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Programa de Doctorado en Ingeniería

Línea de Investigación

Geotecnia y Riesgos Geoambientales

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Área Curricular de Ingeniería Civil y Agrícola
Facultad de Ingeniería
Sede Bogotá

UNIVERSIDAD NACIONAL DE COLOMBIA

Method for preparing inventories of terrestrial landslides with semi-automatic procedures: the case in the eastern central zone of the department of Cauca, Colombia

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Tutor: Carol Andrea Murillo Feo, PhD - Adviser: Luis Joel Martinez Martinez, MSc

Outline

- 1. Introduction
- 2. Theoretical perspective
- 3. Zone training model
- 4. Background
- 5. DEM accuracy assessment
- 6. Change detection
- 7. Morphometric analysis
- 8. Quality assessment of GPS georeferencing
- 9. Conclusions
- 10. Some references

Exploratory analysis

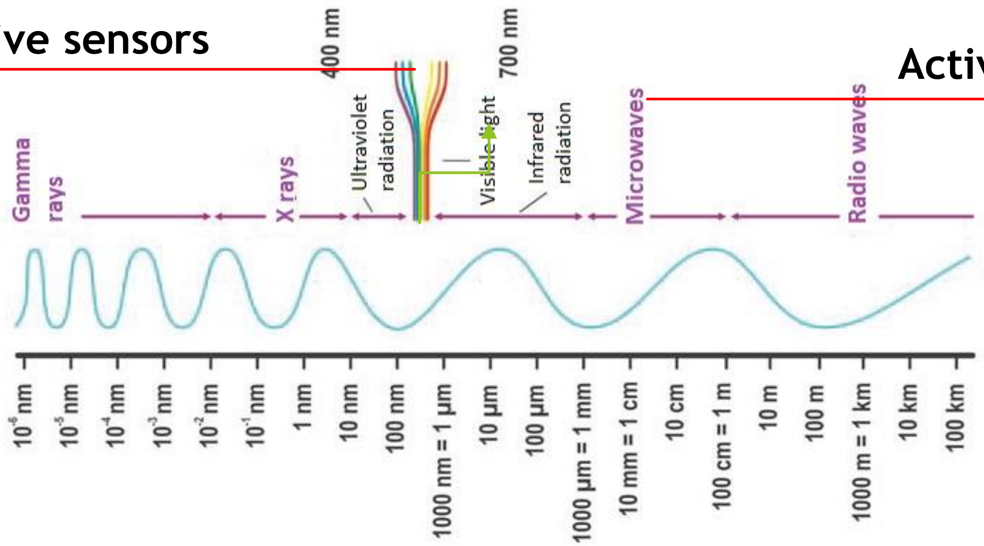
Introduction

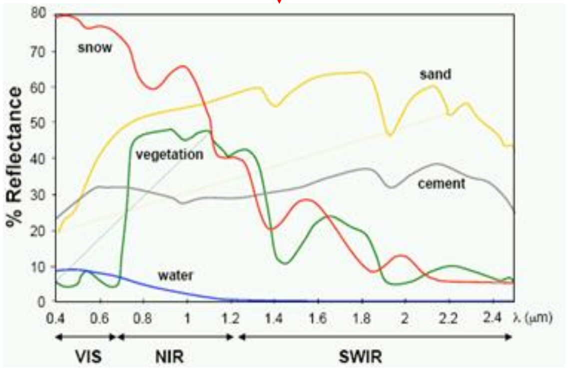
- Inventories, susceptibility, hazard and risk
- Landslide inventories with conventional methods
- Detecting remote of landslides with passive and active sensors
- In semi-automatic detection, brain functions for extracting objects are not fully understood.
- Hybrid approach:
  - Multi-sensor feature fusion
  - Multi-temporal feature fusion
  - Multi-resolution feature fusion
  - Multi-angular feature fusion

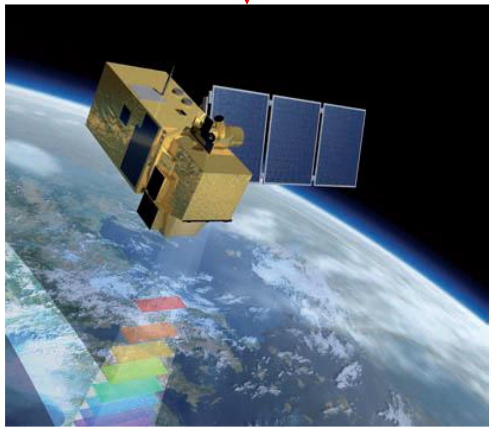
Theoretical perspective

Passive sensors

Active sensors







X band λ= 3 cm

L band λ= 27 cm

P band λ= 70 cm

Fusion approach

- Spectral and radiometric data
- Textural and coherence information of radar system
- Phase shifts of differential interferometry radar

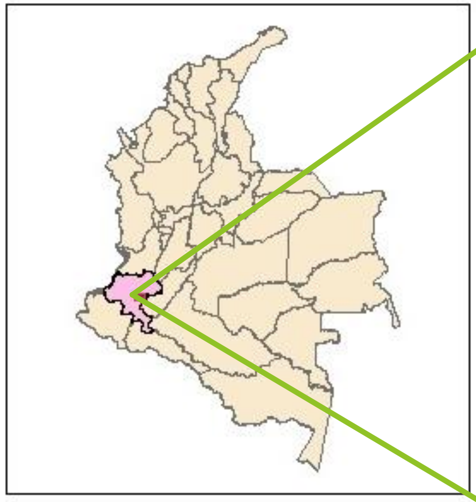
Pattern recognition techniques

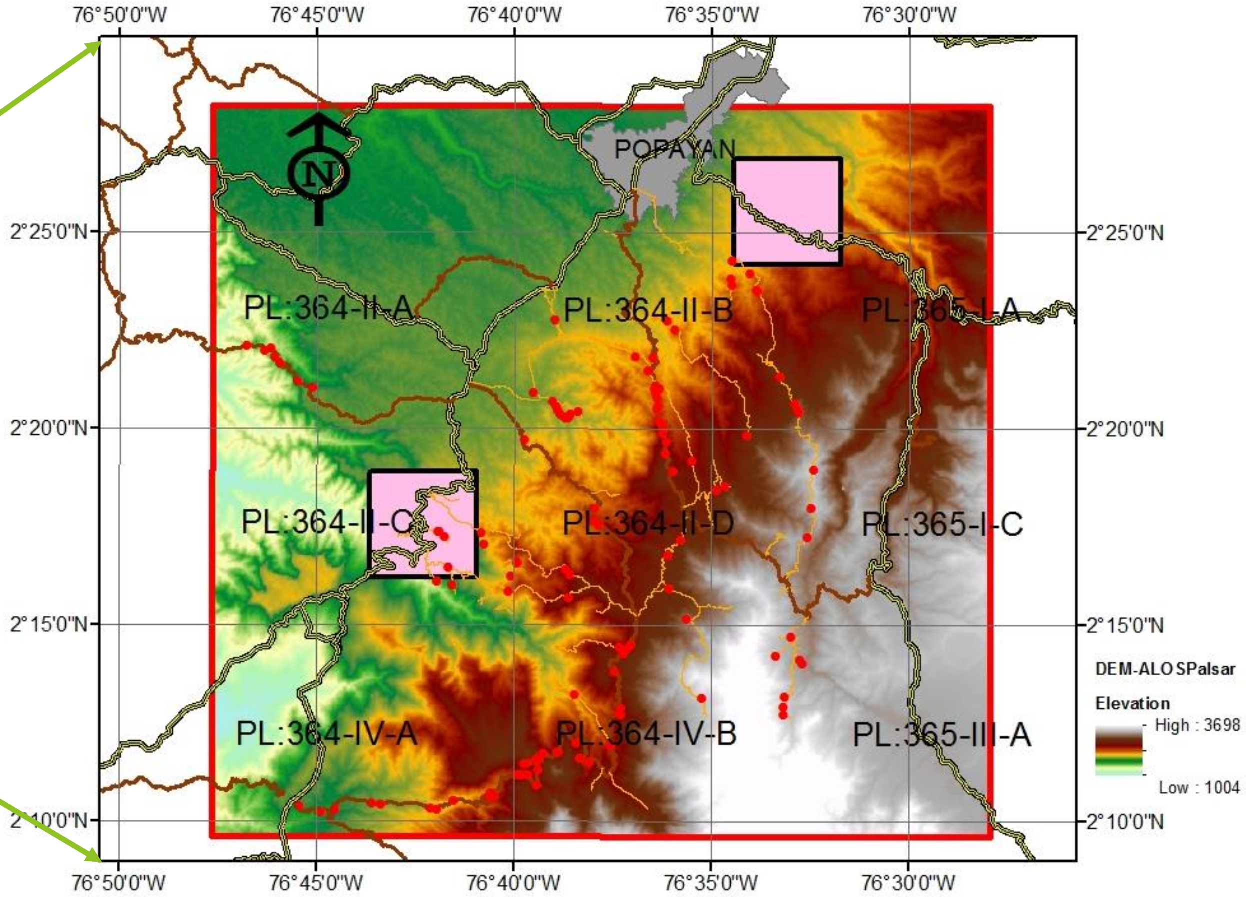
Semi-automatic recognition of landslides

DEM - INTERFEROMETRY RADAR

Zone training model

Cauca department

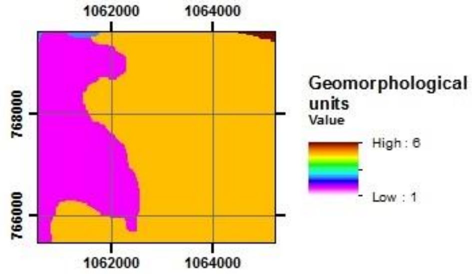


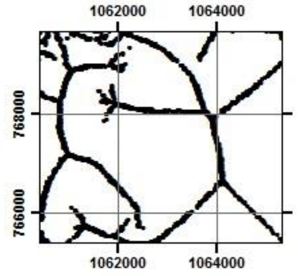


Background

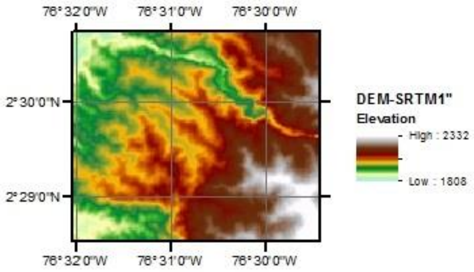
Semi-automatic classification of landforms

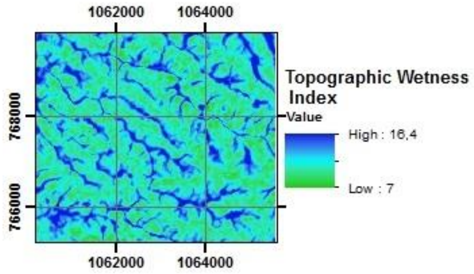
Geomorphometry
Multinomial logistic regression
Fuzzy c-means classification

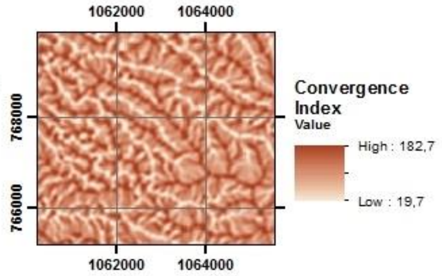


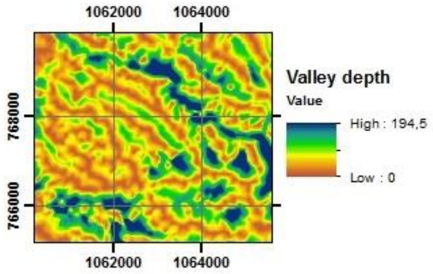


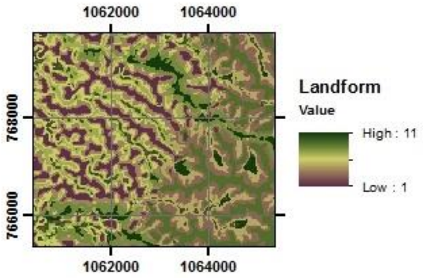
• Training points

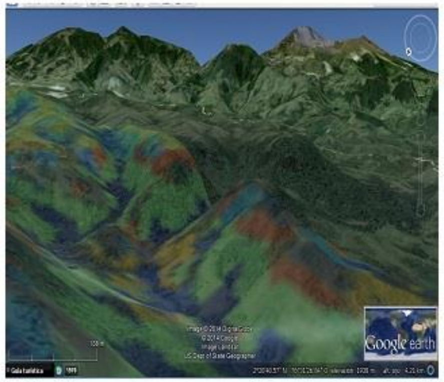


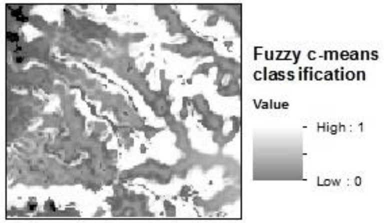




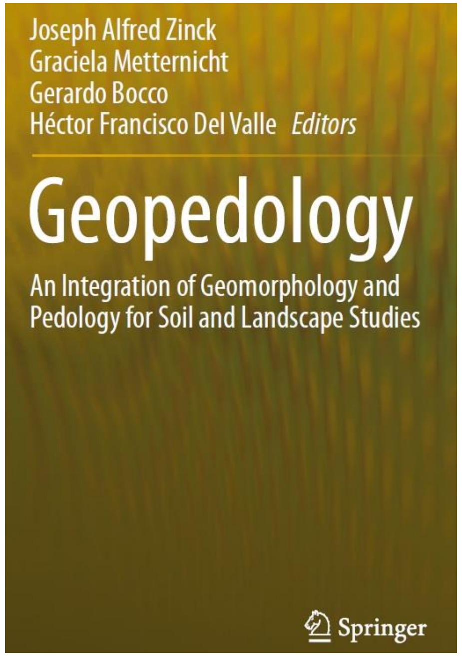








Accuracy classification = 60%



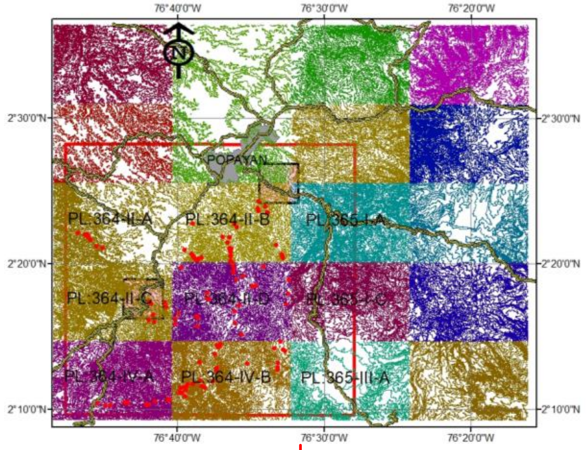
2016

Chapter 22
Digital Elevation Models to Improve Soil Mapping in Mountainous Areas: Case Study in Colombia

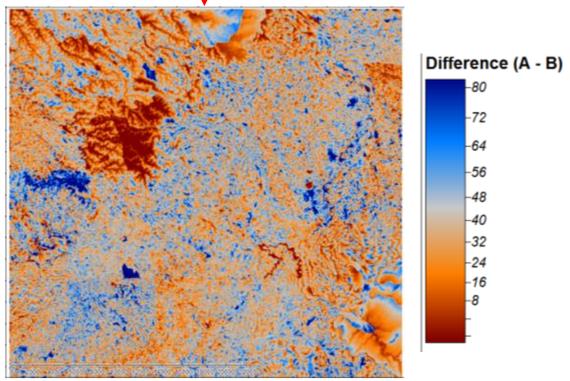
L.J. Martinez Martinez and N.A. Correa Muñoz

DEM accuracy assessment

Topographic map

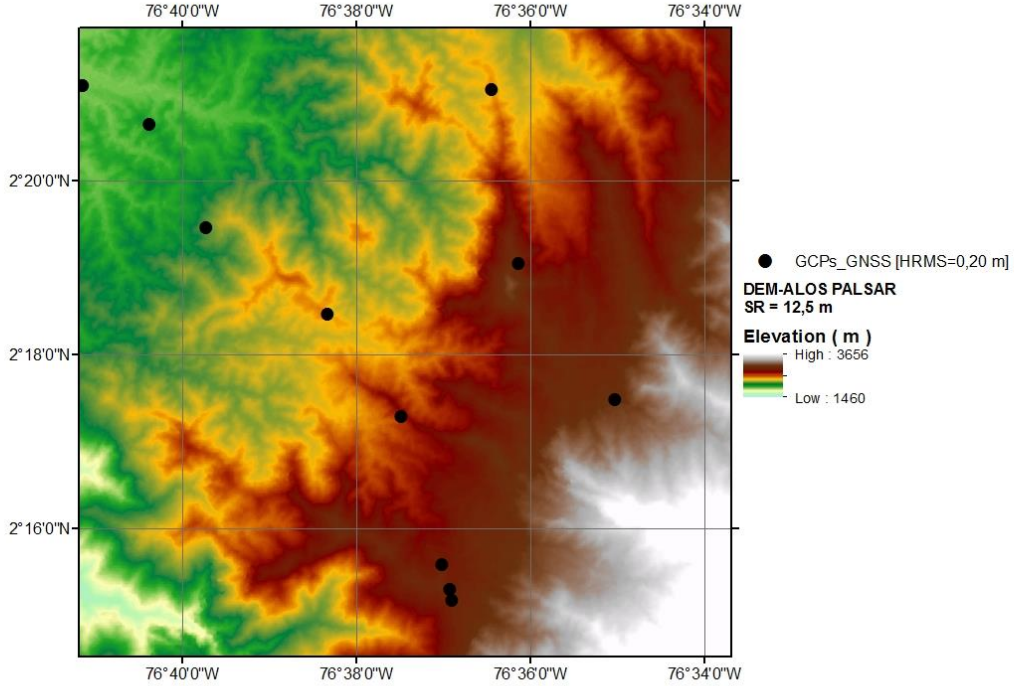


DEM (Thin plate spline)



DEM ALOS-PALSAR

AP_23078_FBD_F0030_RT1.dem.tif



BLUH
[Bundle block adjustment
Leibniz **U**niversity **H**annover]

↓

DEMANAL
[Analysis of a digital elevation model (DEM) against a reference DEM]

↓

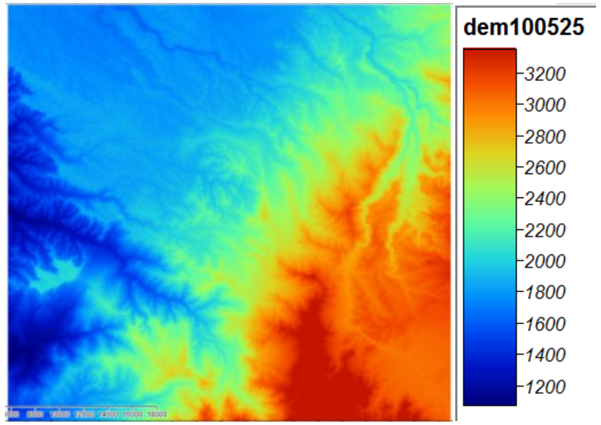
RMSz = 5,86 m
BIAS = 1,06 m
RMSz without bias = 5,77 m
NMAD (68% probability level) = **4,57 m**

↓

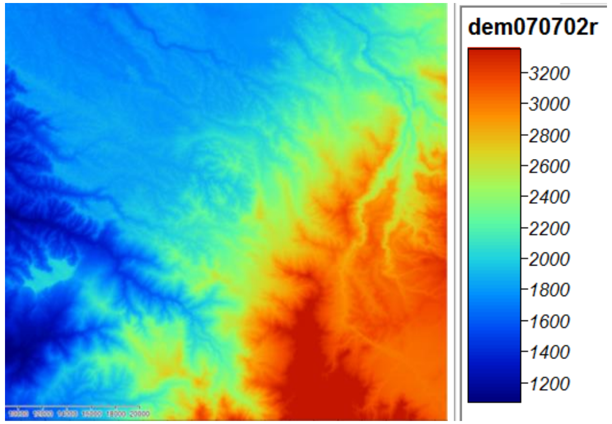
Sz = 2,06 + 19,063*TAN(SLOPE)
Sz* = 0,09 + 22,877*TAN(SLOPE)

Change detection

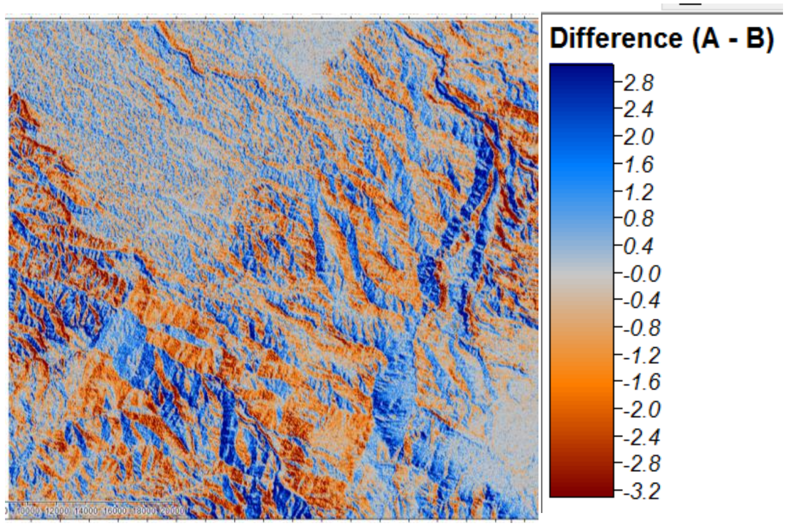
AP_23078_FBD_F0030_RT1.dem



AP_07645_FBD_F0030_RT1.dem



DEM 1 – DEM 2



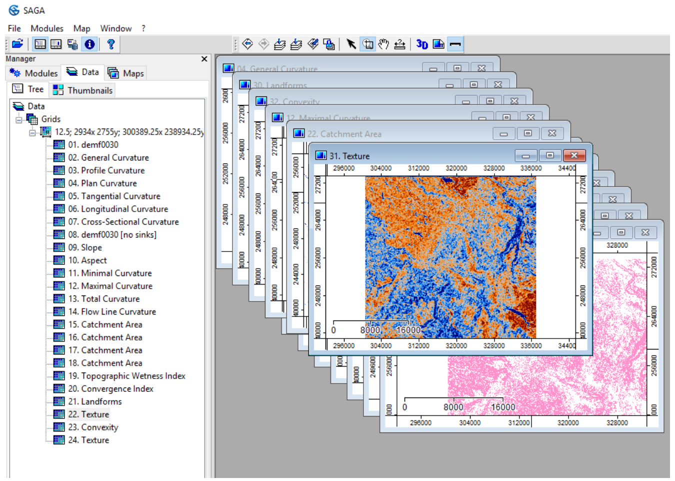
(SAGA Development Team, 2008)

BLUH
DEMSHIFT (Shift and rotation of a DEM to another in X, Y, Z, scaling in Z, rotation in X-and Y-direction)

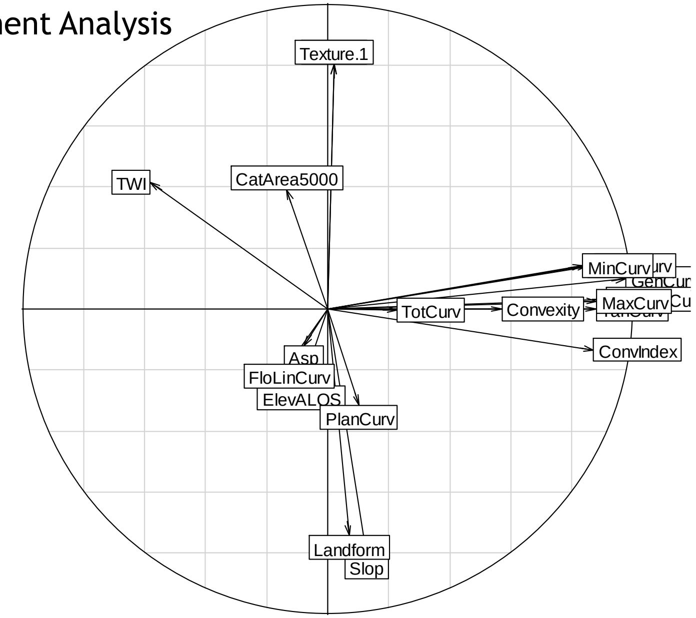
RMSz = 1,56 m
BIAS = -0,21 m
RMSz without bias = 1,55 m
NMAD (68% probability level) = **1,65 m**

Sz = 0,99 + 3,264*TAN(SLOPE)
Sz* = 1 + 3,065*TAN(SLOPE)

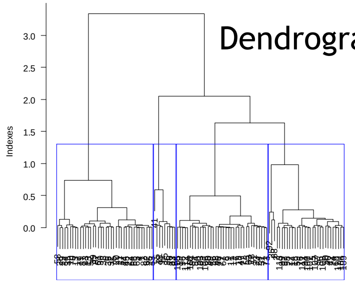
Morphometric analysis



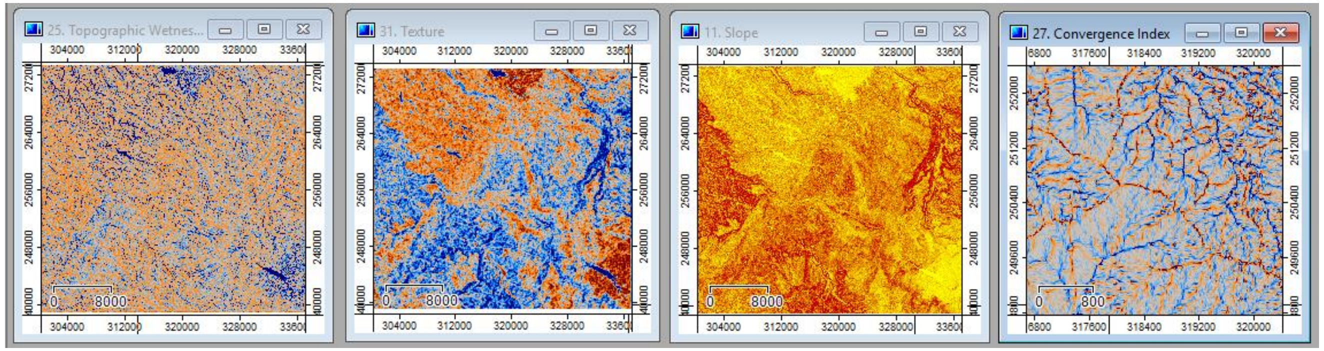
Principal Component Analysis

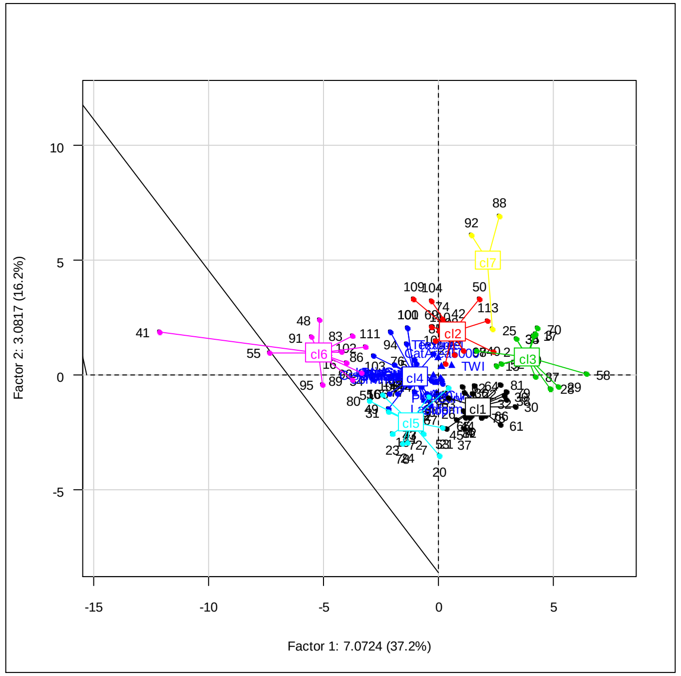


Dendrogram



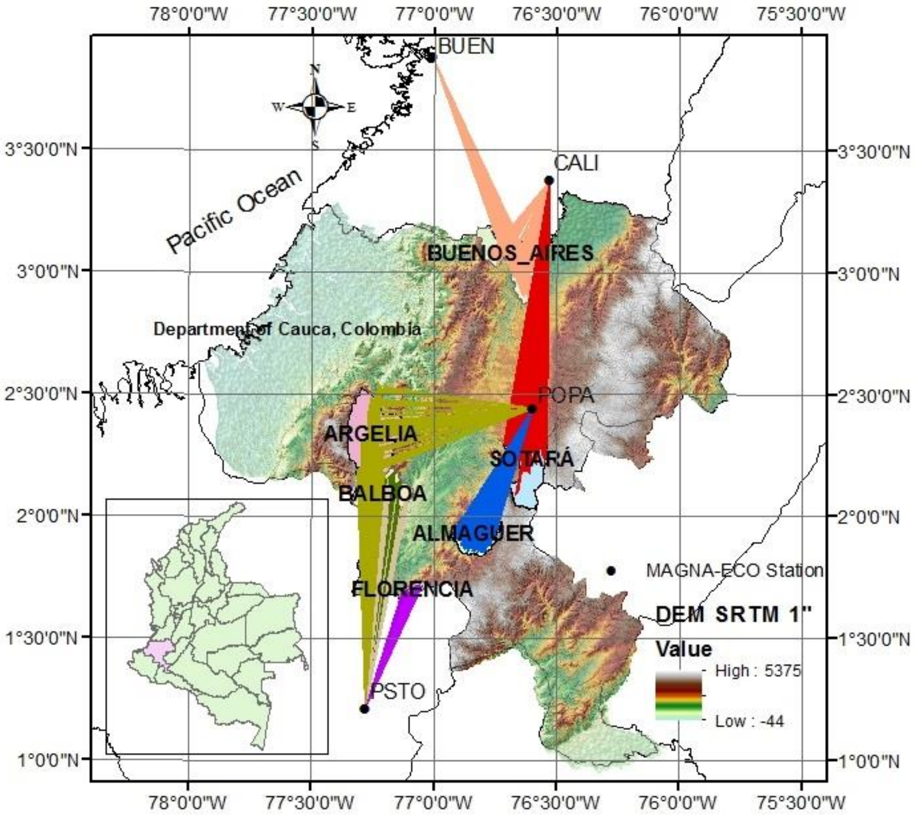
Topographic Wetness Index | Texture | Slope | Convergence Index





Unsupervised classification
Ward method

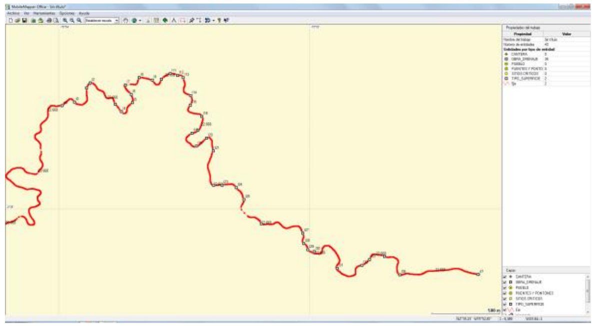
Quality assessment of GPS georeferencing [1]



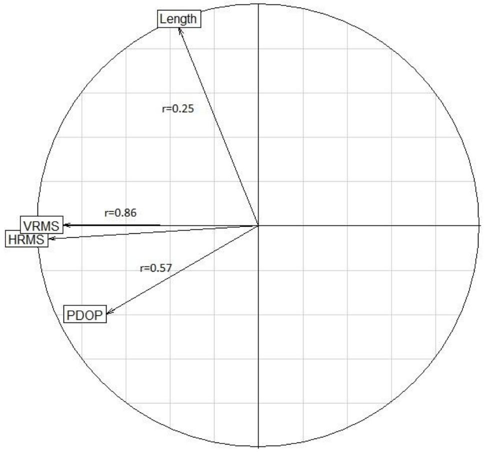
Static mode

Single-frequency receiver

Dynamic mode

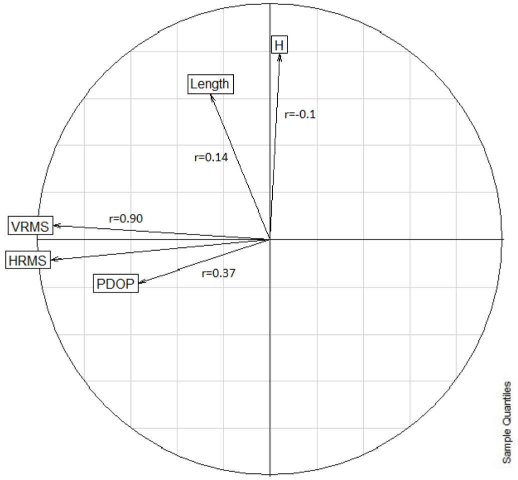


Static mode for landmarks

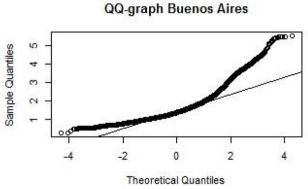


HRMS = 2,45 m

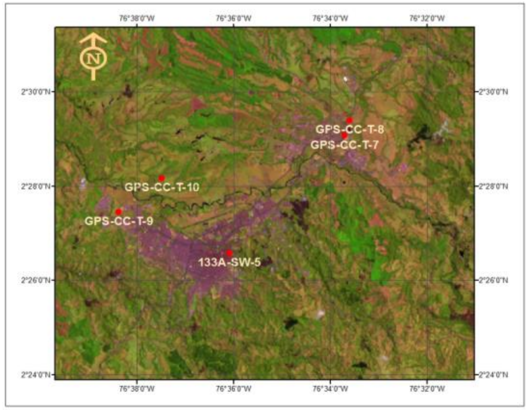
Dynamic mode for road axes



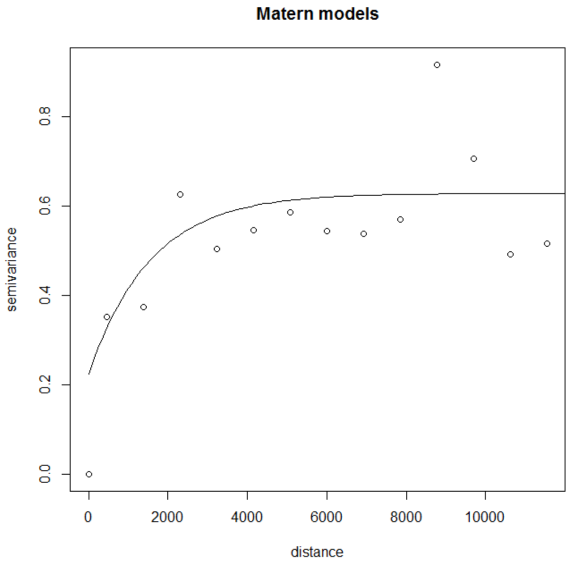
NMAD*1,96(95%)
= 4,20 m



Quality assessment of GPS georeferencing [2]



HRMS (ITRF 1995.4)
= **2,393 m**



Nuggett =0,13 m
Sill = 0,64 m
Range = 1559 m

HRMS (Kriging Ordinary)
= **2,568 m**

Authors

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Session Overview

Session

II/4 16/7 13:30: II/4 - Spatial Statistics and Uncertainty Modeling

Time: Saturday, 16/Jul/2016: 1:30pm - 3:00pm

Presentations

A Contributor–Reputation Based Trust Degree Computation Model for Crowdsourcing Geographic Data

Xiaoguang Zhou, Yijiang Zhao
Central South University, China, People's Republic of; zxgcsu@foxmail.com

A version-similarity based trust degree computation model for crowdsourcing geographic data is presented. In this model, The contributor's reputation is calculated using the similarity degree among the multi-versions for the same entity state. The trust degree of VGI object is determined by the trust degree of its previous version, the reputation of the last contributor and the modification proportion.

Accuracy and spatial variability of GNSS surveying to landslides mapping in road inventories to semi-detailed scale: case in Colombia

Nixon Alexander Correa Muñoz, Carol Andrea Murillo Feo, Luis Joel Martinez Martinez
Universidad Nacional de Colombia, Colombia; nacorream@unal.edu.co

As part of the research project related to semi-automatic detection of landslides, we took as study case the evaluation of accuracy and spatial distribution of the horizontal error in GNSS positioning in the tertiary road network located in mountainous areas in the department of Cauca, Colombia. The evaluation of the internal validity of the data gave metrics of a confidence level of 95% between 1.24 and 2.45 m in static-fast mode and between 0.86 and 4.2 m in the pseudo-kinematic mode. The external validity gave an absolute error of 4.69 m. Modeling the spatial variability showed no spatial dependence.

VALIDATION AND UPSCALING OF SOIL MOISTURE SATELLITE PRODUCTS IN ROMANIA

Ionut Sandric[1,3], Andrei Diamandi[2], Oana Nicola[2], Daniela Saizu[1], Cristian Vasile[1], Bogdan Lucaschi[2]
[1]Esri Romania; [2]National Meteorological Administration, Romania; [3]University of Bucharest, Romania; isandric@esriro.ro

The study presents the validation of SMOS and ASCAT soil moisture satellite products for Romania. The validation was performed with 20 points spatially balanced over Romania and with additional 10 points spatially concentrated in one SMOS pixel. An upscaling method based on the relations between soil moisture, land surface temperature and vegetation indices was tested. The study was financed by the Romanian Space Agency within the framework of ASSIMO project http://assimo.meteoromania.ro

Analysis and Validation of Grid DEM Generation Based on Gaussian Markov Random Field (GMRF)

Fernando J. Aguilar, Manuel A. Aguilar, José Luis Blanco, Abderrahim Nemmaoui
University of Almeria, Spain; faguilar@ual.es

Since the potential utility of DEMs for object detection is clearly linked to their accuracy, it is required to analyse and improve their main sources of error. This work deals with the application of a mathematical framework based on Gaussian Markov Random Field (GMRF) to reduce the interpolation error when building grid format DEMs. The performance of the proposed GMRF interpolation model was tested on a set of LiDAR data provided by the Spanish Government (PNOA Programme) over a working area mainly covered by greenhouses in the province of Almería, Spain.

Conclusions

- The ALOS PALSAR-DEM quality was evaluated by using GPS control points in the field.
- A mass shift evaluation was obtained by the difference between two ALOS PALSAR-DEM.
- Furthermore, Principal Component Analysis technique allowed to choose terrain parameters with low collinearity.
- Morphometric variation of the study area was evaluated
- The precision and accuracy of a single frequency GPS mapping was stimated by robust statistics methods.
- Next stage will be analyze radiance and radiometric data of satellite images; including backscater and coherence, as well as polarimetric and shift phase of radar images.

Some references

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Thank you for your attention!


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