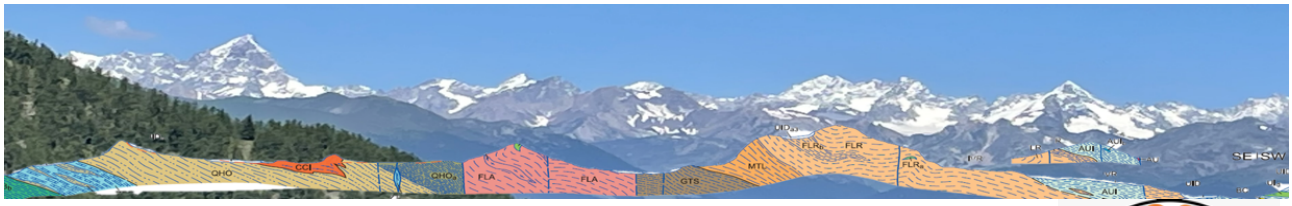


IESO 2022

15th EDITION ITALY-AOSTA HOST COUNTRY

DATA MINING TEST N.4

STUDENT CODE

VOLCANOES AND EARTHQUAKES, science, and history

the Lisbon Earthquake -engrave of 1755

MAY 18, 1980, MT. ST. HELENS: AN ERUPTION THAT CHANGED THE HISTORY OF VOLCANOLOGY

Mount Saint Helens is an active stratovolcano *(=aktiivinen kerrostulivuori)* located in the US, Washington state. The crater *(=kraateri)* is part of the Cascades Volcanic Arc, a segment of the Pacific Fire Belt *(=Tyynenmeren tulirengas)*.

At 3.37 pm on March 20, 1980, the seismographs of the seismic network of the University of Seattle, in the state of Washington in the north-west of the United States, recorded an earthquake of magnitude 4.1. The succession of shocks that followed the first *(=ensimmäistä järistystä seuranneet järistykset)* turned out to be different from the typical sequence of a main shock *(=pääjäristys)* and successive aftershocks *(=jälkijäristykset)*.

This was the deadliest and most economically destructive volcanic event in U.S. history. 57 people lost their lives while 47 bridges were destroyed. 200 homes, 24 km of railways and 298 of motorways. Massive avalanches of debris, triggered by a magnitude 5.1 earthquake generated a lateral eruption that reduced the elevation of the mountain peak from 2,950 to 2,550 m, leaving a 1.6 km wide crater in the shape of a horseshoe. The avalanche of debris amounted in terms of volume to 2.5 km^3.

The 1980 eruption marked a deep crisis for terrestrial ecosystems, while, on the contrary, aquatic ones benefited greatly from the quantities of ash, as it allowed underwater species to reproduce more quickly. Six years after the eruption, most of the lakes in the area have returned to their normal state.

After its eruption in 1980, the volcano experienced continuous volcanic activity until 2008. Future eruptions are expected to be even more destructive, as the conformation of the lava domes will require more pressure for it to occur.


Mount St.Helens eruption

1) the presence and activity of this volcano is due to
   a. being at a divergent margin *(=erkaantuva laattaraja)*
   b. being in correspondence with a converging margin *(=lähentyvä laattaraja)*
   c. it is a hot spot volcano

Using the information provided at the link https://www.pnsn.org/volcanoes/mount-st-helens

- find the volcano seismicity of Mount St. Helens, the link should drive you directly to Saint Helen, otherwise you can use the lens to find it
- then using Tools follow the instructions:
- Control panel: show all magnitudes > 1, depth
- Analyze, click Drow and draw a line WEST- EST direction intersecting Mount Saint Helen (for example from Silver Lake to Gifford Pinchot National Forest) then select a x-section
- then plot

2) a) take a screen shot of the result of the plot and attach it to the answer sheet
-

3) Using the same link, you can compare *(=vertailla)* the layers:  *topographic and imagery* and answer: a) between which altitudes (in m or ft) the volcano is still covered by volcanic materials (you can the tree line *(=puuraja)* as a reference) .....

4)using the Display legend in the Control Panel, you can recognize if there have been earthquakes in the last ten days.
Were there any?

a. Yes
b. no

5) See the Recent EQ list. Calculates the average depth of the hypocenter *(=maanjäristyskeskus)* of the last 10 earthquakes
..... km
6) these were earthquakes with hypocenter:
a. superficial < 10km
b. deep > 10 km
the correct answers will be decided on the spot, based on the situation in real time

The volcano Ol Doinyo, Lengai (Tanzania)

Find this volcano on a planisphere using the link
https://volcano.si.edu --> Database, volcano search

7) The presence and activity of this volcano is due to
a. being at a divergent margin
b. being in correspondence with a converging margin
c. it is a hot spot volcano

8)which kind of volcan is.? .....

9)when occurred the last known eruption?.....

10)which volcano on the map belongs to the same geological structure.
this link
https://www.volcanoesandearthquakes.com
can help you to choose the right one

.....

11) which kind of lavas are produced by this volcano

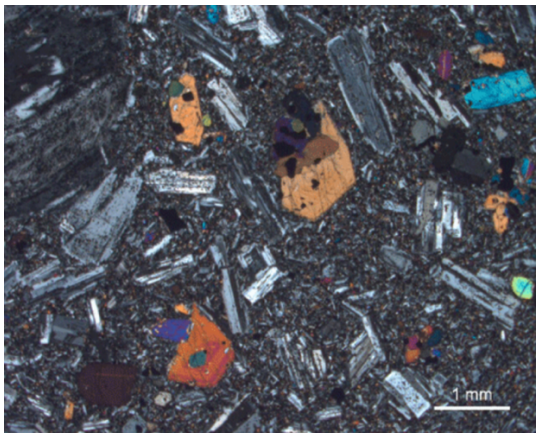
.....

12)what the lava produced will look like (more answers are possible)

a. rope lava flow
b. Pahoehoe type lava
c. Aa lava type
d. columnar structure

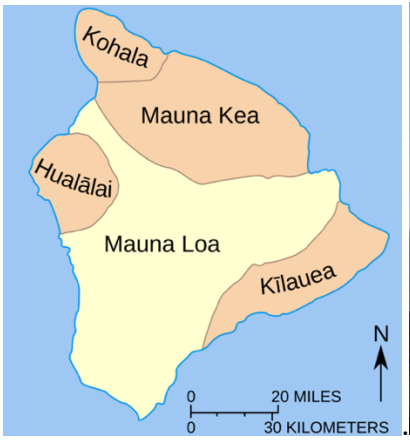
13) This is the thin section of a basalt *(=ohuthieleike basaltista)*, with polarized light *(=ristipolarisoitu näkymä)* (more answers are possible)
Which are the prevailing minerals

a. sodium plagioclase (albite)
b. olivine
c. silica > 50%
d. silica <50%



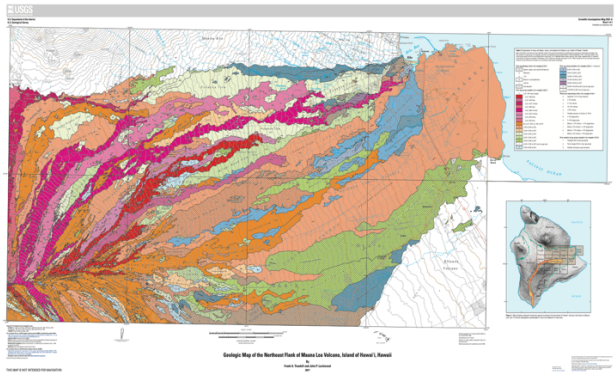
MAUNA LOA, THE LARGEST VOLCANO ON EARTH.

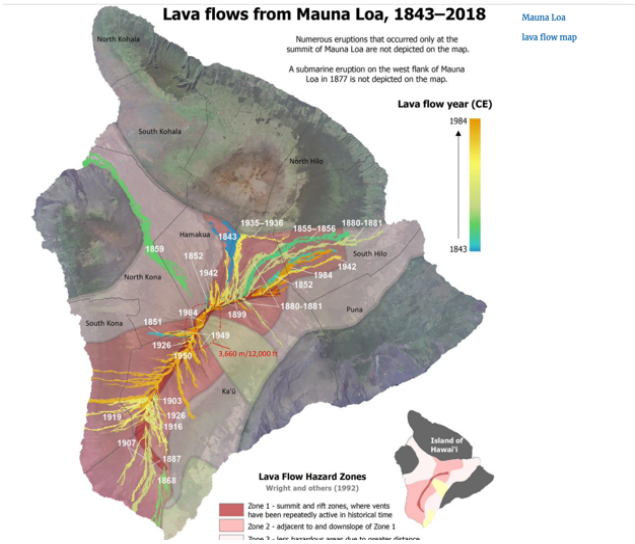
Mauna Loa is a volcano located on the island of Hawaii. It is a shield volcano *(=kilpitulivuori)*, with an estimated volume of 75,000 km³, which makes it the largest active volcano on Earth by volume, although its summit (4,169 m.) is 36 m lower than its neighbor Mauna Kea, another of the five volcanoes that make up the largest island of Hawaii. Since its cone-shaped *(=kartionmuotoinen)* structure rests on the ocean floor about 5000m deep, the overall height of the mountain exceeds that of Everest.
The Mauna Loa volcano has erupted 33 times since written descriptions became available in 1832. Some eruptions were preceded by only brief seismic unrest *(=seisminen levottomuus)*, while others followed several months to a year of increased seismicity



14) the presence and activity of this volcano is due to
   a. being at a divergent margin
   b. being in correspondence with a converging margin
   c. it is a hot spot volcano

Using this links, you can open the maps below
https://www.usgs.gov/node/278878
https://pubs.usgs.gov/sim/2932/a/sim2932a_sheet1.pdf





https://www.usgs.gov/media/images/map-showing-subaerial-extents-historical-mauna-loa-lava-flows. (*Original* is the best version)

Observe where the main Mauna Loa flows are situated.

Compare now these maps, with the topographical one
https://it.m.wikipedia.org/wiki/File:Hawaii_Island_topographic_map-fr.svg

15) Volcanic flows in the last 150 years have always followed the same path
   a. Y
   b. N

16) In which parts of the island the danger now is lowest:
   a. NE
   b. SE
   c. SW
   d. NW

17) In which parts of the island the risk is highest:
   a. NE
   b. SE
   c. SW
   d. NW

18) Which areas of the island have the greatest vulnerability:
   a. beaches
   b. mountains
   c. inhabited centers *(=asutuskeskukset)*

This DMT for IESO 2022 has been developed by scientific researchers in collaboration with INGV, the National Institute of Geophysics and Volcanology, which we thank for the collaboration.