

nat haz25

4th International Workshop on NATURAL HAZARDS

GEOTECHNICAL RISKS

FIELD TRIP PICO ISLAND

Jose Macedo
26-12-2015



GUIDE

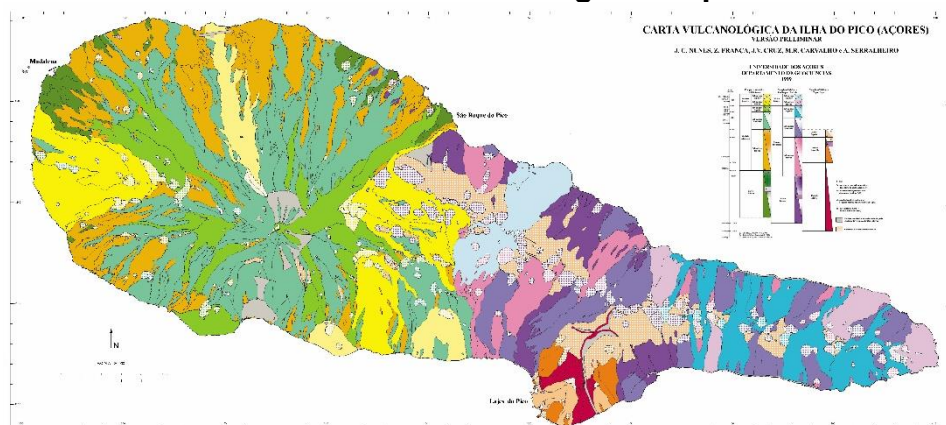
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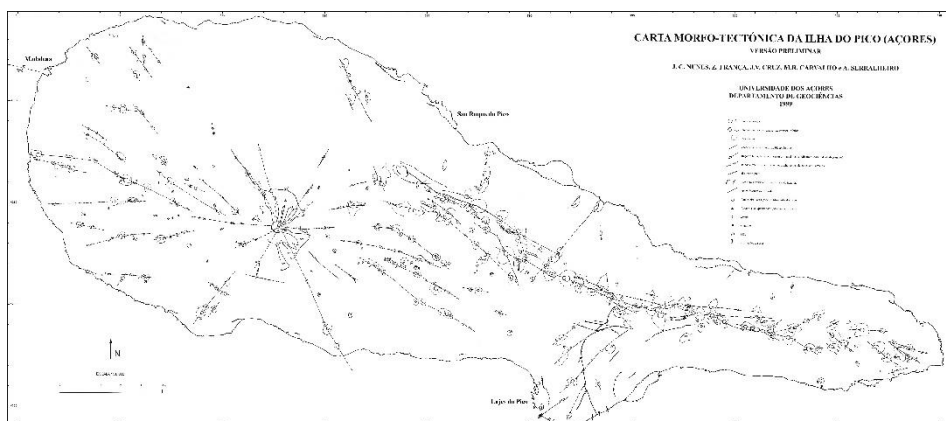
Pico Island geology: a brief overview

Pico is the biggest island of the Central Group, the second largest of the archipelago (445 km²) and exhibits the highest point of Portugal (2,351 m), the Pico Mountain volcano, which is the 3rd highest volcano of the North Atlantic Ocean. In relation to the surrounding sea-floor Pico Mountain is a 3,500 m high stratovolcano, characterized by dominant effusive basaltic volcanism episodes of Hawaiian type eruptions and extensive pahoehoe lava fields. The main geological features of the island are related to the fact that Pico is the youngest island of the archipelago (about 300,000 years old) and its volcanism is almost exclusively of basaltic nature, evident either in the Pico Mountain volcano, the Topo shield volcano or in the volcanic ridge of the Planalto da Achada. This volcanic ridge (e.g. the São Roque-Piedade Volcanic Complex) has a length of 30 km and is composed of about 190 scoria and spatter cones and eruptive fissures. Since the island's settlement there have been historical eruptions in 1562/64, in 1718 and in 1720; the 1718 eruption had two subaerial eruptive centres and a third submarine vent offshore the southern coast of the island. The last eruption took place in 1963 off the northern coast of the island, north of Cachorro, being a serretian-type submarine eruption.

Pico Island volcanological map



Pico Island morphotectonic map



NUNES, J.C., 1999. *A actividade vulcânica na Ilha do Pico do Plistocénico Superior ao Holocénico: mecanismo eruptivo e hazard vulcânico. Provas de Doutoramento. Ramo de Geologia. Especialidade de Vulcanologia. Departamento de Geociências. Universidade dos Açores. Ponta Delgada. 357 p.* <http://dited.bn.pt/30404/index.html>

MAP ROUTE



STOP 1: “Lajido da Criação Velha” pahoehoe lava field

The word “lajido” applies to the flatten, smooth and regular surface lava flows of basaltic nature that characterizes several areas of Pico Island, mostly in the Pico Mountain volcano area: thus “lajido” can be considered a synonymous of *pahoehoe*-type lava flows.

Tumulus, pressure ridge, lava trench, *pahoehoe* toe, ropy lava, lava blister and lava tree mold, are some of the structures and micro-landforms types that can be observed in this lava field.

This is also an important Azorean geo-cultural landscape, part of the Landscape of the Pico Island Vineyard Culture WHS – World Heritage Site, nominated by UNESCO in 2004.

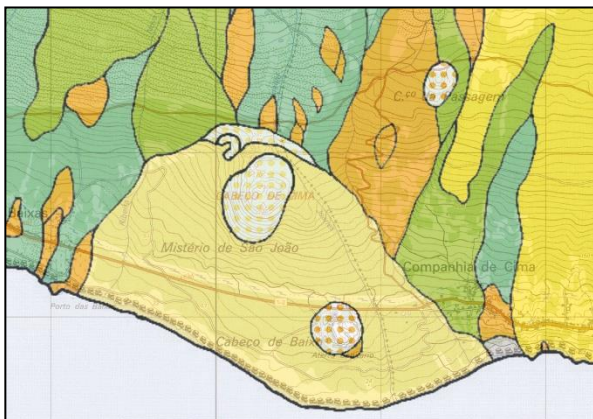


STOP 2: “Mistério de São João” – 1718 A.D. eruption

This is the site of the 1718 A.D. volcanic eruption that started on February 2nd and lasted most probably until 15th January 1719, destroying several houses and the São João church, as well as several farming and vineyards lands.

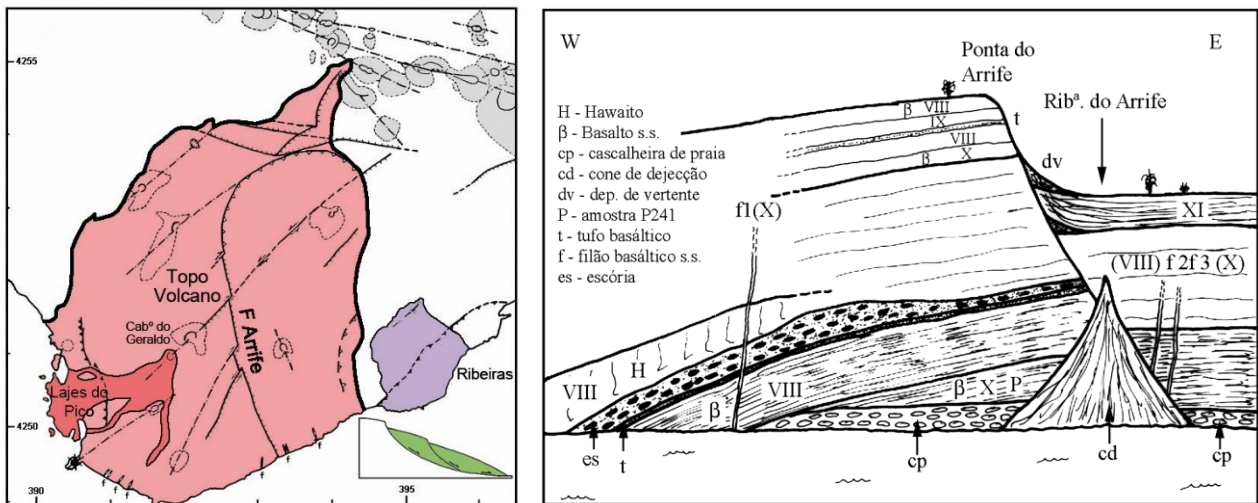
During that period basaltic aa-type lavas were extruded from the Cabeço de Cima scoria cone that increased the size of the Pico island, with a promontory SE of Cabeço de Baixo scoria cone. The later cone (e.g. Cab° de Baixo) corresponds today to a kipuka, i.e. an island completely surrounded by the 1718 lava flows.

The “mistério” wording: scared and lacking understanding about those natural phenomena, local people named after “mistério” (“mystery”) the lava flows they observed during the volcanic eruptions.



The Arrife fault scarp marks the western border of a massive gravitational collapse structure that affects the south flanks of the Topo shield volcano. This polygenetic volcano (built about 95% by basaltic lava flows), comprises the oldest geological formations of Pico Island, with an estimated maximum age of about 300 *ka*, that outcrop only at the base of the shield volcano pile, at the Arrife shoreline.

Located east of Arrife, the Ribeiras lava delta was formed in several episodes, being its youngest sector (e.g. south) associated with a NE-SW eruptive fissure active about 3,500 years ago.



The Lajes do Pico village is emplaced on a lava delta (lava “fajã”, as locally named), formed by *pahoehoe* type lava flows extruded from a small spatter cone located near the Cabeço do Geraldo scoria cone. Both the spatter and the scoria cones are monogenetic volcanoes emplaced on the SW flanks of the Topo shield volcano.

The old sea cliff that was spilled over by the Lajes do Pico basaltic lava flow is well preserved to the East of the village, e.g. along the main road, and South of the lava delta is located the volcanic neck of Castelete, the inner remains of an old scoria cone.

This low altitude coastal platform is vulnerable to flooding episodes namely associated with storms (“enchentes de mar” as named in old records): to mitigate such risk an Antifer blocks breakwater was built.



===== LUNCH =====

Stop 5: Lagoa do Capitão lake and fault scarp

The Capitão lake is emplaced in the westernmost part of the São Roque – Piedade volcanic ridge, on a tectonic sag pond. Thus, the lake is bordered by the Capitão fault scarp, with azimuth N120°, maximum high of about 20 m and one of the major tectonic features of the Pico Island, about 9 km total length.



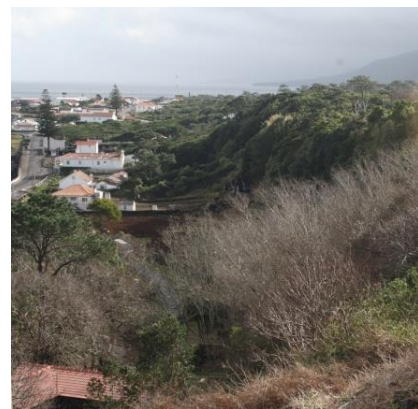
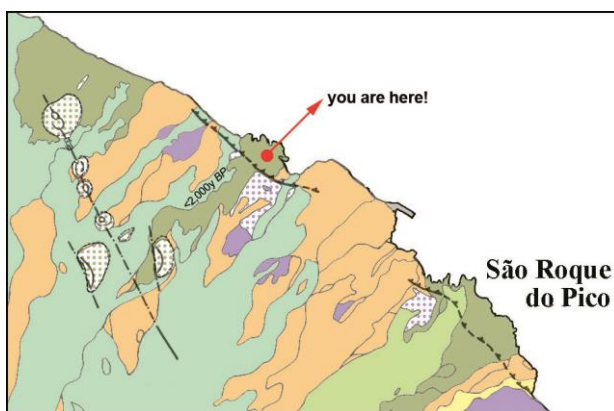
This fault scarp (facing towards south) is the westernmost morphological signature in Pico island of the Pedro Miguel Graben (Faial Island), hidden by the young volcanism (mostly Holocene lava flows) of the Pico Mountain polygenetic volcano.

Stop 6: Santo António old sea cliff

Between Santo António and São Roque do Pico villages, and for about 4.5 km length, there is an old sea cliff often as a rocky steep slope that marks the old coastline of the Pico Island in this area.

In several places younger basaltic lava flows spill over the edge of this old sea cliff, often as very fluid *pahoehoe* type lava flows extruded from the Pico Mountain Volcano that gave origin to spectacular lava cascades, as those that can be seen at the Furna - camping area, and at Ginjal.

In the nearby old quarry of “Nariz de Ferro” outcrops the ankaramite lava flow, which blocks were used to build the São Roque do Pico harbor breakwater.



Stop 7: Pressure Ridge

Pressure ridges are arched landforms on the superficial crust of pahoehoe type lava flows, as elongated elevations which are formed due to the hydrostatic pressure applied on the top of lava flow by the movement of the fluid lava underneath it (as an underground lava river). If the bending is more accentuated, the top of the pressure ridge will crack and display a longitudinal fissure.

Near the north shoreline of Pico Island (close to the Cabeço Debaixo da Rocha tuff cone) is the more important landform of this type in the Azores Islands, with a total length of about 100 m.



Stop 8: Azores Wine Company

At the end of the technical visit, participants will be invited to enjoy a “pico de honra” at the facilities of the Azores Wine Company. This convivial moment aims to celebrate the visit and provide an opportunity for sharing and networking in a relaxed atmosphere, accompanied by the renowned wines produced on Pico Island.



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