

National Report from Iceland

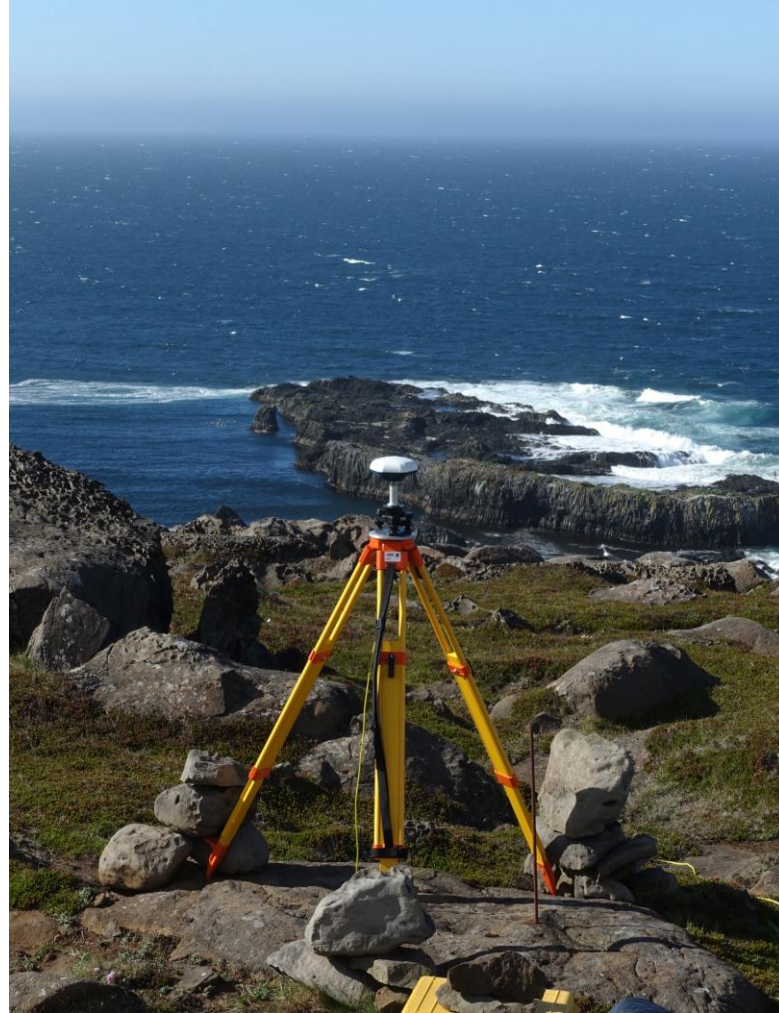
NKG WGFP meeting at NKG Science Week 2020

9. – 11. March 2020
Reykjavík, Iceland

Pórarinn Sigurðsson
National Land Survey of Iceland

Datum

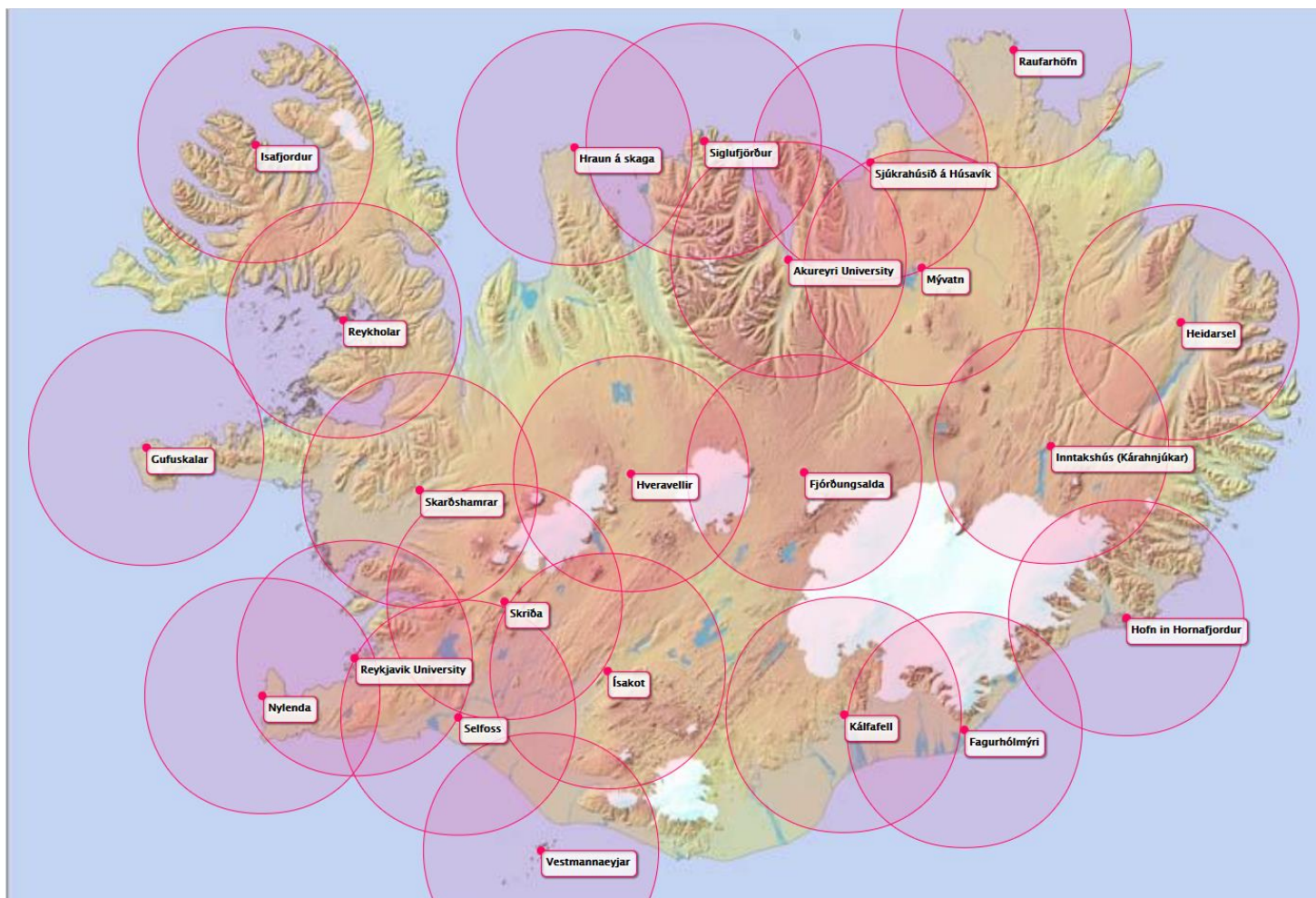
- Reykjavík 1900
- Hjörsey 1955
- ISN93
- ISN2004
- ISN2016



IceCORS - The Icelandic CORS system

- NLSI is building up a CORS system for Iceland
- We use GNSMART from Geo++
 - Today we are operating 23 stations
 - Installing two new stations a year
 - Planning to have 30-34 stations in the network
- Cooperation with the geophysical community
- Use of older GPS receivers
- All data are available free of charge

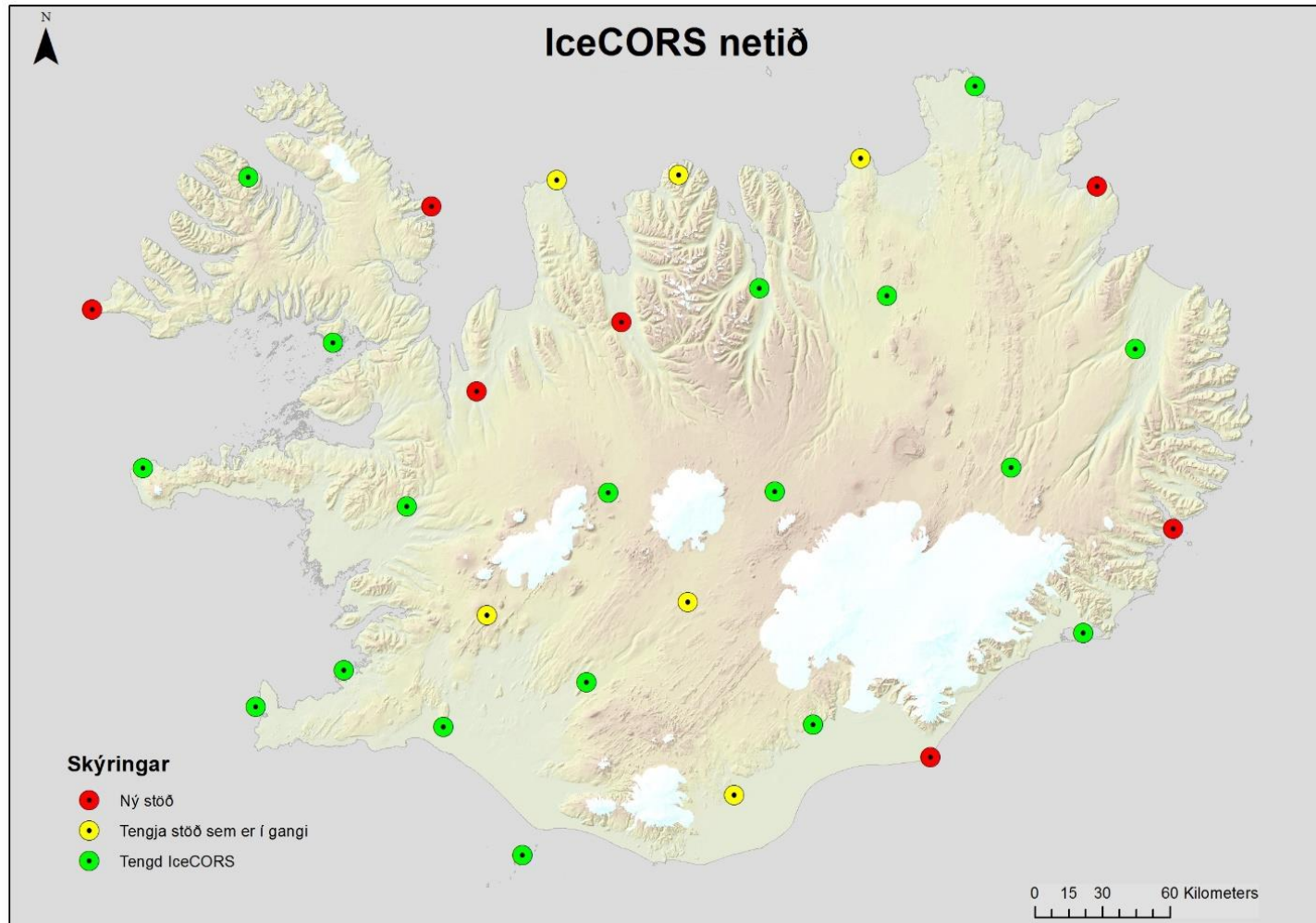
IceCORS – Today



IceCORS – Streams

- Network Solutions
 - VRS, epoch 2016.5
 - FKP, epoch 2016.5
 - Mac, epoch 2016.5
 - SSR, epoch “real time”
- Single Base Solutions
 - RTCM 2.3 og 3.0, epoch 2016.5

IceCORS Future




Long-term goals and measures for the next years

- Implementation of a new datum - ISN2016 Semi-Dynamic Datum
- Continue with establishment of the continuously operating reference stations network, IceCORS
- Maintenance/monitoring of the geodetic networks due to crustal deformation
 - ISN2016
 - ISH2004
 - IceCORS
- Create a database for “all” Icelandic geodetic benchmark
- To change GPS only stations to GPS+GLONASS???
- Apply ISAF/RHOL/GUSK/AKUR/HEID/SKHA for EPN stations if the stations will met the requirements.
- Dense the area near the REYK with mobile ref. stations to evaluate the corrections for VRS and SSR.
- New stations: VOGS and STKA

Web Applications

Cocodat- i

Transformation Tool Between Different Icelandic Datums – PROJ based

 Convert Single Coordinate Convert File here

Source

Reference Frame: ISN2016

Coordinate Format: LCC ⓘ

E: 0

N: 0

Height: 0 h

Convert

Target

Reference Frame: ISN2016


Coordinate Format: ISN93

Degrees Minutes Second

Latitude: Hjørsey

Longitude: ISN_DRF

Height: Reykjavik City h



Post – processing Services (IceCORS – PPS)

▼ About PPS (Updated 2019-05-26)

IceCORS-PPS is an online application for GPS and GLONASS data post-processing, that allows users to submit observation data in RINEX 2.x, and by using Orbit, Clock information, to improve the position of the observation point in the IGS14 Reference Frame.

[View Manual](#) for Post-processing Services (PPS)

▼ Number of points (*)

* Choose the number of points:

▼ Processing mode (*)

* Static

* Measurement type: dual frequency

* Orbits/Clocks used: COD final , COD rapid, COD ultra rapid, depending on your RINEX EPOCH. (Currently only COD final is used.)

* Min rate: 30sec (most base data is 30sec interval)

* Minimum data input: 1 hour. (.)

* (Currently only Rinex from year > 2009 are processed.)

RINEX EPOCH for all points:

Year (*) Month (*) Day (*) Week: (*) Day: (*)

▶ Ocean Loading File (.BLQ)

▶ Tectonic Plate name input (*)

▶ RINEX observation file (*) (.o)

▼ Results (*)

* Google Map url with the plotted trajectory/site.

* Coordinates output using 3 deg and 10 deg cutoff angle and in IGS14, user's RINEX epoch

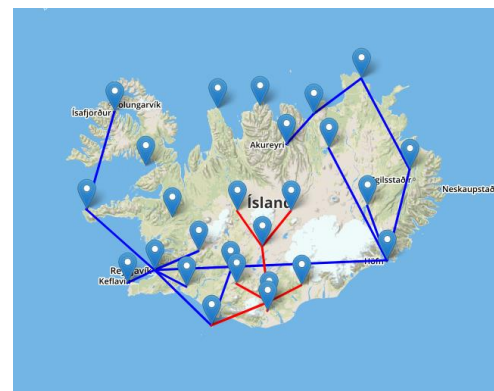
* Transformed coordinates into IGS14, epoch 2016.5 (ISN2016).

Send results to e-mail (*)

I agree to let LMI use the inputed RINEX files

{{msg}}

- RINEX2
- GPS+GLONASS
- The user can enter up to 6 points.
- In the background the Bernese software uses similar scripts as NKG GNSS AC
- The user will be provided with ISN2016 coordinates (PROJ based transformation)
- All 23 IceCORS stations are used as fixed. In the output the user gets the baseline map:



SBPPS (Short Baseline Post – Processing Services)

▼ About SBPPS (Updated 2019-08-07)

SBPPS is an online application for GNSS short baselines data post-processing, that allows users to submit observation data in RINEX 2.x for a rover station. The processing is automatically made with a selected nearest reference station from the ICECORS network. Wasoft software is used for processing.

[View Manual](#) for Short-Baseline Post-processing Services (SBPPS)

▼ Processing mode (*)

- * Static baseline processing by default
- * Min measurement duration: 1min.
- * Measurement type: dual frequency
- * Orbits used: final CODE ephemerides products for GPS+GLONASS or rapid igr for GPS only (if they are not available the broadcast ephemerides files are used instead of)
- * Satellite clock parameters: from the broadcast ephemerides file
- * GLONASS biases: biases will be taken into account, [read more](#). Rover receiver name must be on the list.
- * Ionospheric corrections: ionospheric model will be used in all cases
- * Antenna phase centre corrections: individual/absolute calibration file in ANTEX format will be used, [allowed antenna types](#).
- * Elevation mask angle: choose manually. (10 degrees is recommended)
- * Observation interval: smallest common multiple of the epoch intervals of the observation files.
- * The year of measurement must be greater than 2009.

Day of the measurement:

Year (*) 2019 Month (*) 03 Day (*) 06

Processing option:

Minimal Elevation of RINEX data (*) 3

► RINEX observation file (*) (.o)

▼ Results (*)

* Coordinates output in ISN2016 datum, epoch 2016.5

Send results to e-mail (*)

I agree to let LMI use the inputted RINEX files

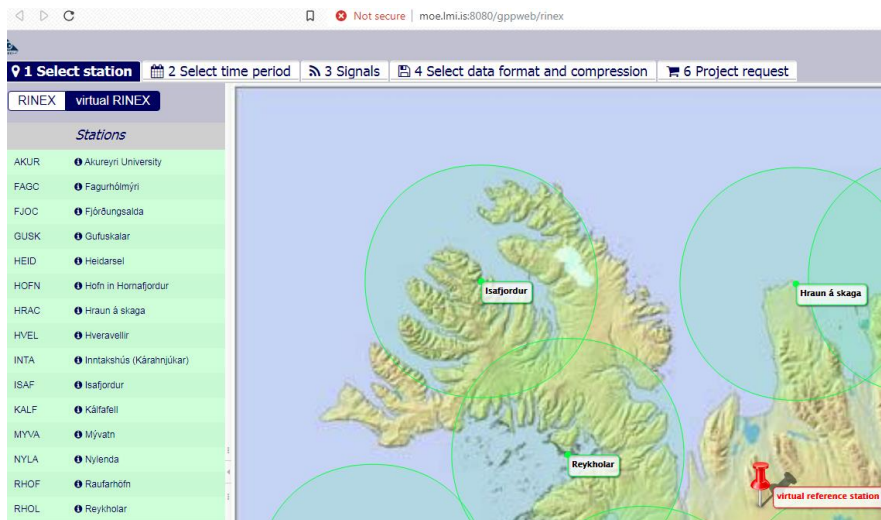
CALCULATE

- RINEX2
- GPS+GLONASS
- User can enter only 1 point.
- One of the nearest IceCORS station will be selected as base station.
- In the background the WaSofst, the baseline processing engine Wa2 is used. Files ANTEX/SP3/IONEX/Tropospheric Model (GPT/Saastamoinen standard model with GMF mapping function)
- Prepared for dual-frequency observations.
- Can be used for Static and Kinematic measurements.
- Output: solution type FixedLo (+tropo). Tropospheric modelling: estimation of relative zenith delays.
- The user will be provided with ISN2016 coordinates.

Virtual RINEX

Advantage of virtual RINEX compared to original RINEX is the absence of station dependent errors (phase center variations, far-field and near-field multipath). Due to the processing of several reference stations and the state space representation, the virtual RINEX is free or greatly reduced of any station dependent errors. The noise of the observation is lower. Hence it is often better than original RINEX.

SSR files is used to generate "virtual observations", so called "Virtual RINEX files" for a given station location anywhere within the network area.



GPPNULLANTENNA indicate that no additional phase and offset adjustment are needed.

Approximate position is valid for ARP

Selecting Virtual Rinex using **red pin**, the xyz in the rinex file represent ITRF14 datum, in the epoch of the day you have selected Virtual Rinex.

1	2.11	OBSERVATION DATA	M	RINEX VERSION / TYPE
2	GN-RINEX 1.3	Geo++ GmbH	04-NOV-19 14:45	PGM / RUN BY / DATE
3	RXOZR XO 1.11w	Geo++ RX Converter	2019-11-04 14:47	COMMENT
4	VGUS			MARKER NAME
5	0000			MARKER NUMBER
6		Geo++ GmbH		OBSERVER / AGENCY
7	0	GPP srx2rx	05-Sep-2018	REC # / TYPE / VERS
8	0	GPPNULLANTENNA		ANT # / TYPE
9	2481296.9252 -1096817.3722 5753062.3836			APPROX POSITION XYZ
10	Info: APPROX POSITION is valid for: ARP			COMMENT
11	0.0000	0.0000	0.0000	ANTENNA: DELTA H/E/N
12	1	1		WAVELENGTH FACT L1/2
13	6	C1	L1 D1 P2 L2 D2	# / TYPES OF OBSERV
14	5			INTERVAL
15	2019	8	2 0 0 0.0000000	GPS
16	18			TIME OF FIRST OBS
17				LEAP SECONDS
				END OF HEADER

Testing Virtual RINEX

- Testing Epoch: 10.10.2019
- AKUR/GUSK/HEID.... , 24h, 15sec interval data used to calculate coordinates with Bernese for the testing epoch.
- In WaSoft, Virtual Rinex used for base station to calculate AKUR/GUSK/HEID.... coordinates.
- dx/dy/dz -> Bernese 24h output „minus“ WaSoft output.
- Different intervals tested.
- Different distances.

Conclusion:

- Virtual Rinex can be used but we need to make more tests regarding accuracy
- In most cases E and N components can be achieved up to 2cm and in height 3-4cm

	dx	dy	dz	Distance	Duration	Interval
AKUR	-0,005	0,000	-0,006	14,5km	24h	15sec
	-0,013	0,004	-0,011		15:00-15:05	
	-0,012	0,004	-0,007		15:00-15:10	
	-0,008	0,002	0,002		15:00-15:30	
	-0,014	0,006	-0,011		15:00-16:00	
GUSK	-0,006	-0,001	-0,003	54.3km	24h	15sec
	-0,006	-0,001	0,005		15:00-15:05	
	-0,002	-0,005	0,016		15:00-15:10	
	-0,002	0,000	0,013		15:00-15:30	
	-0,003	0,003	0,000		15:00-16:00	
HEID	-0,006	0,001	-0,006	43,8km	24h	15sec
	-0,010	0,006	-0,014		15:00-15:05	
	-0,006	0,006	-0,005		15:00-15:10	
	0,011	0,002	0,028		15:00-15:30	
	-0,001	0,003	0,011		15:00-16:00	
VMEY GPS only	-0,004	-0,001	-0,010	2,5km	24h	15sec
	0,011	-0,006	0,039		15:00-15:05	
	0,007	-0,004	0,030		15:00-15:10	
	0,001	-0,001	0,020		15:00-15:30	
	0,004	-0,001	0,020		15:00-16:00	
FJOC GPS only				7km	24h	1sec
	-0,020	0,007	-0,029		15:00-15:05	
	-0,011	0,005	-0,011		15:00-15:10	
	-0,031	0,011	-0,045		15:00-15:30	
	-0,022	0,009	-0,023		15:00-16:00	
MYVA	-0,003	0,000	-0,007	7,1km	24h	1sec
	0,001	0,000	0,003		15:00-15:05	
	-0,002	0,001	-0,002		15:00-15:10	
	-0,006	0,004	-0,010		15:00-15:30	
	-0,003	0,004	-0,003		15:00-16:00	
REYK	-0,006	-0,002	-0,008	20,3km	24h	1sec
	-0,002	0,008	0,006		15:00-15:05	
	0,002	0,006	0,012		15:00-15:10	
	-0,001	0,002	0,013		15:00-15:30	
	-0,001	0,003	0,010		15:00-16:00	

Thank you

thorarinn@lmi.is