A 3D Earth

CESAR Scientific Challenge

Research on topographic maps with data from the Copernicus Programme and Google Earth

Beatriz González García on behalf of the CESAR Science Cases Team

Scientist of the COPERNICUS Space Programme analyse the scientific data from Earth collected by the ESA satellites “Sentinel”. Their main goal is to protect of our planet, Earth.

Figure 1: https://marine.copernicus.eu/preparing-copernicus-2/

Could we count on you to help our scientist?

Didactics

Figure I: *The considered top 10 skills in the 2020. (Credits: Rethinking).*

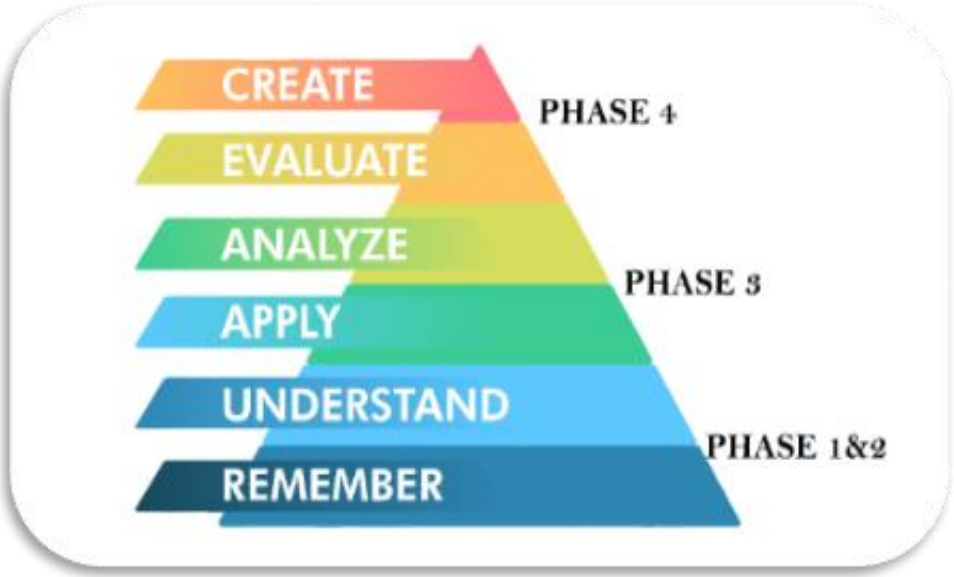

Figure II: *Bloom's Taxonomy diagram. (Credits: https://medium.com/@ryan.ubc.edtech/)*


Speaking: Rosa Doran (Cohost)
Ville Holopainen
ΑΙΚΑΤΕΡΙΝΗΦΙΛΙΠΠΟΥ
ΕΥΑΓΓΕΛΟΠΟΥΛΟΥ ΑΝΑ...
ΚΡΟΜΠΑ ΒΕΝΕΤΙΑ
ΦΙΛΙΠΠΟΥ ΑΙΚΑΤΕΡΙΝΗ
Viewing Rosa Doran's screen
The Scientific Method
Curiosity / Question
Hypothesis
Plan and Run an Investigation
Gather and Analyse Data
Conclude and Check Hypothesis
Discuss and consider other solutions
A JOURNEY TO SPACE - EXPLORATION MISSIONS
GALILEO TEACHER TRAINING PROGRAM

Writer:

_____
____

Responsible of the material:

_____

Reader:

_____
_____

Speaker:

_____
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Drawer:

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_____

Fast Facts

Age range: (10-12) years old

Type: Lab

Complexity: Easy - Medium

Preparation time: from 2 to 4 hours, depending on the chosen experience

Required time: Between an hour and a full term, depending on the chosen format

Location: Inside

Includes the use of: Computers or tablets, Internet, Google Earth Pro

Data used: Physical and topographic maps and images of the ***Copernicus programme*** within Google Earth Pro

Currículum relevance

Natural sciences: Introduction to the science activity. Matter and energy. Technology, objects, and machines.

Social sciences: The world we live in.

Mathematics: Processes, methods, and attitudes un mathematics. Measurements

The students should already know…

- Representations of the Earth: maps and planispheres. Scales.
- Orientation in space. Globes.
- Geographical diversity of the landscapes around the world: topography and hydrography.
- Human intervention in the environment and a sustainable and fair energetic development.
- Comparing surfaces of flat shapes by overlapping them, breaking them down and measuring them.

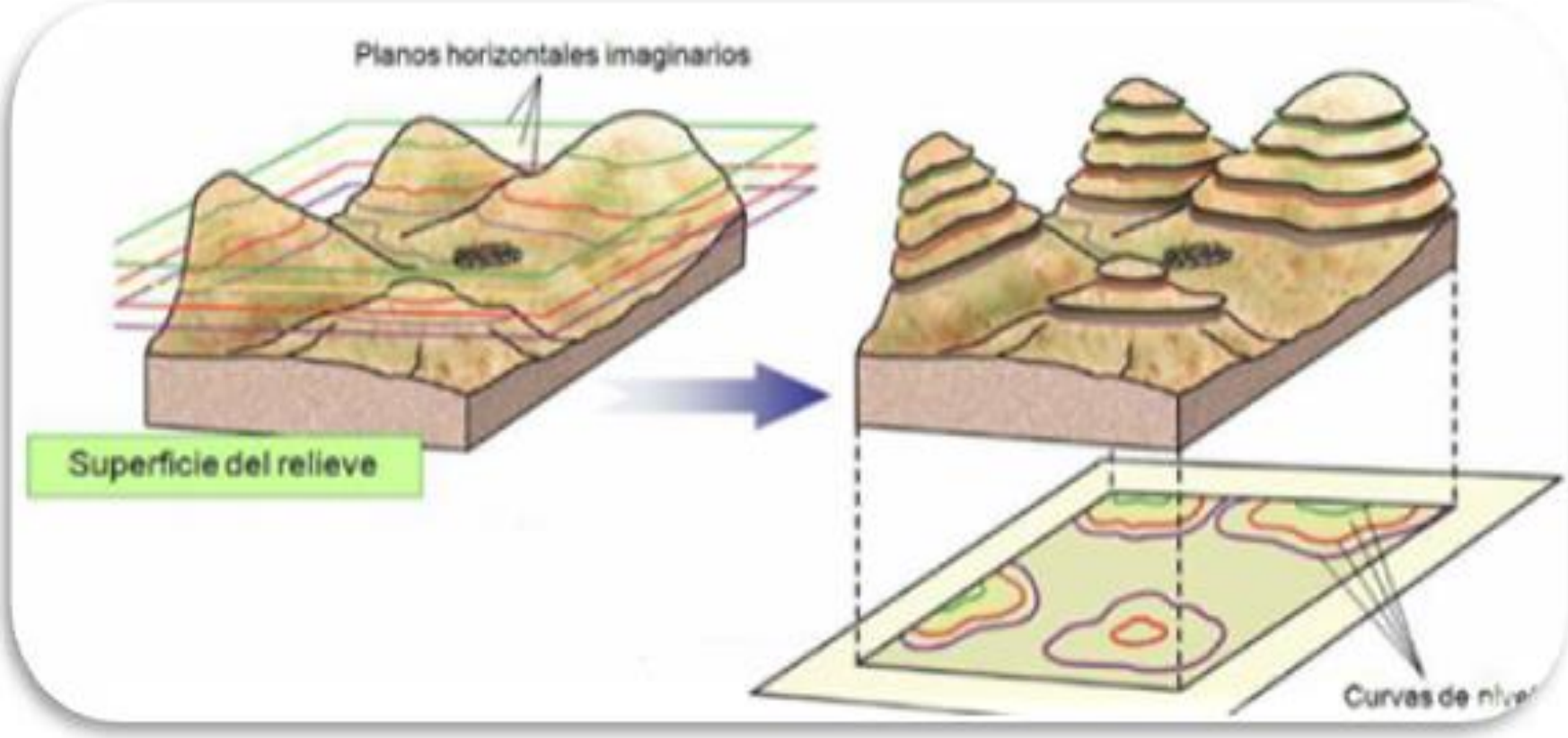
Students will learn …

- Tools that transform flat representations into three dimensional ones, and vice versa.
- Pinpoint in a topographical map the main landmarks and their hydrographic slopes.
- Analyze the importance of studying all the previous data and their usefulness in science and society.

Students will improve …

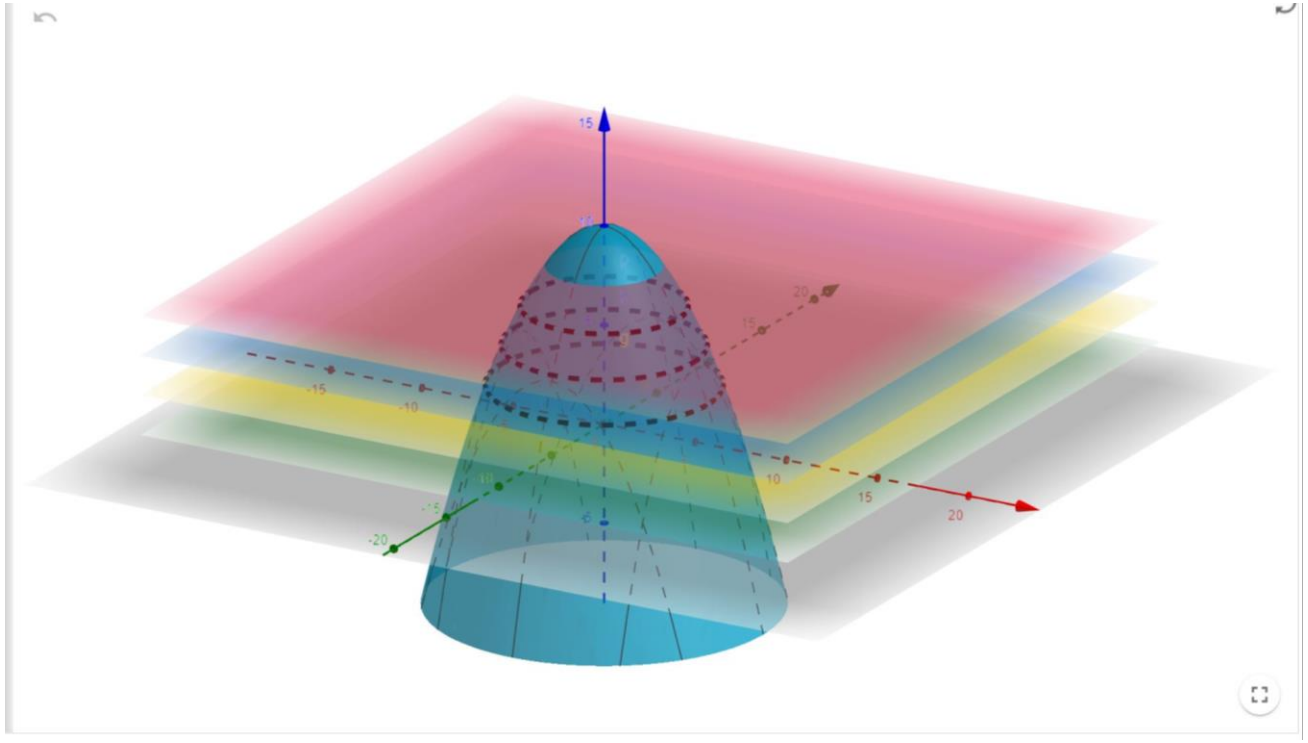
- Their understanding of critical thinking.
- The strategies of the scientific method.
- Their teamwork and communication.
- Self-evaluating skills.
- The application of theoretical knowledge to real situations.
- Their skills in ICT (Information and Communication Technology)..

Let's get prepared for the Challenge

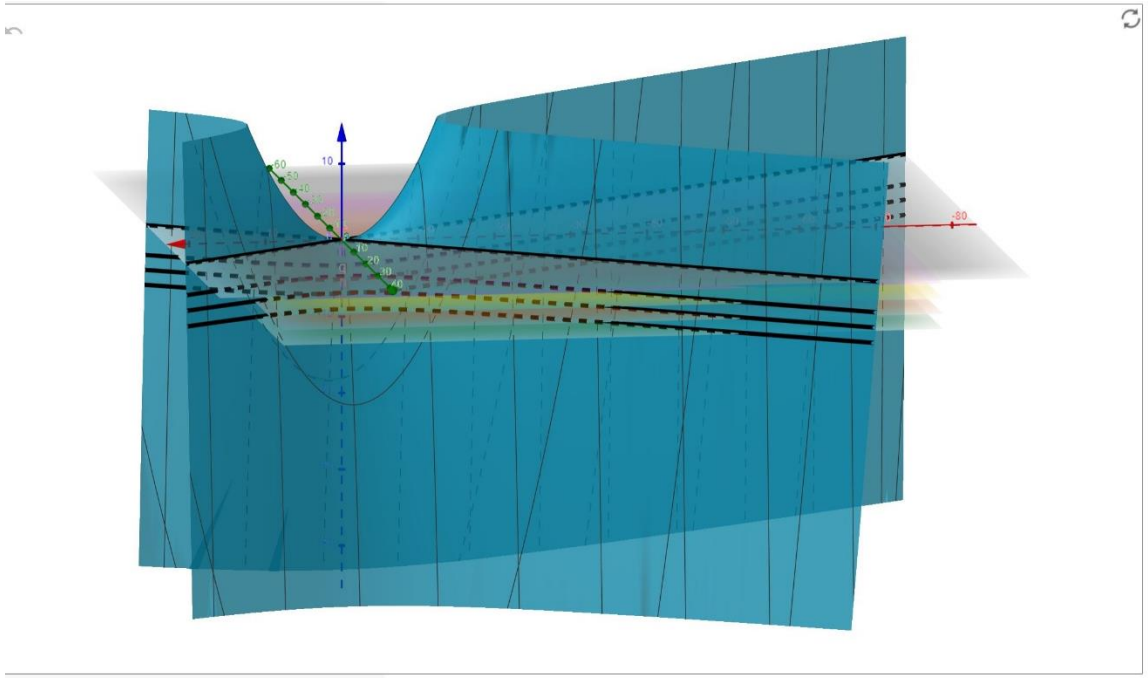


Get familiar with topographic maps with Geogebra 3d Graphic

GeoGebra



Mountain with contour lines



Valley with contour lines

Valley/islands with contour lines

Sentinel- Discover which living beings inhabit the surface of the ocean, knowing their color

Sentinel- Study the air pollution that affects Paris.

Sentinel- Study changes in the vegetation, soil or water surface of a natural park .

Sentinel- Monitoring Arctic sea ice during storm periods .

Sentinel- Study changes in the hole in the ozone layer .

Sentinel -6 will be launched in November 2020 to study the composition of the Earth and the topography of the seas, respectively.

Edit Share View Audio & Video Participant Meeting Help

Beatriz Gonzalez Garcia
Me

David Cabezas
Host

Michel Breitfellner
Cohost

Jorge Esteban Fa...

Ana Paula Reis M...

Viewing Jorge Esteban Faust...

Copernicus Sentinel satellites

esa

Sentinel-1 (A/B/C/D) – SAR image
Weather, night/day applications, interferometry

Sentinel-2 (A/B/C/D) – Multispectral image
Land applications: urbane areas, forest, agriculture,...
Landsat, SPOT data continuity

Sentinel-3 (A/B/C/D) – General land and sea surveillance
Ocean colors, vegetation, land/sea
Superficial temperature, altimetry

Sentinel-4 (A/B) – Atmospheric geostationary (together with MTG)
Monitoring atmospheric composition and pollution

Sentinel-5 Precursor/ Sentinel-5 (A/B/C) – Low orbit
Atmosphere composition (MetOp-SG Series A)
Atmospheric pollution

Sentinel-6 [Jason-CS] (A/B) – Low inclination altimeter
Sea level, wind speed, waves height

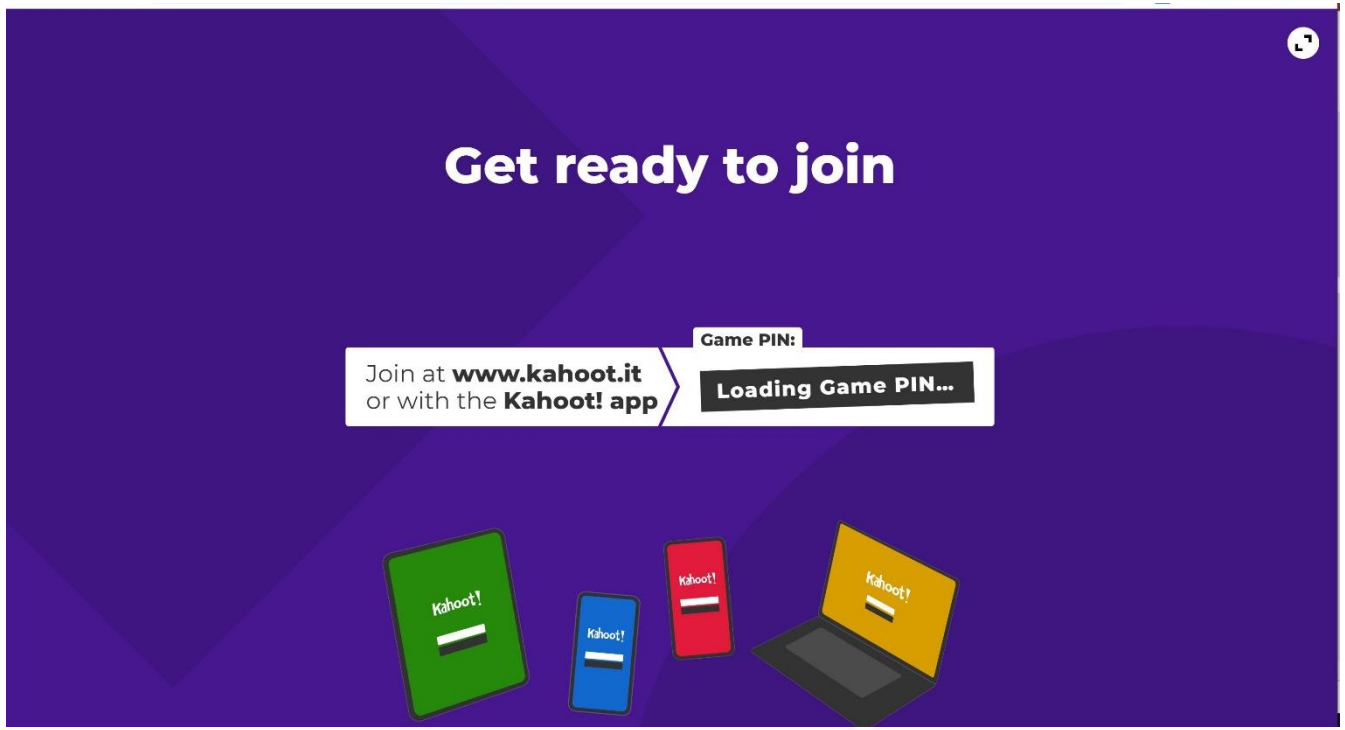
opernicus

European Space Agency

Let's start the Challenge

What do we already know?

https://play.kahoot.it/



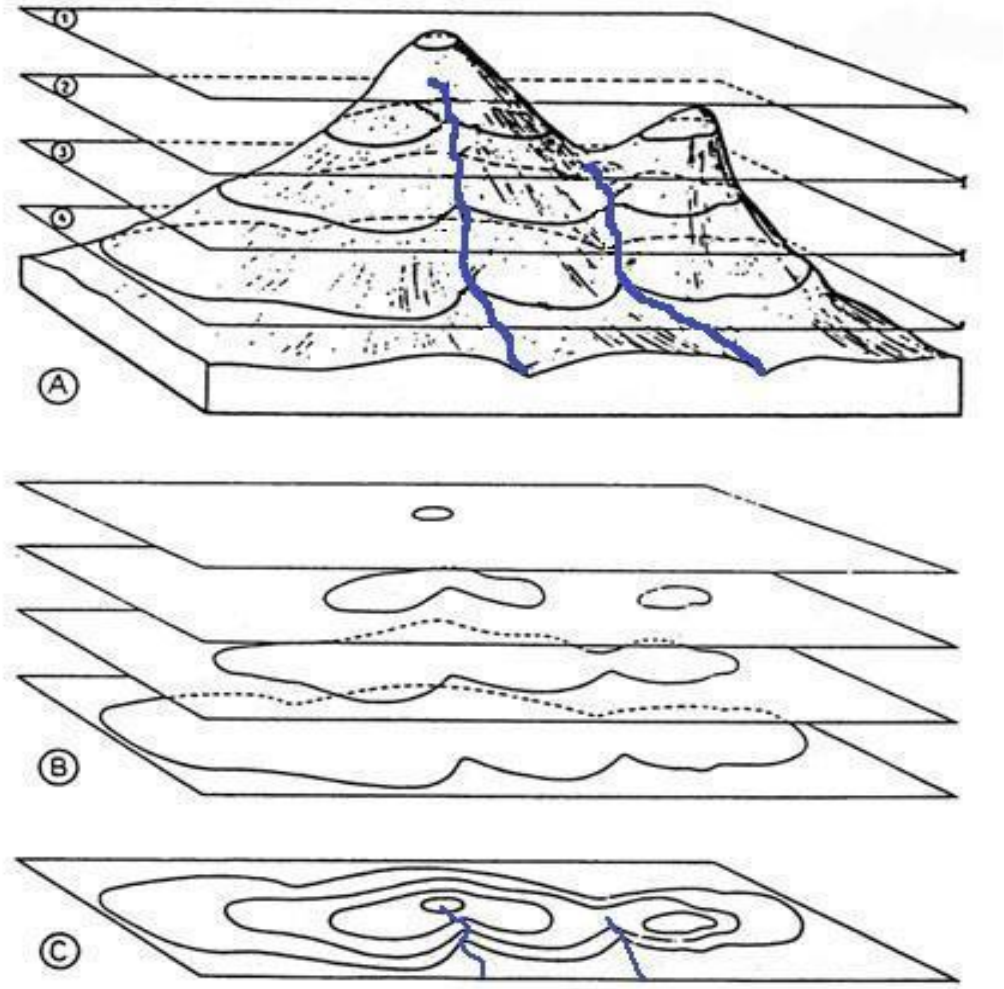
Step 1

Create your own topographic map

Draw on the image which path you think the water would follow after a heavy rain.

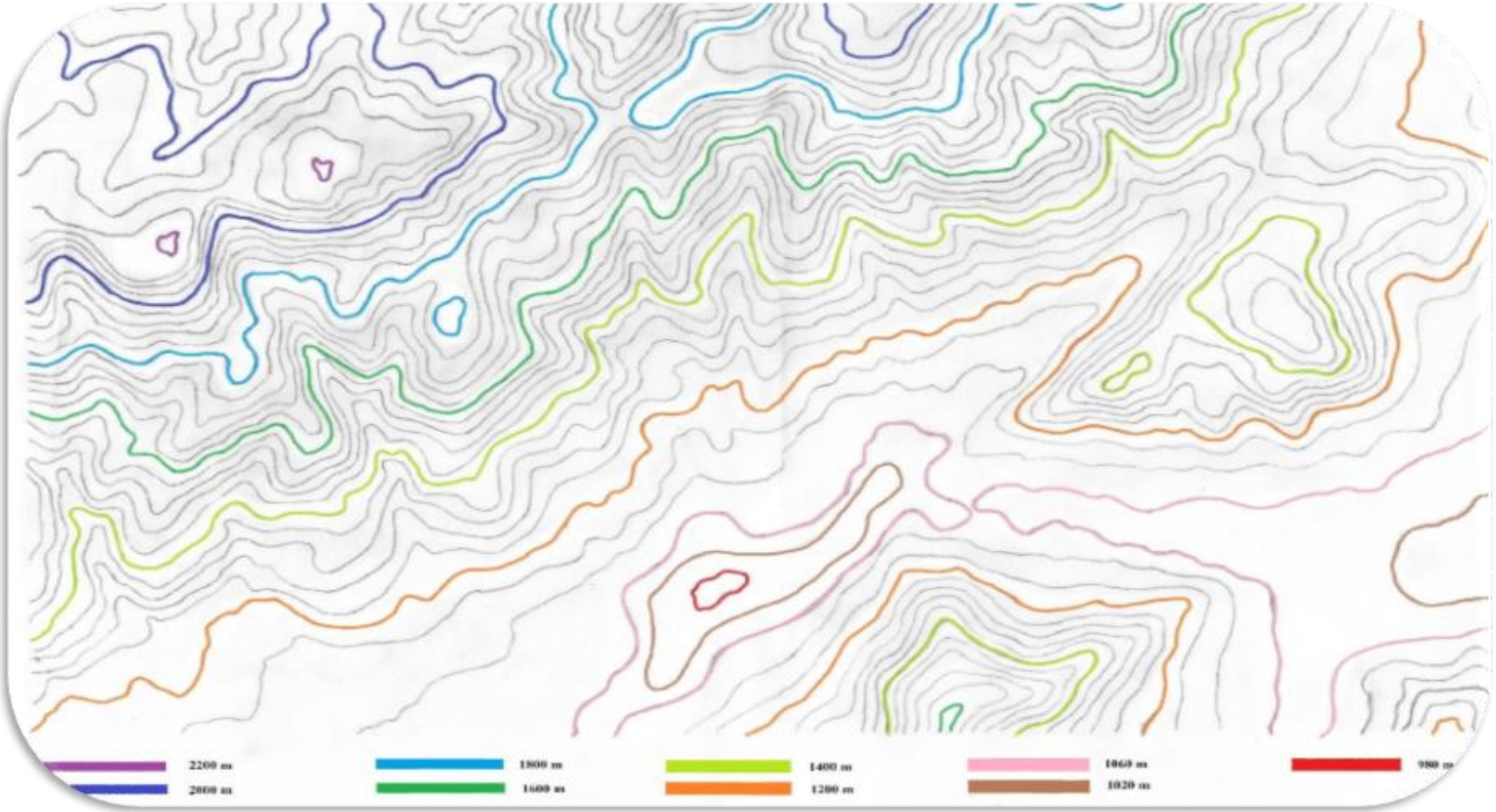
Draw on the image which path you think the water would follow after a heavy rain.

Try to draw the mountain with the river on a plane:

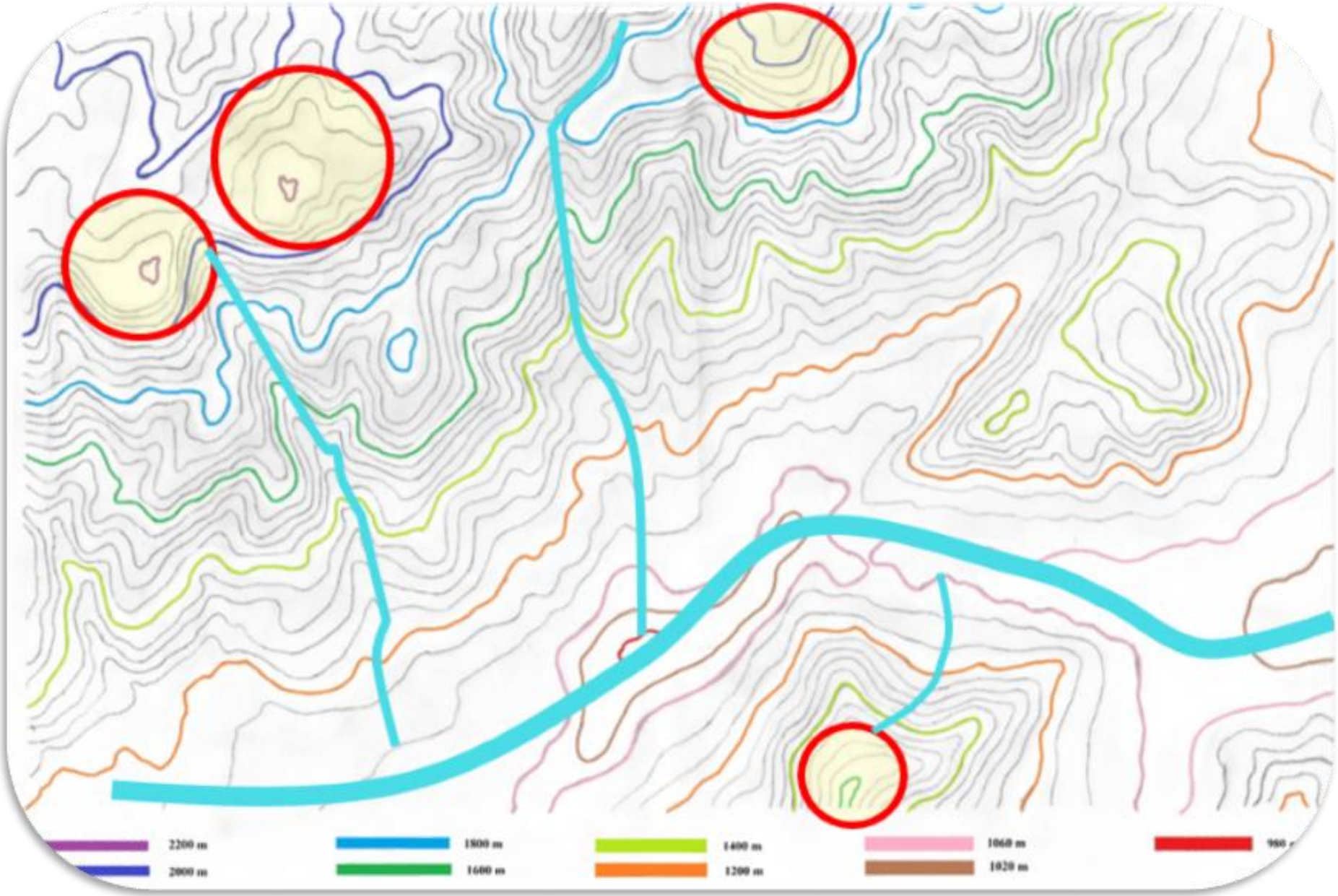


Step 2

Read topographic maps



2 200 m
2 000 m
1 800 m
1 600 m
1 400 m
1 200 m
1 060 m
1 020 m
900 m



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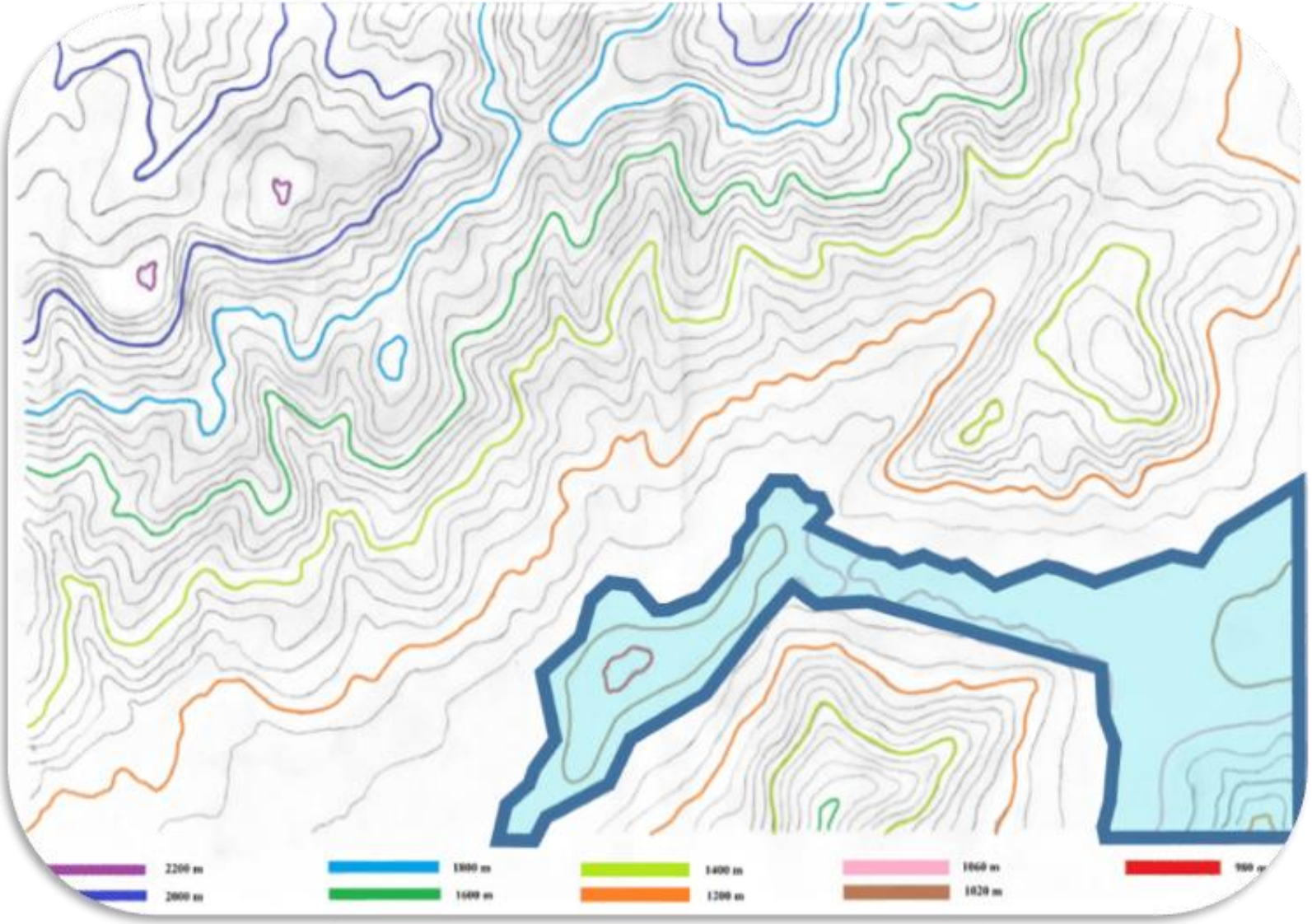
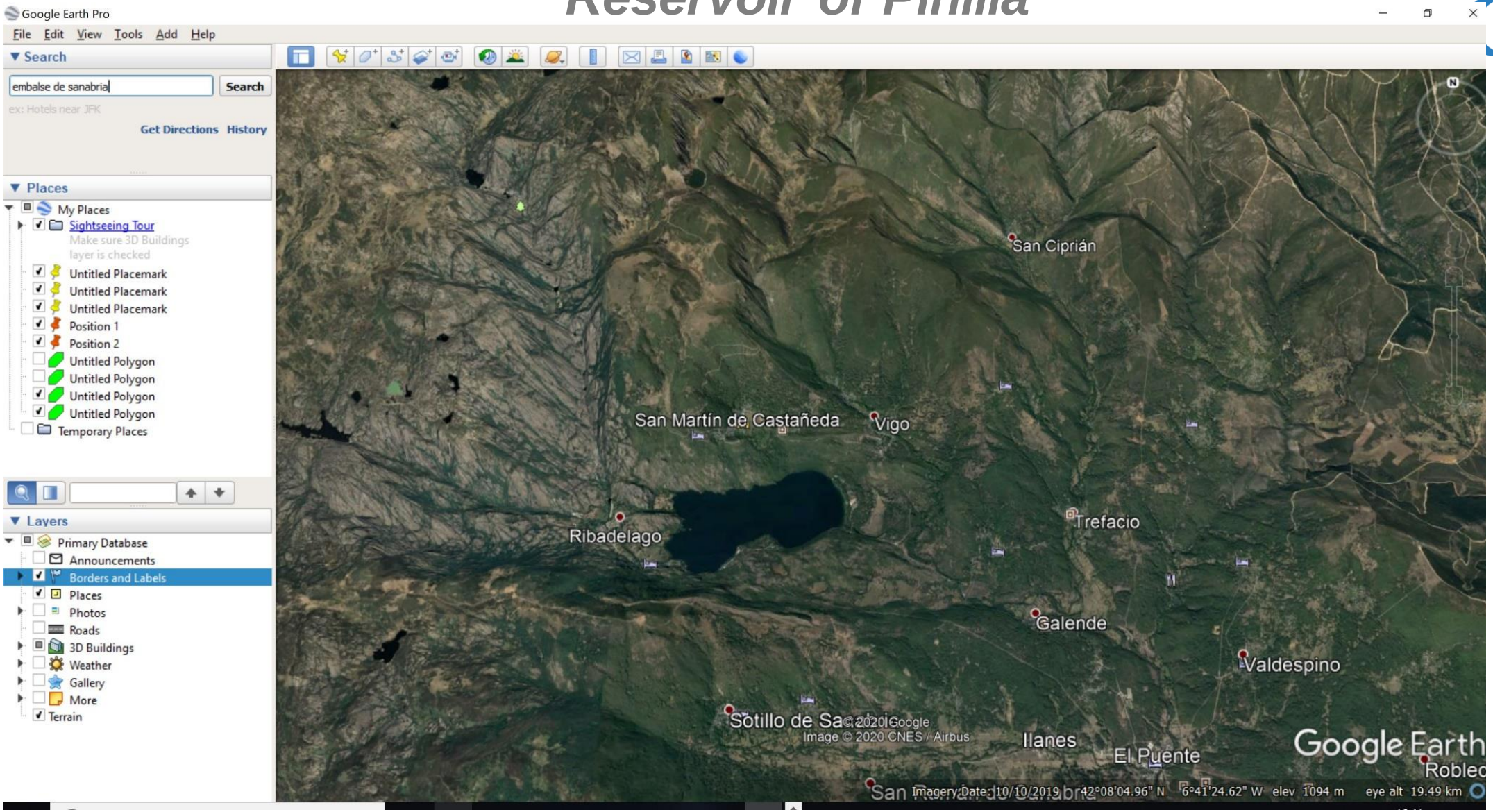


2 200 m
2 000 m
1 800 m
1 600 m
1 400 m
1 200 m
1 060 m
1 020 m
900 m

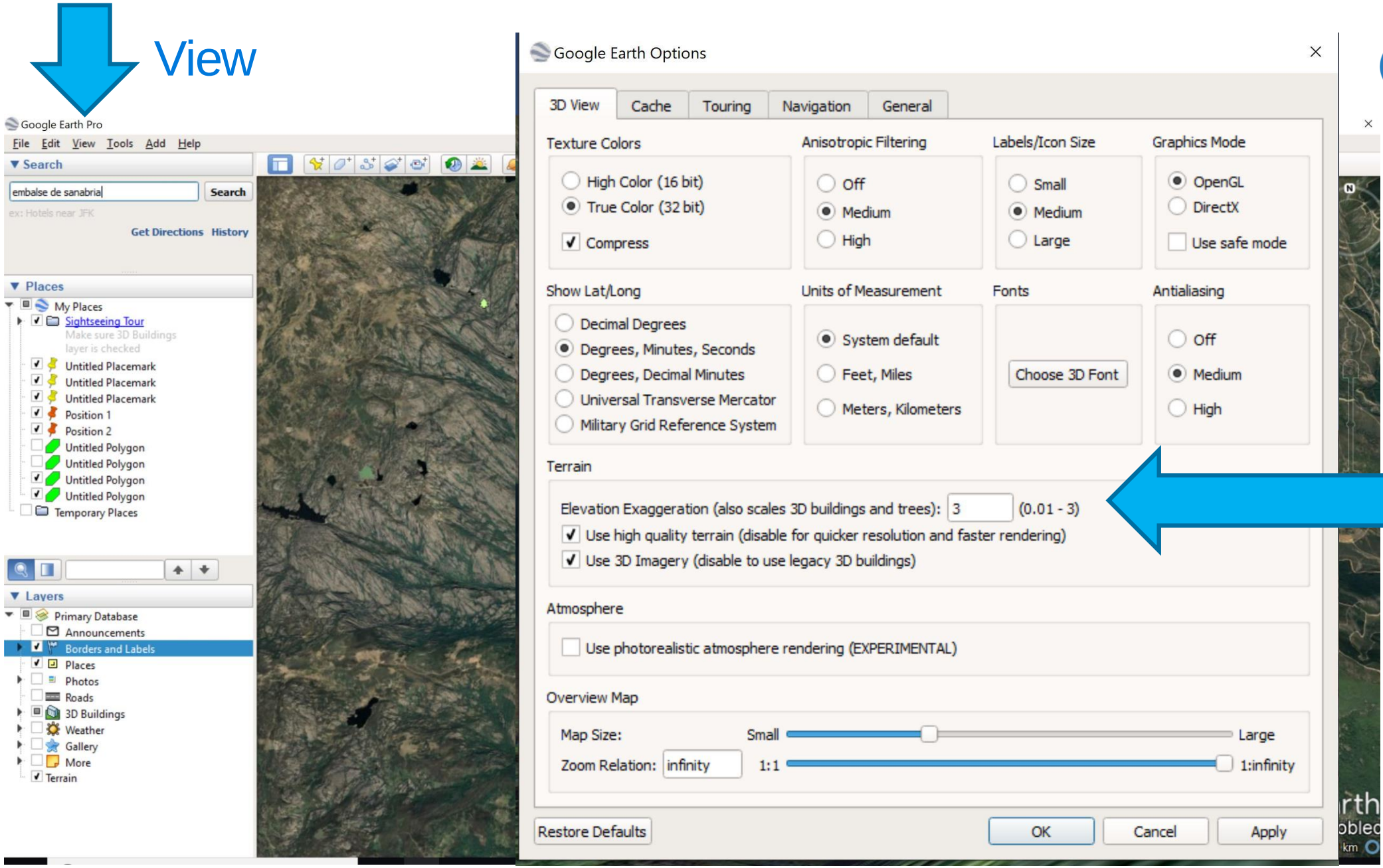
Step 3

Check your 3D vision from a 2D map

Reservoir of Pinilla



View


Google Earth Pro
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Search
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Search
Get Directions History
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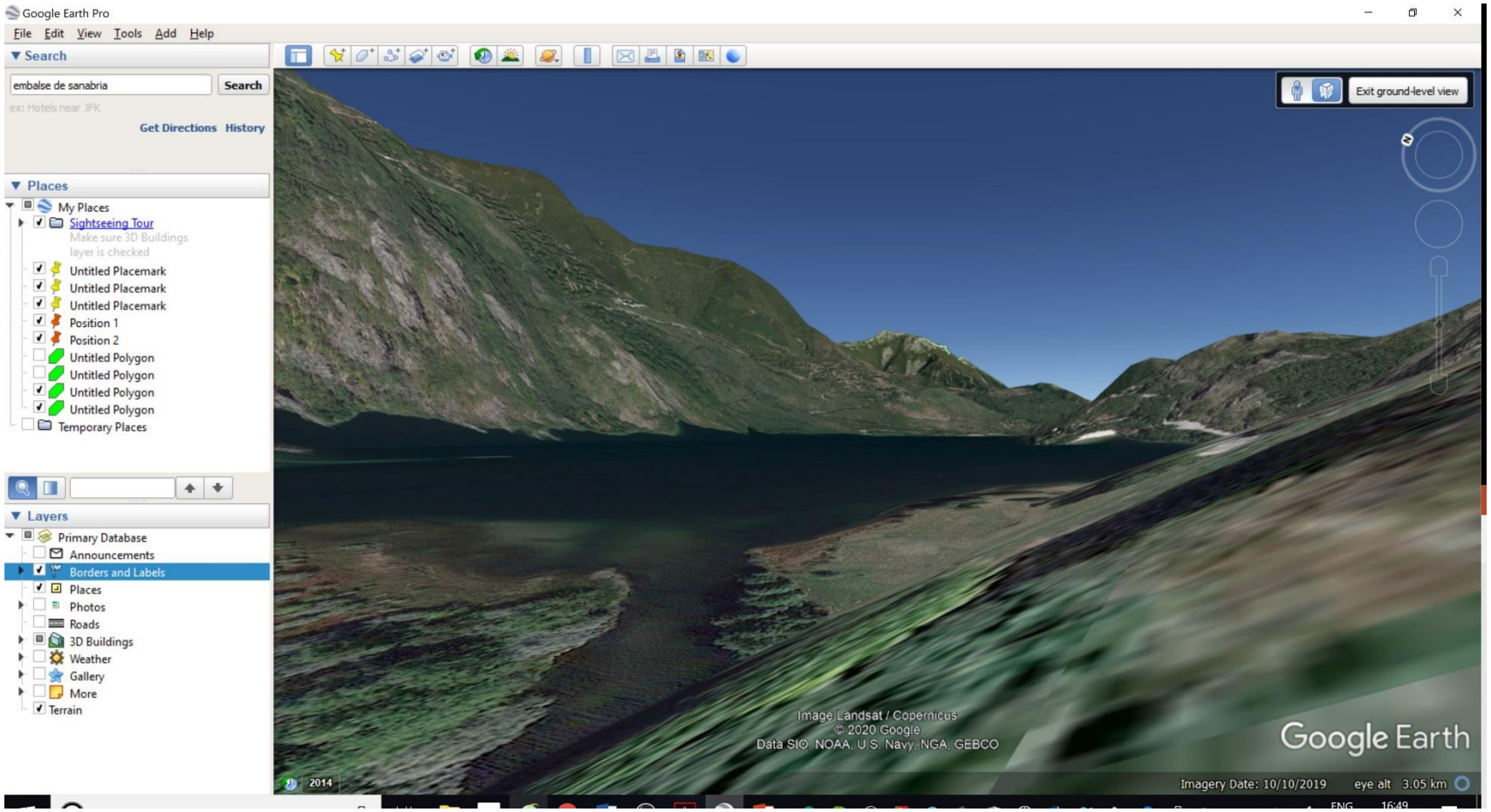
Photos
Roads
3D Buildings
Weather
Gallery
More
Terrain
Google Earth Options
3D View
Cache
Touring
Navigation
General
Texture Colors
High Color (16 bit)
True Color (32 bit)
Compress
Anisotropic Filtering
Off
Medium
High
Labels/Icon Size
Small
Medium
Large
Graphics Mode
OpenGL
DirectX
Use safe mode
Show Lat/Long
Decimal Degrees
Degrees, Minutes, Seconds
Degrees, Decimal Minutes
Universal Transverse Mercator
Military Grid Reference System
Units of Measurement
System default
Feet, Miles
Meters, Kilometers
Fonts
Choose 3D Font
Antialiasing
Off
Medium
High
Terrain
Elevation Exaggeration (also scales 3D buildings and trees): 3 (0.01 - 3)
Use high quality terrain (disable for quicker resolution and faster rendering)
Use 3D Imagery (disable to use legacy 3D buildings)
Atmosphere
Use photorealistic atmosphere rendering (EXPERIMENTAL)
Overview Map
Map Size: Small Large
Zoom Relation: infinity 1:1 1:infinity
Restore Defaults
OK
Cancel
Apply

3


Google Earth Pro
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My Places
Sightseeing Tour
Make sure 3D Buildings layer is checked
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Borders and Labels
Places
Photos
Roads
3D Buildings
Weather
Gallery
More
Terrain
Exit ground-level view
Image Landsat / Copernicus
© 2020 Google
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Google Earth
Imagery Date: 10/10/2019 eye alt 3.05 km

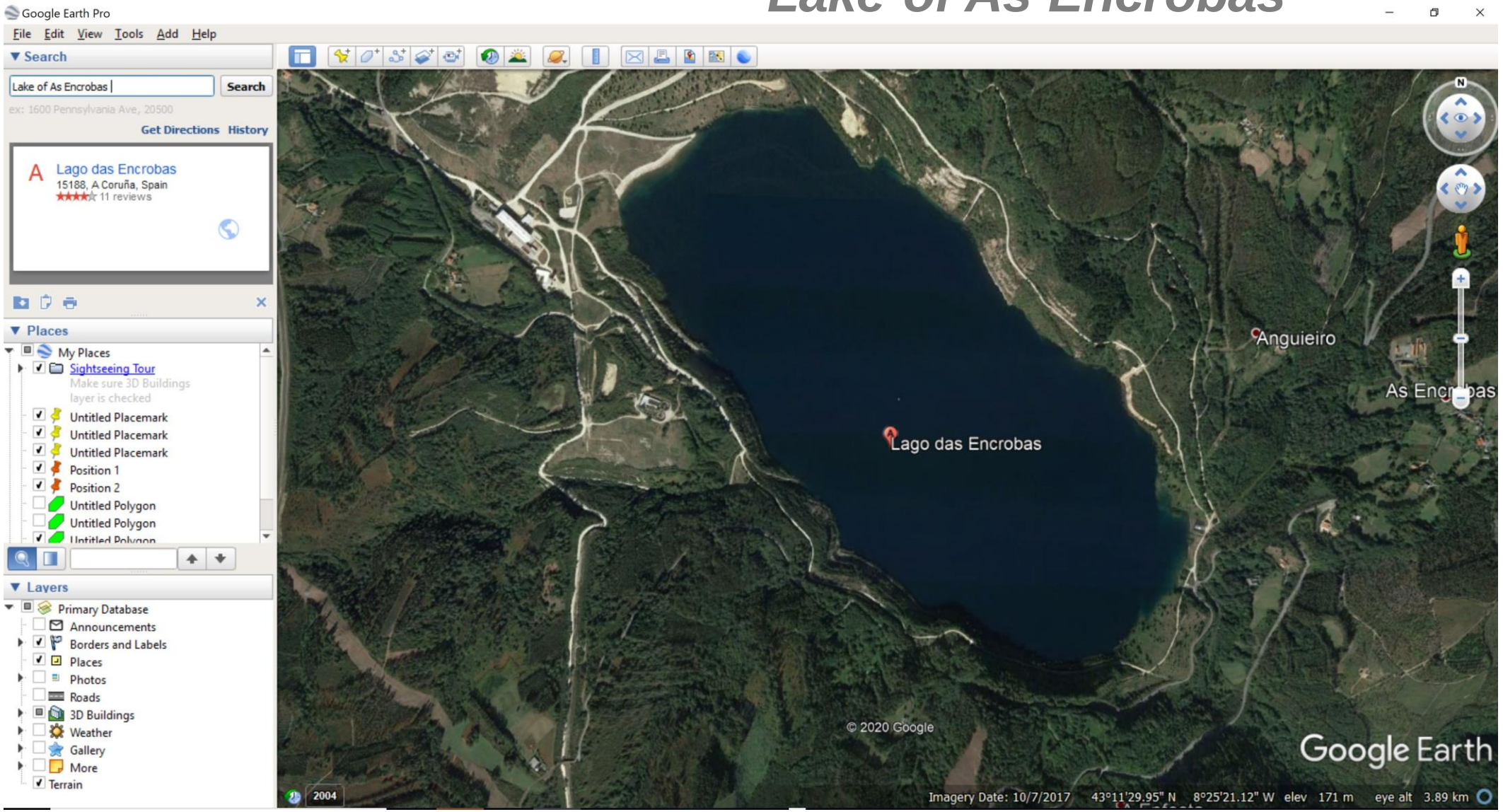

N
nes de Street View

Step 4

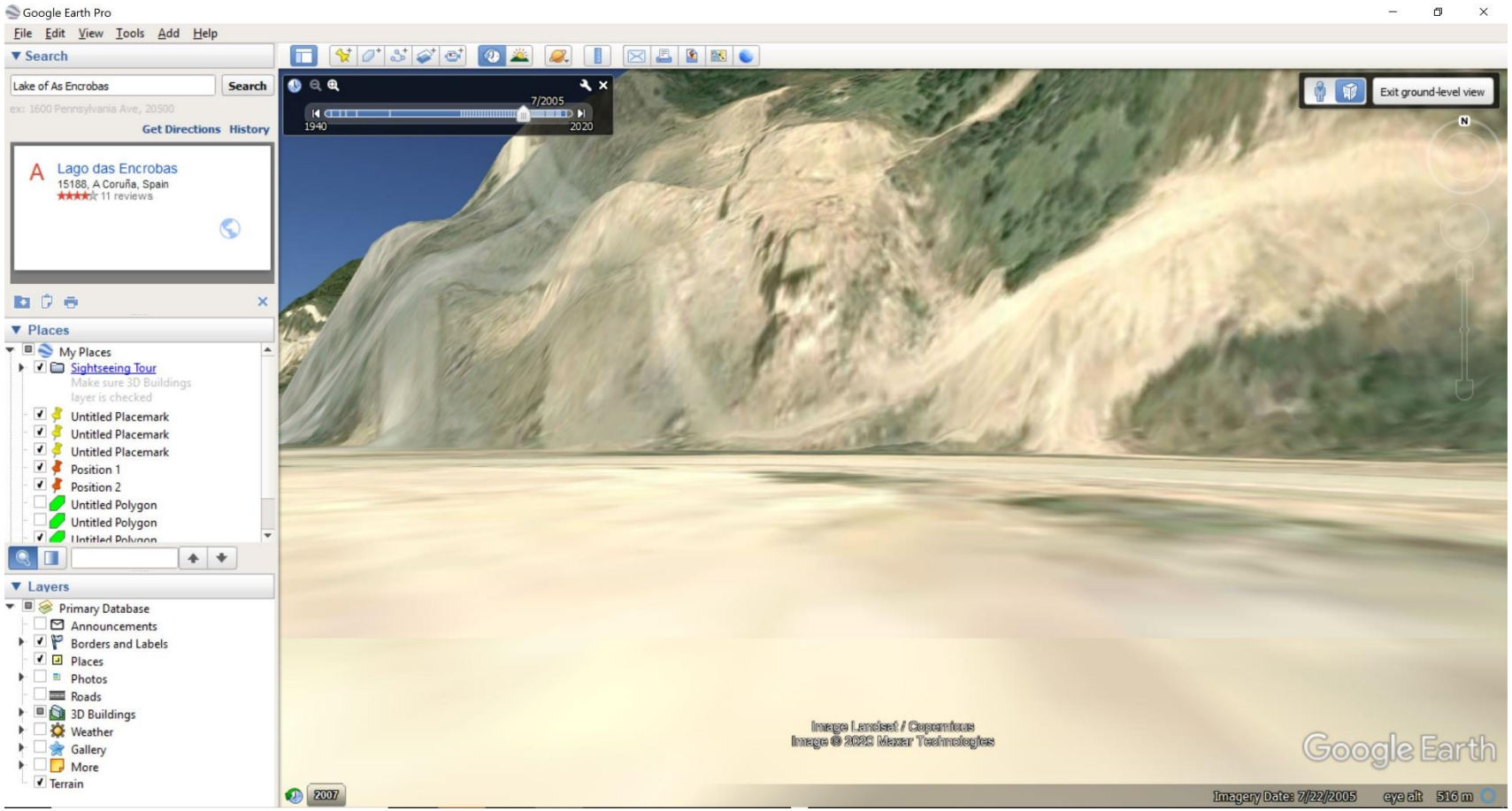
Time travel

Show historical imagery

Lake of As Encrobas



Date (year)	What do you see in the image?	What satellite took the image?	Add here the snapshot of what you are seen
1940			
...			
...			
...			
2020			


Google Earth Pro
File Edit View Tools Add Help
Search
Lake of As Encrobas
Search
Get Directions History
Lago das Encrobas
15188, A Coruña, Spain
Places
My Places
Sightseeing Tour
Untitled Placemark
Untitled Placemark
Untitled Placemark
Position 1
Position 2
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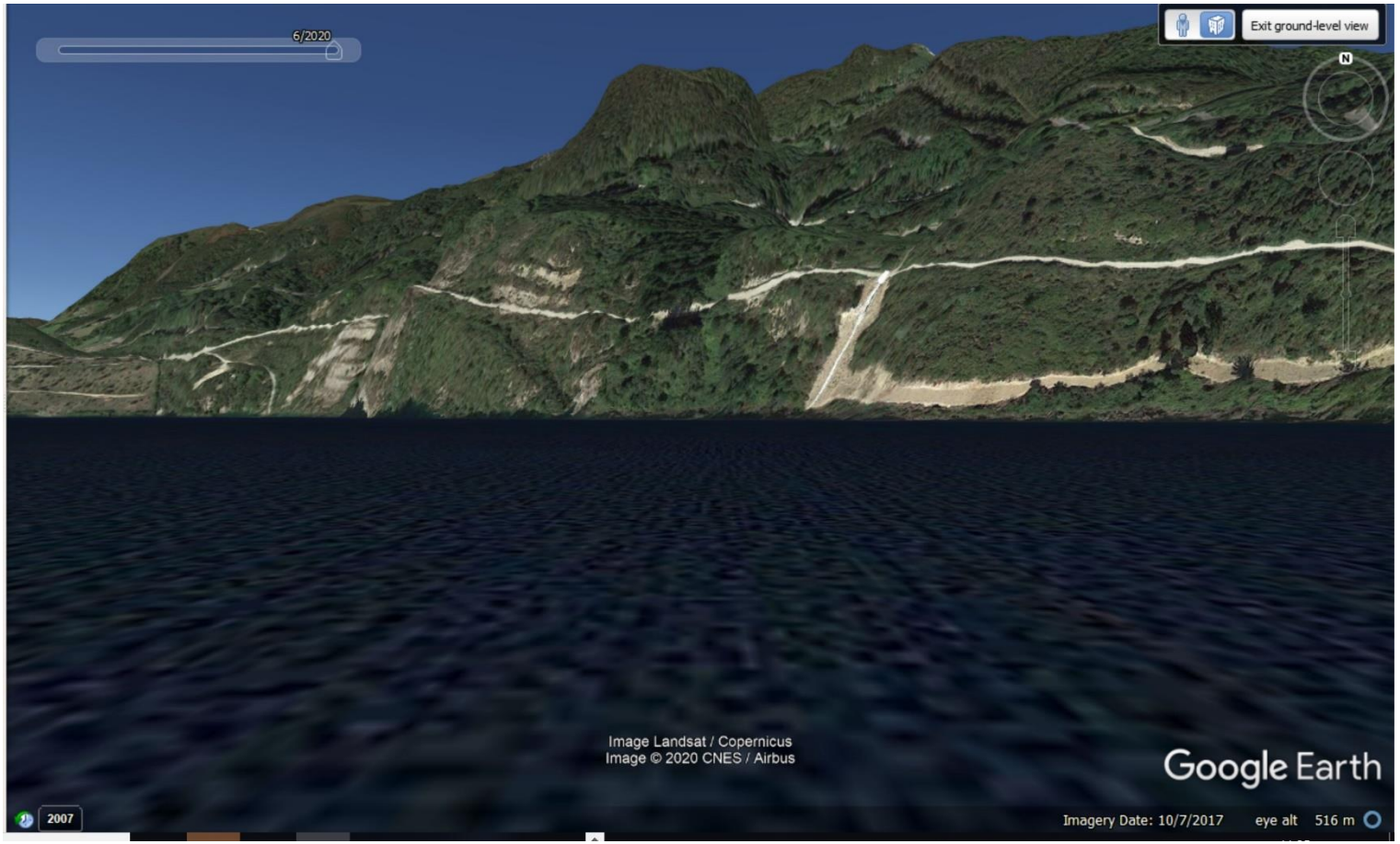
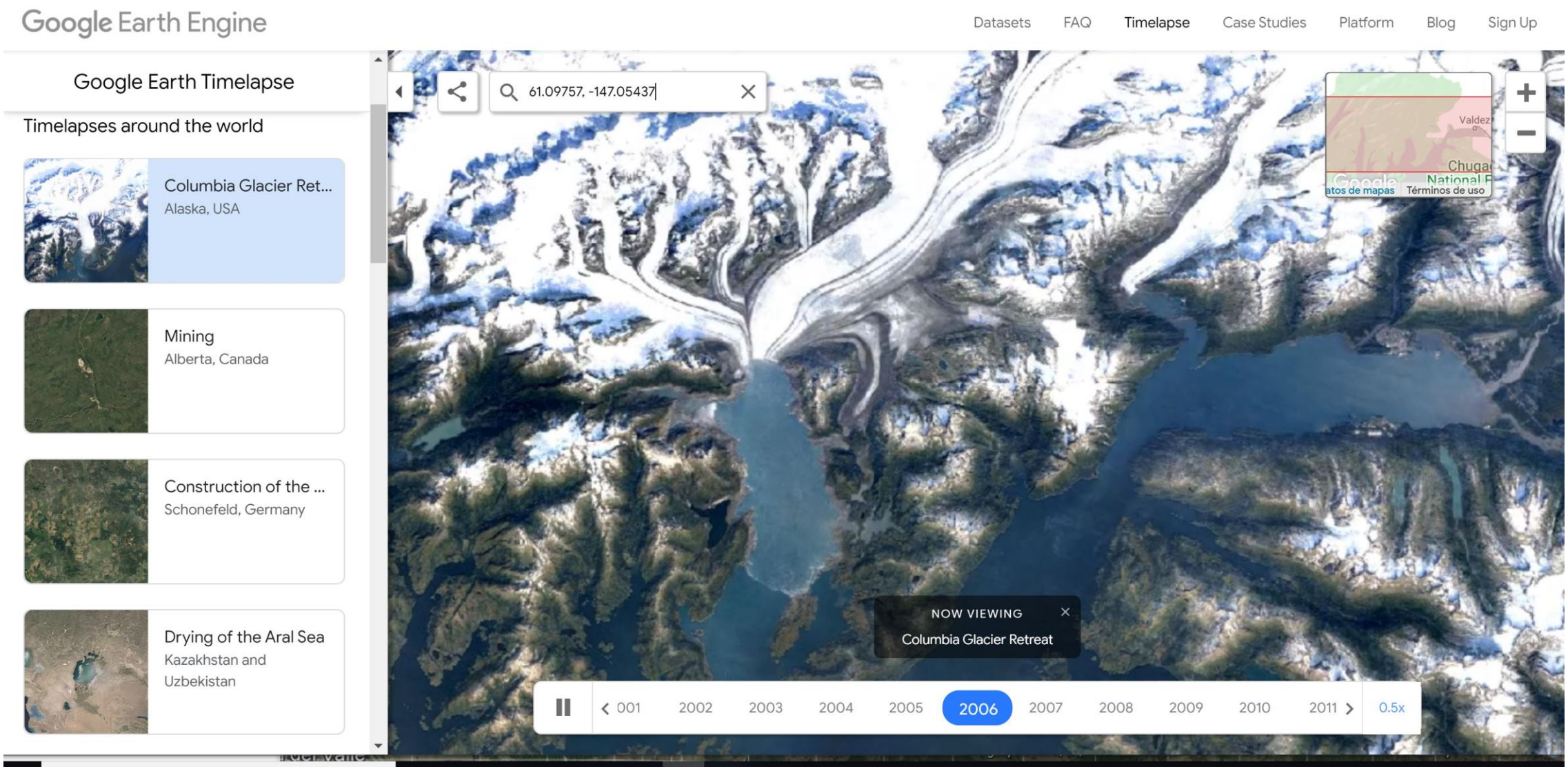
Places
Photos
Roads
3D Buildings
Weather
Gallery
More
Terrain
Exit ground-level view
Image Landsat / Copernicus
Image © 2023 Maxar Technologies
Google Earth
2007
Imagery Date: 7/22/2005 eye alt 516 m

In 2005



In 2020

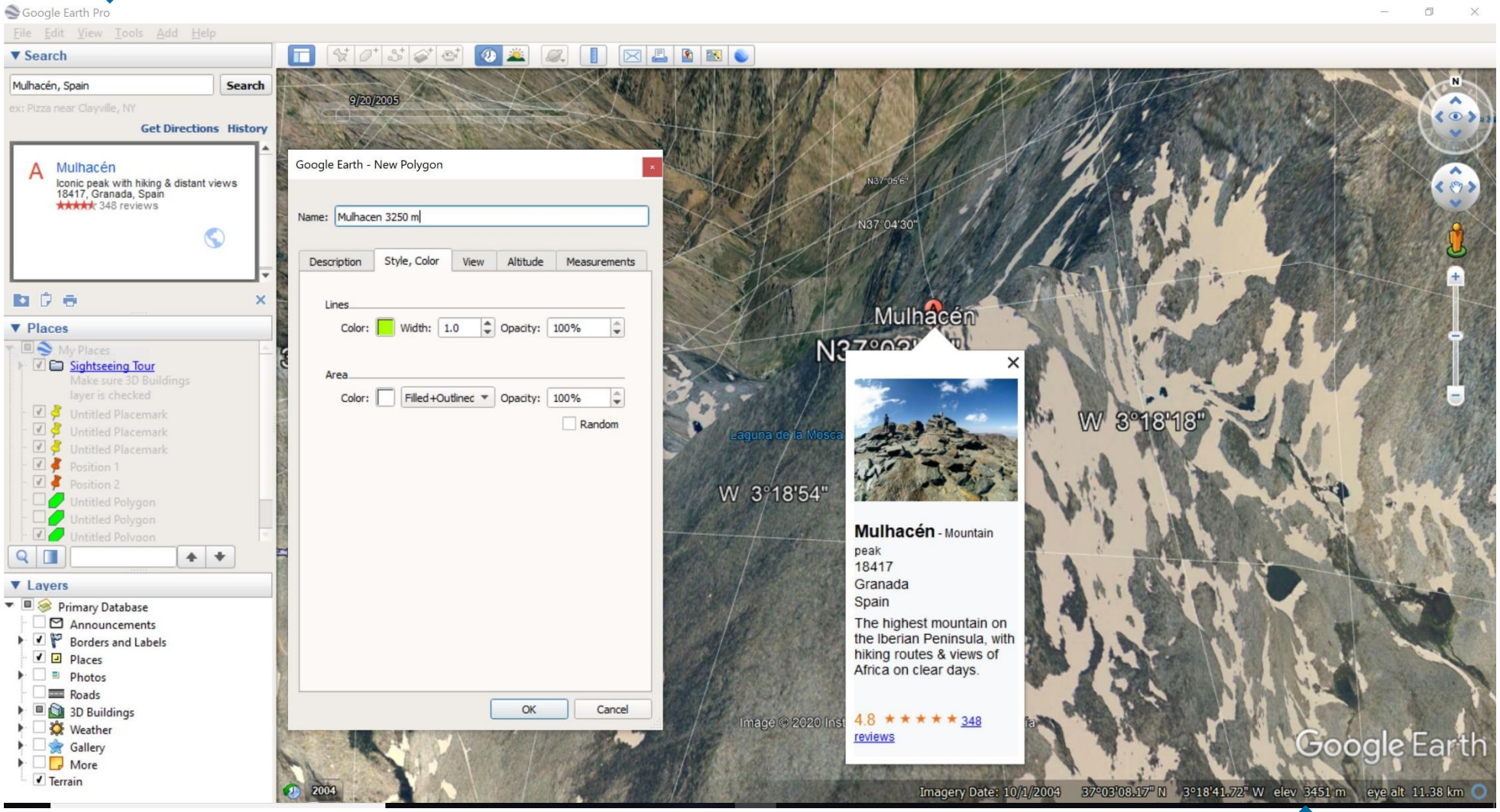
https://earthengine.google.com/timelapse/



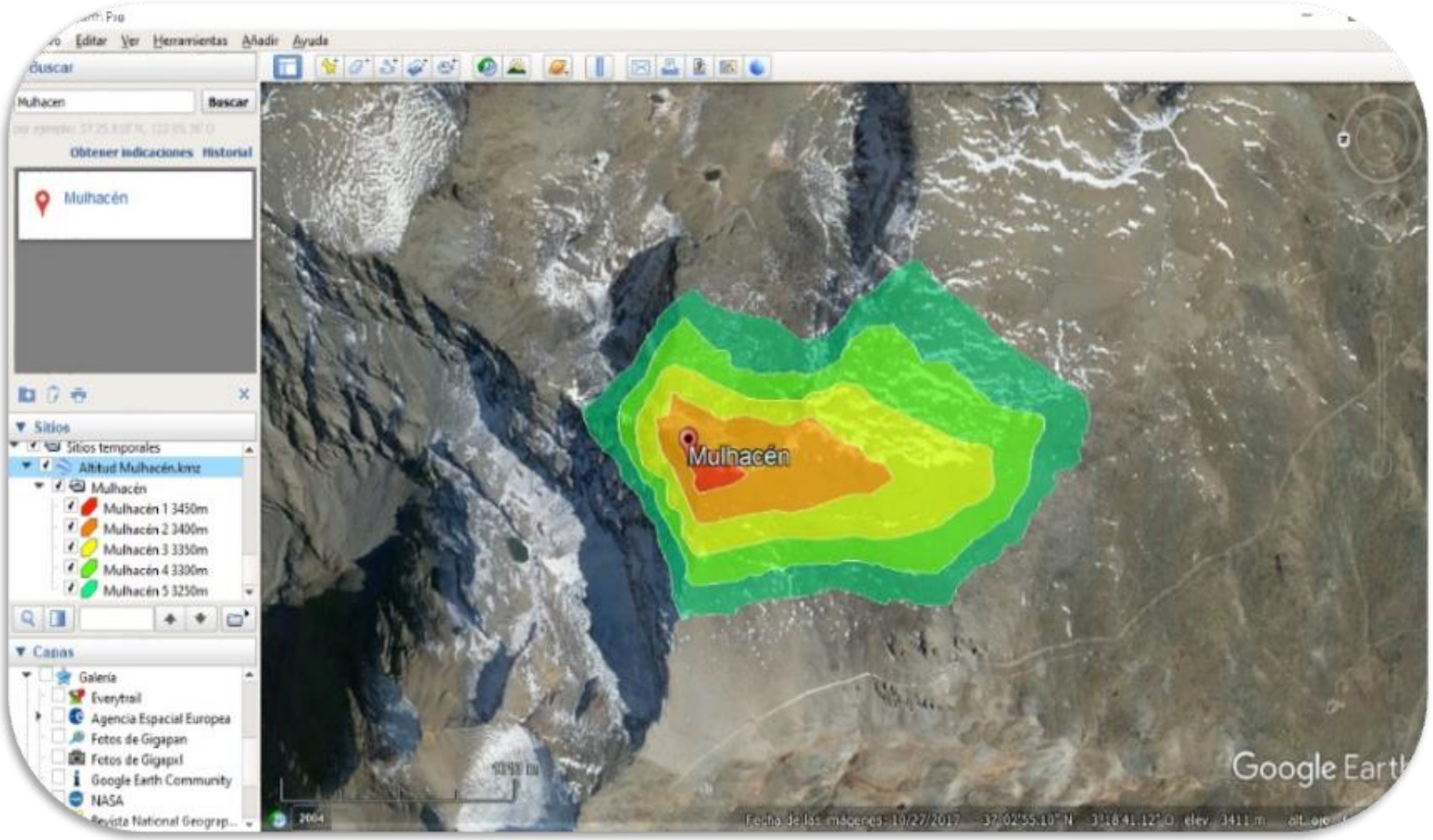
Step 5

Create your own 3D contour maps

Add polygon



Elevation



3 450 m

3 400 m

3 350 m

3 300m

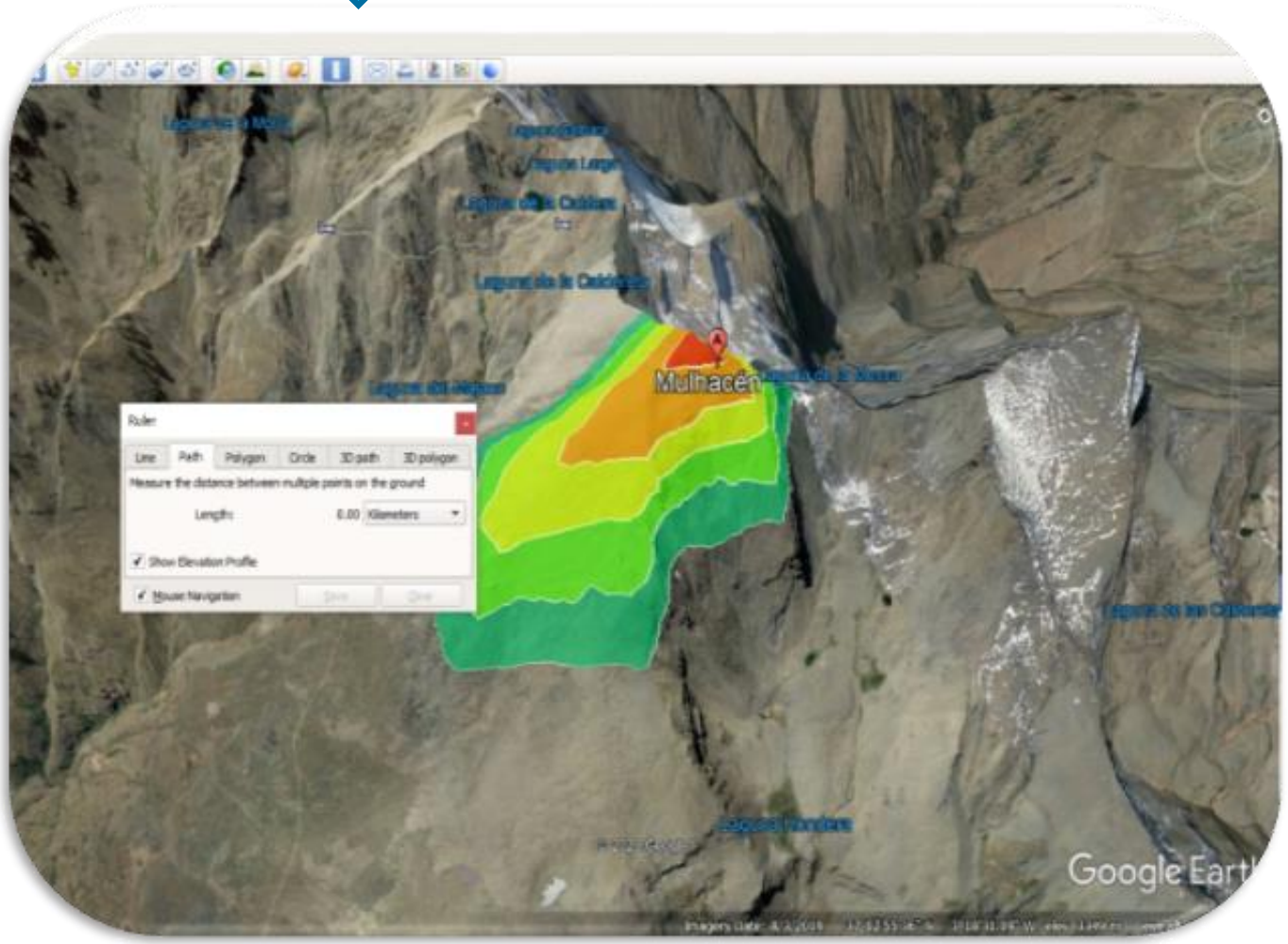
3 250 m

Step 6

Design your walking route


Municipio de Medellín
Caminos Puerto Alegre
Los Vásquez
Torre de incendios
Senderos Puerto Alegre
Sendero Mafesanos
BA
6.705Ha

Ruler


Ruler
Line
Path
Polygon
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3D path
3D polygon
Measure the distance between multiple points on the ground
Length:
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Mouse Navigation
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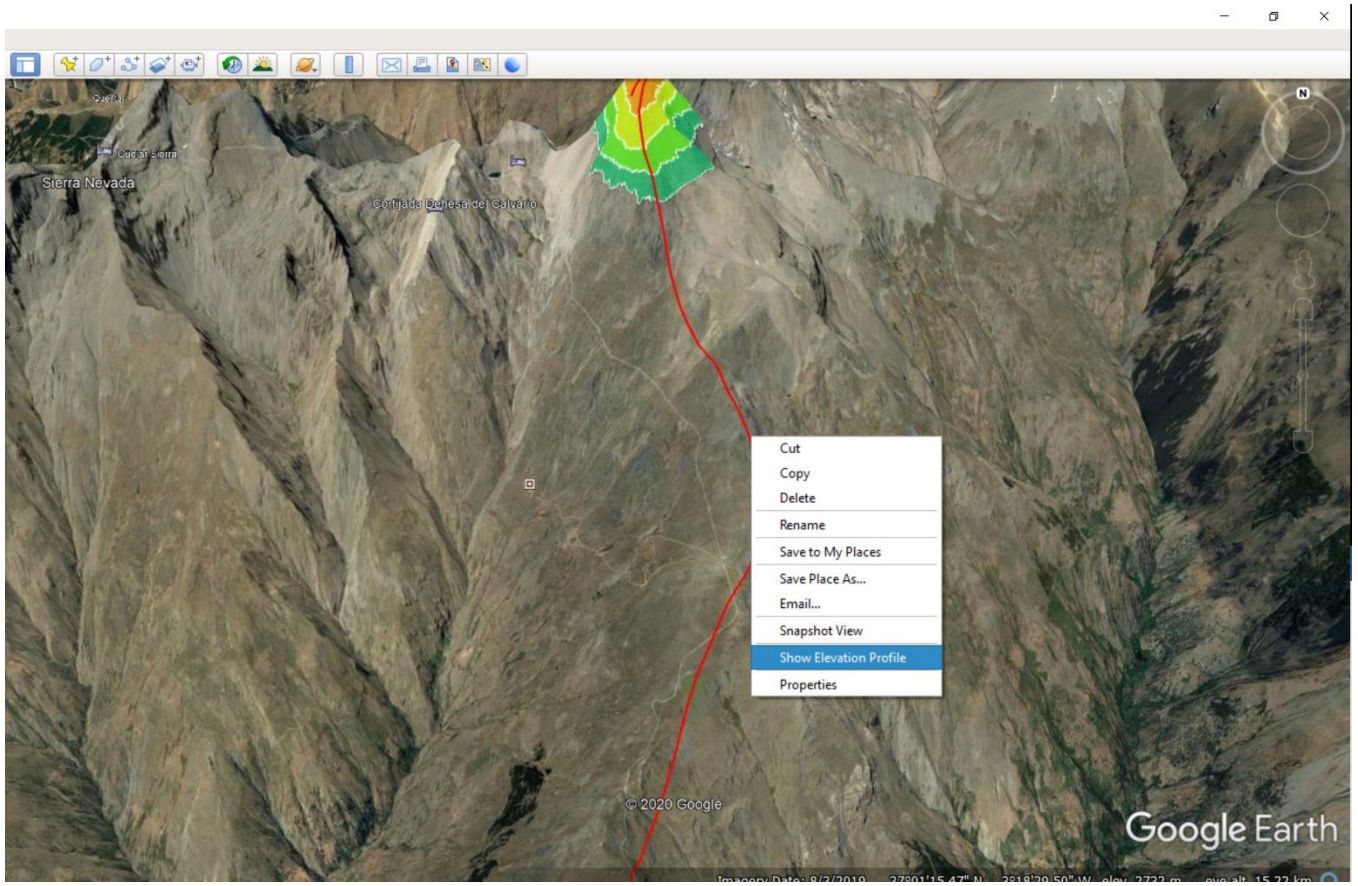
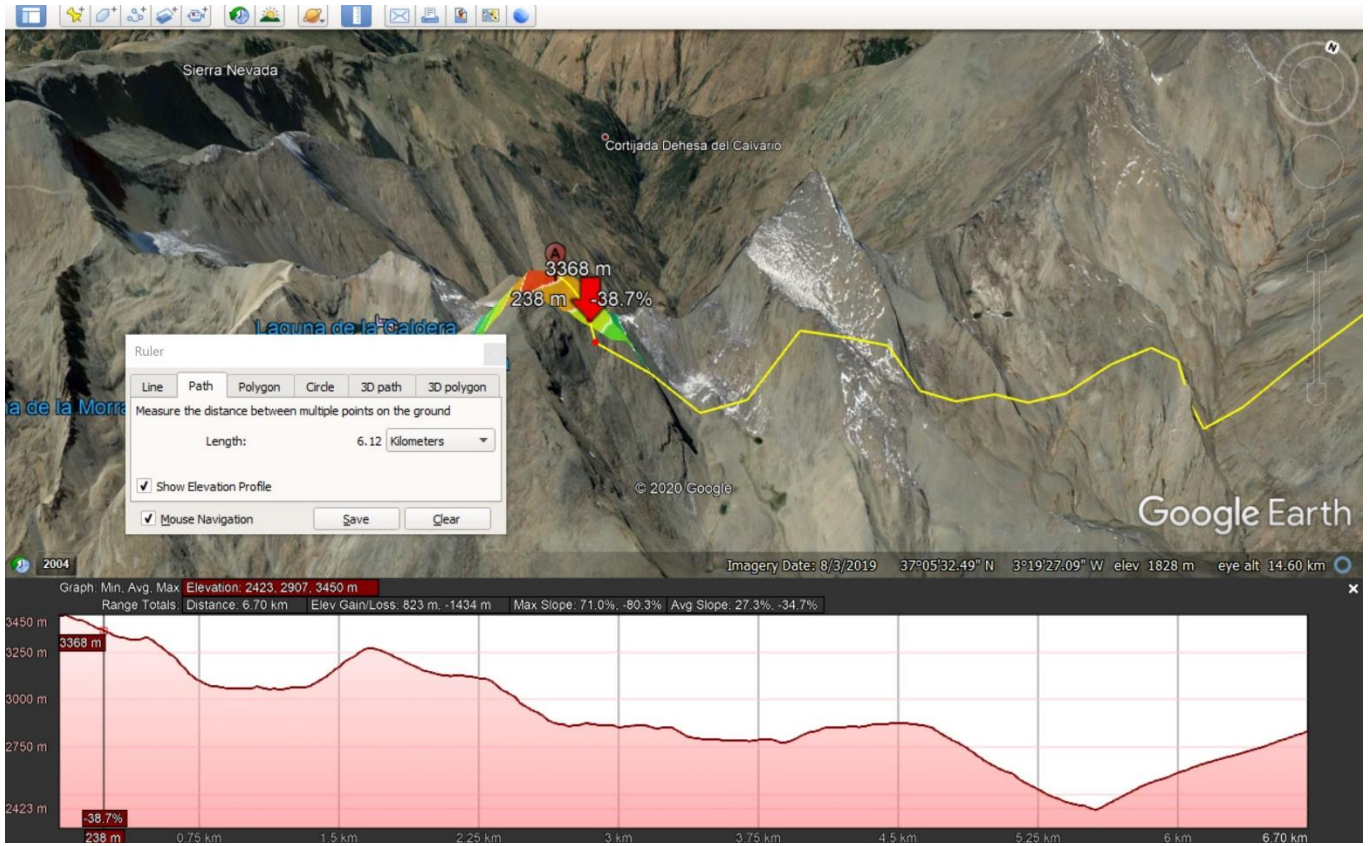
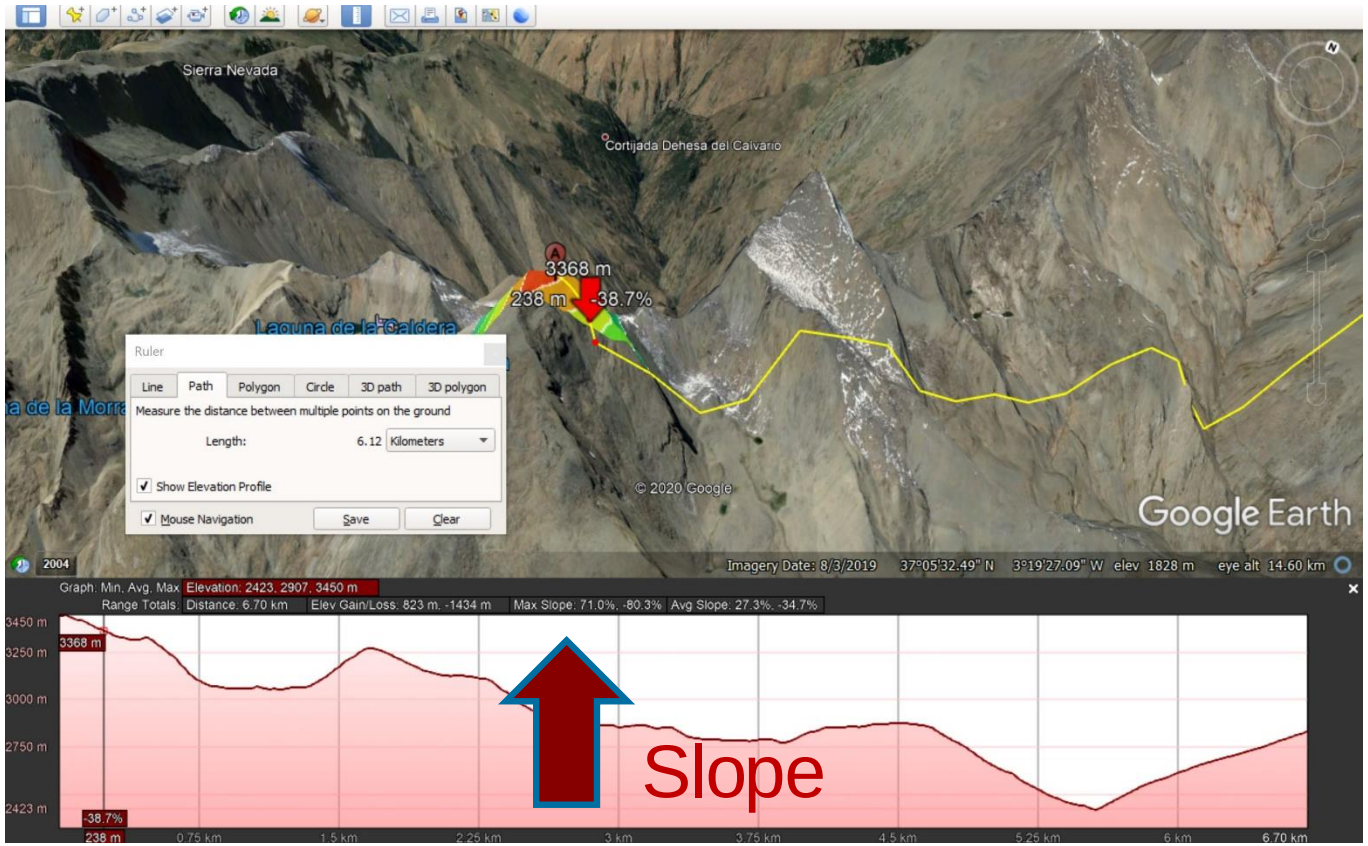

Sierra Nevada
Cut
Copy
Delete
Rename
Save to My Places
Save Place As...
Email...
Snapshot View
Show Elevation Profile
Properties
© 2020 Google
Google Earth


Sierra Nevada
Cortijada Dehesa del Calvario
3368 m
238 m
-38.7%
Laguna de la Caldera
Ruler
Line
Path
Polygon
Circle
3D path
3D polygon
Measure the distance between multiple points on the ground
Length:
6.12
Kilometers
Show Elevation Profile
Mouse Navigation
Save
Clear
© 2020 Google
Google Earth
2004
Imagery Date: 8/3/2019 37°05'32.49" N 3°19'27.09" W elev 1828 m eye alt 14.60 km
Graph: Min, Avg, Max Elevation: 2423, 2907, 3450 m
Range Totals: Distance: 6.70 km Elev Gain/Loss: 823 m, -1434 m Max Slope: 71.0%, -80.3% Avg Slope: 27.3%, -34.7%
3450 m
3250 m
3000 m
2750 m
2423 m
3368 m
-38.7%
238 m
0.75 km
1.5 km
2.25 km
3 km
3.75 km
4.5 km
5.25 km
6 km
6.70 km


Sierra Nevada
Cortijada Dehesa del Calvario
3368 m
238 m
-38.7%
Laguna de la Caldera
Ruler
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Circle
3D path
3D polygon
Measure the distance between multiple points on the ground
Length:
6.12
Kilometers
Show Elevation Profile
Mouse Navigation
Save
Clear
© 2020 Google
Google Earth
2004
Imagery Date: 8/3/2019 37°05'32.49" N 3°19'27.09" W elev 1828 m eye alt 14.60 km
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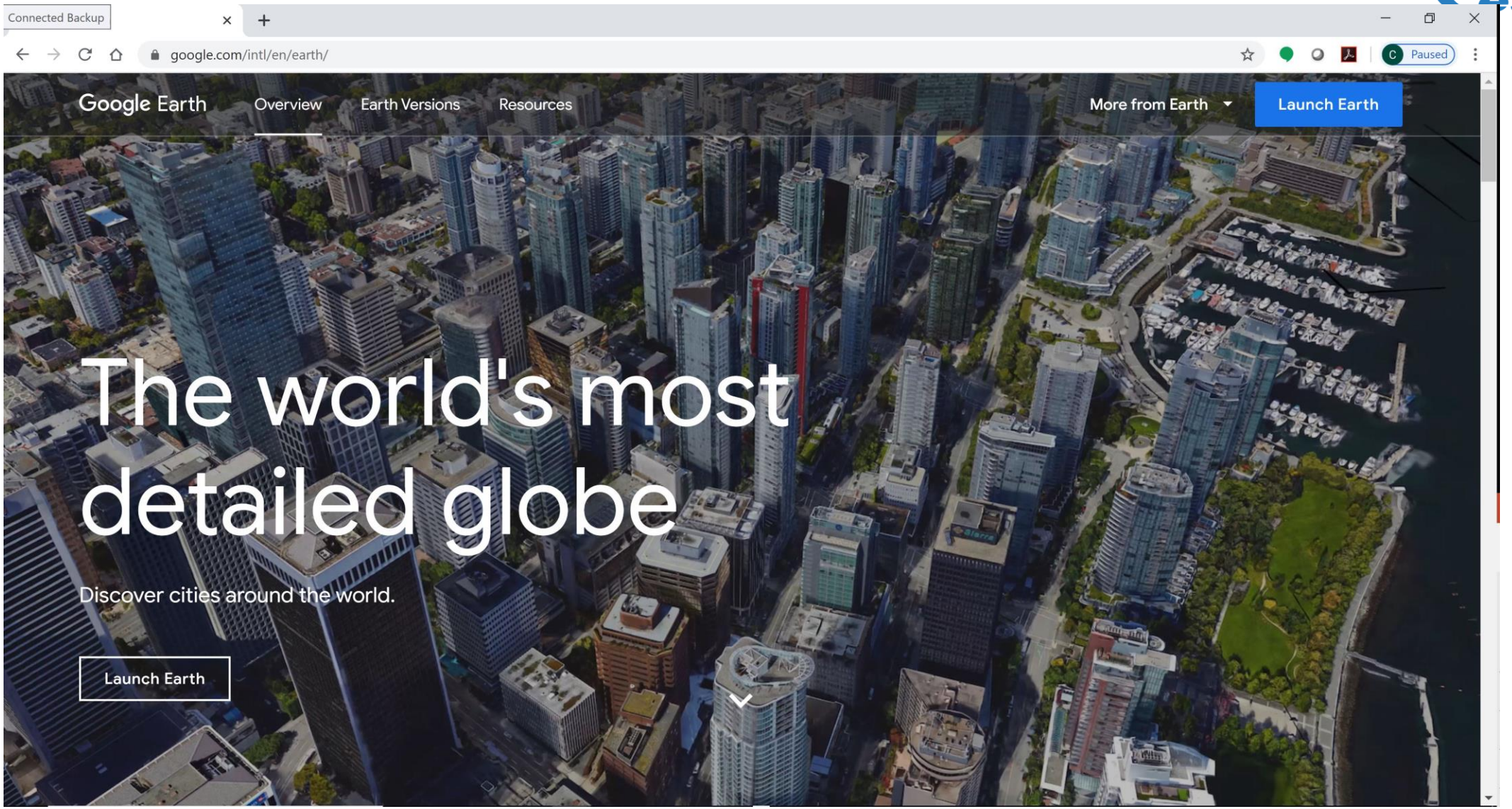
3450 m
3250 m
3000 m
2750 m
2423 m
3368 m
-38.7%
238 m
0.75 km
1.5 km
2.25 km
3 km
3.75 km
4.5 km
5.25 km
6 km
6.70 km
Slope

Step 7

Google Project


Connected Backup
google.com/intl/en/earth/
Paused
Google Earth
Overview
Earth Versions
Resources
More from Earth
Launch Earth
The world's most detailed globe
Discover cities around the world.
Launch Earth

Let's create together an ESA-GTTP collaborative project

Link here