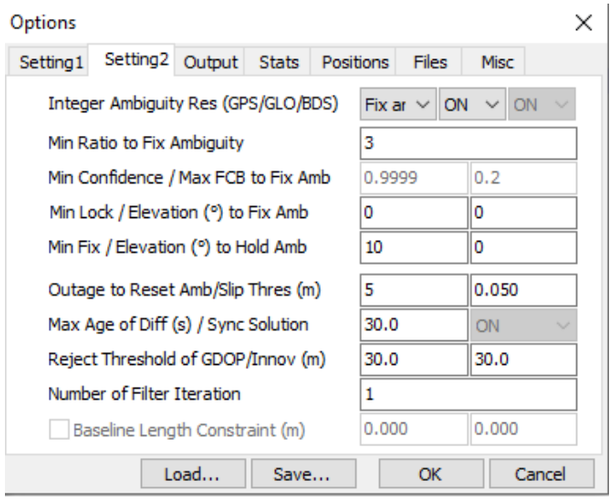


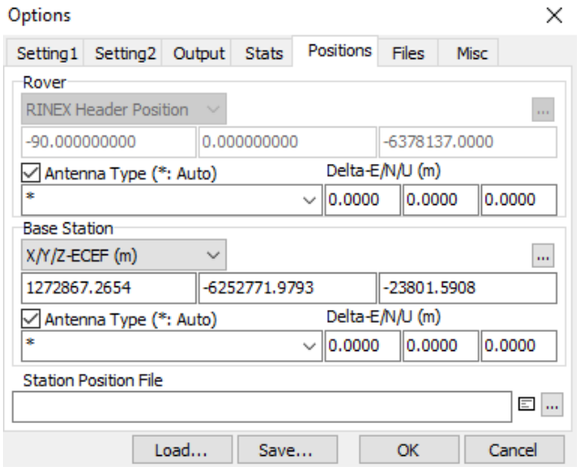


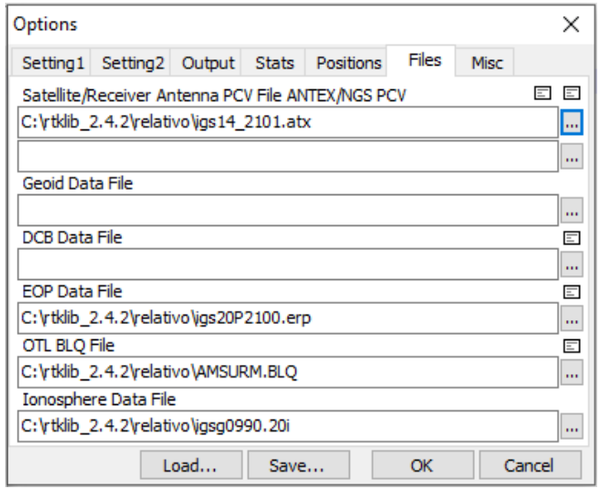
QUI1-EPEC







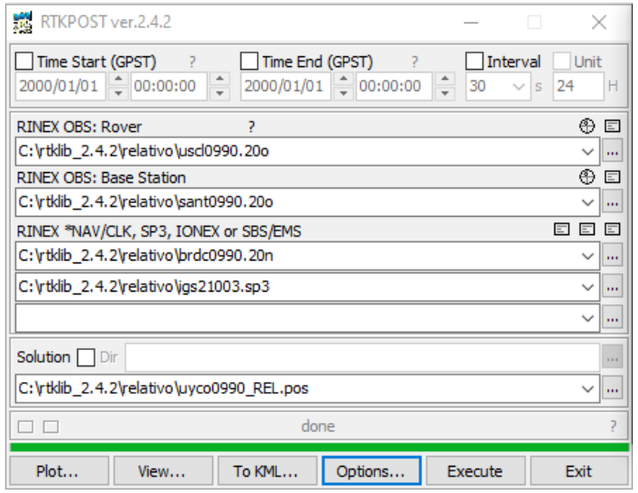


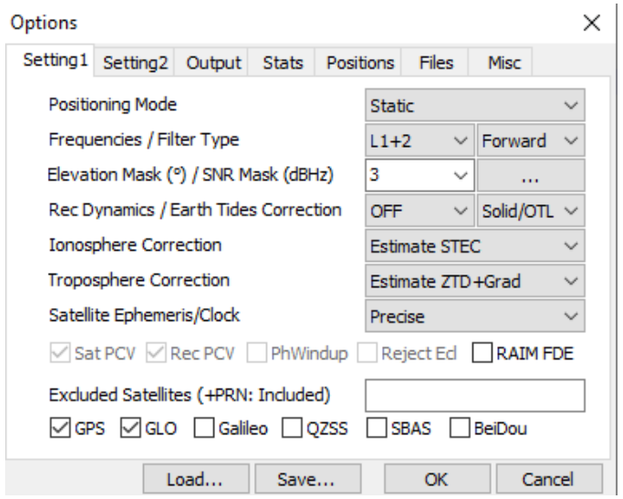


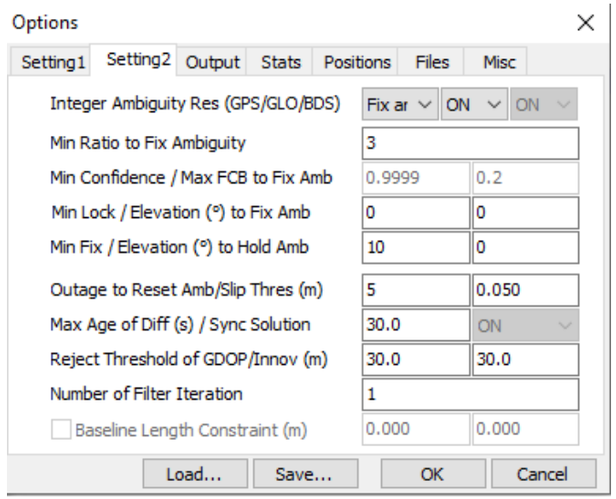
PPP-AR(solo GNSS): https://www.ion.org/publications/abstract.cfm?articleID=11187

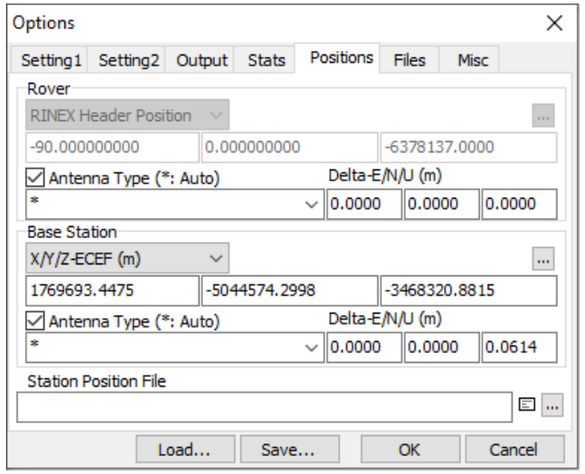
SIRGAS
www.sirgas.org

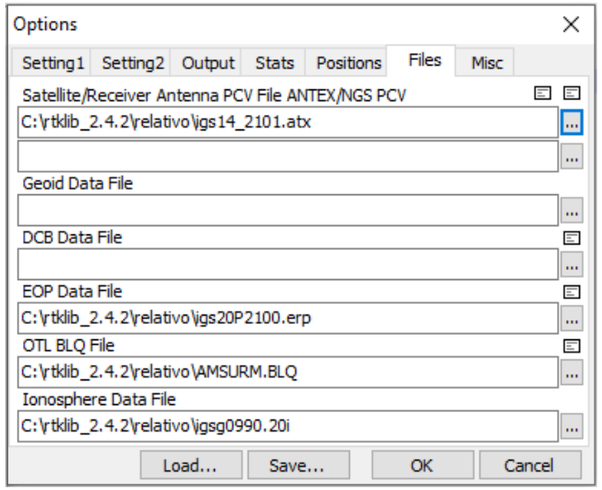
SANT-USCL





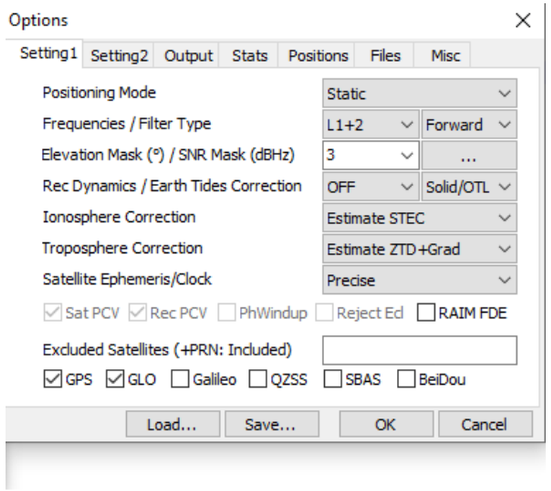


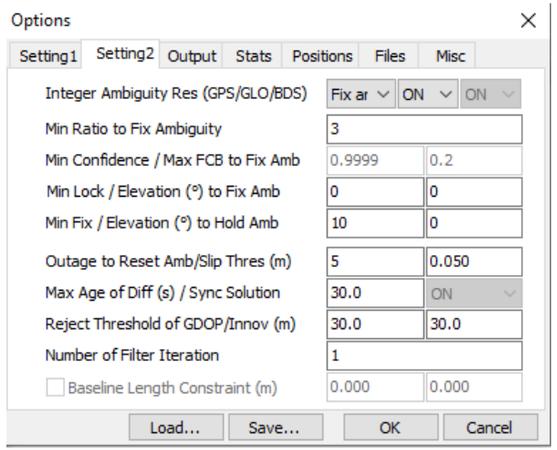


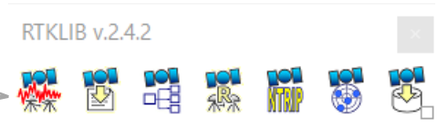


PPP-AR(solo GNSS): https://www.ion.org/publications/abstract.cfm?articleID=11187

Procesamiento de observables: RTKlib

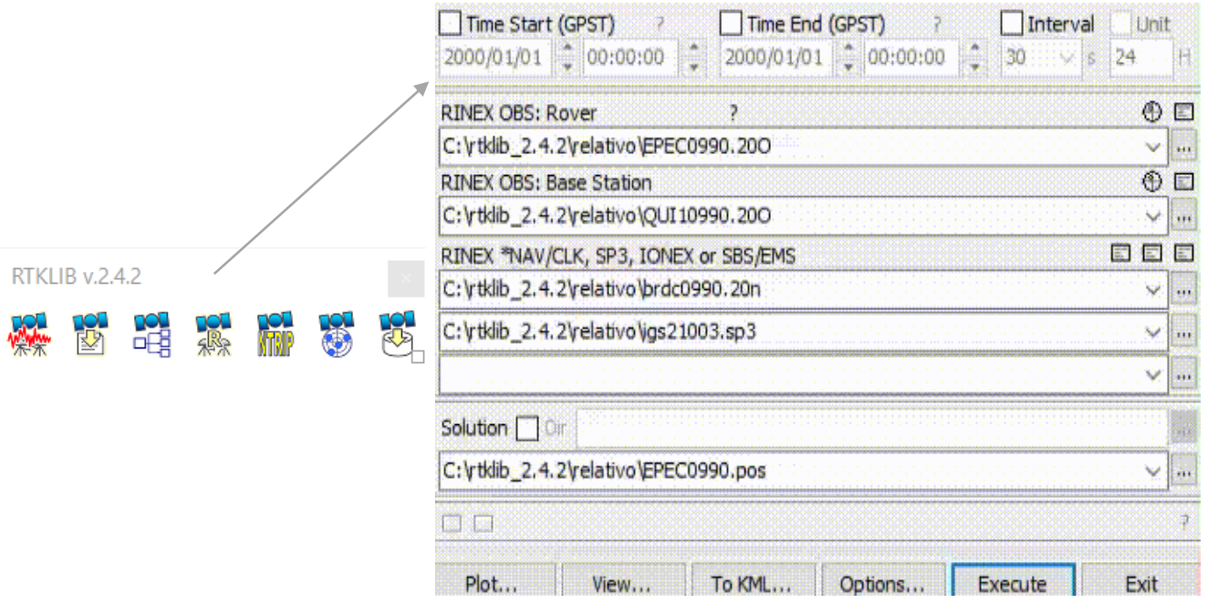


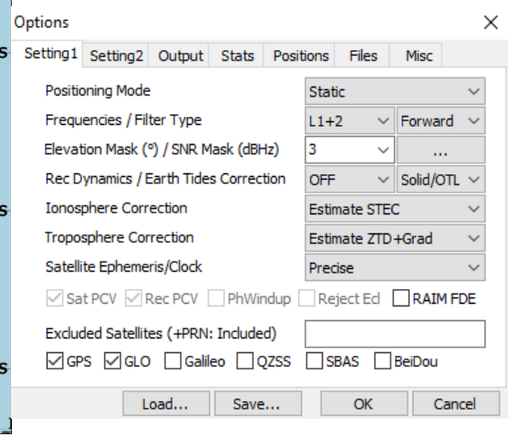


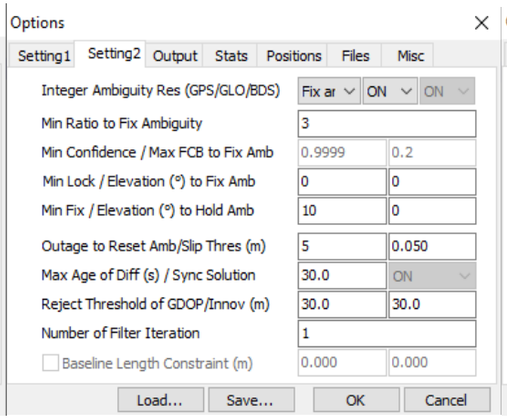


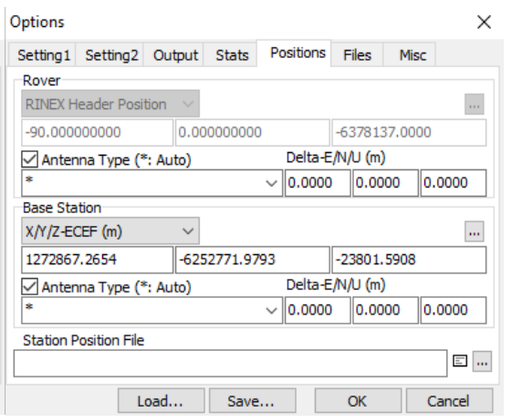
QUI1-EPEC

QUI1
Ecuador
EPEC
EPEC
Ecuador
Venezuela
Colombia
Guyana
Surinam
Guayana Francesa (Francia)
Perú
Brasil
Bolivia
Paraguay
SPS1
POLI
SANT
USCL
MZAC
Chile
Argentina
UYCO
AGGO
Islas Malvinas (RU)
0 300 600 km
90.0°O
80.0°O
70.0°O
60.0°O
50.0°O
40.0°O
0.0°
10.0°S
20.0°S
30.0°S
40.0°S
50.0°S


RTKLIB v.2.4.2
Time Start (GPST)
2000/01/01
00:00:00
Time End (GPST)
2000/01/01
00:00:00
Interval
30
Unit
24
RINEX OBS: Rover
C:\rtklib_2.4.2\relativo\EPEC0990.20O
RINEX OBS: Base Station
C:\rtklib_2.4.2\relativo\QUI10990.20O
RINEX *NAV/CLK, SP3, IONEX or SBS/EMS
C:\rtklib_2.4.2\relativo\brdc0990.20n
C:\rtklib_2.4.2\relativo\igs21003.sp3
Solution
C:\rtklib_2.4.2\relativo\EPEC0990.pos
Plot...
View...
To KML...
Options...
Execute
Exit

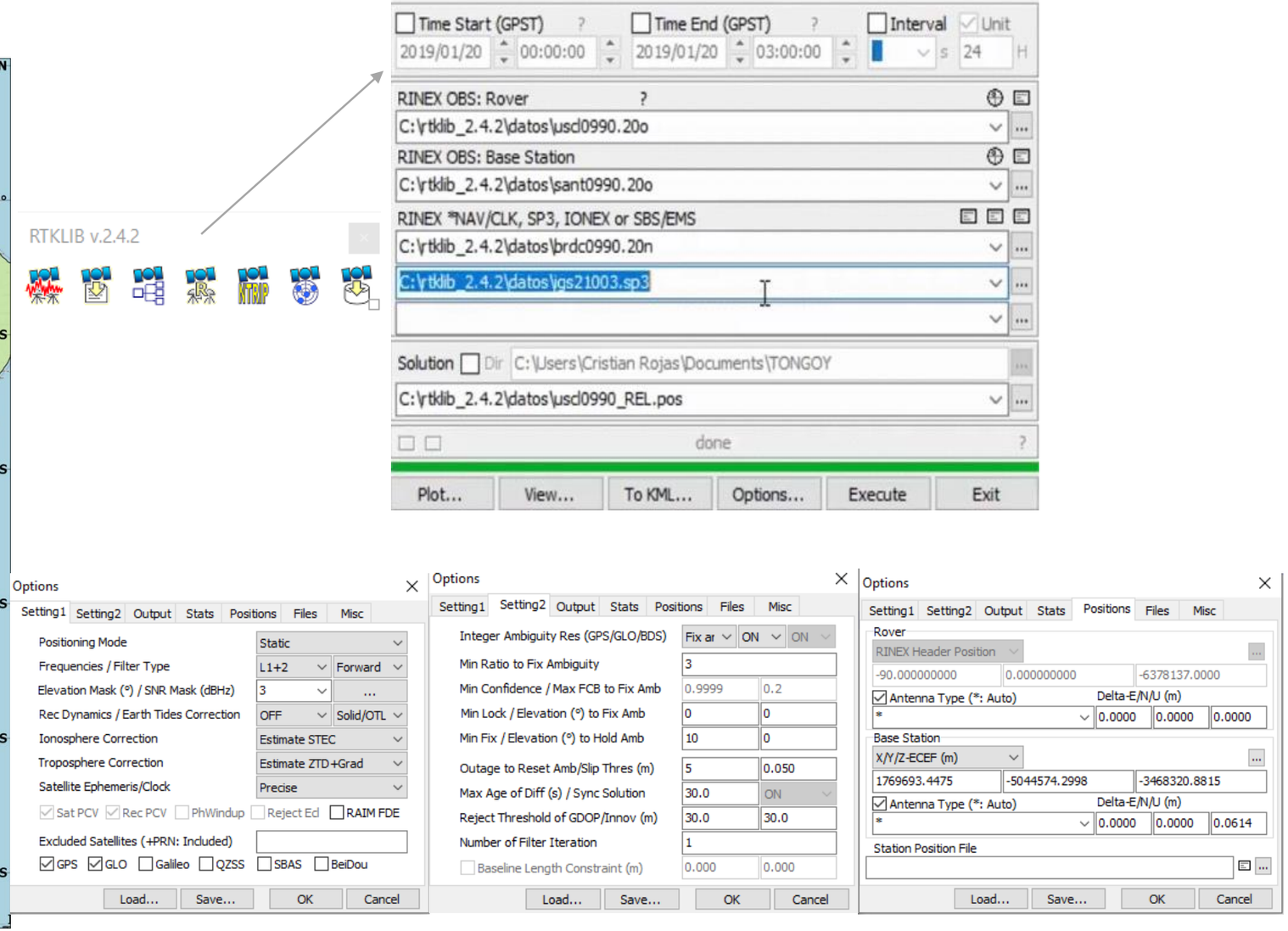

Options
Setting1
Setting2
Output
Stats
Positions
Files
Misc
Positioning Mode
Static
Frequencies / Filter Type
L1+2
Forward
Elevation Mask (°) / SNR Mask (dBHz)
3
Rec Dynamics / Earth Tides Correction
OFF
Solid/OTL
Ionosphere Correction
Estimate STEC
Troposphere Correction
Estimate ZTD+Grad
Satellite Ephemeris/Clock
Precise
Sat PCV
Rec PCV
PhWindup
Reject Ed
RAIM FDE
Excluded Satellites (+PRN: Included)
GPS
GLO
Galileo
QZSS
SBAS
BeiDou
Load...
Save...
OK
Cancel


Options
Setting1
Setting2
Output
Stats
Positions
Files
Misc
Integer Ambiguity Res (GPS/GLO/BDS)
Fix ar
ON
ON
Min Ratio to Fix Ambiguity
3
Min Confidence / Max FCB to Fix Amb
0.9999
0.2
Min Lock / Elevation (°) to Fix Amb
0
0
Min Fix / Elevation (°) to Hold Amb
10
0
Outage to Reset Amb/Slip Thres (m)
5
0.050
Max Age of Diff (s) / Sync Solution
30.0
ON
Reject Threshold of GDOP/Innov (m)
30.0
30.0
Number of Filter Iteration
1
Baseline Length Constraint (m)
0.000
0.000
Load...
Save...
OK
Cancel

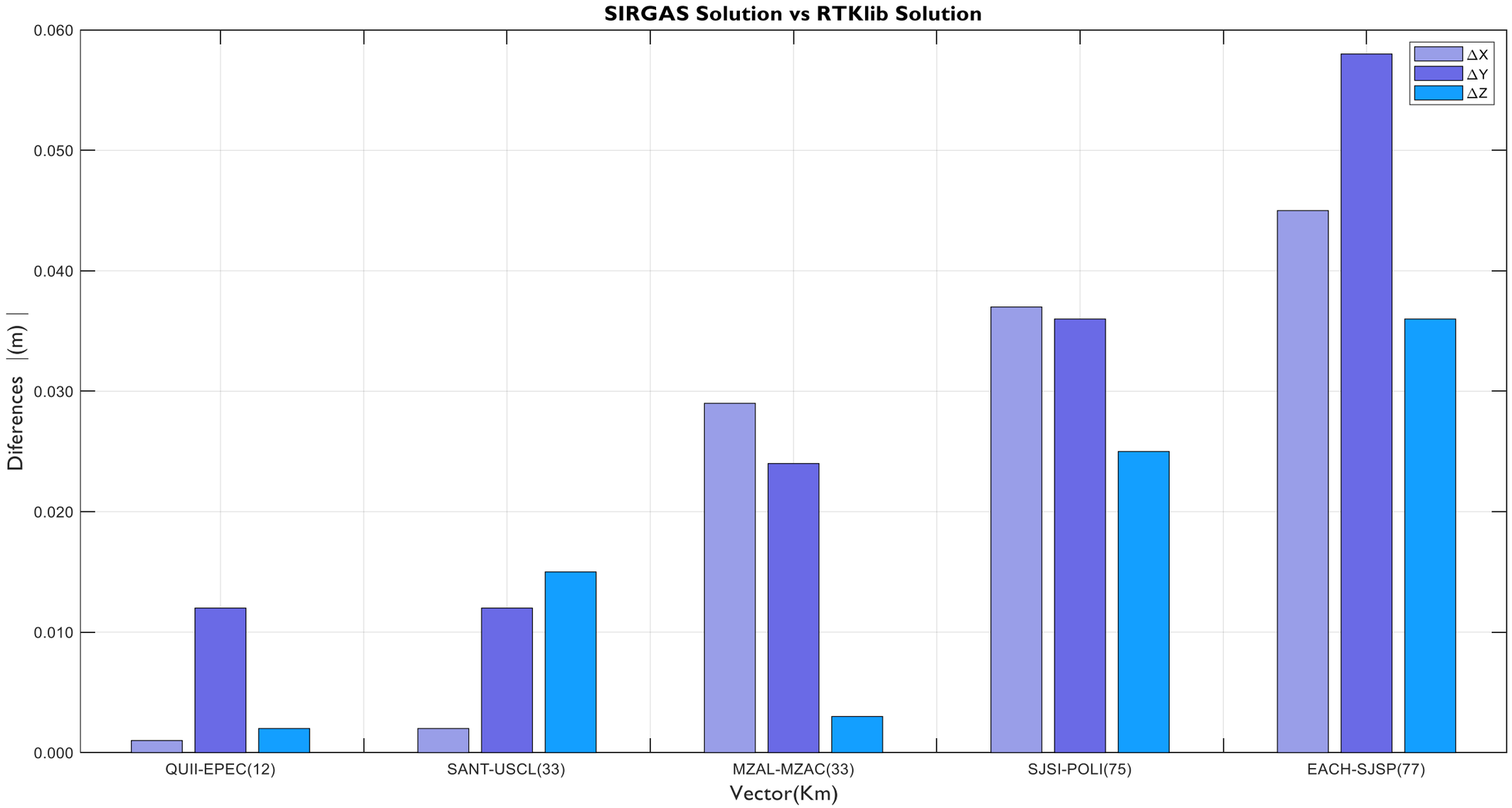

Options
Setting1
Setting2
Output
Stats
Positions
Files
Misc
Rover
RINEX Header Position
-90.000000000
0.000000000
-6378137.0000
Antenna Type (*: Auto)
Delta-E/N/U (m)
0.0000
0.0000
0.0000
Base Station
X/Y/Z-ECEF (m)
1272867.2654
-6252771.9793
-23801.5908
Antenna Type (*: Auto)
Delta-E/N/U (m)
0.0000
0.0000
0.0000
Station Position File
Load...
Save...
OK
Cancel

SANT-USCL

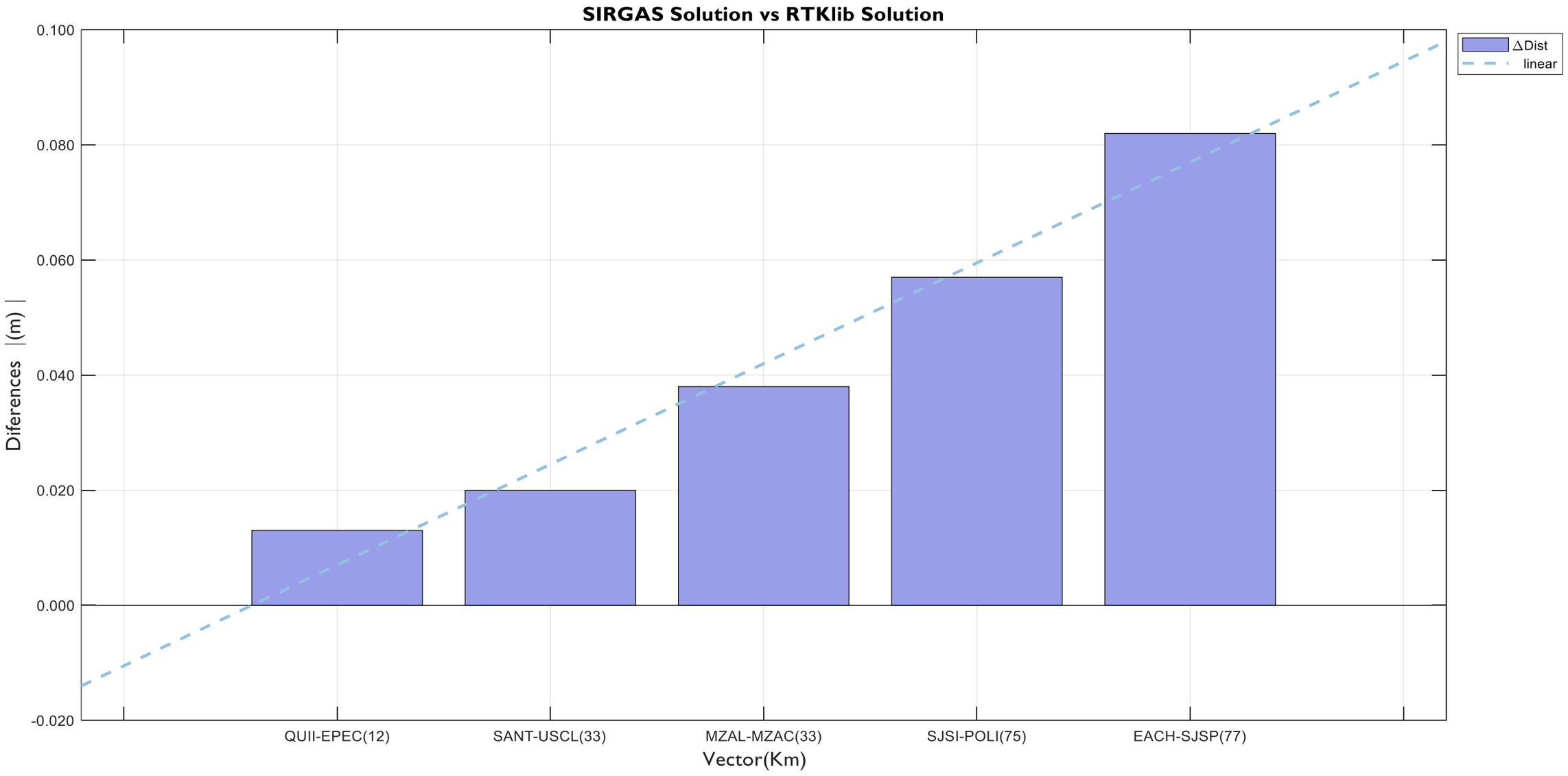
Venezuela
Colombia
Guyana
Surinam
Guayana Francesa (Francia)
EPEC
Ecuador
Perú
Brasil
Bolivia
Paraguay
SPS1
EACH
MZAL
MZAC
SANT
USCL
Chile
Argentina
UYCO
AGGO
Islas Malvinas (RU)
0 300 600 km


RTKLIB v.2.4.2
Time Start (GPST)
Time End (GPST)
Interval
Unit
2019/01/20 00:00:00
2019/01/20 03:00:00
24 H
RINEX OBS: Rover
C:\rtklib_2.4.2\datos\uscl0990.20o
RINEX OBS: Base Station
C:\rtklib_2.4.2\datos\sant0990.20o
RINEX *NAV/CLK, SP3, IONEX or SBS/EMS
C:\rtklib_2.4.2\datos\brdc0990.20n
C:\rtklib_2.4.2\datos\igs21003.sp3
Solution
Dir C:\Users\Cristian Rojas\Documents\TONGOY
C:\rtklib_2.4.2\datos\uscl0990_REL.pos
done
Plot... View... To KML... Options... Execute Exit
Options
Setting1 Setting2 Output Stats Positions Files Misc
Positioning Mode Static
Frequencies / Filter Type L1+2 Forward
Elevation Mask (°) / SNR Mask (dBHz) 3
Rec Dynamics / Earth Tides Correction OFF Solid/OTL
Ionosphere Correction Estimate STEC
Troposphere Correction Estimate ZTD+Grad
Satellite Ephemeris/Clock Precise
Sat PCV Rec PCV PhWindup Reject Ecl RAIM FDE
Excluded Satellites (+PRN: Included)
GPS GLO Galileo QZSS SBAS BeiDou
Load... Save... OK Cancel
Integer Ambiguity Res (GPS/GLO/BDS) Fix ar ON ON
Min Ratio to Fix Ambiguity 3
Min Confidence / Max FCB to Fix Amb 0.9999 0.2
Min Lock / Elevation (°) to Fix Amb 0 0
Min Fix / Elevation (°) to Hold Amb 10 0
Outage to Reset Amb/Slip Thres (m) 5 0.050
Max Age of Diff (s) / Sync Solution 30.0 ON
Reject Threshold of GDOP/Innov (m) 30.0 30.0
Number of Filter Iteration 1
Baseline Length Constraint (m) 0.000 0.000
Rover
RINEX Header Position
-90.000000000 0.000000000 -6378137.0000
Antenna Type (*: Auto) Delta-E/N/U (m)
* 0.0000 0.0000 0.0000
Base Station
X/Y/Z-ECEF (m)
1769693.4475 -5044574.2998 -3468320.8815
Antenna Type (*: Auto) Delta-E/N/U (m)
* 0.0000 0.0000 0.0614
Station Position File

Resultados y verificación



Resultados y verificación



Dudas?

SIRGAS
www.sirgas.org

IAG

INSTITUTO PANAMERICANO DE GEOGRAFIA E HISTORIA
OEA

www.sirgas.org

¡Gracias!

Thank you!

SIRGAS
www.sirgas.org

IAG

INSTITUTO PANAMERICANO DE GEOGRAFIA E HISTORIA
OEA

www.sirgas.org