UNIVERSIDAD EIA®

Ser, Saber y Servir

Con Acreditación Institucional

MULTI-TIERED INTEGRATED APPROACH TO ASSESS THE IMPACTS OF CHANGES IN CLIMATIC CONDITIONS ON THE INTEGRITY OF PÁRAMO ENVIRONMENTS: studying tropical upper tropospheric warming and its impacts on the integrity of high-altitude Andean biodiversity hotspots

Daniel Ruiz Carrascal
C.E., M.Sc., M.A., M.Phil., Ph.D.

Programa en Ingeniería Ambiental
Universidad EIA, Colombia

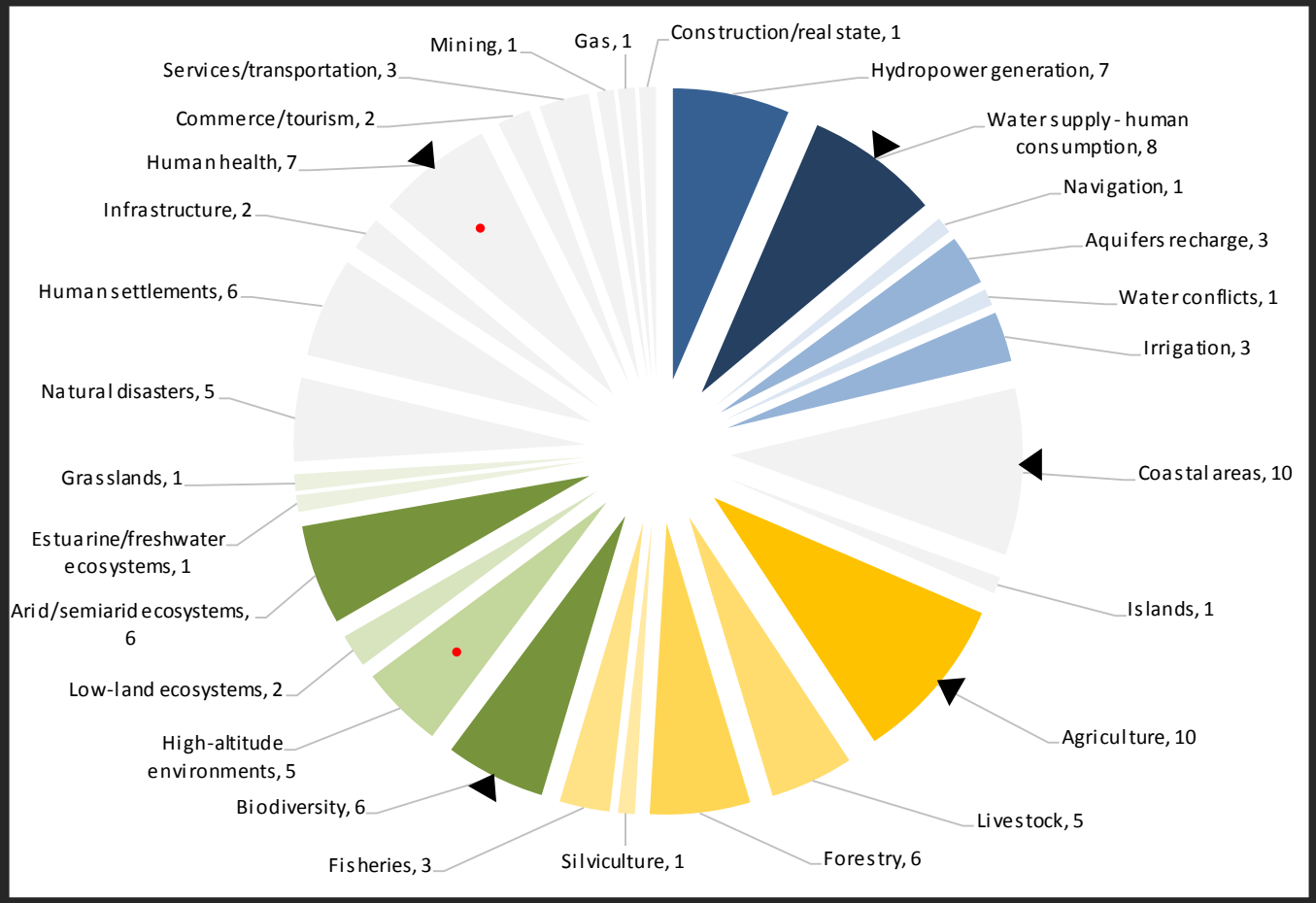
International Research Institute for Climate and Society
Lamont-Doherty Earth Observatory, Columbia University in the City of New York, USA

UNIVERSIDAD EIA®

Ser, Saber y Servir

Con Acreditación Institucional

PRIORITY SECTORS IN THE LATEST TWELVE SOUTH-AMERICAN NATIONAL COMMUNICATIONS TO THE UNFCCC



Blue, orange and olive green sectors are directly related to water resources, productive activities (consumption and revenue) and biodiversity, respectively

Source: Ruiz (2013)


The tropical Andes are one of the
top biodiversity hotspots on Earth

South America is the continent with the highest extinction risks related to projected climate change

Forest loss in South America has already surpassed the global deforestation rate, leading to a significant decrease in the extent of its Important Bird and Biodiversity Areas (Tracewski et al., 2016)

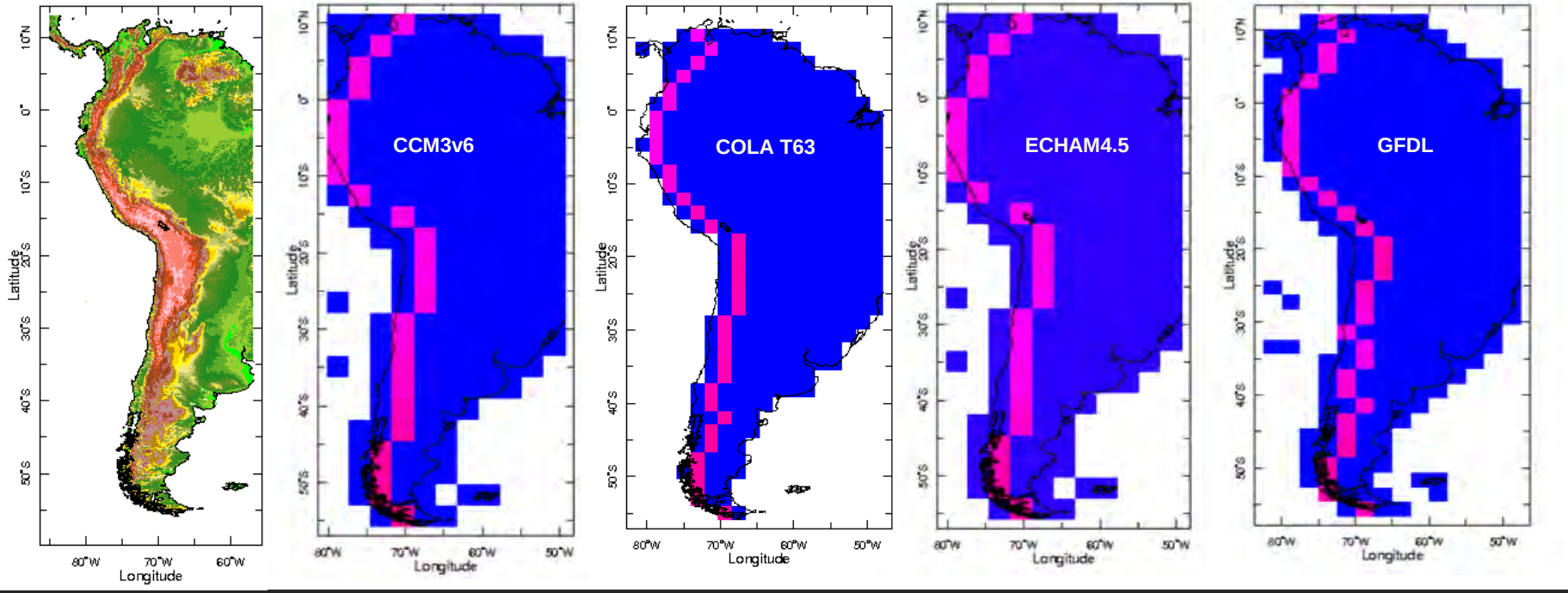

Long-term climate change and rapid land-use change are synergistically threatening the integrity and functioning of Andean ecosystems and thereby the environmental goods and services they provide to humans

UNIVERSIDAD EIA

Ser, Saber y Servir

Con Acreditación Institucional

AXIS OF THE ANDES CORDILLERA



Source: González, Gutiérrez and Ruiz. (2014)

(Left panel) NOAA NGDC GLOBE gridded 1-km, quality-controlled digital elevation model

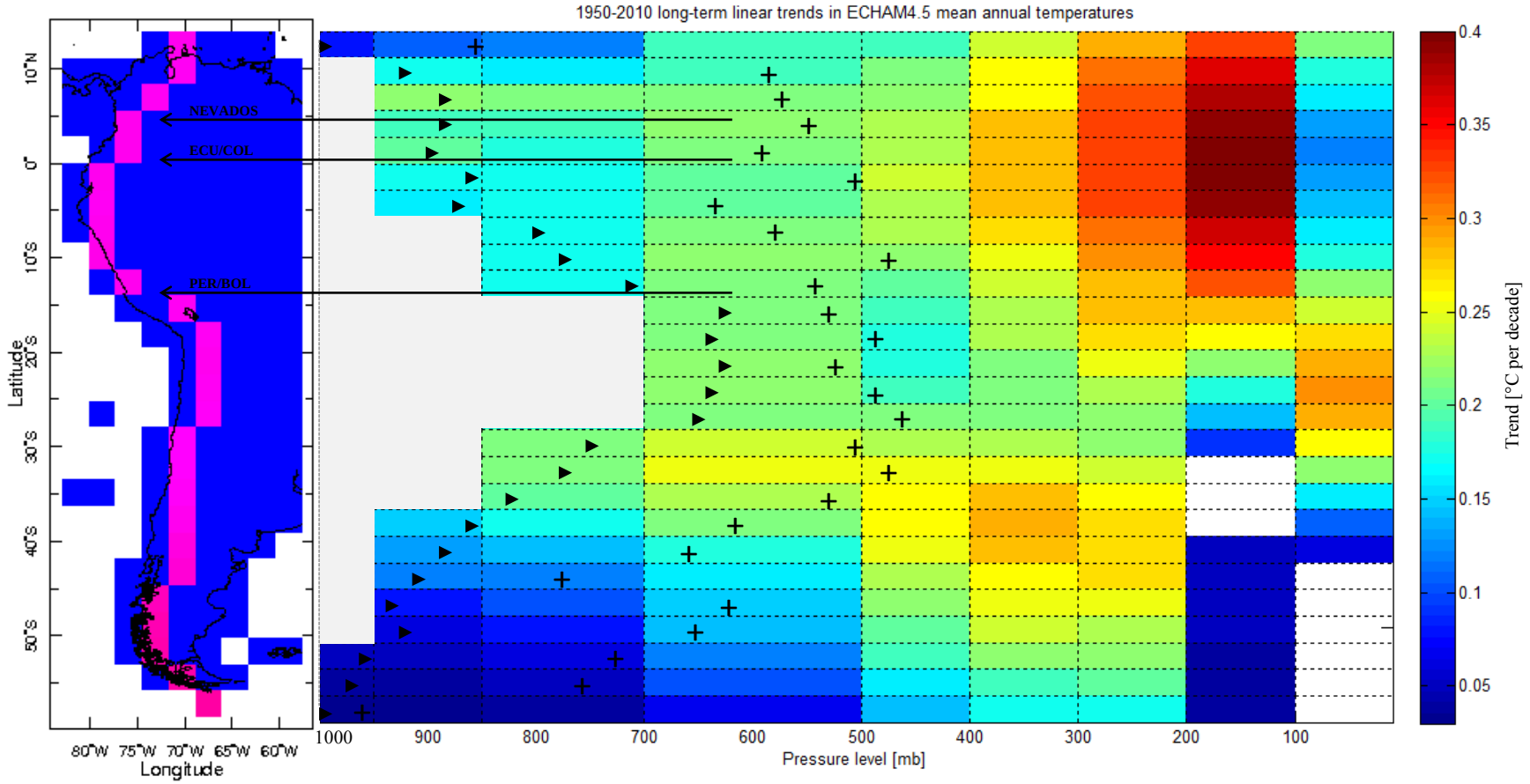
(Right panels) Grid points for the analysis of CCM3v6, COLA T63, ECHAM4.5, and GFDL ensemble simulation outputs

UNIVERSIDAD EIA

Ser, Saber y Servir

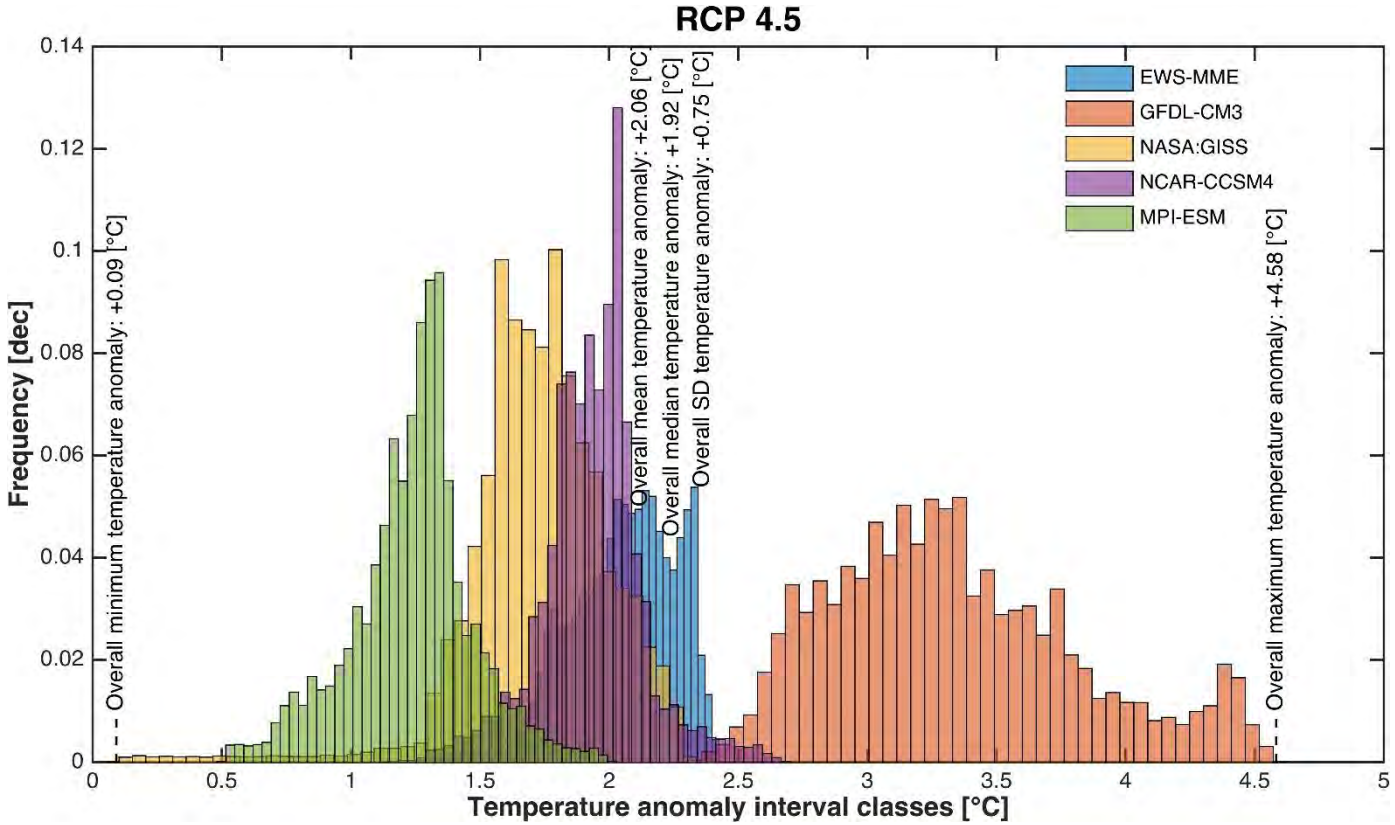
Con Acreditación Institucional

Source: Ruiz et al. (2012)



LOS NEVADOS ALTITUDINAL GRADIENT [04°50'N-05°00'N] ECUADOR-COLOMBIA TRANSBOUNDARY REGION ECOTRANSECT [00°30'N-01°30'N] PERU-BOLIVIA TRANSBOUNDARY REGION ECOTRANSECT [14°00'S-15°00'S]

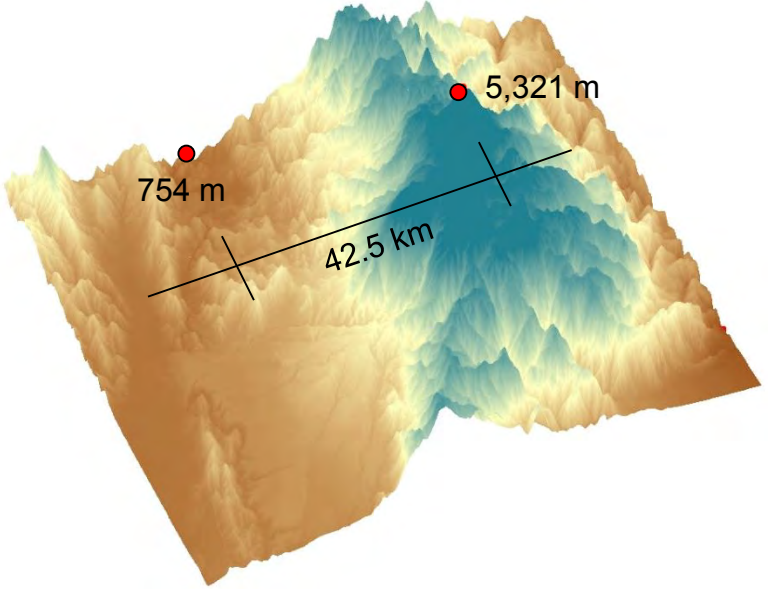
Black solid triangles and crosses depict, respectively, the average and maximum altitudes of the NOAA NGDC GLOBE gridded 1-km, quality controlled global DEM in the ECHAM4.5 model grid points

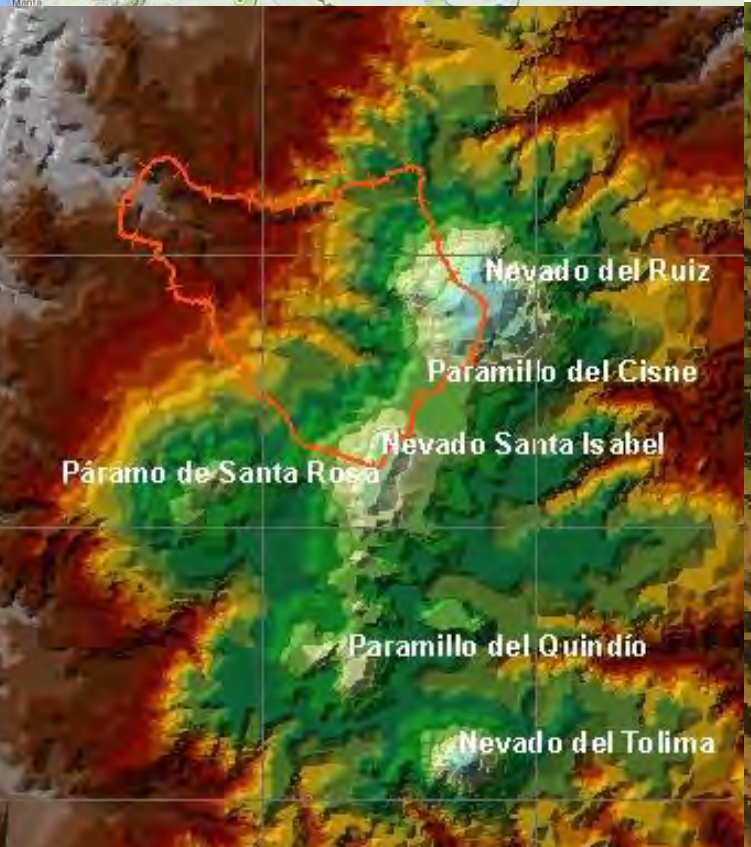


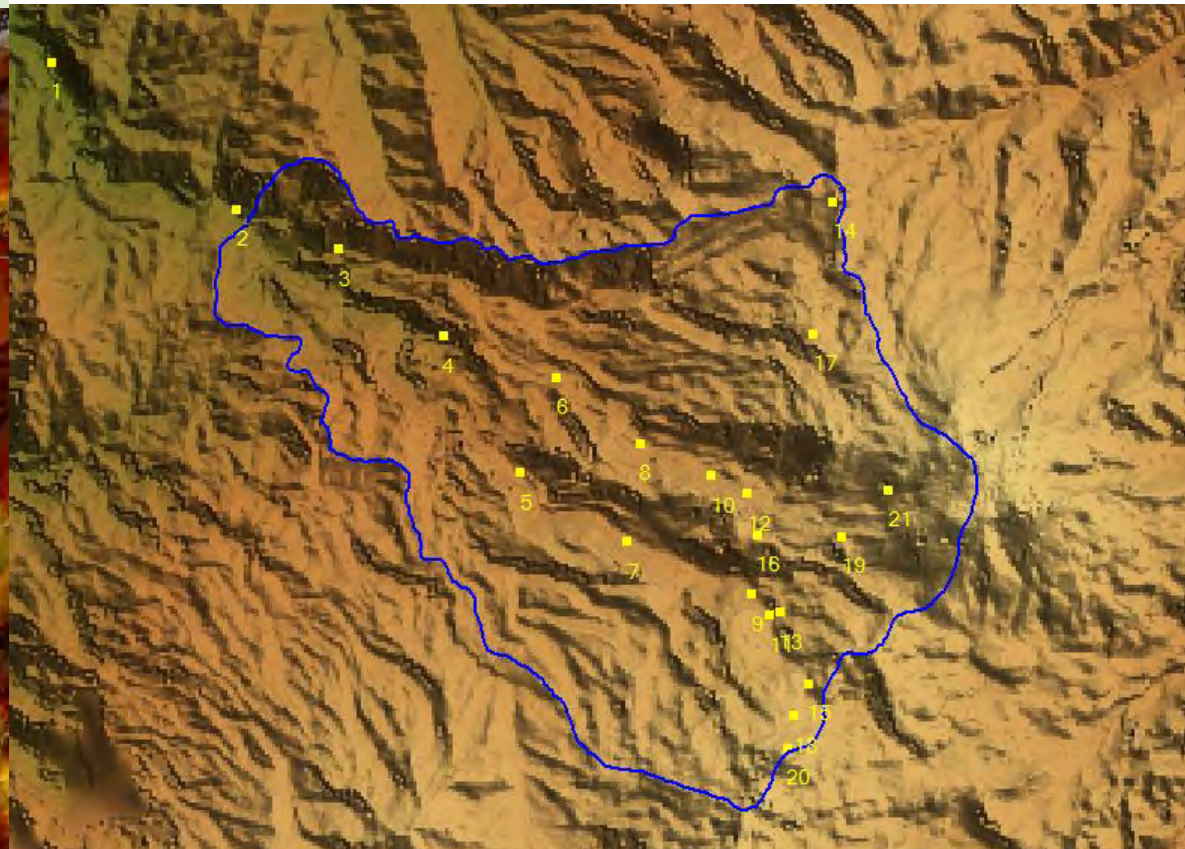
2040-2069 MEAN ANNUAL NEAR-SURFACE TEMPERATURE ANOMALIES, WITH RESPECT TO THE HISTORICAL PERIOD 1961-1991

Category 5 – low severity [< +1.60°C]; Cat 4 [+1.61 to +1.93°C]; Cat 3 [+1.94 to +2.27°C]; Cat 2 [+2.28 to +2.61°C]; and Cat 1 – high severity [> +2.61°C]


Barranquilla (Distrito Especial, Industrial Y Portuario)
Maracaibo
Caracas
Cartagena
Barquisimeto
Valencia
Panamá (Panamá)
Venezuela
Medellín
Bucaramanga
Bogotá
Colombia
Cali
Pasto
Quito


5,321 m
754 m
42.5 km

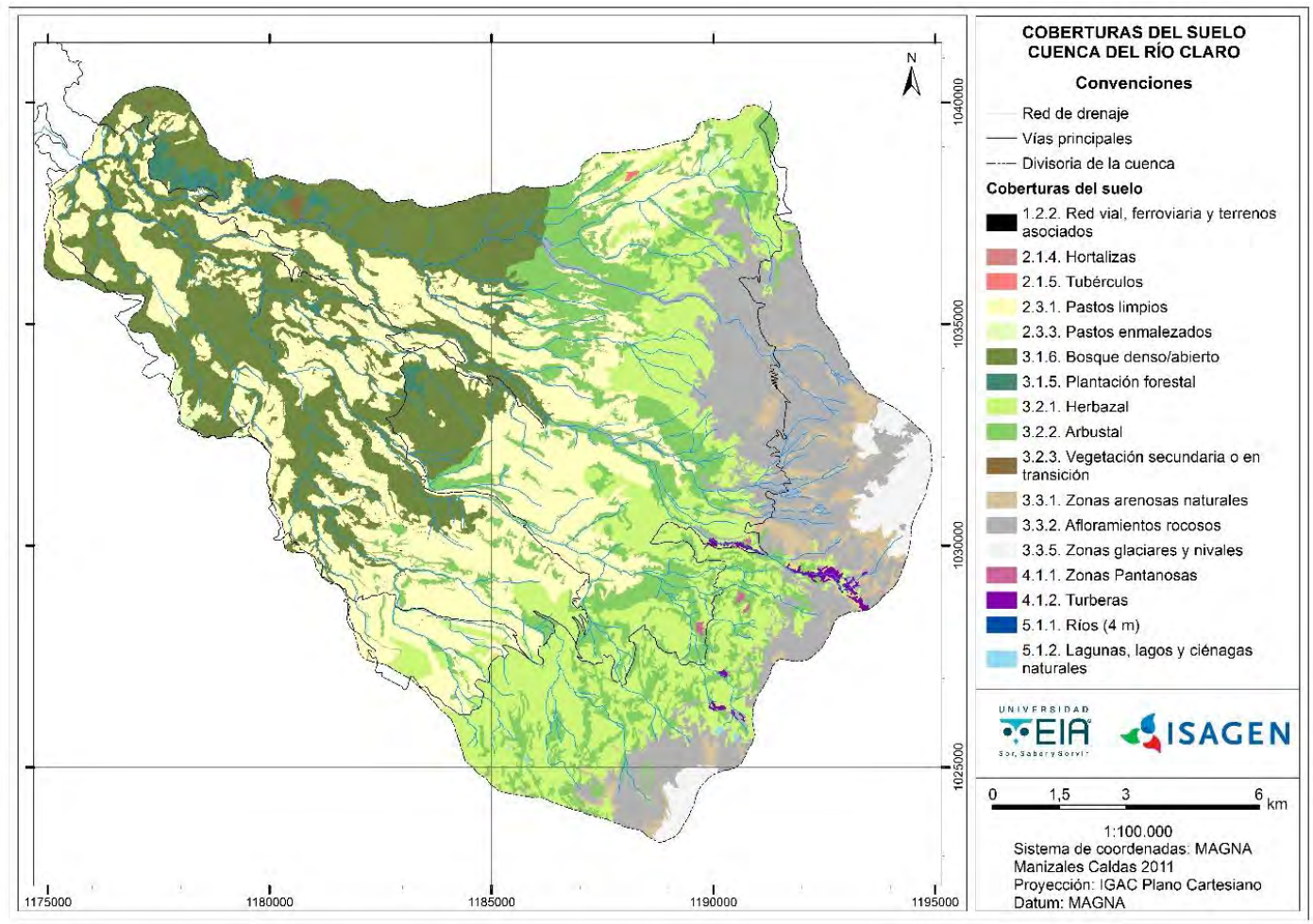

Nevado del Ruiz
Paramillo del Cisne
Nevado Santa Isabel
Páramo de Santa Rosa
Paramillo del Quindío
Nevado del Tolima


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

UNIVERSIDAD EIA

Ser, Saber y Servir

Con Acreditación Institucional




Lycopodium crassum


Draba pennell-hazenii


Loricaria colombiana


Gentianella sp.


Plantago rigida

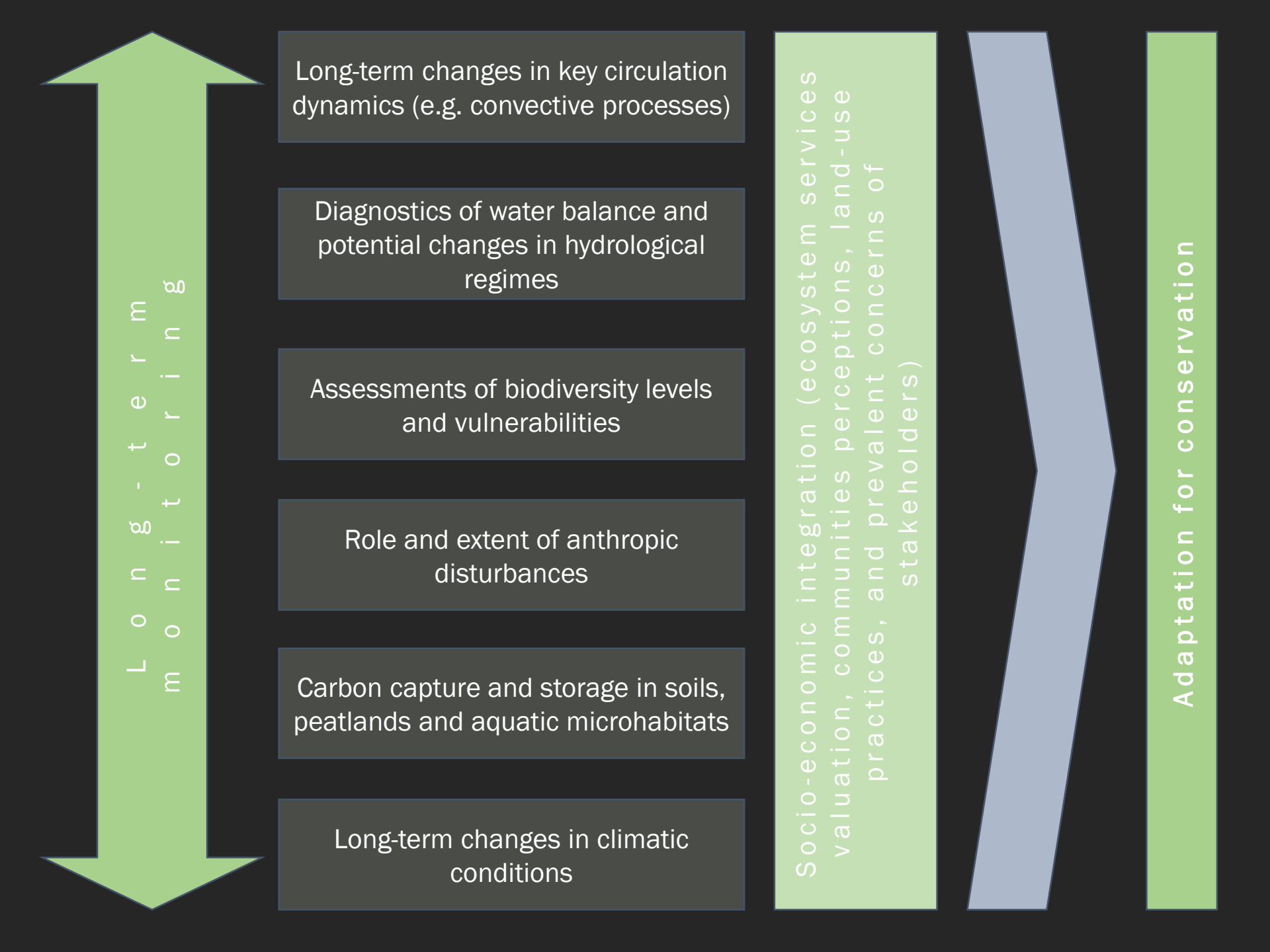

Diplostephium sp.

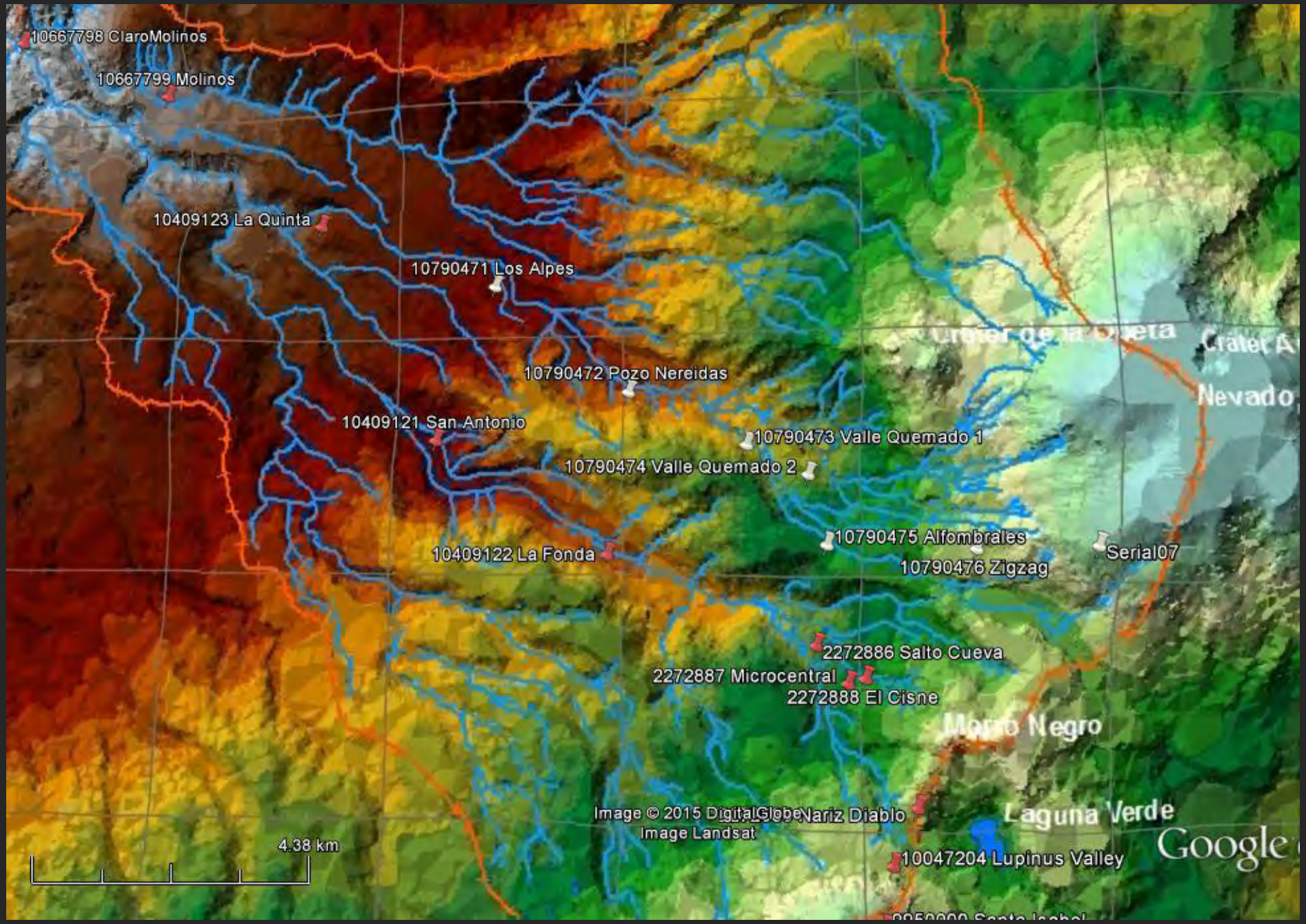

Miconia salicifolia

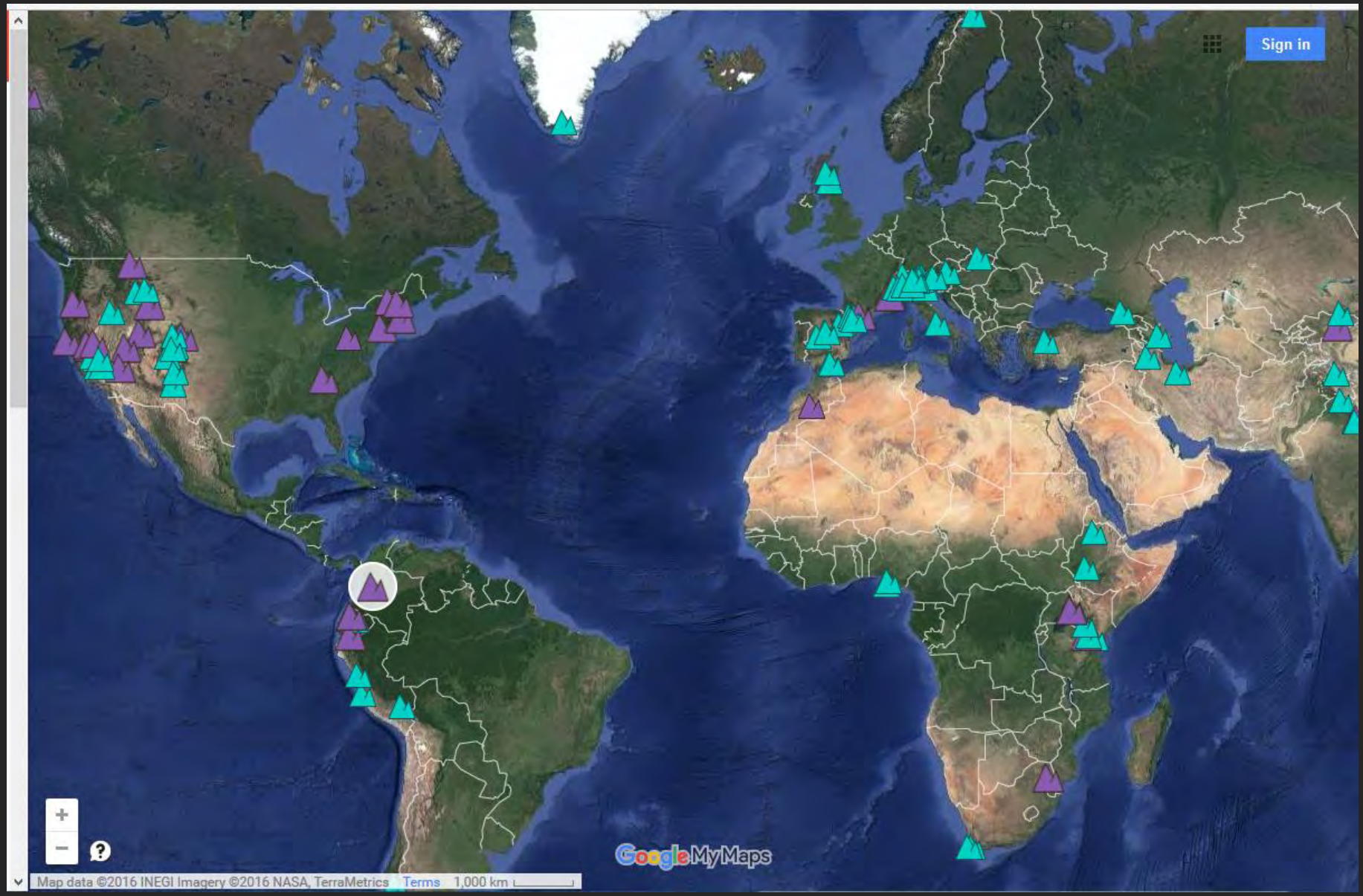

Berberis rigidifolia


Monnina aff. salicifolia

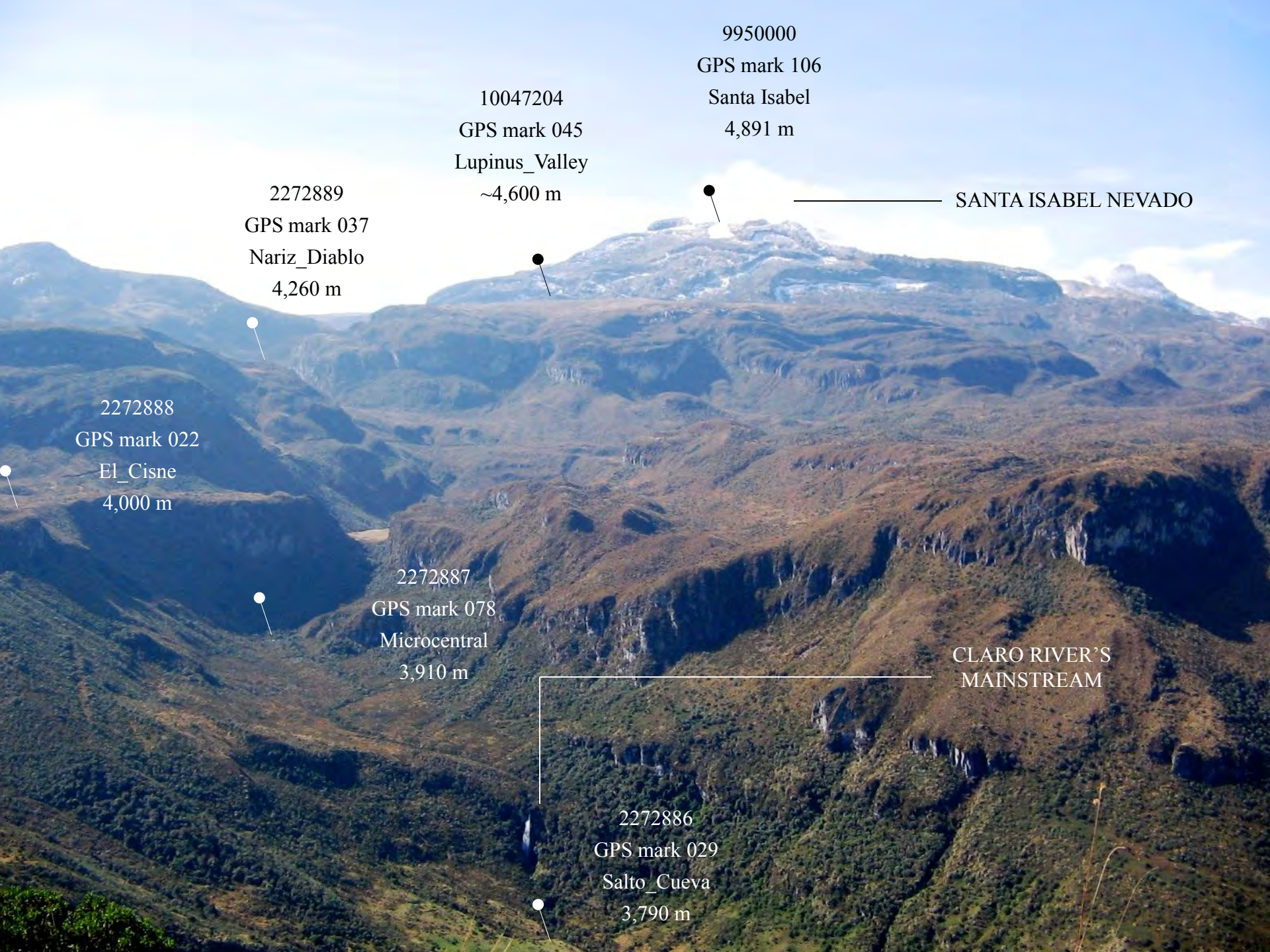
http://catalogofloraaltamontana.eia.edu.co/


Long-term monitoring
Long-term changes in key circulation dynamics (e.g. convective processes)
Diagnostics of water balance and potential changes in hydrological regimes
Assessments of biodiversity levels and vulnerabilities
Role and extent of anthropic disturbances
Carbon capture and storage in soils, peatlands and aquatic microhabitats
Long-term changes in climatic conditions
Socio-economic integration (ecosystem services valuation, communities perceptions, land-use practices, and prevalent concerns of stakeholders)
Adaptation for conservation


10667798 ClaroMolinos
10667799 Molinos
10409123 La Quinta
10790471 Los Alpes
10790472 Pozo Nereidas
10409121 San Antonio
10790473 Valle Quemado 1
10790474 Valle Quemado 2
10790475 Alfombrales
10409122 La Fonda
10790476 Zigzag
Serial07
2272886 Salto Cueva
2272887 Microcentral
2272888 El Cisne
Morro Negro
Nariz Diablo
Laguna Verde
10047204 Lupinus Valley
Nevado
Image © 2015 DigitalGlobe
Image Landsat
4.38 km
Google



GLOBAL NETWORK OF MOUNTAIN OBSERVATORIES - GNOMO

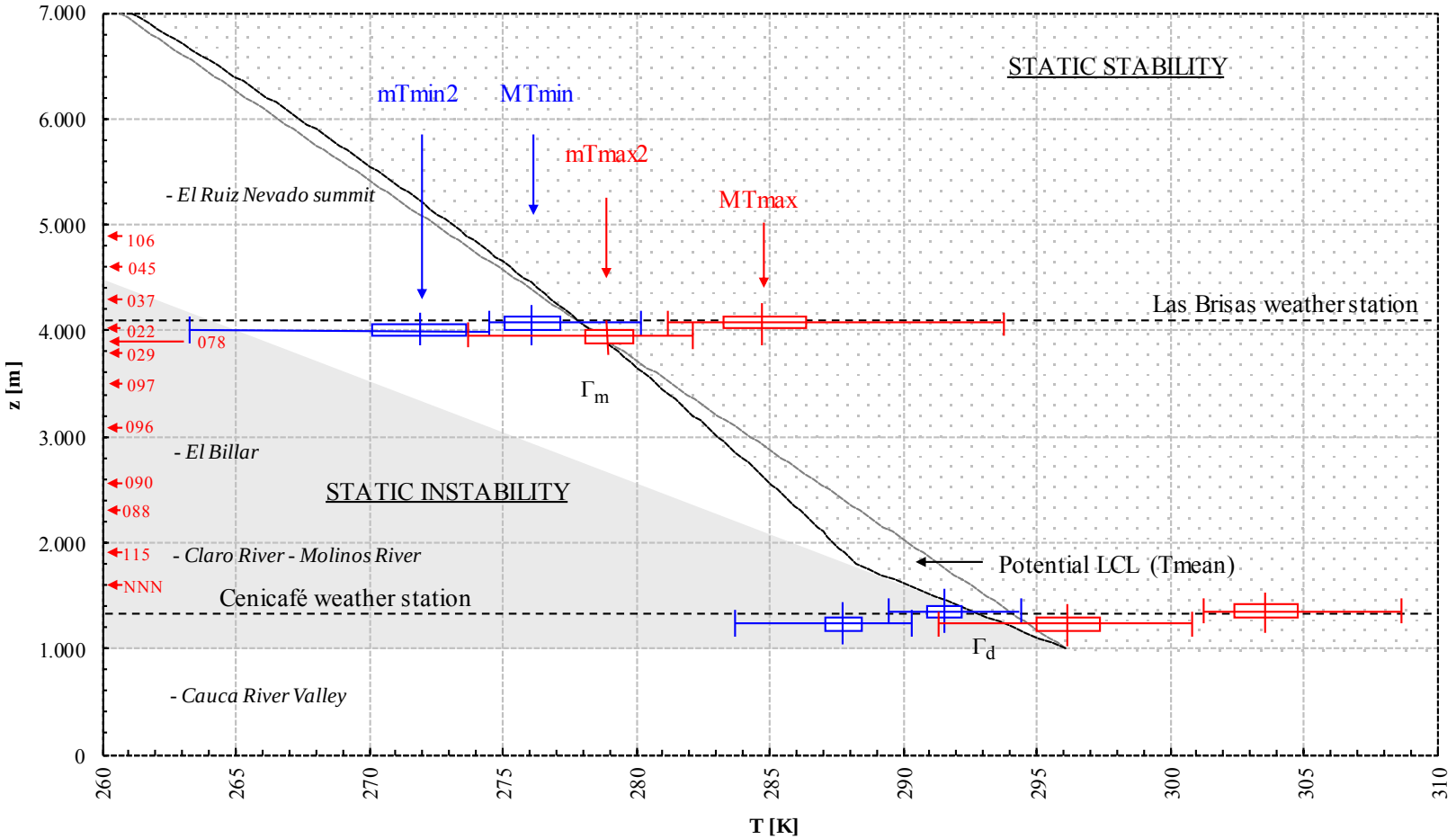

9950000
GPS mark 106
Santa Isabel
4,891 m
10047204
GPS mark 045
Lupinus_Valley
~4,600 m
2272889
GPS mark 037
Nariz_Diablo
4,260 m
SANTA ISABEL NEVADO
2272888
GPS mark 022
El_Cisne
4,000 m
2272887
GPS mark 078
Microcentral
3,910 m
CLARO RIVER'S
MAINSTREAM
2272886
GPS mark 029
Salto_Cueva
3,790 m

UNIVERSIDAD EIA

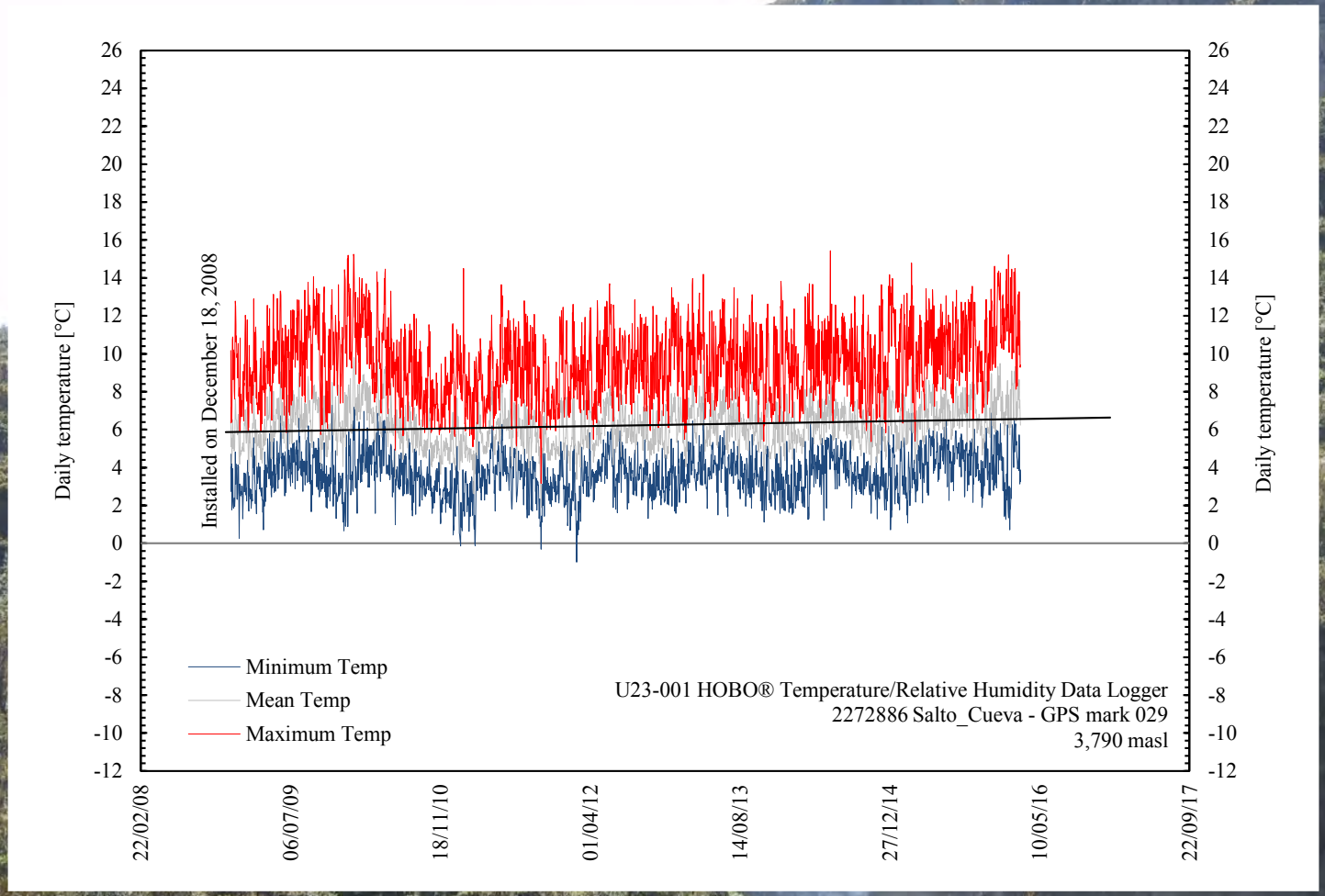
Ser, Saber y Servir

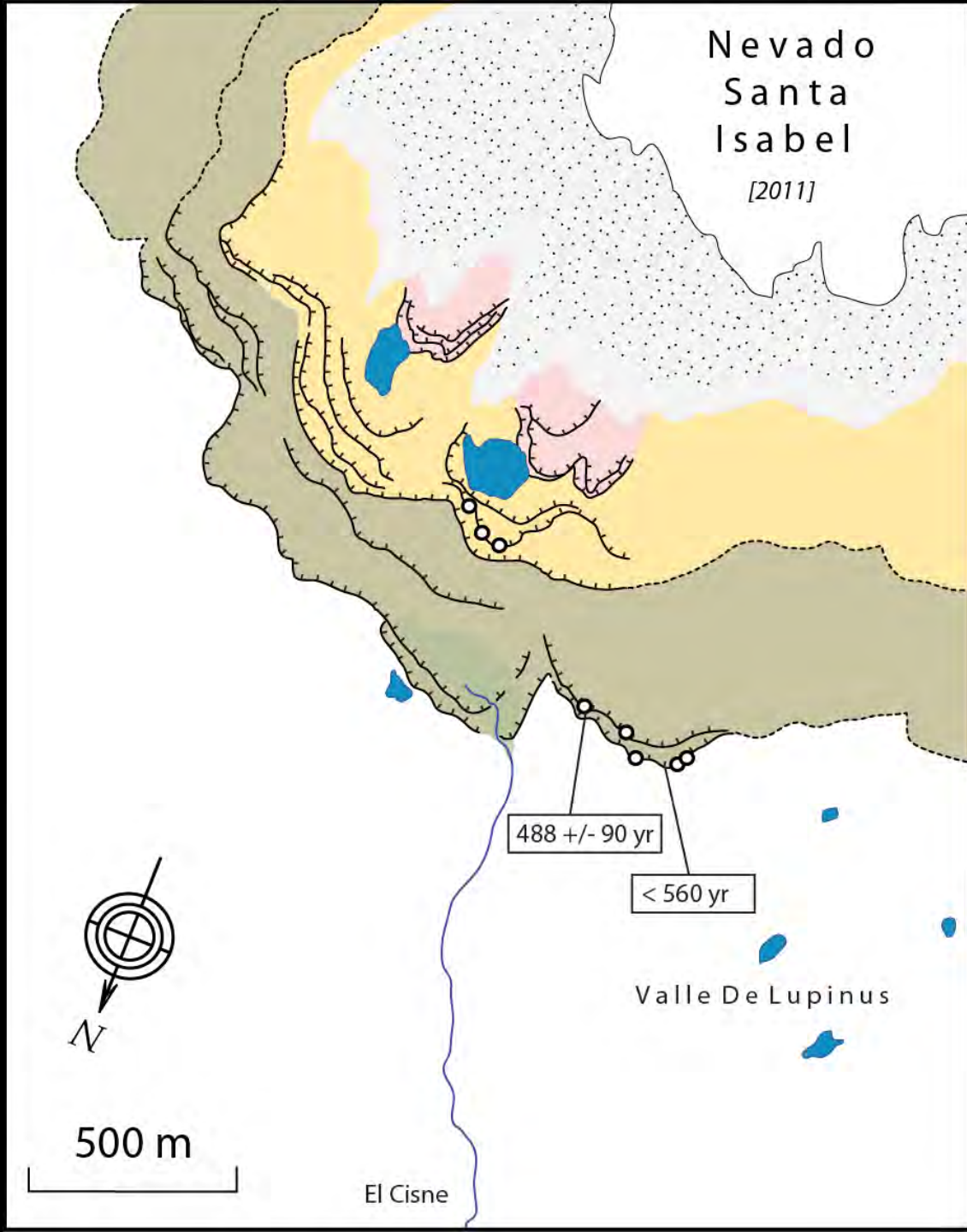
Con Acreditación Institucional

POLEKA KASUE MOUNTAIN OBSERVATORY



2272886
GPS mark 029
Salto_Cueva
3,790 m




Nevado
Santa
Isabel
[2011]
488 +/- 90 yr
< 560 yr
Valle De Lupinus
N
500 m
El Cisne

UNIVERSIDAD EIA®

Ser, Saber y Servir

Con Acreditación Institucional

Programa en Ingeniería Ambiental
Universidad EIA, Colombia
pfcarlos@eia.edu.co

International Research Institute for Climate and Society
Lamont-Doherty Earth Observatory, Columbia University in the City of New York, USA
pfcarlos@iri.columbia.edu

IRI public profile:
http://iri.columbia.edu/contact/staff-directory/daniel-ruiz-carrascal/

LinkedIn public profile:
http://www.linkedin.com/pub/daniel-ruiz-carrascal/31/a70/94

ResearchGate public profile:
http://www.researchgate.net/profile/Daniel_Ruiz_Carrascal/

Twitter public profile:
http://twitter.com/#!/RuizCarrascalD