

Thème 1 – La Terre dans l'Univers, la vie, l'évolution du vivant

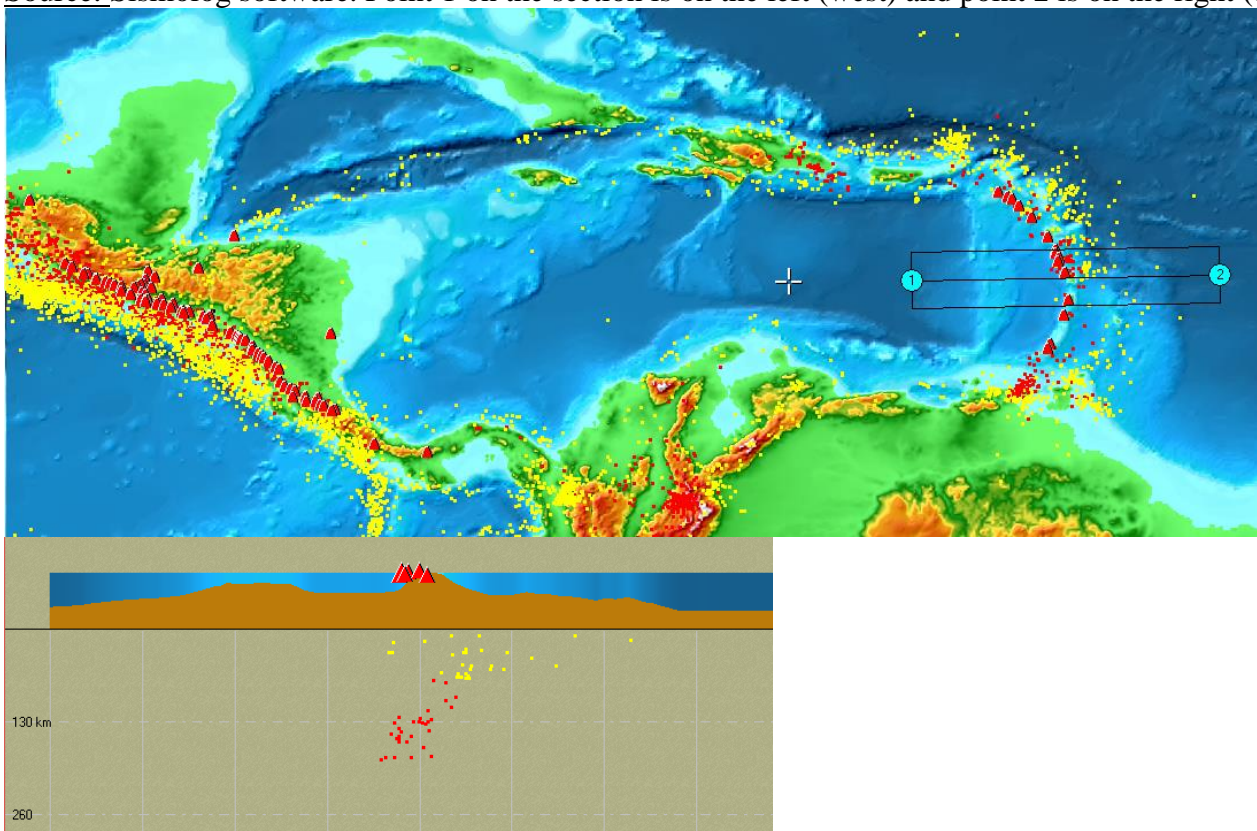
1-B – Le domaine continental et sa dynamique

The eruption of Mt Pelée.

Using your knowledge and the documents, you will explain the main features of a subduction zone and why the Mt Pelée eruption was so devastating in 1902. How can you explain the Tower of Pelée?

Document 1: Central America and the Caribbean map. Section through Martinique.

Source: Sismolog software. Point 1 on the section is on the left (west) and point 2 is on the right (east).



Document 2: Focus on Martinique.

The Lesser Antilles form a long, partly volcanic island arc between the Greater Antilles to the north-west and the continent of South America. The islands form the eastern boundary of the Caribbean Sea with the Atlantic Ocean. Martinique is an insular region of France located in the Lesser Antilles in the eastern Caribbean Sea. St Pierre has now a population of 4,341 inhabitants.



Document 3: A witness report.

A young shoemaker, Léon Compere-Léandre, was sitting on his doorstep when the *nuée ardente* hit. Although he was severely burnt he survived, partly because of his good health, but also because his house was near the edge of the pyroclastic flow. Here is his experience, in his own words:

"I felt a terrible wind blowing, the earth began to tremble, and the sky suddenly became dark. I turned to go into the house, with great difficulty climbed the three or four steps that separated me from my room, and felt my arms and legs burning, also my body. I dropped upon a table. At this moment four others sought refuge in my room, crying and writhing with pain, although their garnets showed no sign of having been touched by flame. At the end of 10 minutes one of these, the young Delavaud girl, aged about 10 years, fell dead; the others left. I got up and went to another room, where I found the father Delavaud, still clothed and lying on the bed, dead. He was purple and inflated, but the clothing was intact. Crazy and almost overcome, I threw myself on a bed, inert and awaiting death. My senses returned to me in perhaps an hour, when I beheld the roof burning. With sufficient strength left, my legs bleeding and covered with burns, I ran to Fonds-Saint-Denis, six kilometers from St. Pierre."

Sources: http://www.geology.sdsu.edu/how_volcanoes_work/Pelee.html

Document 4:

Document 4a: The remains of St. Pierre after the eruption on May 8, 1902.



**VOLCANO DESTROYS
WEST INDIAN TOWN**
St. Pierre, Martinique, Entirely Wiped Out.
DEAD MAY NUMBER 25,000
It is Said that All the Inhabitants
of the Town Have Been Killed.

Source: From Heilprin, 1908, The eruption of Mt. Pelée: Philadelphia Geographic Society, 72 p.

Document 4b:

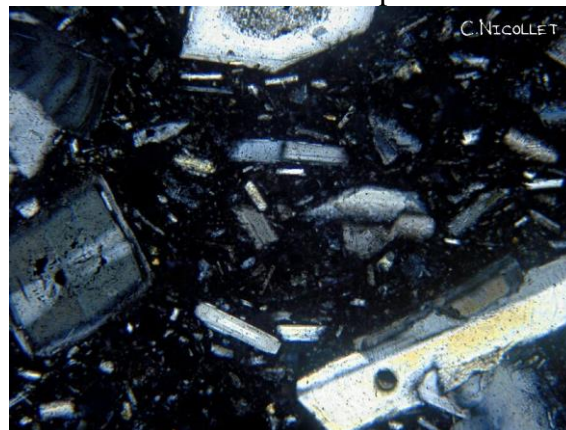


At its maximum size, the Tower of Pelée was twice the height of the Washington Monument and equal in volume to the Great Pyramid (Cheops) of Egypt. It finally became unstable and collapsed into a pile of rubble in March 1903, after 11 months of growth. No geologist had ever witnessed the emergence of such an object before.

Source:

<http://christian.nicollet.free.fr/page/enseignement/LicenceSN/martinique/P3LP355.jpg>

Document 5: Andesite rock from Mount Pelée. Microscopic view.



Teacher's corner :

St Pierre is located close to a major active volcano: the Mount Pelée.

This volcano belongs to a volcanic arc in the lesser Antilles. Locate it on the map.

We can see that it is on a plate boundary in a subduction zone (convergent zone):

- Wadatti-Benioff plan (earthquakes' hypocenters repartition)
- A trench
- Volcanoes on one side of the trench

Deduction: The North American plate is downgoing the Caribbean plate.

Note that you have two oceanic plates!

According to your knowledge, you should tell us which one is the older one (thing at the gravity and buoyancy).

Document 4a: St Pierre was a very well-known city.

A lot of inhabitants (25,000). Very good climate, fashionable city...

All of them have been wiped out: compare the description of the city in the text and the picture.

You could have died from the eruption, the nuée ardente, or by the overheat air which burns everything especially your lungs inside (→ oedema). (Witness report)

In fact, you had been warned but it was a political decision. By the way, the governor and his wife also passed.

The city has never fully recovered (population of 25,000 in 1902. 4,341 in St Pierre now) and has been overwhelmed by Fort-de-France.

The Tower of Pelée showed us how sticky the magma was; it was absolutely not a fluent one, a liquid one.

Document 5: The volcanic rock is shown under a microscope. The slide shows us large crystals (having had time for growth), microlites (very small crystals in a stick-shape → little time to grow up) and black part as glass: vitreous part (no crystallization at all because that cools down in the open-air, so quite fast)

Other possible questions:

Would you like to live nearby a volcano? Why or why not?

Is this volcano dormant, inactive yet? ...More than a century after this last eruption...

Can you name other active volcanoes in Europe, in the world?...