The logo for the National Oceanography Centre, featuring a square with a white top half and a blue bottom half, with the text "National Oceanography Centre" in black on the blue background.

National
Oceanography
Centre

A background image of ocean waves with white foam, overlaid with a solid blue horizontal band.

INTRODUCTION TO GNSS AND GNSS-IR : DATA AND APPLICATIONS



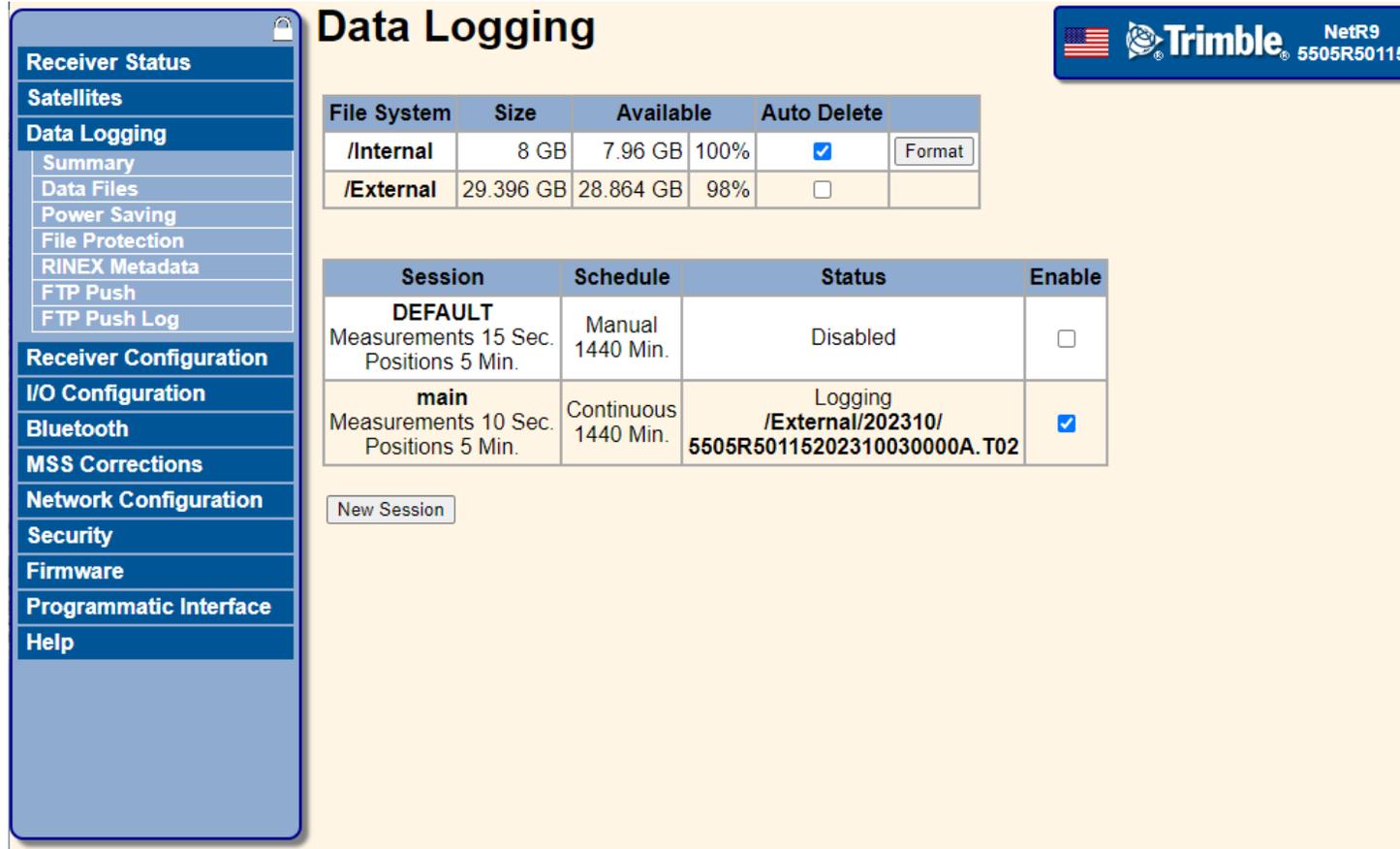
In addition to the radar gauge [3] the portagauge also has a geodetic quality GNSS unit [Trimble Alloy] and GNSS Antenna [1].

The primary purpose of the GNSS system is to record the position of the system and measure the stability of the system over time

The instructions for connecting with the Trimble are in the Portagauge installation and operations instructions

A secondary operations is as a secondary tide gauge channel using GNSS-IR if possible in the location

If you needed to access the Trimble via the built in web interface you will see something similar to this..





File System	Size	Available	Auto Delete	
/Internal	8 GB	7.96 GB 100%	<input checked="" type="checkbox"/>	Format
/External	29.396 GB	28.864 GB 98%	<input type="checkbox"/>	

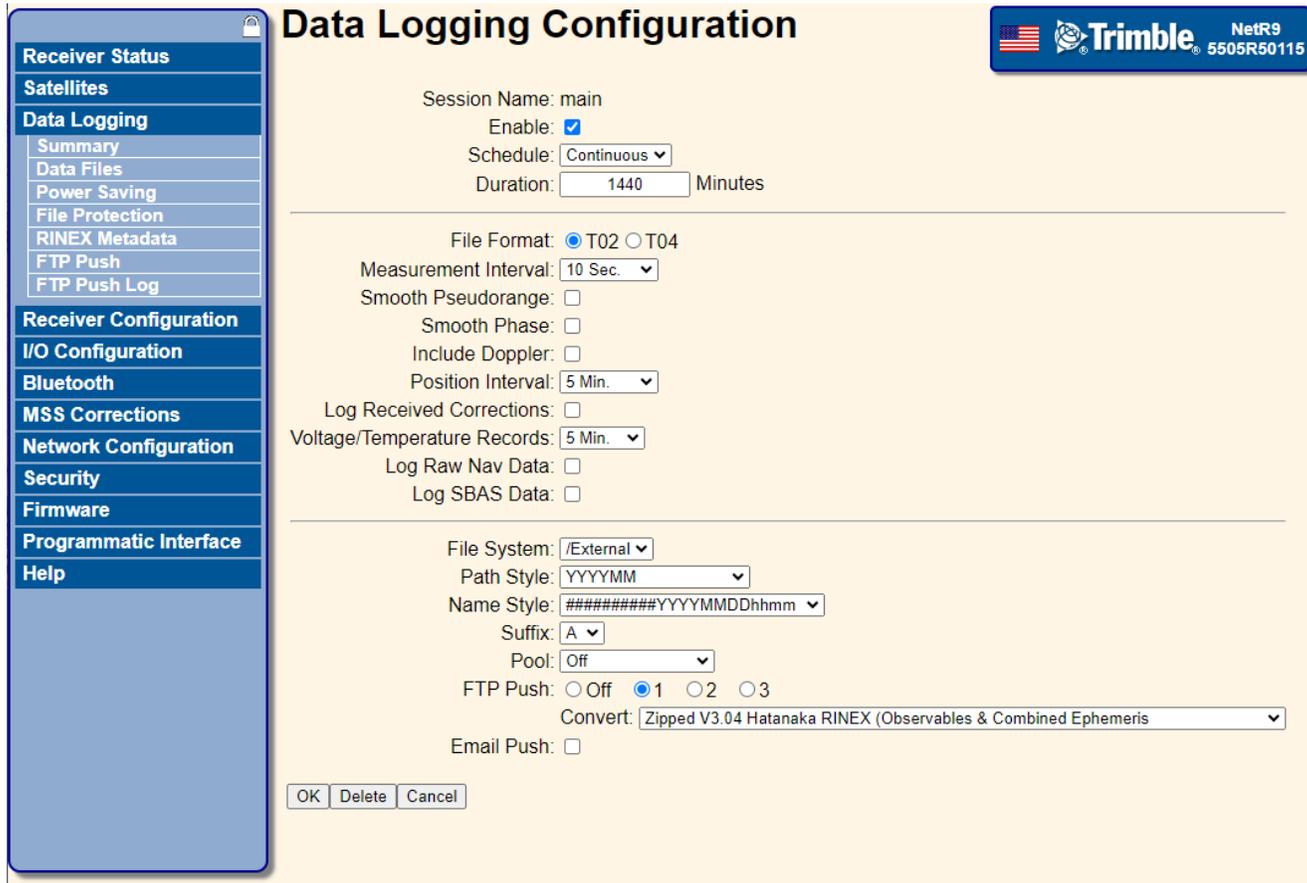
Session	Schedule	Status	Enable
DEFAULT Measurements 15 Sec. Positions 5 Min.	Manual 1440 Min.	Disabled	<input type="checkbox"/>
main Measurements 10 Sec. Positions 5 Min.	Continuous 1440 Min.	Logging /External/202310/ 5505R50115202310030000A.T02	<input checked="" type="checkbox"/>

New Session

Note that this system is taking a measurement every 10 second continuously over 24 hours.

It stores it on the file system as a Trimble Native Binary file : T02

You might want to change the duration and measurement interval.



Data Logging Configuration Trimble NetR9 5505R50115

Session Name: main
 Enable:
 Schedule: Continuous
 Duration: 1440 Minutes

File Format: T02 T04
 Measurement Interval: 10 Sec.
 Smooth Pseudorange:
 Smooth Phase:
 Include Doppler:
 Position Interval: 5 Min.
 Log Received Corrections:
 Voltage/Temperature Records: 5 Min.
 Log Raw Nav Data:
 Log SBAS Data:

File System: /External
 Path Style: YYYYMM
 Name Style: #####YYYYMMDDhhmm
 Suffix: A
 Pool: Off
 FTP Push: Off 1 2 3
 Convert: Zipped V3.04 Hatanaka RINEX (Observables & Combined Ephemeris)
 Email Push:

OK Delete Cancel

You get to that by clicking on the session name on the previous data logging page

Note here we are telling the ftp system to push

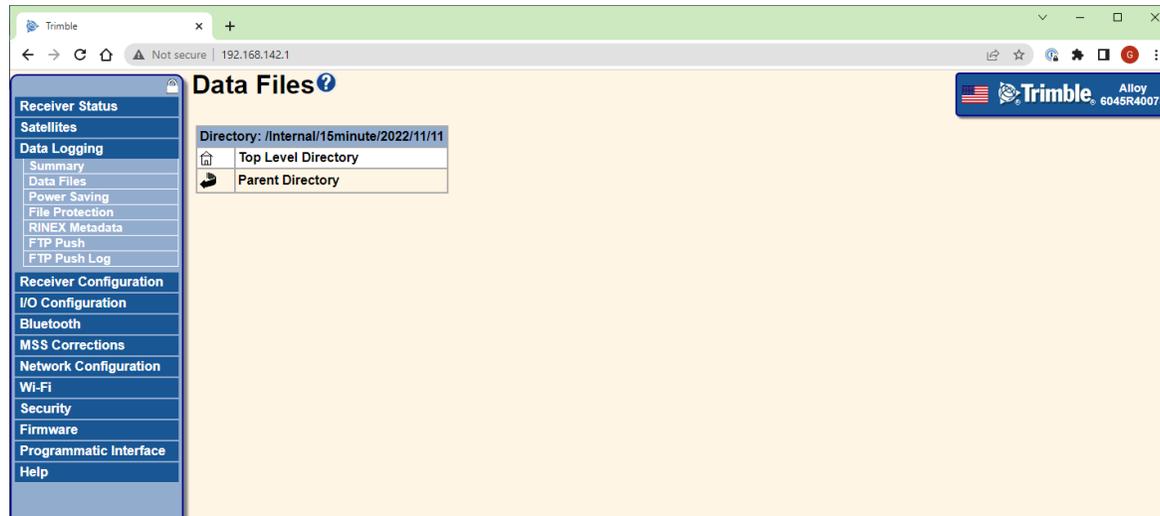
Zipped V3.04 Hatanaka RINEX

THIS IS IMPORTANT IF YOU WANT THE DATA TO BE PROCESSED FOR POSITIONING AND GNSS-IR

You can convert afterwards but this is the easiest option

DOWNLOAD GNSS DATA FROM PORTAGAUGE

- Either using wifi or ethernet cable



Identify the wanted files (named *6221R40032<YYYYMMDD>0000*) and transfer to laptop

DOWNLOAD GNSS DATA FROM PORTAGAUGE



- Either using wifi or ethernet cable
- Downloaded files should be 6221R40032<YYYYMMDD>0000
 - Inside SWIO00MDG_R_YYYYDDD0000_01D_15S_MO.crx and SWIO00MDG_R_YYYYDDD0000_01D_MN.rnx

Name	Date Modified	Size
6221R40032202306280000	Today at 14:19	18.2 MB
SWIO00MDG_R_20231790000_01D_15S_MO.crx	28 June 2023 at 00:00	14 MB
SWIO00MDG_R_20231790000_01D_MN.rnx	28 June 2023 at 00:00	4.2 MB

HOW DO I GET DAILY POSITION DATA (E.G. FOR LAND MOVEMENT)?



RINEX V3 files are the world standard for post-processing GNSS data.

There are many software packages available to process GNSS data

Some are commercial, some research grade and some hobbyist packages

Whatever software package you have to have some prior knowledge of GNSS positioning in order to get a “correct” result.

However there are also several on-line systems that do the work for you, such as

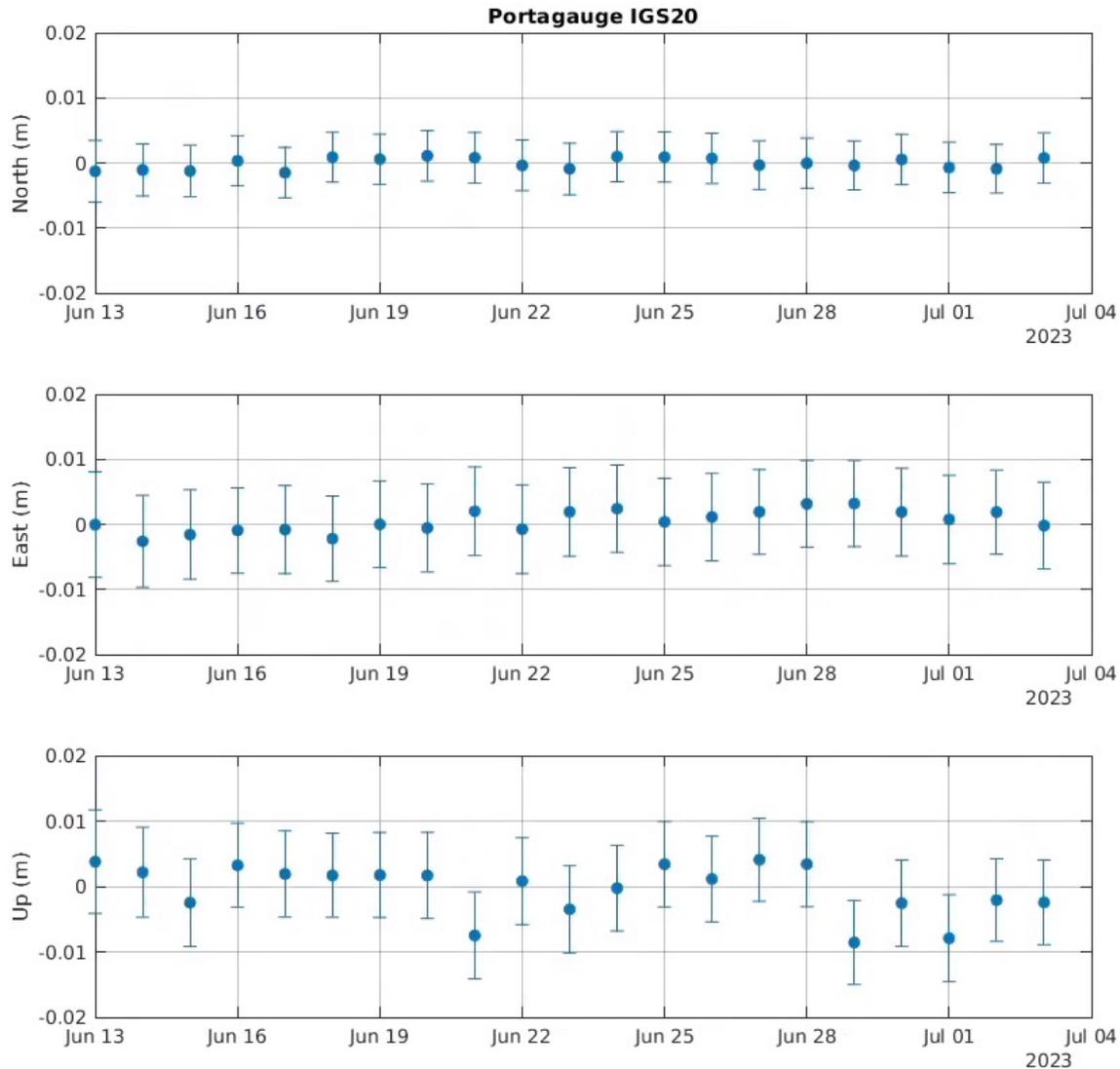
JPL APPS <http://pppx.gdgps.net>

AUSPOS <http://gnss.ga.gov.au/auspos>

CSRS-PPP <https://webapp.csrscs.nrcan-rncan.gc.ca/geod/tools-outils/ppp.php>

You generally just submit the RINEX file and your e-mail address and it returns the result

Canadian CSRS-PPP system



Processing mode

Static Kinematic

NAD83 ITRF

You want it in Static mode and in ITRF

- The epoch will be the same as the GPS data.
- A UTM zone will be calculated from the longitude.

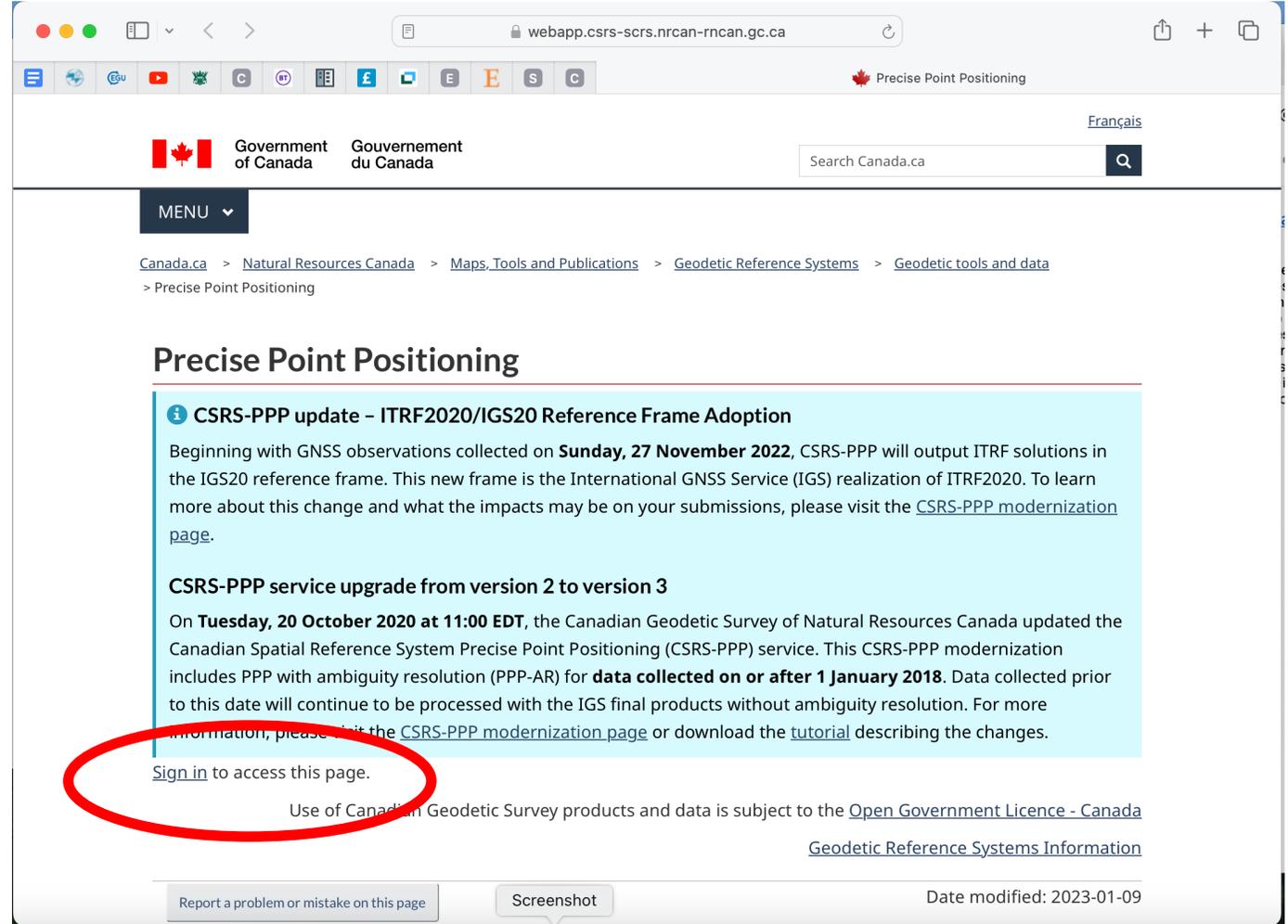
RINEX observation file(s), 300 MB max (.zip, .gz, .Z, .tar, .??O)

Note: You may submit multiple RINEX files in a single .zip or .tar archive

Choose File No file chosen

PROCESSING GNSS FILES USING CANADIAN SYSTEM: CSRS-PPP

- <https://webapp.csrscs.nrcan-rncan.gc.ca/geod/tools-outils/ppp.php>
- NB – you can choose to select French Language option!
- Click on “Sign in to access this page”



The screenshot shows a web browser window with the URL webapp.csrscs.nrcan-rncan.gc.ca. The page is titled "Precise Point Positioning" and features a navigation menu, a search bar, and a main content area. The main content area contains two news items: "CSRS-PPP update - ITRF2020/IGS20 Reference Frame Adoption" and "CSRS-PPP service upgrade from version 2 to version 3". A red circle highlights the "Sign in to access this page." link at the bottom of the page.

Government of Canada / Gouvernement du Canada

Search Canada.ca

Franglais

MENU

Canada.ca > Natural Resources Canada > Maps, Tools and Publications > Geodetic Reference Systems > Geodetic tools and data > Precise Point Positioning

Precise Point Positioning

CSRS-PPP update - ITRF2020/IGS20 Reference Frame Adoption

Beginning with GNSS observations collected on **Sunday, 27 November 2022**, CSRS-PPP will output ITRF solutions in the IGS20 reference frame. This new frame is the International GNSS Service (IGS) realization of ITRF2020. To learn more about this change and what the impacts may be on your submissions, please visit the [CSRS-PPP modernization page](#).

CSRS-PPP service upgrade from version 2 to version 3

On **Tuesday, 20 October 2020 at 11:00 EDT**, the Canadian Geodetic Survey of Natural Resources Canada updated the Canadian Spatial Reference System Precise Point Positioning (CSRS-PPP) service. This CSRS-PPP modernization includes PPP with ambiguity resolution (PPP-AR) for **data collected on or after 1 January 2018**. Data collected prior to this date will continue to be processed with the IGS final products without ambiguity resolution. For more information, please visit the [CSRS-PPP modernization page](#) or download the [tutorial](#) describing the changes.

[Sign in to access this page.](#)

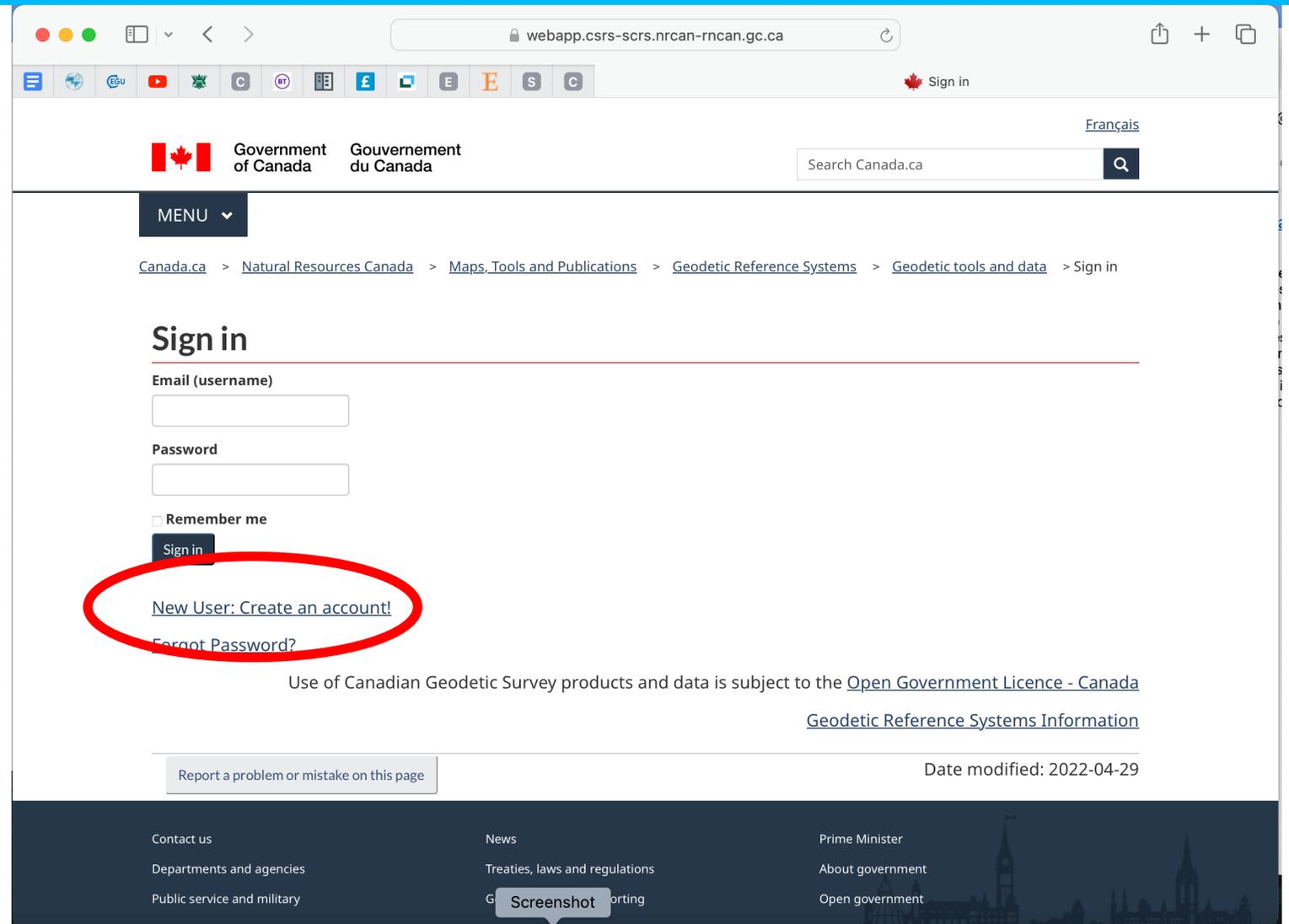
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[Geodetic Reference Systems Information](#)

Report a problem or mistake on this page | Screenshot | Date modified: 2023-01-09

PROCESSING GNSS FILES CONT. (2)

- New User: Create an account!
 - enter details and submit
 - receive email with link to activate your account



webapp.csr-scrs.nrcan-rncan.gc.ca

Sign in

Frçais

Search Canada.ca

MENU

Canada.ca > Natural Resources Canada > Maps, Tools and Publications > Geodetic Reference Systems > Geodetic tools and data > Sign in

Sign in

Email (username)

Password

Remember me

Sign in

[New User: Create an account!](#)

[Forgot Password?](#)

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PROCESSING GNSS FILES CONT. (3)



- Sign in
- Under “Access the tools”, click on Canadian Spatial Reference System Precise Point Positioning (???? – check)
- Scroll down
 - Click on ITRF
 - Under “RINEX observation file(s) – choose file to upload from your laptop
 - Click on Submit to PPP
- Wait for email with results

webapp.csr-scrs.nrcan-rncan.gc.ca

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Franglais

Search Canada.ca

MENU

Canada.ca > Natural Resources Canada > Maps, Tools and Publications > Geodetic Reference Systems > Geodetic tools and data > Precise Point Positioning

Precise Point Positioning

CSRS-PPP update – ITRF2020/IGS20 Reference Frame Adoption
Beginning with GNSS observations collected on **Sunday, 27 November 2022**, CSRS-PPP will output ITRF solutions in the IGS20 reference frame. This new frame is the International GNSS Service (IGS) realization of ITRF2020. To learn more about this change and what the impacts may be on your submissions, please visit the [CSRS-PPP modernization page](#).

CSRS-PPP service upgrade from version 2 to version 3
On **Tuesday, 20 October 2020 at 11:00 EDT**, the Canadian Geodetic Survey of Natural Resources Canada updated the Canadian Spatial Reference System Precise Point Positioning (CSRS-PPP) service. This CSRS-PPP modernization includes PPP with ambiguity resolution (PPP-AR) for **data collected on or after 1 January 2018**. Data collected prior to this date will continue to be processed with the IGS final products without ambiguity resolution. For more information, please visit the [CSRS-PPP modernization page](#) or download the [tutorial](#) describing the changes.

CSRS-PPP Files Processed (Last Updated: 2024-01-30 14:33:02 GMT)

▶ Help for CSRS PPP (Updated 2023-01-09) Profile Sign out

Email for results (required)
d.cotton@satoc.eu

Processing mode
 Kinematic
 ITRF
the same as the GPS data.
• A UTM zone will be calculated from the longitude.

Vertical datum
CGVD2013

Contribute to passive control maintenance? (What is this?)
Authorize the Canadian Geodetic Survey to archive and publish CSRS-PPP submission and solution
Official Canadian federal or provincial geodetic marker number

▶ More options

RINEX observation file(s), 300 MB max (.zip, .gz, .z, .tar, .7z)
Note: You may submit multiple RINEX files in a single .zip or .tar archive
Choose file: no file selected
Remove files from the queue

Submit to PPP

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[Geodetic Reference Systems Information](#)

PROCESSING GNSS FILES CONT. (4)



Do Not Reply / Ne Pas Répondre <DoNotReply-NePasRepondre@nrcan-rncan.gc.ca>
 CSRS-PPP SPARK Results for SWIO00MDG_R_20231790000_01D_15S_MO
 To: Home <cd.cotton@satoc.eu>

CSRS-PPP SPARK Latest update: **2023-01-09**
 CSRS-PPP SPARK [Latest news](#)
 Software Version: **3.54.2**

CSRS-PPP SPARK Results for **SWIO00MDG_R_20231790000_01D_15S_MO.crx.gz** [full_output.zip](#)

SWIO00MDG_R_20231790000_01D_15S_MO.crx [summary](#) [graphics](#) [residuals](#) [GPS & GLONASS NRCan/IGS Final](#)

Warning : Your high-rate static dataset has been decimated to 30 seconds. For more information, please visit the [CSRS-PPP update page](#)
 Warning : Your high-rate static dataset has been decimated to 30 seconds. For more information, please visit the [CSRS-PPP update page](#)

Natural Resources Canada does not assume any liability deemed to have been caused directly or indirectly by any content of its CSRS-PPP online precise positioning service.

To contact us
geodeticinformation-information@geodesique@nrcan-rncan.gc.ca

full_output

Back/Forward Wavemill Mission Requirements (Oct issue) Comment: RSU MASTER.xls CP4

Name	Date Modified
errors.txt	Today at 09:10
output_descriptions.txt	Today at 09:10
SWIO00MDG_R_20231790000_01D_15S_MO.clk	Today at 09:10
SWIO00MDG_R_20231790000_01D_15S_MO.csv	Today at 09:10
SWIO00MDG_R_20231790000_01D_15S_MO.pdf	Today at 09:10
SWIO00MDG_R_20231790000_01D_15S_MO.pos	Today at 09:10
SWIO00MDG_R_20231790000_01D_15S_MO.sum	Today at 09:10
SWIO00MDG_R_20231790000_01D_15S_MO.tro	Today at 09:10



CSRS-PPP 3.54.2 (2022-11-10)

SWIO00MDG_R_20231790000_01D_15S_MO.rnx
 SWIO00MDG



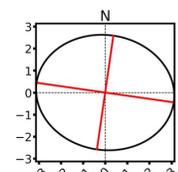
Data Start	Data End	Duration of Observations
2023-06-28 00:00:00.00	2023-06-28 23:59:30.00	23:59:30
Processing Time	14:10:47 UTC 2024/01/30	
Observations	Frequency	Mode
Phase and Code	Double	Static
Elevation Cut-Off	Rejected Epochs	Fixed Ambiguities
7.5 degrees	0.00 %	99.20 %
Antenna Model	APC to ARP	ARP to Marker
TRM57971.00 NONE	L1 = 0.064 m L2 = 0.058 m	H:0.000m / E:0.000m / N:0.000m

(APC = antenna phase center; ARP = antenna reference point)

Estimated Position for SWIO00MDG_R_20231790000_01D_15S_MO.rnx

	Latitude (+n)	Longitude (+e)	Ell. Height
ITRF20 (2023.5)	-18° 9' 26.00982"	49° 25' 27.37289"	-4.316 m
Sigmas(95%)	0.002 m	0.003 m	0.010 m
A priori*	-18° 9' 26.00200"	49° 25' 27.34829"	-5.877 m
Estimated - A priori	-0.240 m	0.723 m	1.561 m

95% Error Ellipse (mm)
 semi-major: 3 mm
 semi-minor: 3 mm
 semi-major azimuth: -81° 10' 24.99"



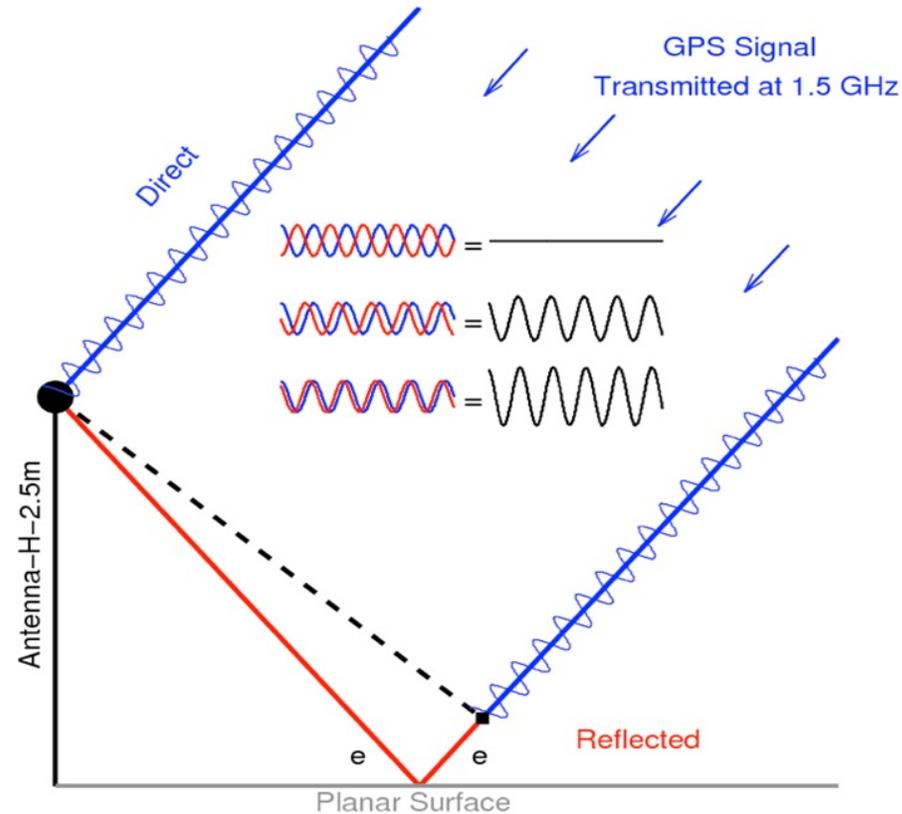
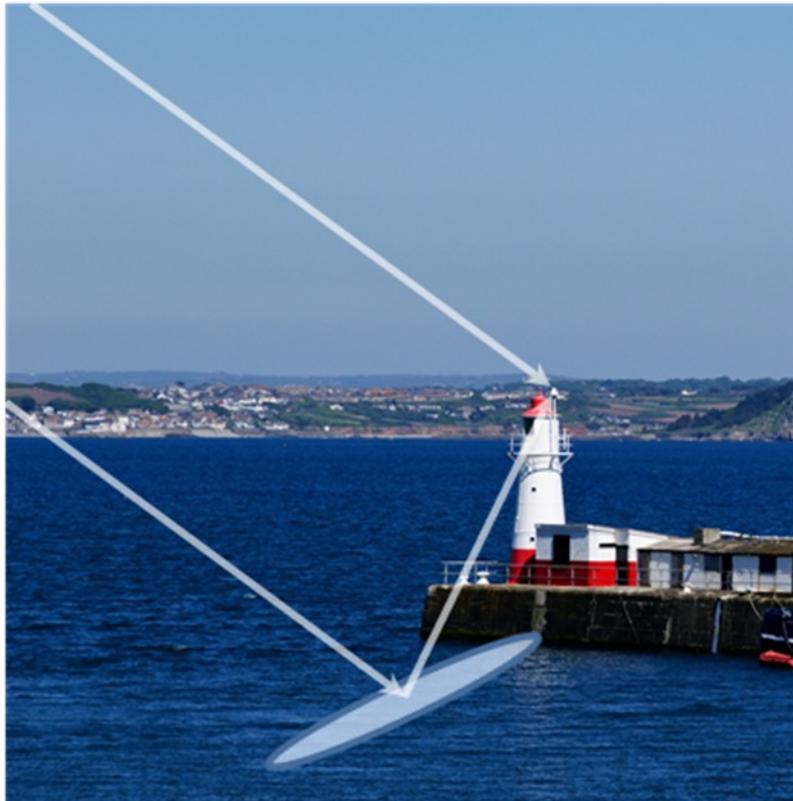
UTM (South) Zone 39

7991705.190 m (N)
 333320.527 m (E)

Scale Factors
 0.99994348 (point)
 0.99994416 (combined)

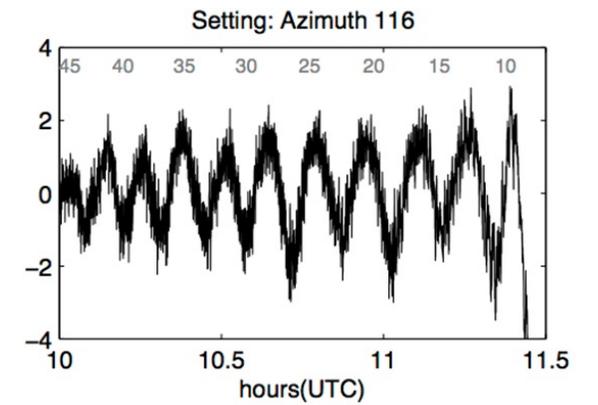
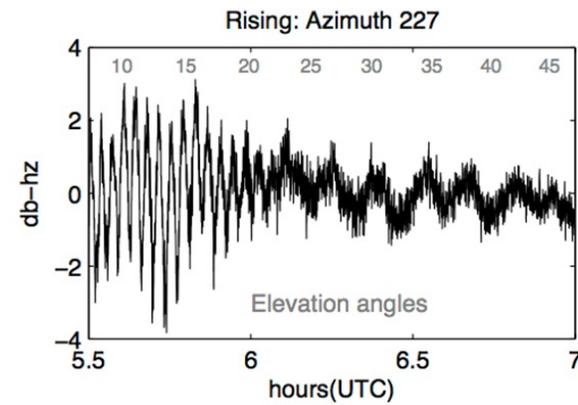
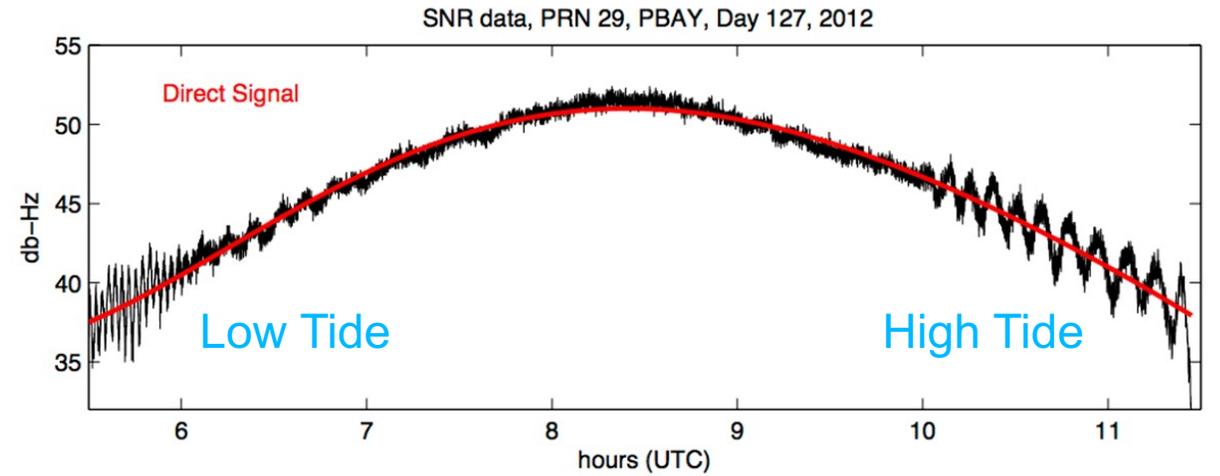
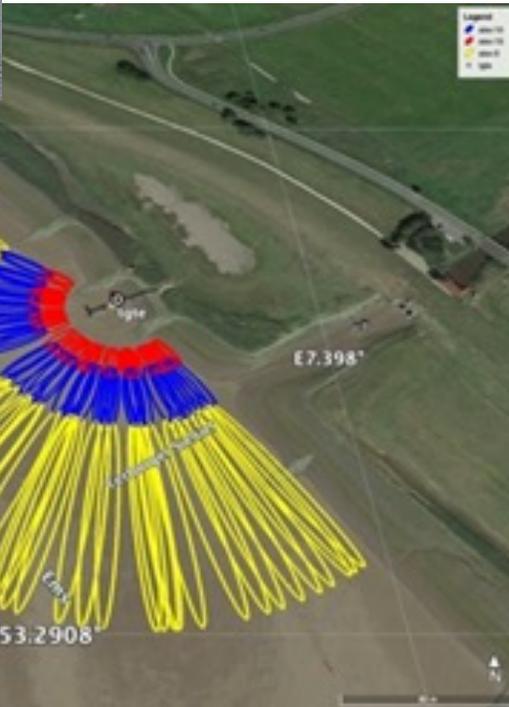
*(Coordinates from RINEX header used as a priori position)

GNSS-INTERFEROMETRIC REFLECTOMETRY (GNSS-IR)

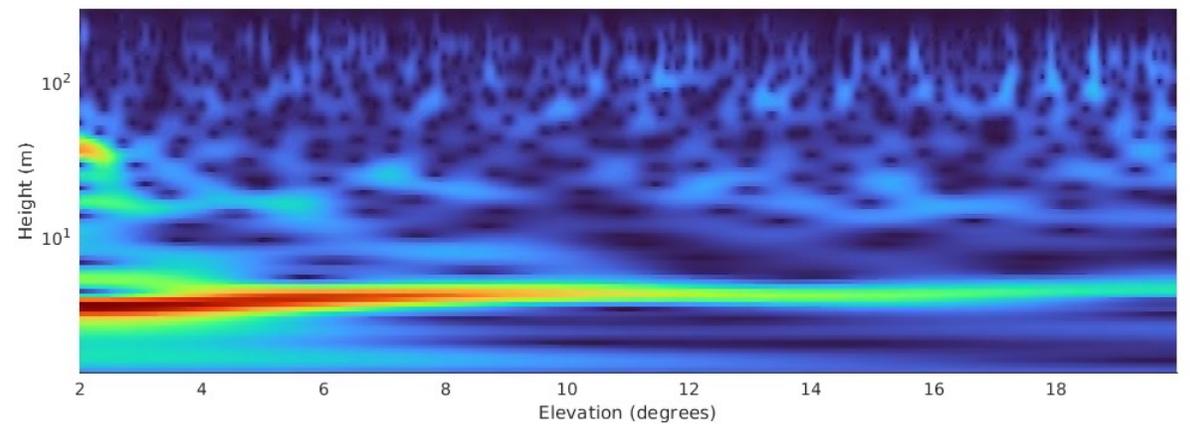
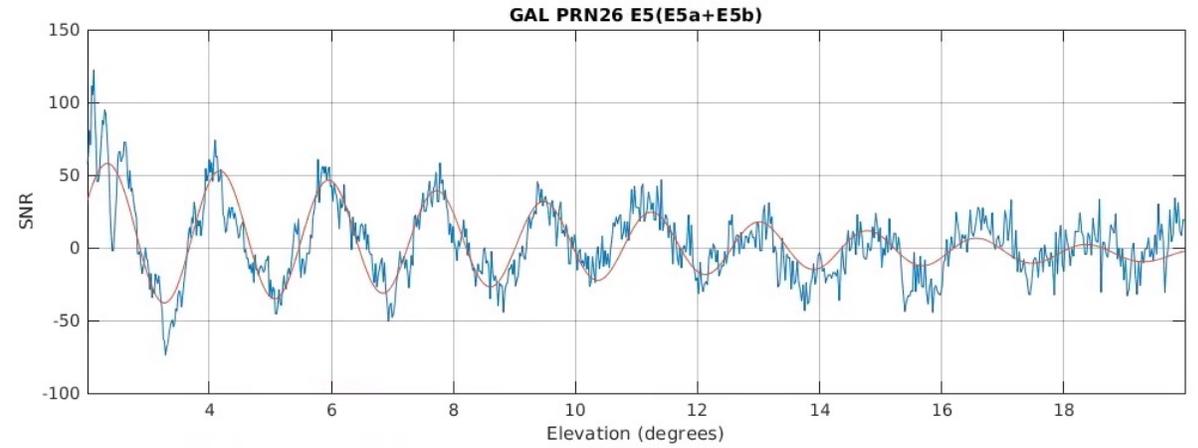
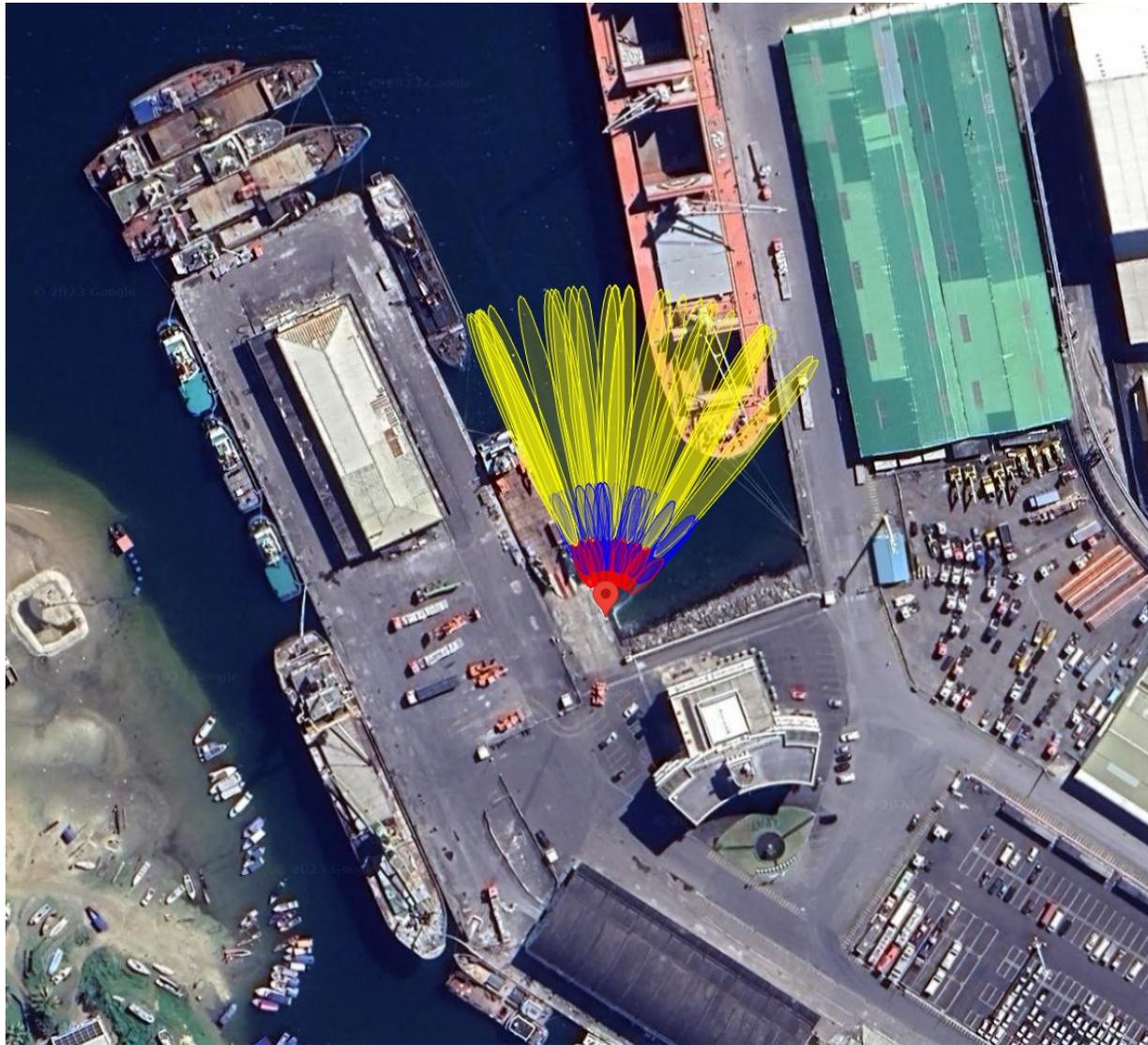


GNSS signals suffer from reflections from surfaces near to the antenna. This is called multipath and interference occurs between the direct and reflected signal. If we understand the interference effects on the signal for instance when the reflection is off a flat surface such as a body of water then we can use this to extract information about these surfaces. Therefore we can measure the height of the antenna above the water.

GNSS-INTERFEROMETRIC REFLECTOMETRY (GNSS-IR)

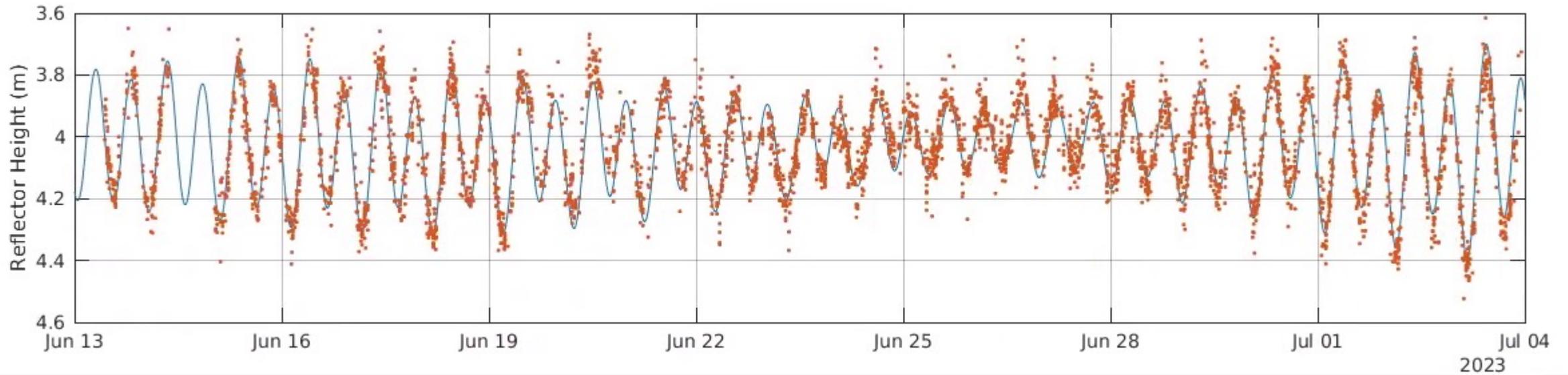


GNSS-IR from the Portagauge at Toamasina

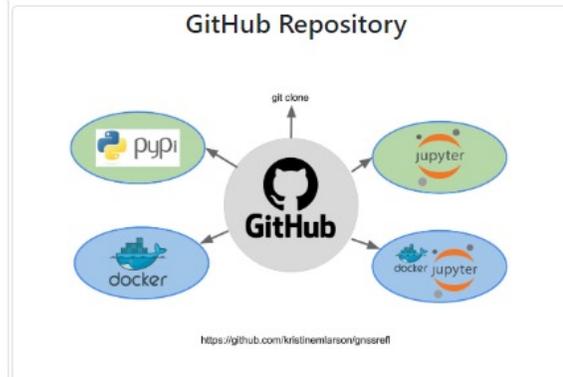
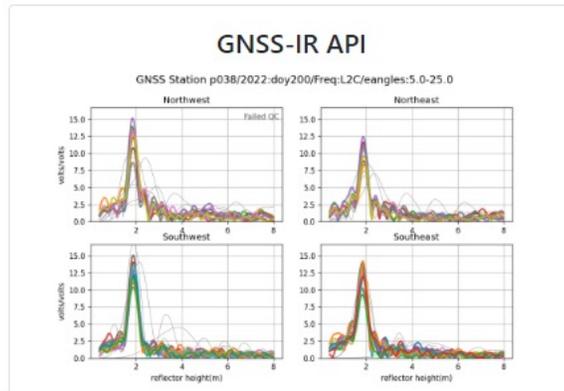


GNSS-IR from the Portagauge at Toamasina

Results from 21 days....
Black line is from a tidal prediction



GNSS Interferometric Reflectometry



GNSS-IR PORTAL

This portal contains water level data extracted from permanent GNSS receivers using interferometric reflectometry.

Get the data

- Explore available sites through an interactive map
- A list of GNSS-IR sites
- An example site page (Newlyn, UK)

About GNSS-IR

- What is GNSS-IR? A brief explanation
- What steps did we take to create these files?
- Interactive widget to help identify the footprint of a GNSS receiver

GNSS-IR is still very much “in development” but if you want more information and software then the best web site is

<https://gnss-reflections.org/>

There is software (python based), a link to the GNSS-IR portal at PSMSL, and examples and links

This link

<https://www.earthscope.org/event/2023-gnss-ir-short-course/>

Takes you to a course on GNSS-IR with presentations and videos

DIRECTLY DOWNLOADED FILES

- Directly Downloaded files are in a different format and must be converted to RINEX
 - 6221R40032YYYYMMDDHHHH.T02
- You need to download the RINEX conversion utility
 - https://forms.trimble.com/support_trl.aspx?Nav=Collection-40773&pt=Trimble%20RINEX
 - After installation it advises you must install the Trimble Configuration Utility, but that is not needed
- Open Convert to RINEX Utility
 - On tools / options select default format to be RINEX 3.04, and select input folder
 - On File, click open
 - Then after it has read the file, click on convert.
 - There are 5 output files, only the .23o file is needed