



The GREAT Gravity Team

Isabelle Stern and Emily Kapr

Overview

Theory

Data Collection

Processing

Challenges

Takeaways

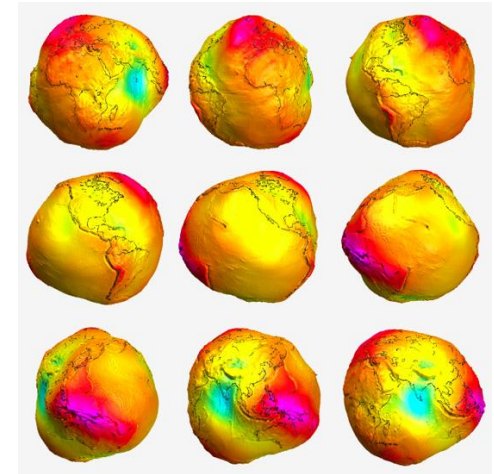
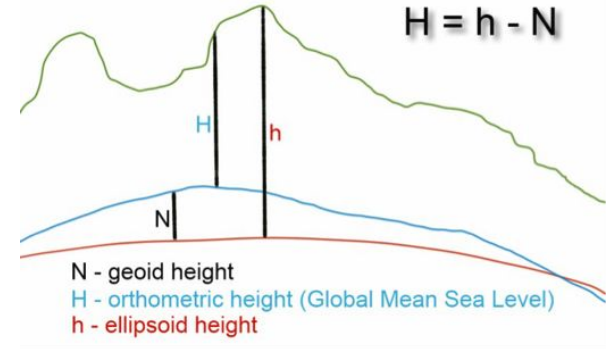
Moving Forward

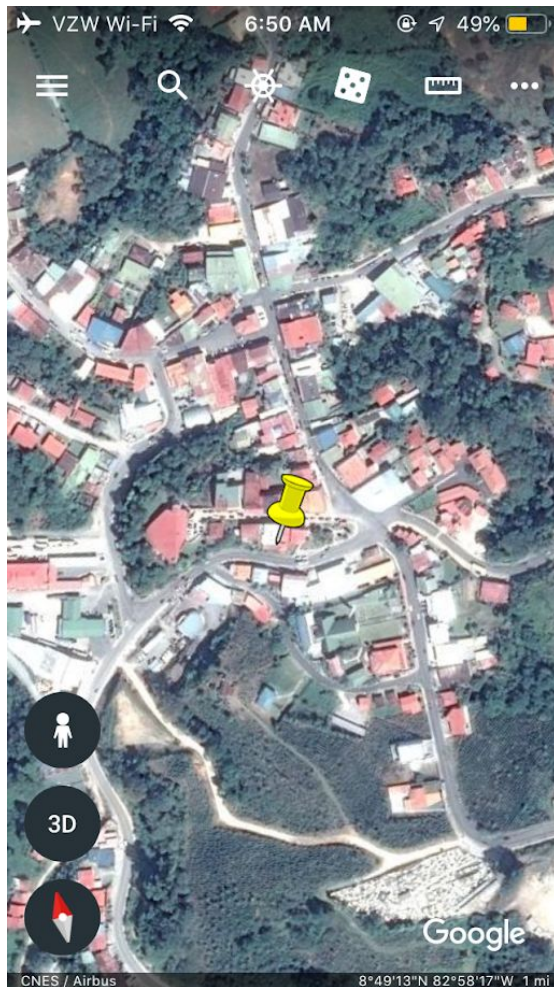
Final Remarks



Finding the perfect geoid model

- Global Geoid Models
 - EGM2008
 - EIGEN-6C4
 - GOCO
- Local Geoid Models → None
- Compare ellipsoid, topographical, and orthometric heights
- Global Navigation Satellite System
- Gravimeter readings





Benchmarks

- Installed mid 1900s
- Established by leveling/surveying
- Most destroyed from rebuilding
- Downloaded locations of these benchmarks onto QGIS maps

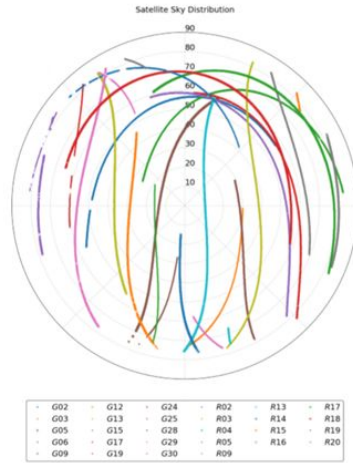
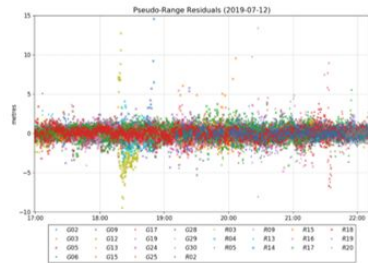
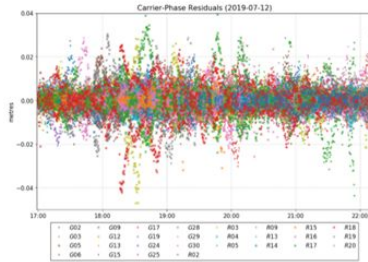


GNSS Field Work

- Must log 6 hours at each site (minimum)
 - Cerro de la Muerte
 - Volcan Irazu
- Helping the landslide team in San Vito



Precise Point Positioning



CSRS-PPP 2.26.1 (2019-05-31)



cdtm.19o
CDMT

Date Start: 2019-07-12 16:59:00.00
Processing Time: 00:53:22 UTC 2019/07/16
Observations: Phase and Code
Elevation Cut-Off: 7.5 degrees
Antenna Model: TRM55971.00

Date End: 2019-07-12 22:11:15.00
Frequency: Double
Rejected Epochs: 0.00 %
APC to ARP: L1 = 0.067 m L2 = 0.050 m

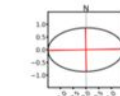
Duration of Observations: 5:12:15
Product Type: NRCan Rapid
Mode: Static
Estimation Steps: 15.00 sec
ARP to Marker: H: 1.009m / E: 0.000m / N: 0.000m

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

Estimated Position for cdtm.19o

	Latitude (+/-)	Longitude (+/-)	Ell. Height
ITRF14 (2019)	9° 33' 17.04665"	-83° 45' 19.65690"	3478.961 m
Sigma(95%)	0.007 m	0.012 m	0.027 m
A priori*	9° 33' 17.03448"	-83° 45' 19.64961"	3481.961 m
Estimated - A priori	0.374 m	-0.225 m	-3.000 m

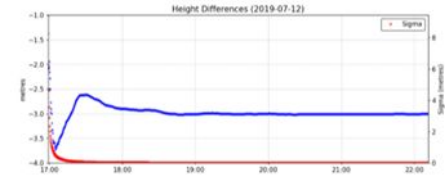
95% Error Ellipse (cm)
semi-major: 1.487 cm
semi-minor: 0.861 cm
semi-major azimuth: 88° 47' 31.58"



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

UTM (North) Zone 17

1057391.176 m (N)
197500.937 m (E)
Scale Factors:
1.000733 (point)
1.000163 (combined)



Natural Resources Canada



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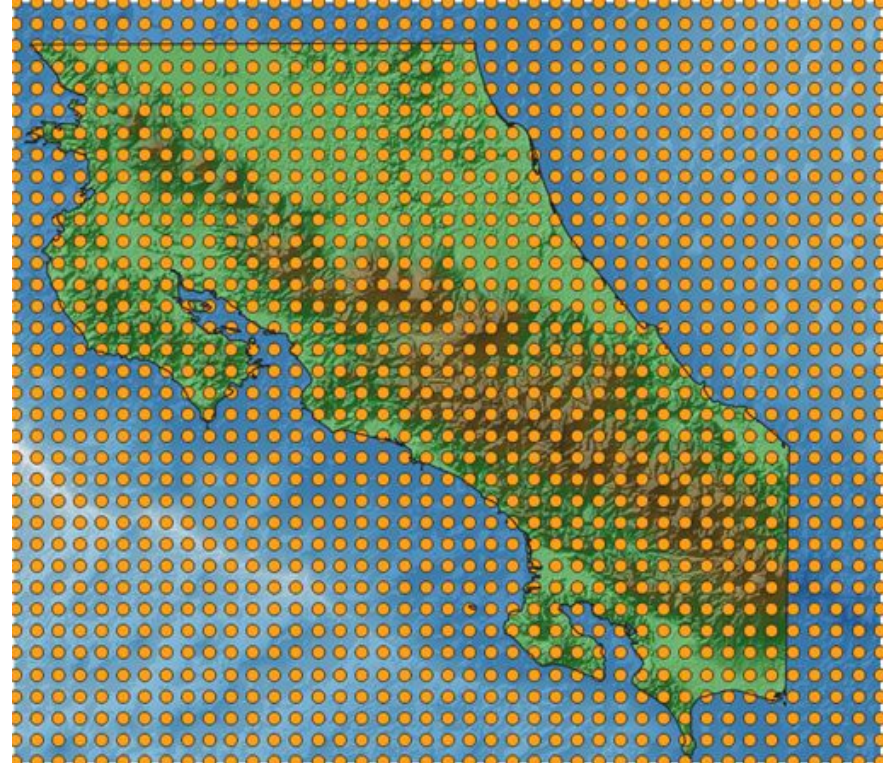
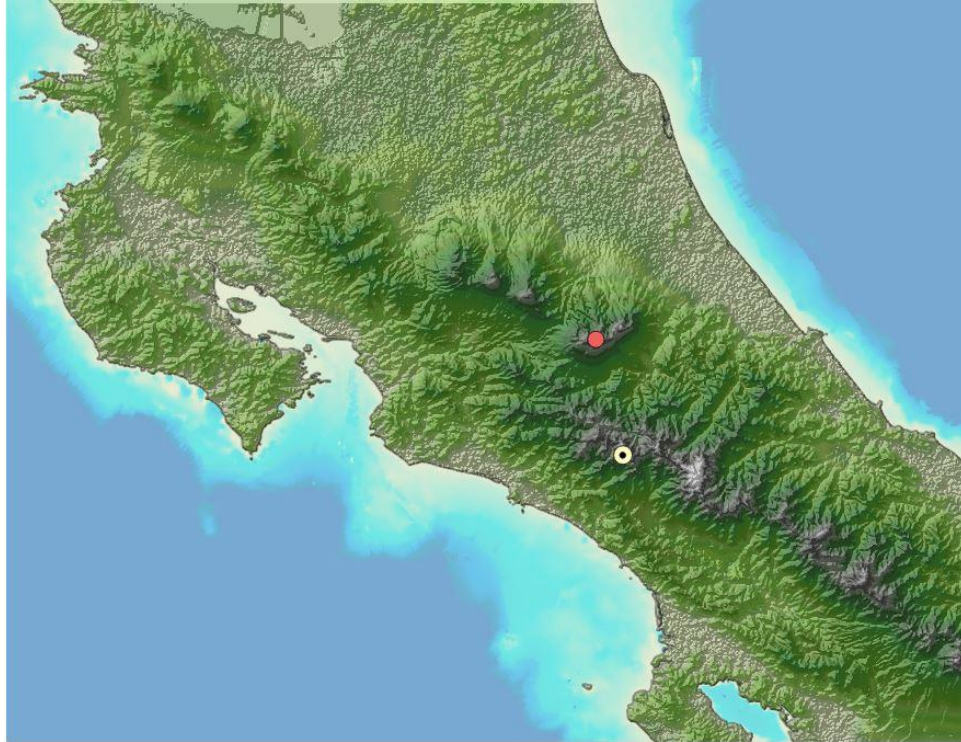
Precise Point Positioning

Notice to users of Canadian Geodetic Survey's tools and applications

To comply with [Information Technology Policy Implementation Notice Number 2018-01 from the Treasury Board of Canada Secretariat](#) regarding the use of [HTTPS protocol](#), the Canadian Geodetic Survey has to make modifications that could potentially impact some clients. To ensure you are not affected, please [download and install the latest version of PPPdirect](#) before **December 31, 2019**.

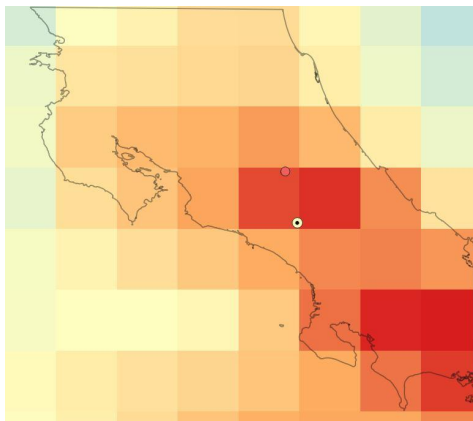
If your system **does not support TLS 1.2**, consider upgrading your operating system and/or web browser before December 31, 2019.

QGIS

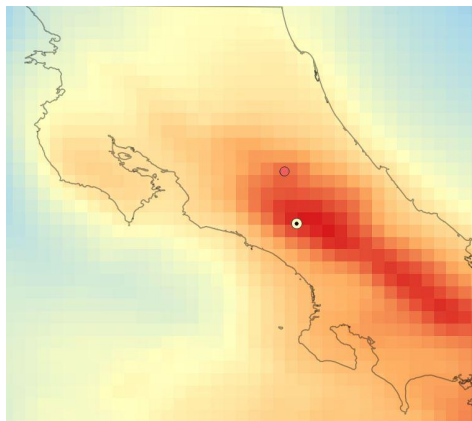


Post Processing (ICGEM)

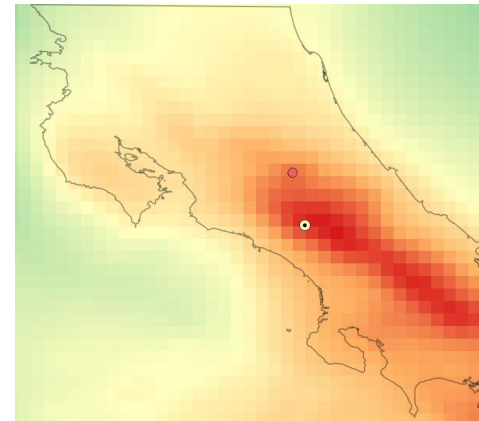
GOCO MAX



EGM08 MAX



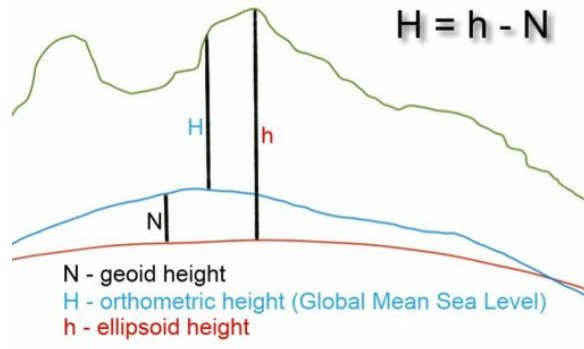
EIGN_6C4 MAX

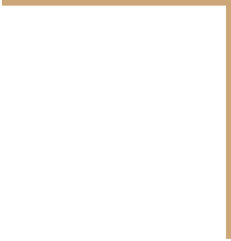


Interpretation Exercise

Geoid Heights (**N**) at Leveled Benchmarks

Name	Observed	EGM2008	Eigen6C4	GOCO	EGM300	Eigen-300
<i>Buena Vista</i>	18.19	17.83	17.81	16.83	15.99	15.34
<i>Summit</i>	12.99	15.35	15.33	14.73	15.34	-





What we are working on now...

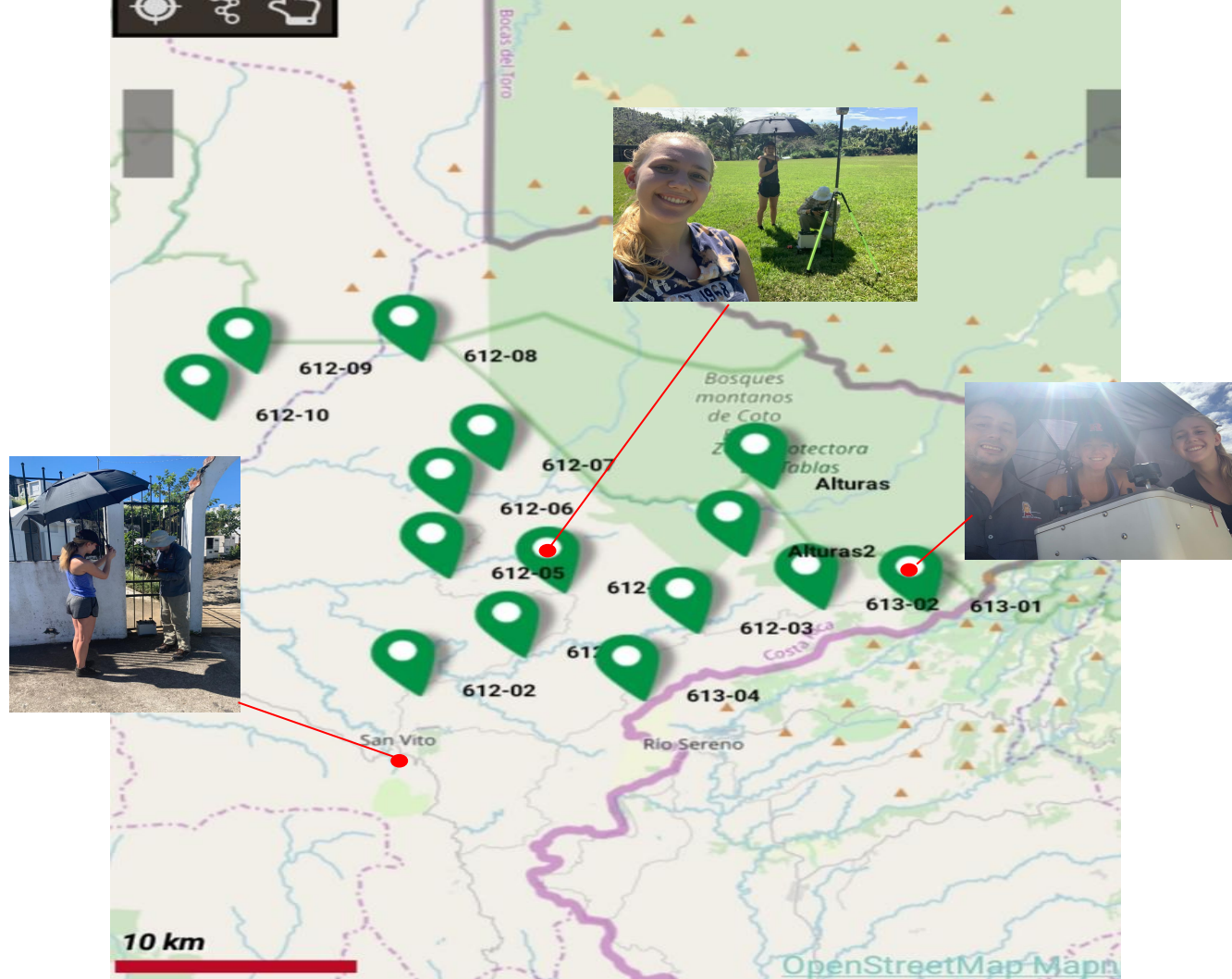


Gravimeter

- Measures gravity in relation to base point
- Gives information about composition of Earth below surface
 - Isostasy and geoid
- 18 base points around Costa Rica
- We used San Vito base to cover new areas in the Talamancas

All about coverage!





15

new sites added in the Talamanca
region this week!

Along Route 612 & 613

TEQC

- Translate, edit, and quality check GNSS data
- Introduction to Unix/Linux
- Useful for Topcon files not Trimble files

GAMIT

- *The point:* analyze GNSS data to study crustal deformation
- *The challenges:* Downloading and using it



Challenges

Working with Unix and GAMIT

Finding the benchmarks

Learning the theory

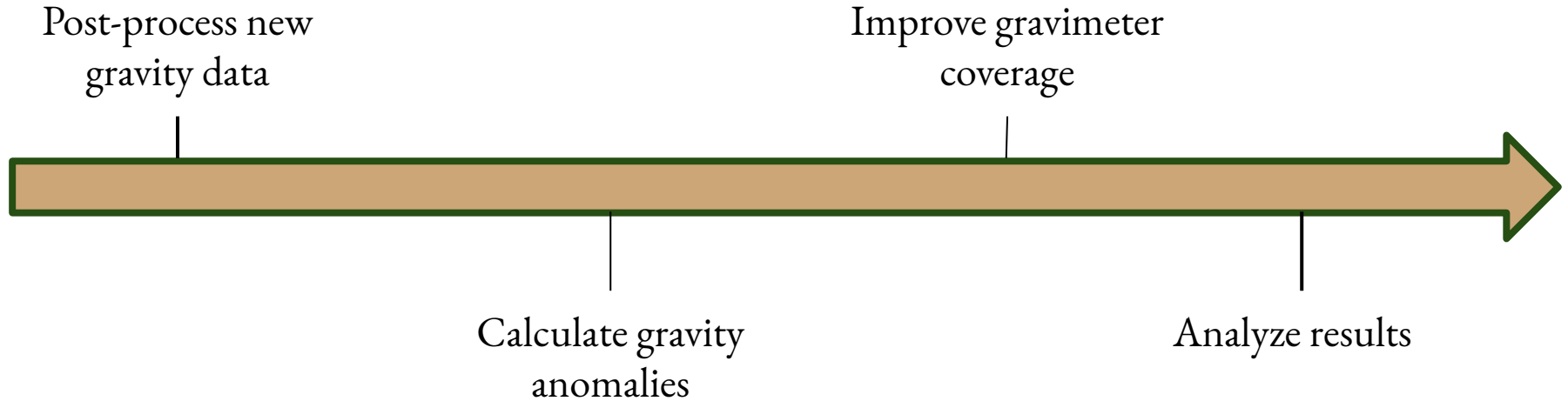
Time management at Rutgers

What we have learned

- Theory
- QGIS cartography
- Field work process
- Post-processing data
- Basic Unix commands



What the future holds



Final Remarks

Thank you

Vadim, Oscar, Paulo, Ivonne,
Alonso, Juan Luis, Krista,
Jaime, Alejandro, Pilar, Jenny,
The GREAT cohort, Chuck,
Catie, RSN staff

References

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