EXCHANGING MEMORIES
- MEMORY OF THE EARTH -

GEODIVERSITY
A POWERFULL EDUCATIONAL RESOURCE

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JERÓNIMO EMILIANO DE ANDRADE

What is geodiversity?

DIA INTERNACIONAL DA GEODIVERSIDADE

6th october

(adaptado de Brilha, 2022)

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Variety of:

- Minerals

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Variety of:

- Minerals
- Rocks

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Variety of:

- Minerals
- Rocks
- Fossils

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Lagos

Variety of:

- Minerals
- Rocks
- Fossils
- Landforms

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Variety of:

- Minerals
- Rocks
- Fossils
- Landforms
- Soils

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Seixal, ilha da Madeira

Variety of:

- Minerals
- Rocks
- Fossils
- Landforms
- Soils
- Active geological processes

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Geodiversity is the support for biodiversity and for the survival and well-being of mankind.

Vila do Bispo, Parque Natural do Sudoeste Alentejano e Costa Vicentina

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Why we depend on geodiversity of planet Earth?

(adaptado de Brilha, 2022)

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Ilha do Corvo, Açores Geoparque Mundial da UNESCO

Regulation of terrestrial systems

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Tavira, Parque Natural da Ria Formosa

Biodiversity support

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Infrastructure support

Freixo de Espada à Cinta, Parque Natural do Douro Internacional

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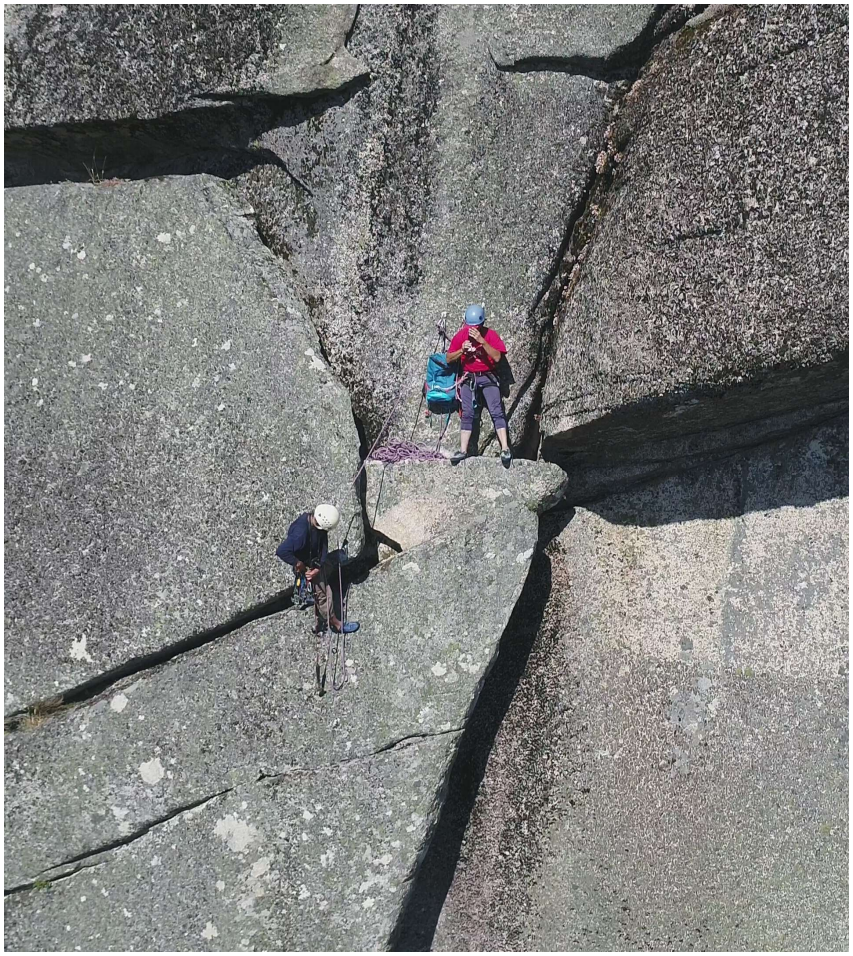

Leisure and well-being activities

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Peneda, Parque Nacional da Peneda-Gerês

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Estremoz

Extraction of rocks and minerals (basis for the development of society)

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Learn about the history of the planet and the evolution of life

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Ribeira Brava, ilha da Madeira

It plays an important role in spatial planning

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Pitões das Júnias, Parque Nacional da Peneda-Gerês

Strong connection with cultural identity

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Ribeira d'Ilhas, Ericeira

Natural laboratory for the teaching of Earth Sciences

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And in the Azores?

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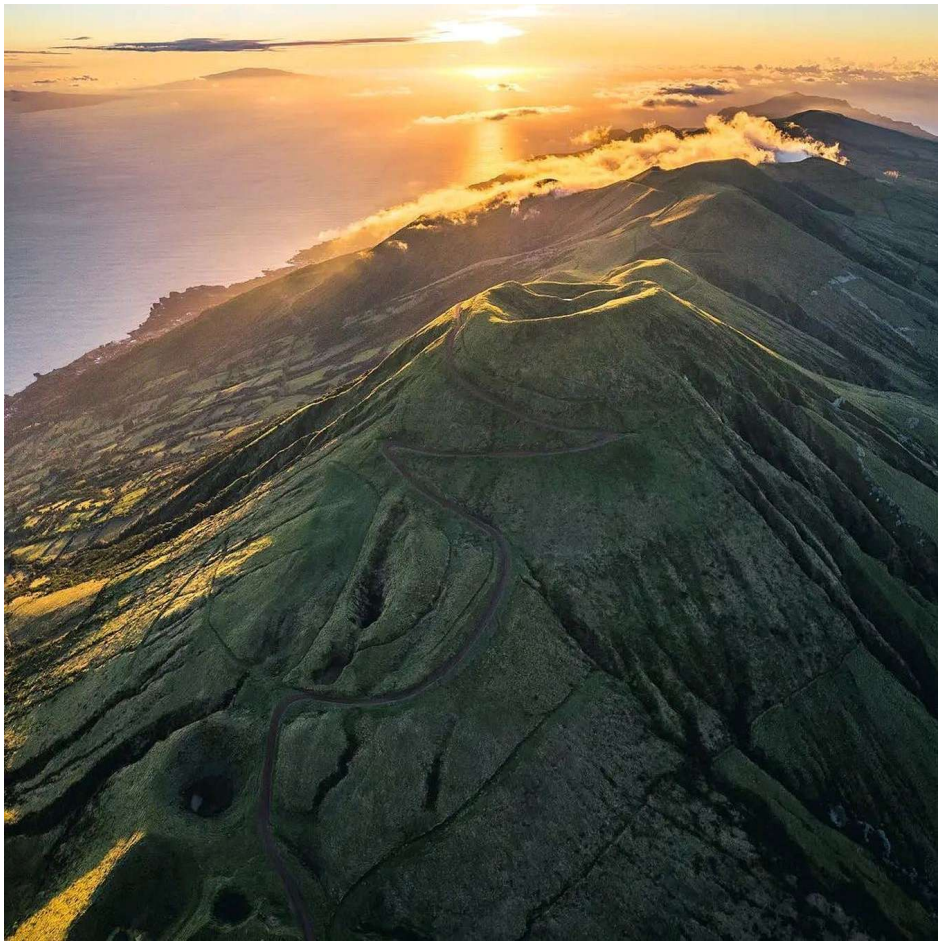

9 ISLANDS, of volcanoes...

✓The Azores are geologically recent islands, with a history dominated by volcanism.

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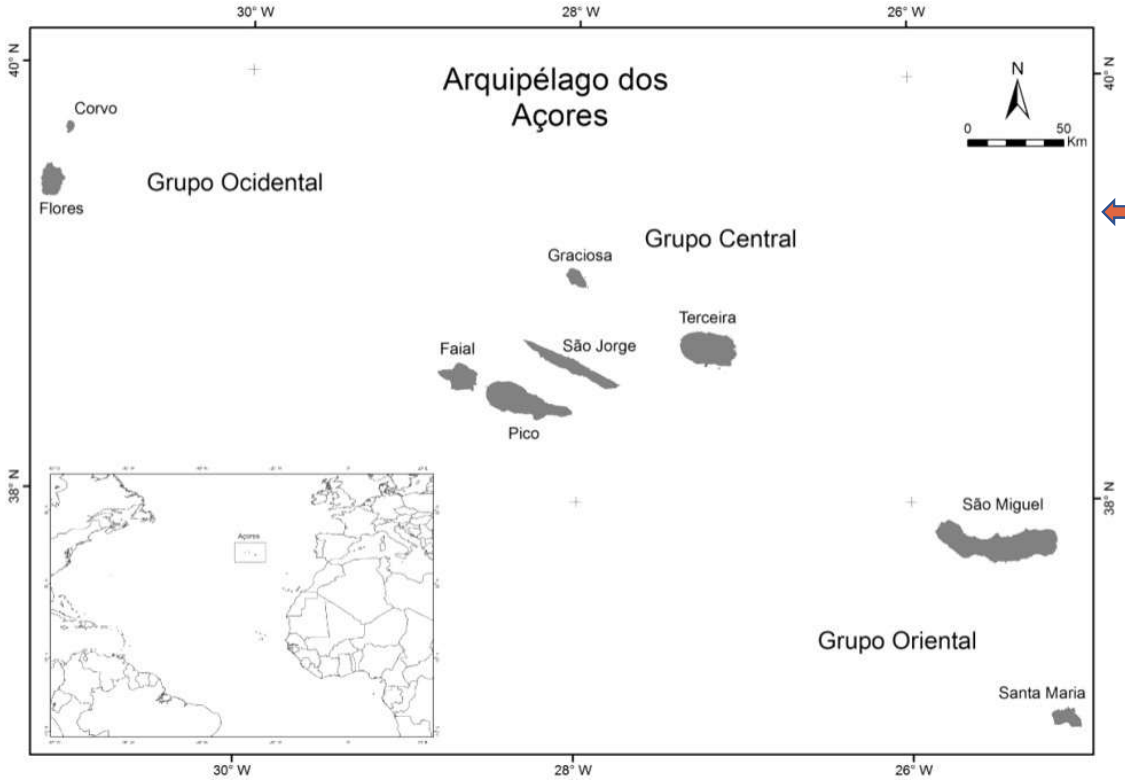
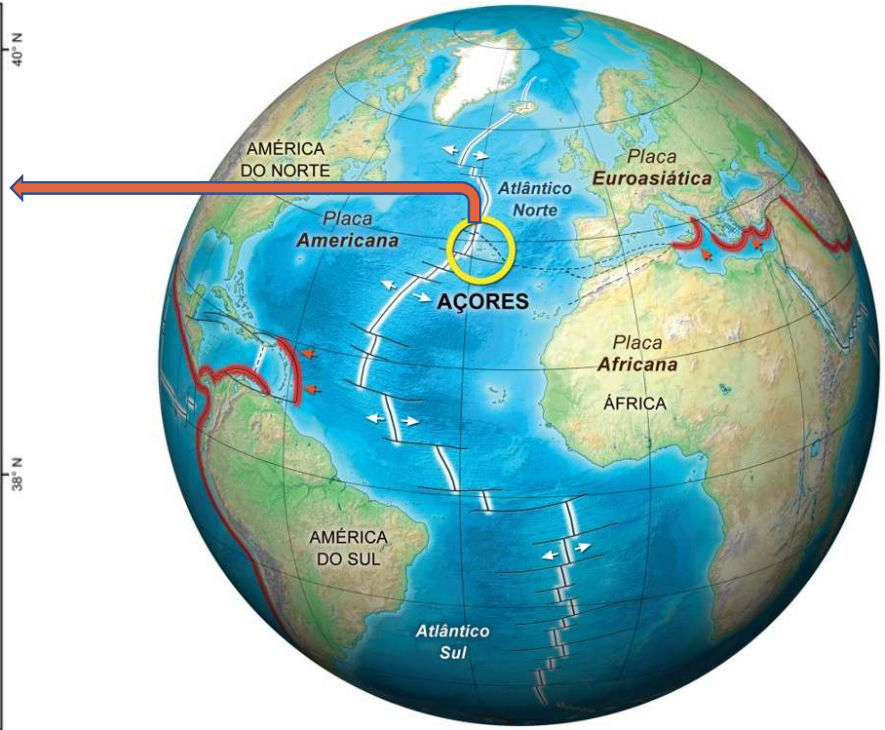
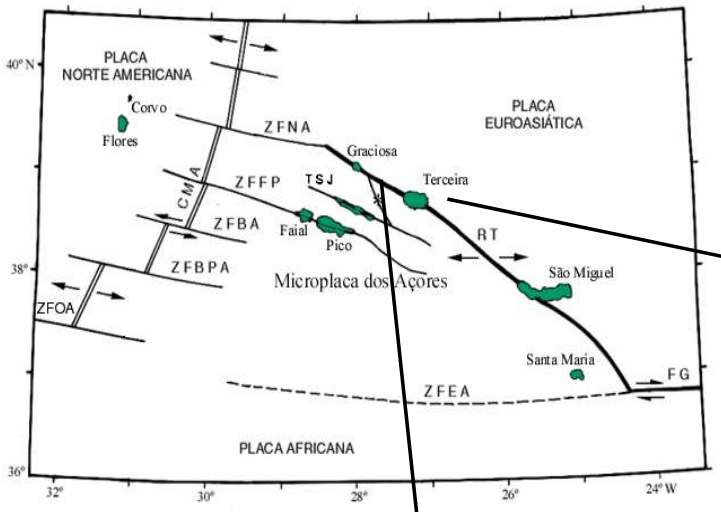
GEOGRAPHICAL CONTEXT





GEOLOGICAL CONTEXT:



Santiago Fault Escarp,Terceira Island

Central volcanic ridge on the island of São Jorge

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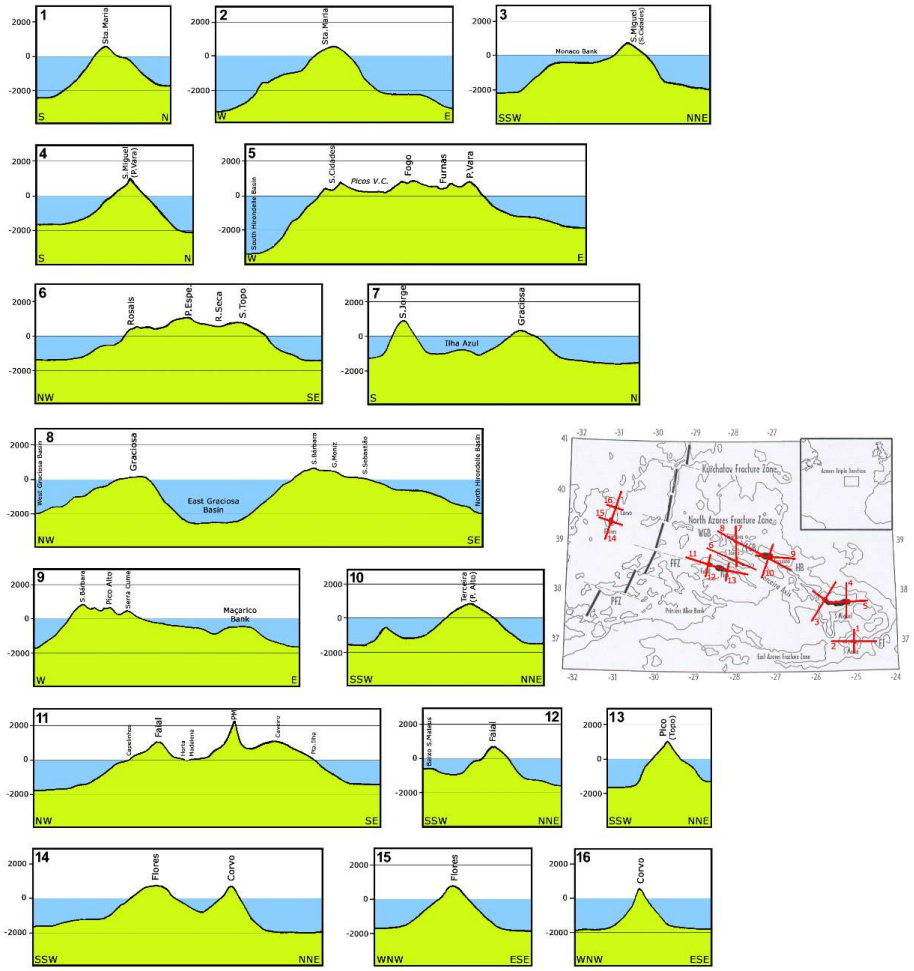
GEOLOGICAL CONTEXT

- The Azorean islands are all of volcanic origin and are distributed along a structure limited by the bathymetric of 2000 m
- The formation process began about:

35 million years

(e.g. Searle, 1980)



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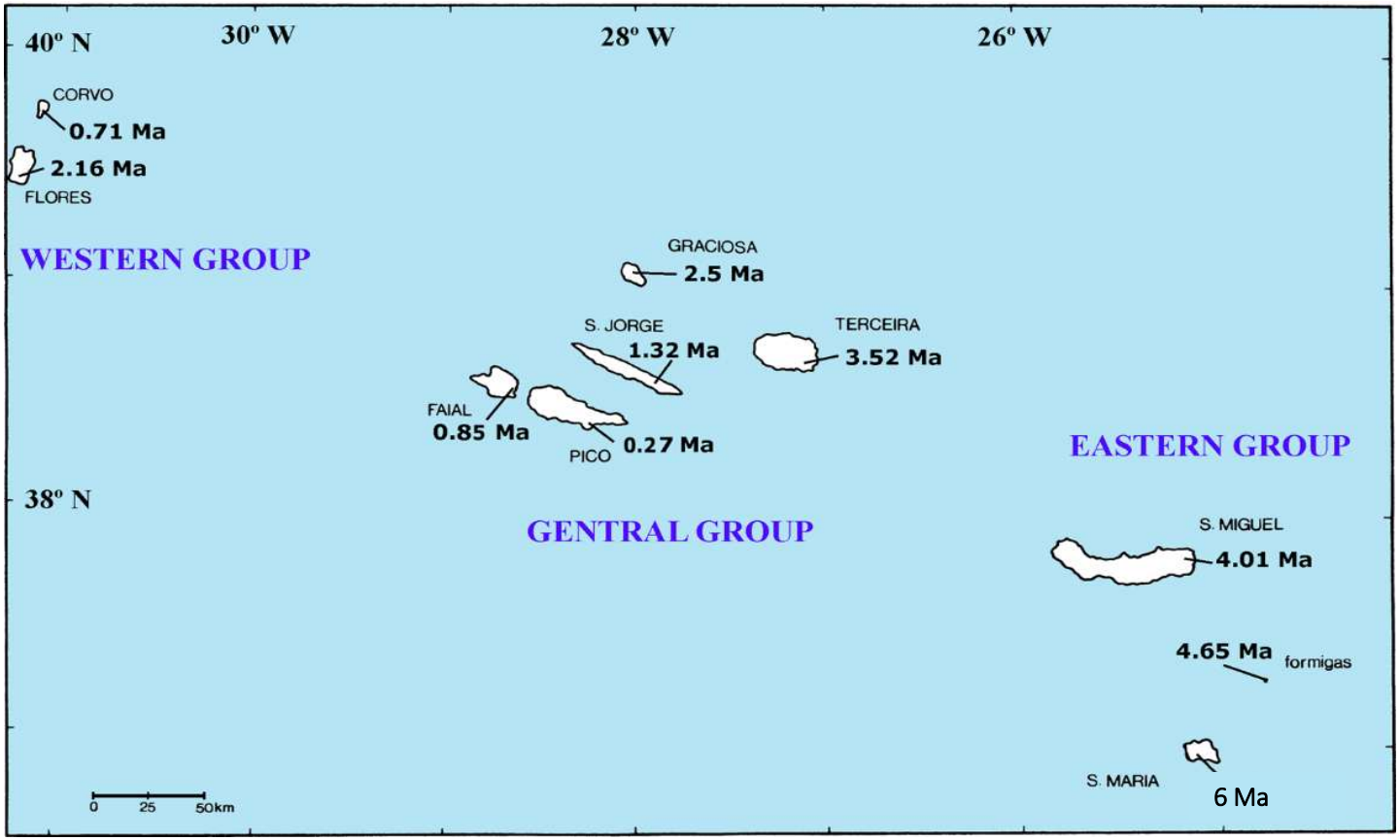
AGES OF THE ISLANDS...



Oldest published (isotopic) ages

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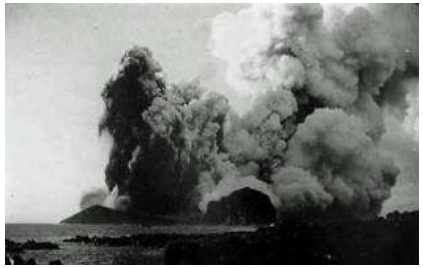
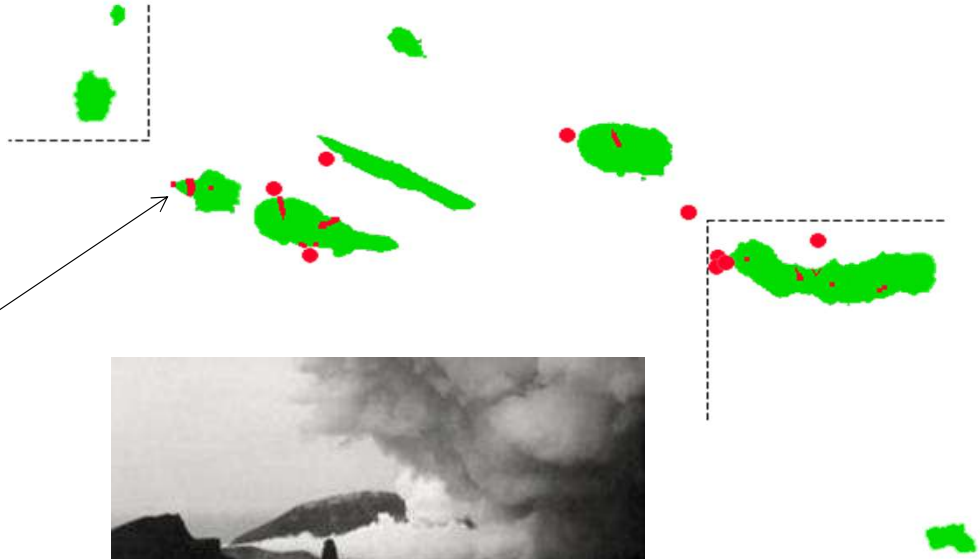
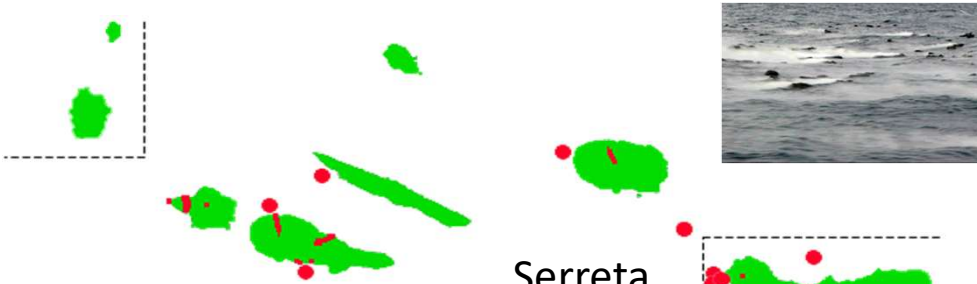
- 26 historical eruptions (since 1439)
- 14 of them submarine





- Capelinhos

(1957/58)



Serreta
(1998/2001)

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27 VOLCANIC SYSTEMS

- ✓ **16 POLYGENETIC VOLCANOES (9 active)**
- ✓ 12 Siliceous volcanic systems with caldera
- ✓ 3 Basic Polygenetic Volcanoes
- ✓ 1 seamount with crater (BDJC)
- ✓ **11 AREAS OF BASALTIC FISSURE VOLCANISM s.l.**
- ✓ **~1750** MONOGENETIC VOLCANOES (scoria cones/spatter, domes, tuff cones/rings, maars...)
- ✓ **26** historical eruptions

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External geodynamics

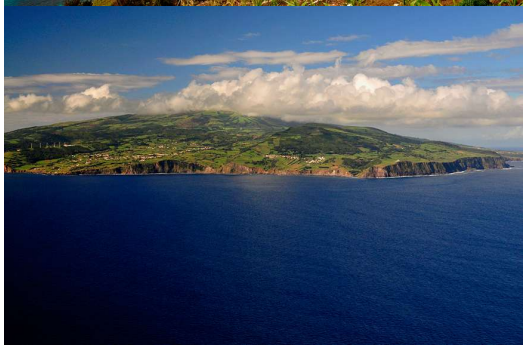
- Wind
- Rain
- Sea
- Sun/Dry
- Animals/Plants

GEOLANDSCAPES OF THE AZORES









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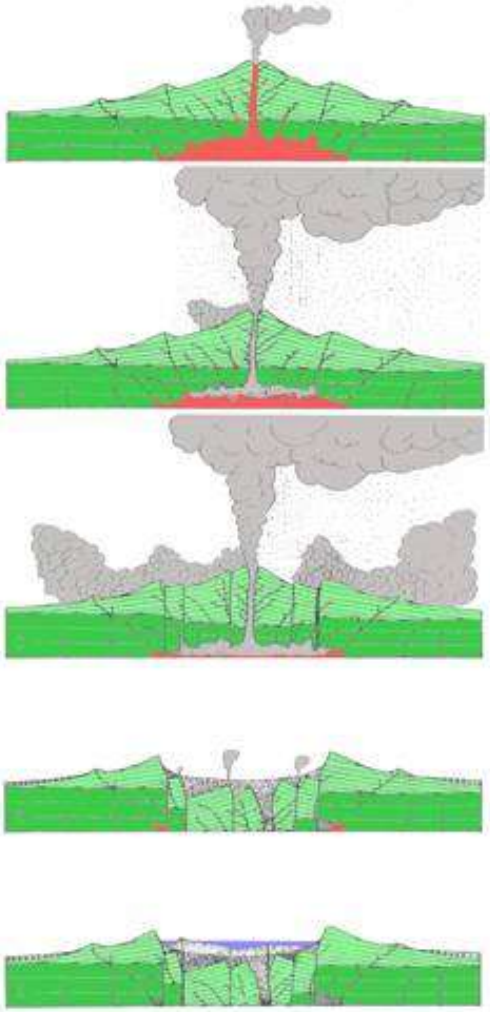
"Large" volcanoes

calderas



"Small" volcanoes

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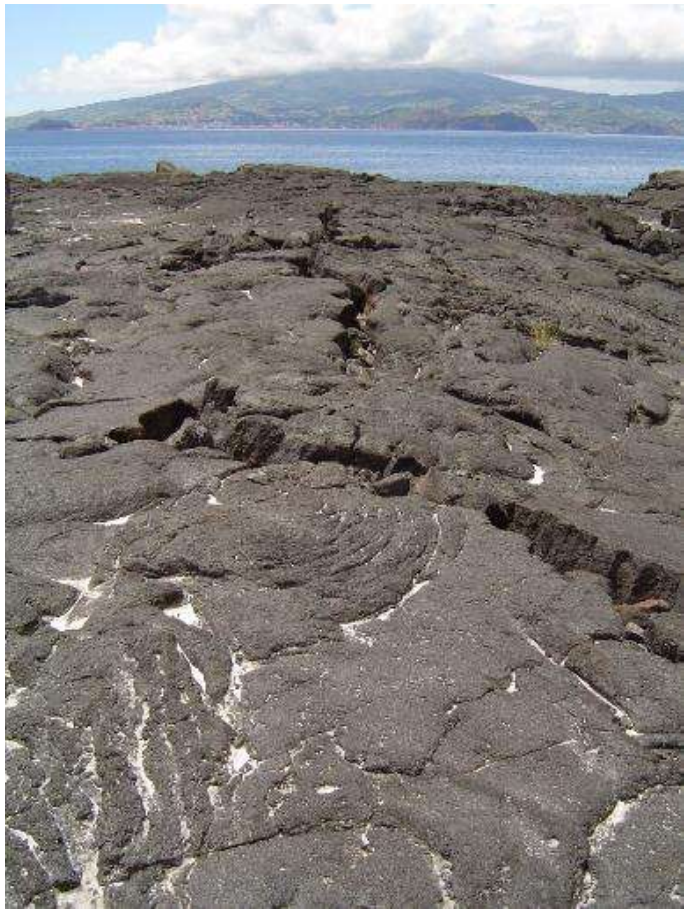
craters

Volcanic Ridges

lajidos



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fajãs

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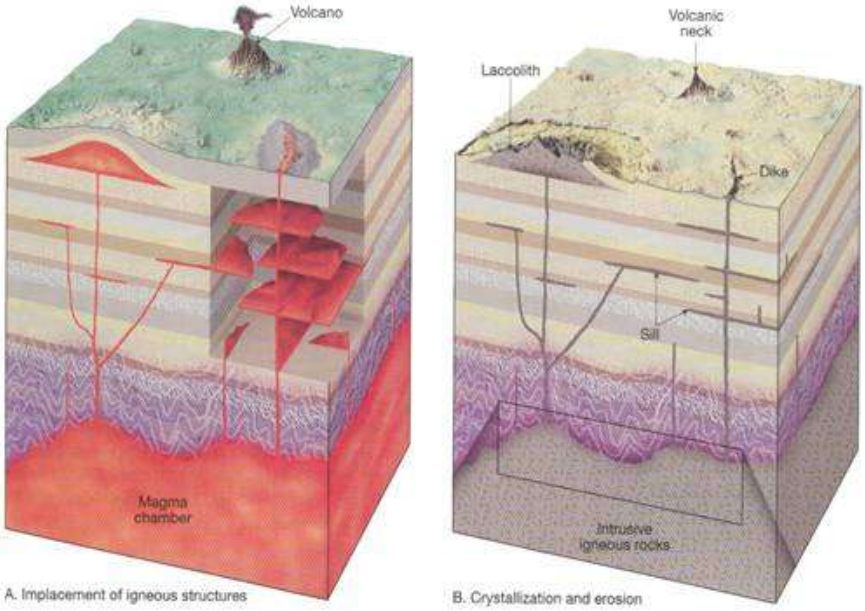
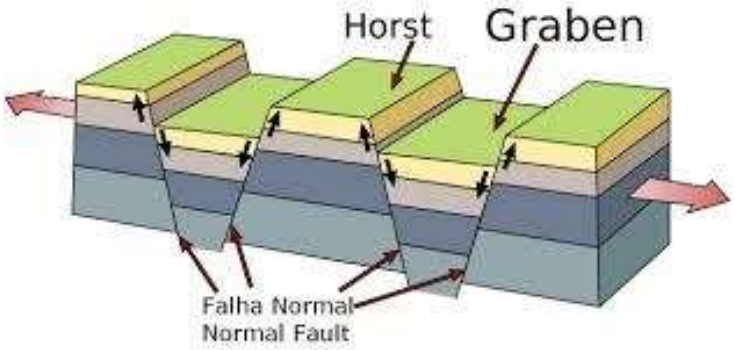
Dikes and vents



graben


Horst
Graben
Falha Normal
Normal Fault


Graben da Ribeira Grande

Disjunctions

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Fumaroles

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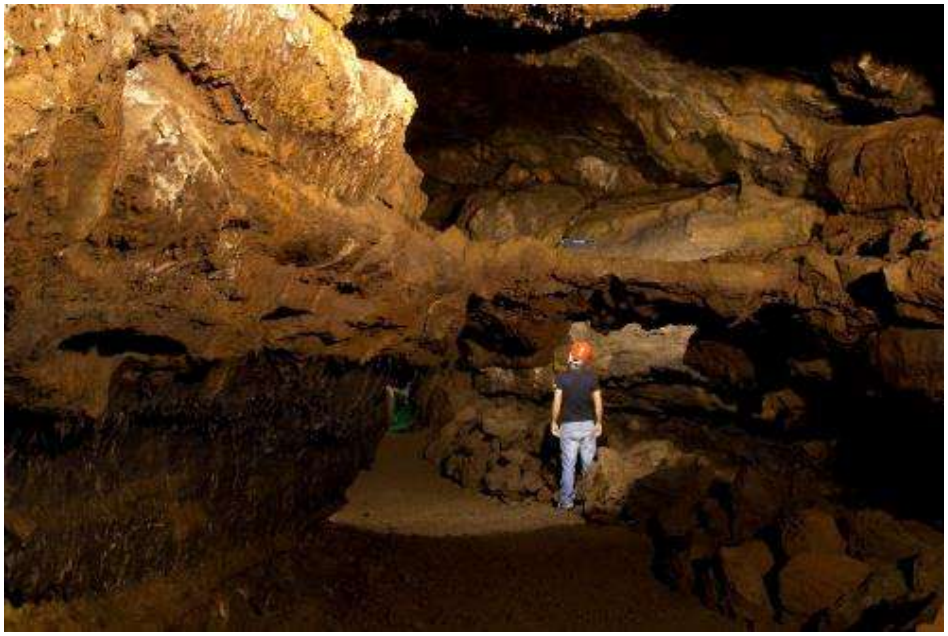
Volcanic Caves



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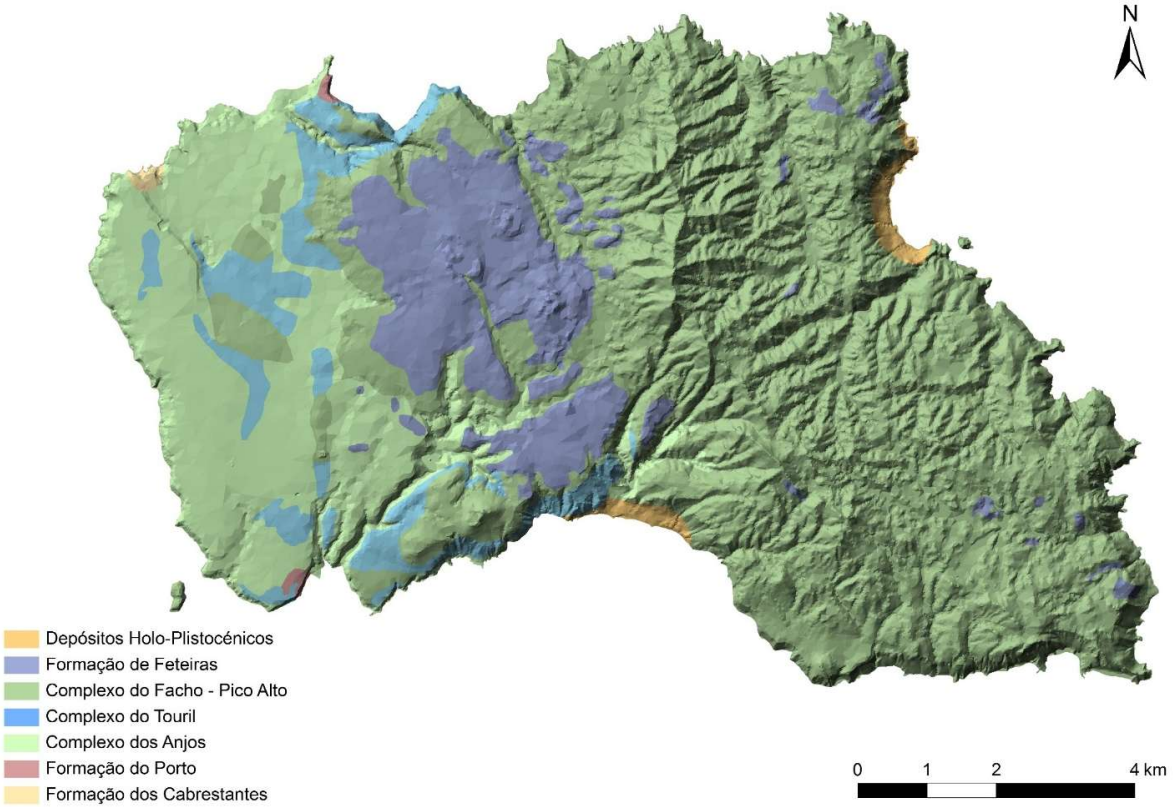
The Geological Cradle of the Azores – Sta. Maria 6 million years



- It has no active volcanism
- Basaltic rocks associated with terrestrial and submarine volcanism predominate
- Important outcrops of submarine lava flows – pillow lavas
- Consolidated sedimentary rocks such as limestones, sandstones, claystones, conglomerates...
- Remarkable fossiliferous content in many of the sedimentary rocks

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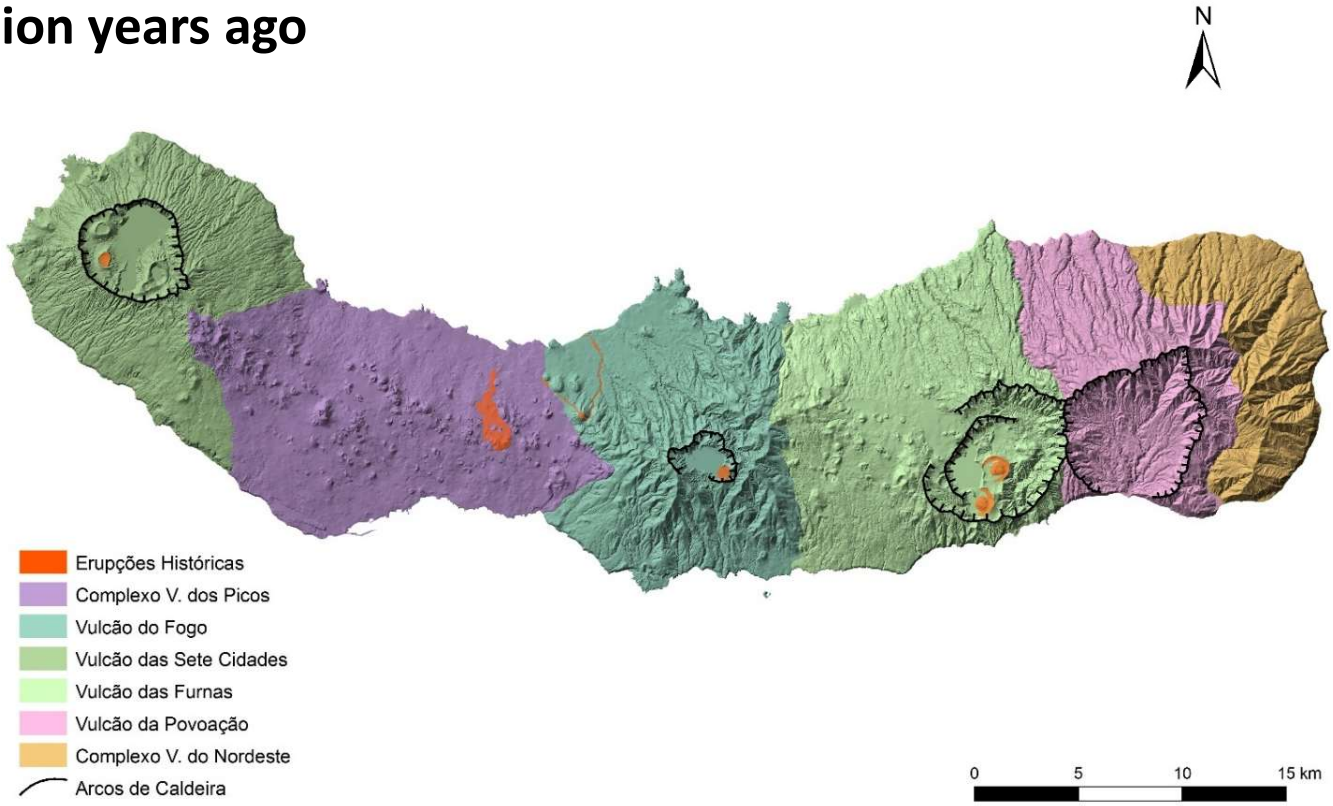
Island of calderas, volcanoes and lagoons – São Miguel
4 million years ago



- 4 large polygenetic volcanoes with caldera (Povoação, Furnas, Sete Cidades, Fogo)
- 2 areas of exclusively basaltic volcanism (Nordeste and Picos – oldest and newest)
- ~500 monogenetic volcanoes
- 35 lagoons, a wide variety of mineral and thermal waters and fumaroles of different types
- 9 Historical eruptions

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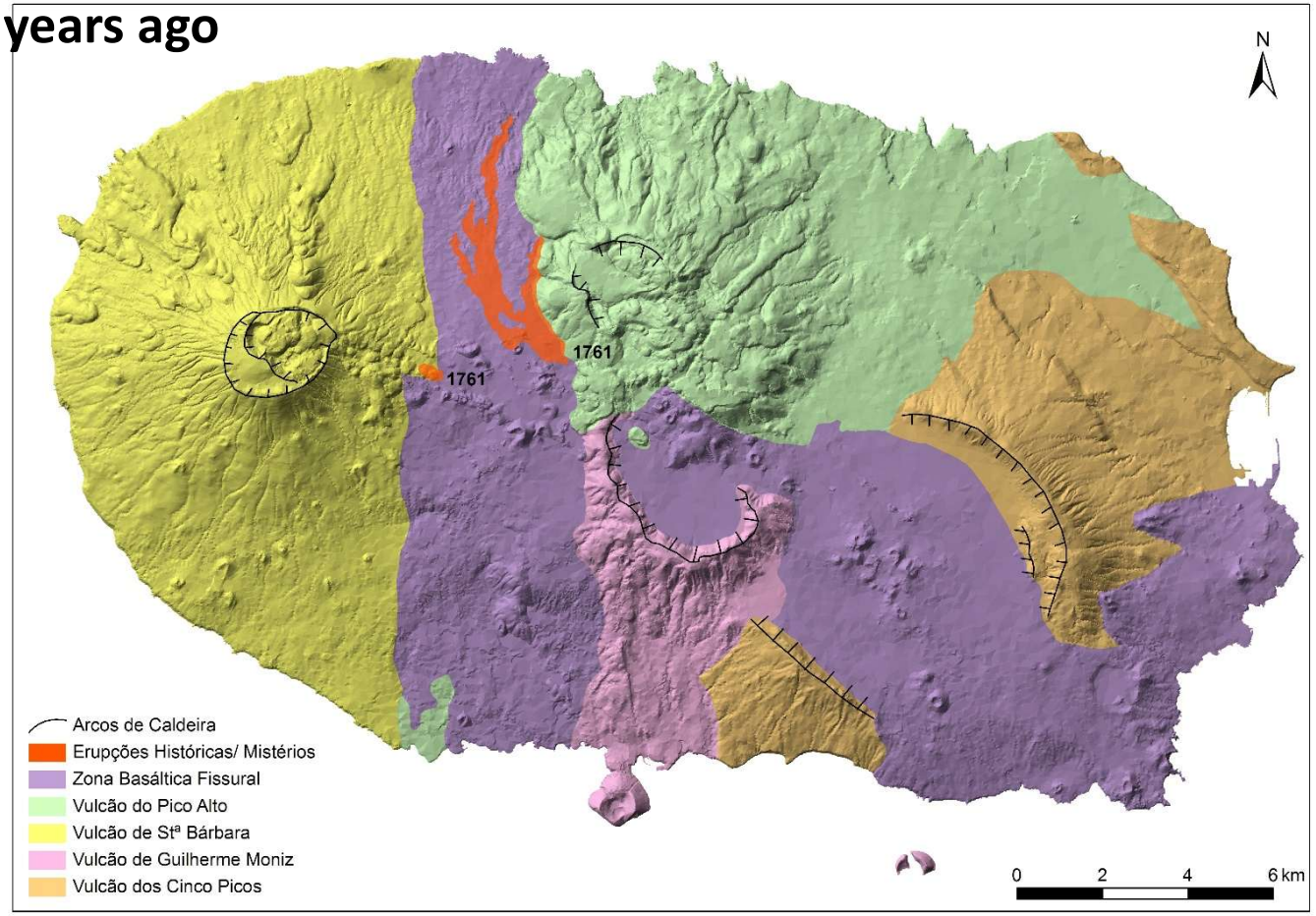
A sea of dense, viscous lava - Terceira

3.5 million years ago



- 4 large volcanic buildings with caldera
- 1 zone of fissure basaltic volcanism
- Predominance of trachytic materials – domes and coulées

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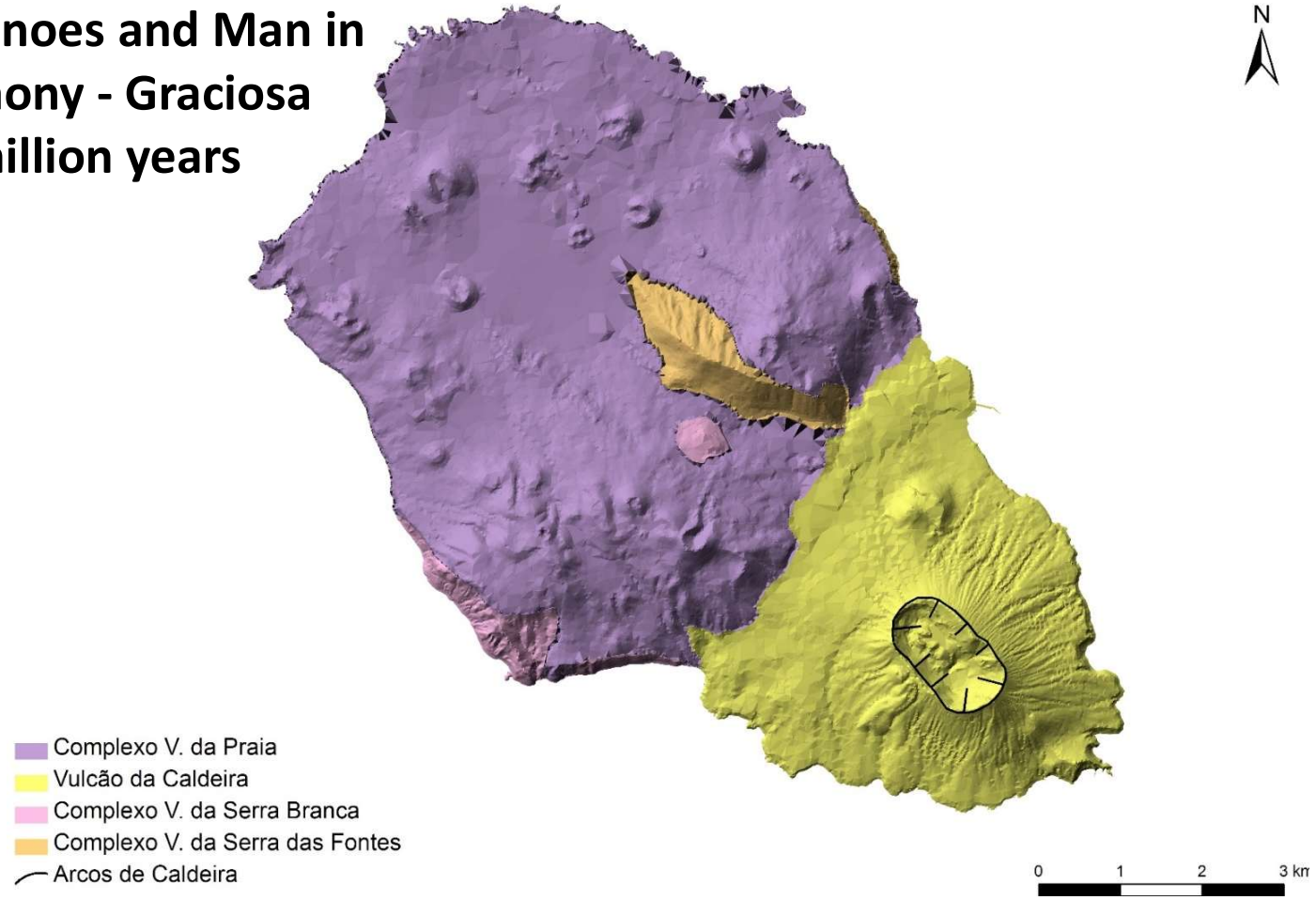
Volcanoes and Man in Harmony - Graciosa
2.5 million years



- It has the smallest polygenetic volcano in the Azores – Caldeira trachytic volcano
- 32 basaltic scoria cones and associated lava flows
- Last eruption – Pico Timão: 2000 years
- Secondary volcanism in the fumarolic field inside Furna do Enxofre – a unique volcanic cave in the Azores.

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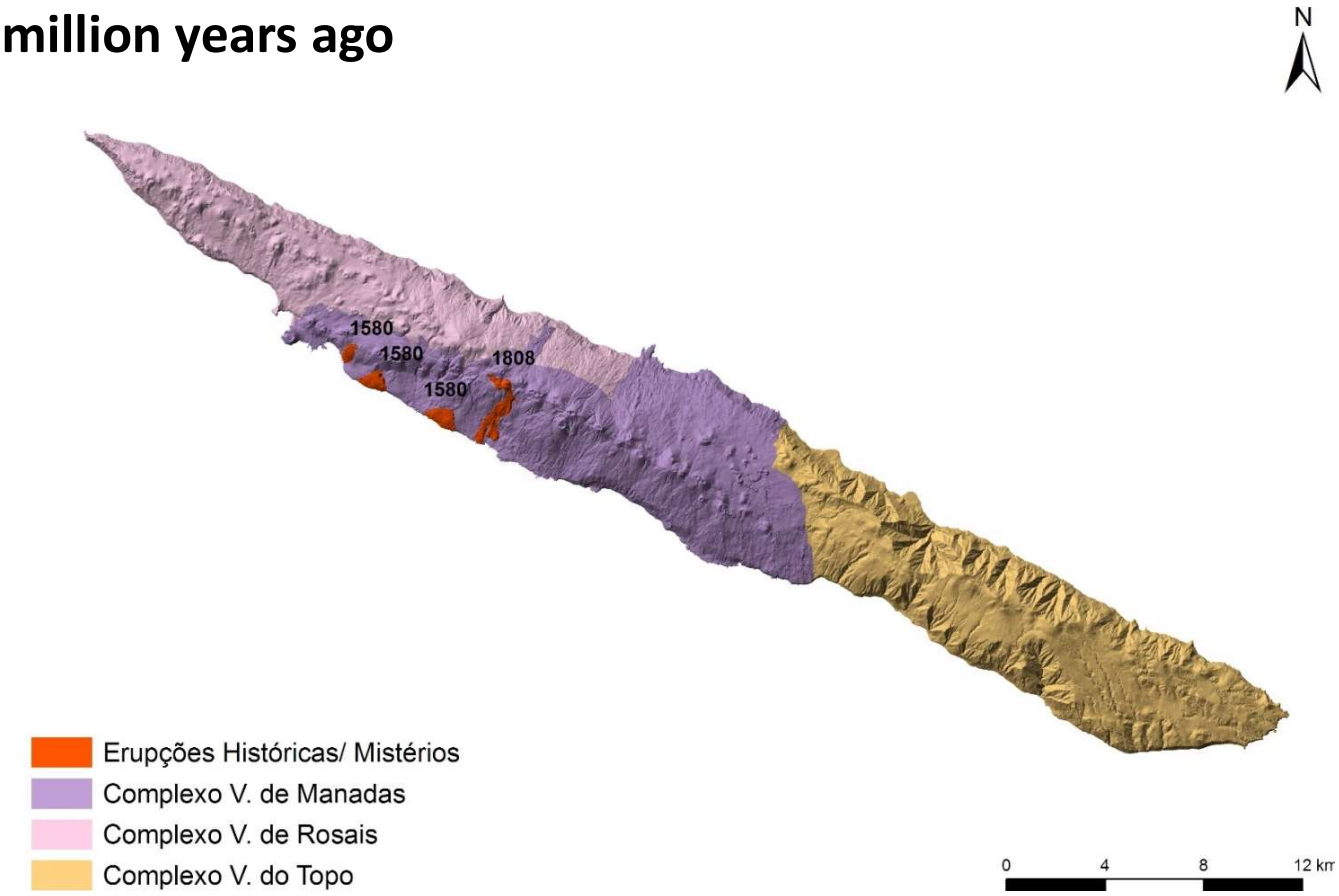
A volcanic ridge – São Jorge
1.32 million years ago



- Exclusively basaltic volcanism s.l.
- It has no central volcanic edifice
- Extensive volcanic mountain range consisting of about 350 monogenetic cones
- The (many) lava and detrital fajã at the base of the high cliffs stand out
- 5 Historical eruptions

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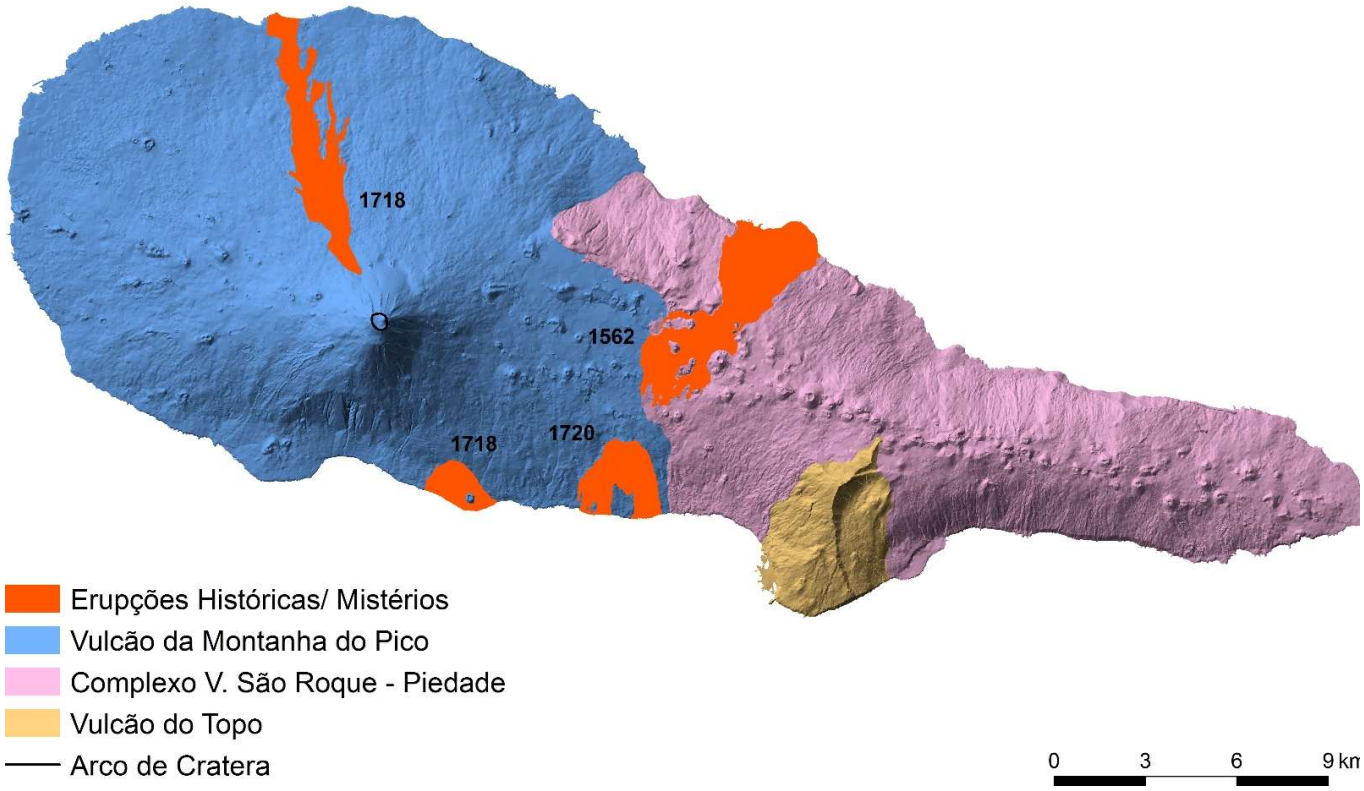
The Good Giant - Pico
270,000 years



- Youngest island in the archipelago (270,000 years old)
- 2 large polygenetic volcanoes (Topo and Pico Mountain)
- Pico Mountain - highest point in Portugal (2350 m); third largest volcano in the North Atlantic
- Achada Plateau volcanic ridge – 30 km long, 190 scoria cones, spatter and eruptive fissures
- Exclusively basaltic volcanism s.l.
- 4 Historical eruptions

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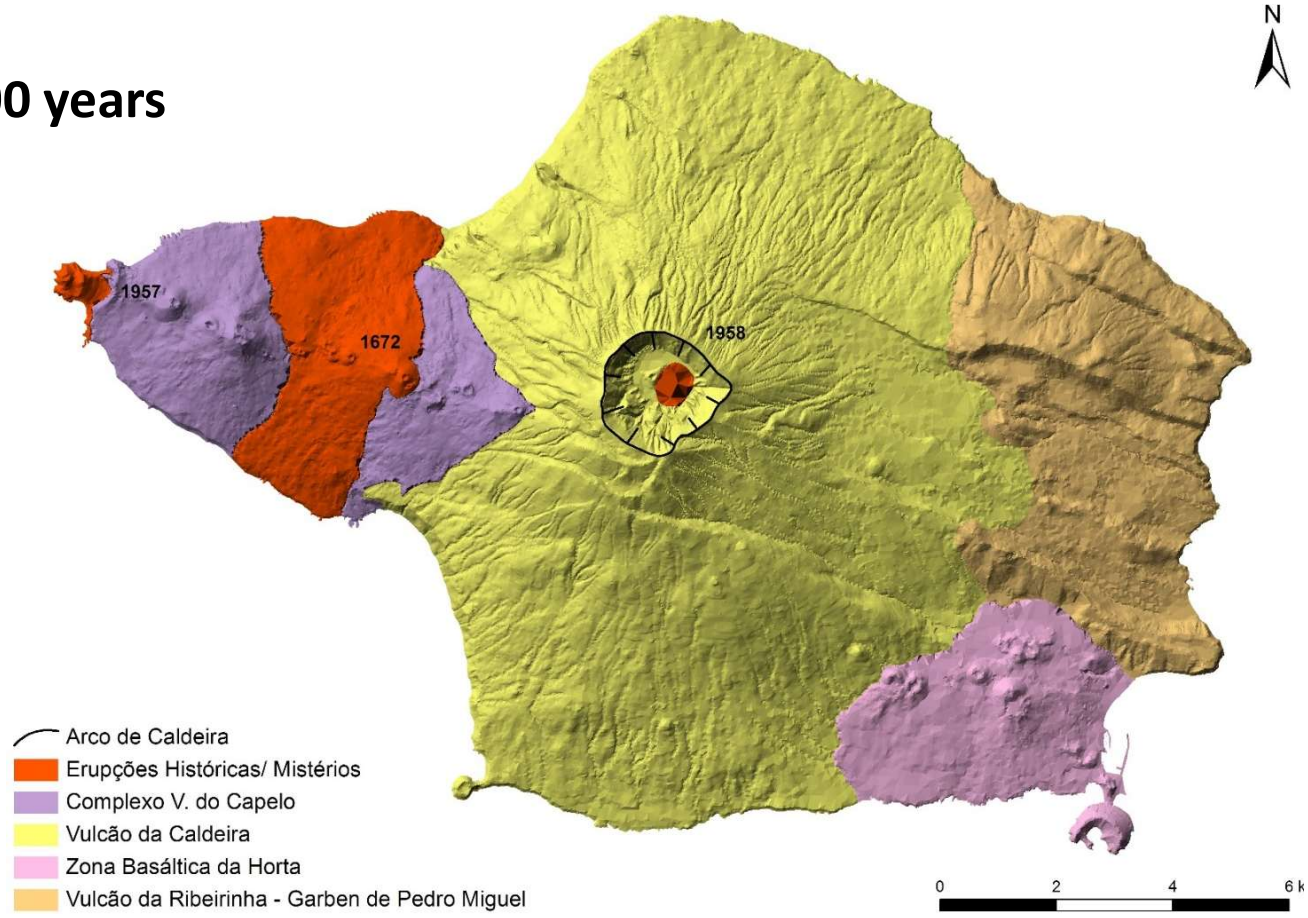
Where Volcanoes and Ocean Clash - Faial

800,000 years



- 2 large polyenetic volcanoes (Ribeirinha and Caldeira)
- 2 Basaltic Fissural Zones (Horta Basaltic Zone and Capelo Peninsula)
- Caldeira is the youngest in the Azores
- 2 historical eruptions (Fogo 1672 and Capelinhos 1957/58)
- Capelinhos increased the area of the island by about 2.4 km2

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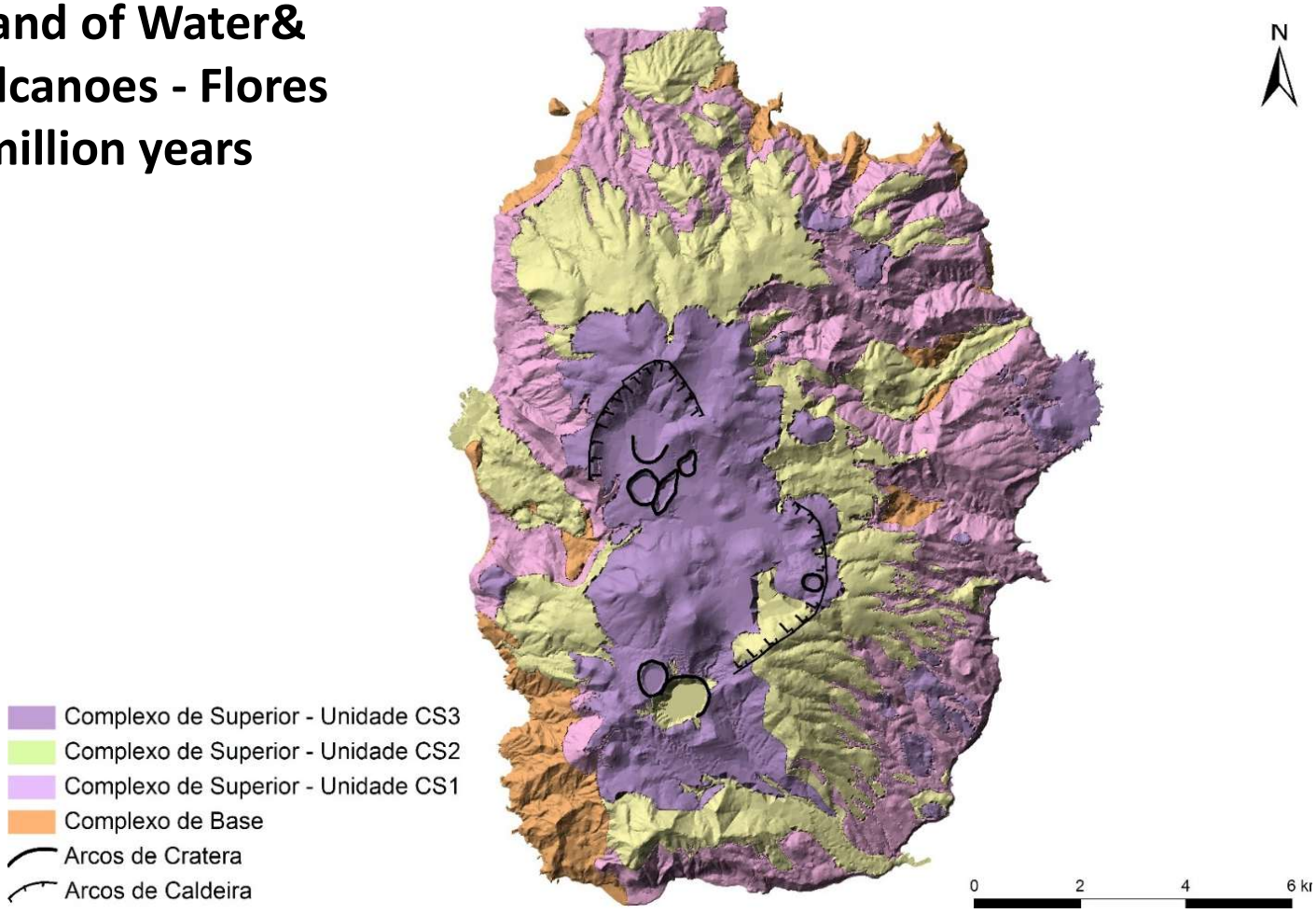
Island of Water& Volcanoes - Flores 2 million years



- Several explosion craters – hydromagmatic eruptions – Lagoa Funda, Lagoa Rasa, Lagoa Comprida, Lagoa Seca, Caldeira Branca
- Important watersheds or river basins and several ancient volcanic cones
- Residual reliefs – volcanic vents and dykes
- Rocha dos Bordões – 570,000 years old

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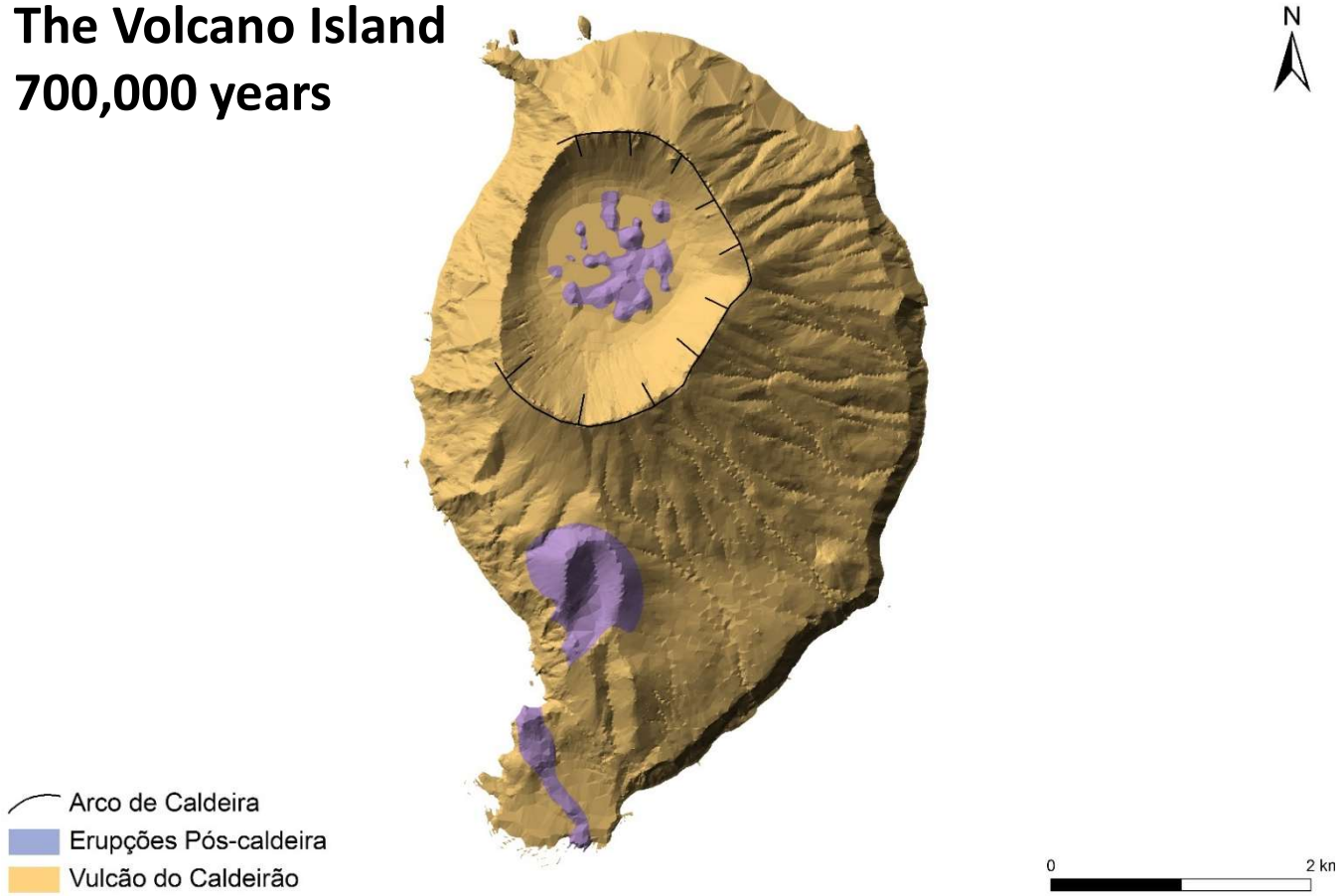
The Volcano Island
700,000 years



- Small size but remarkable diversity of rocks
- 700,000 years,
- 1 volcanic building with Caldera (Caldeirão)
- Several intra-caldera volcanic cones
- Lava Delta of Vila do Corvo – last volcanic eruption of the island in the Pão de Açucar area
- No recent volcanism

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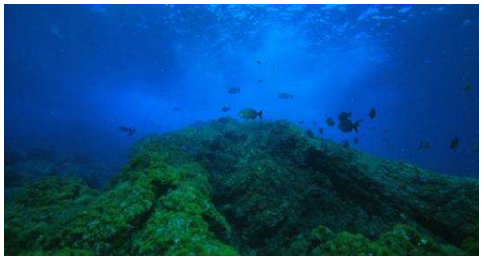





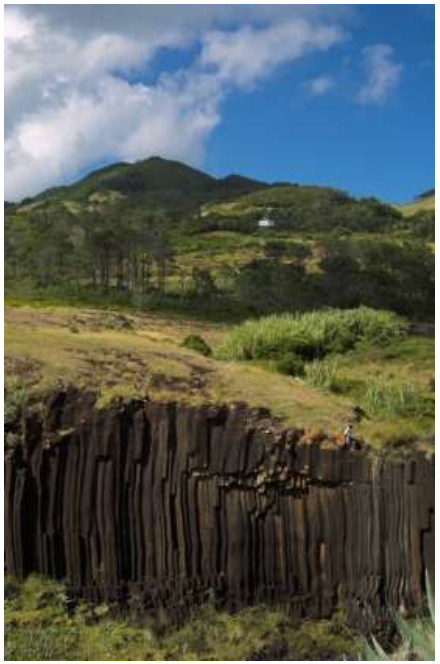

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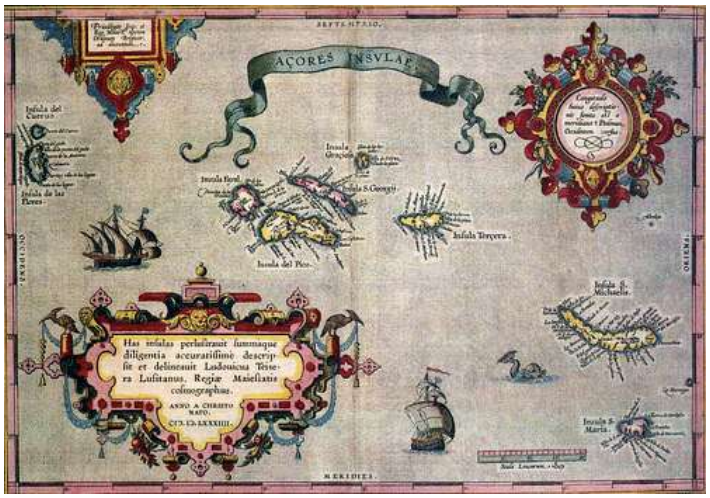
The fascination for THE ISLANDS



Since the XV Century??

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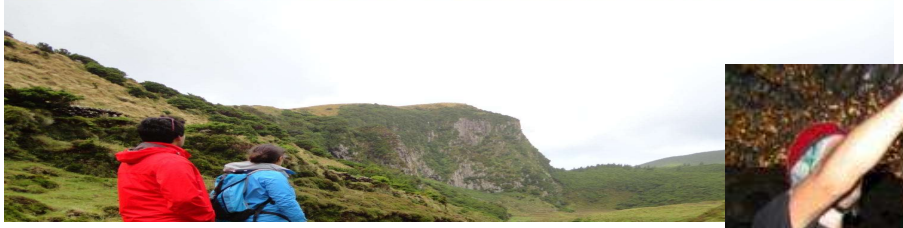
We live with natural hazards...

We take advantage of the fertile (volcanic) soils

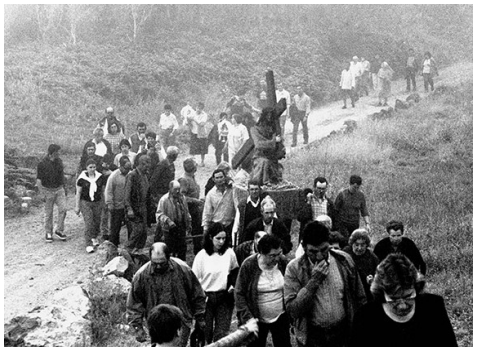
We take advantage of geological resources

We enjoy the volcanic landscapes...



CULTURAL HERITAGE - TANGIBLE AND INTANGIBLE





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The creation of what results today in the uniqueness of this space, namely its extraordinary geolandscapes and a natural heritage of excellence, is the result of the set of manifestations of the geodynamics of Planet Earth as well as the interaction of Man with this heritage.

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AÇORIANIDADE

''The historical product of five centuries of human living in the middle of the sea and solitude, volcanoes and storms (...)''

(…) Geography "is worth as much as history [...]. Like the mermaids, we have a dual nature: we are of flesh and stone. Our bones dive into the sea."

Vitorino Nemésio

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In recent years, the geological heritage of the Azores have been...

“POLITICALLY" RECOGNIZED

"geologically" IDENTIFIED

"legally" PROTECTED




The volcanic landscapes of the Azores present different geological structures and sites that can be considered geomonuments or geosites... that must be preserved and valued!

- ✓ The inspiring volcanic landscapes
- ✓ The rich Biodiversity
- ✓ And the genuine traditions and cultural manifestations

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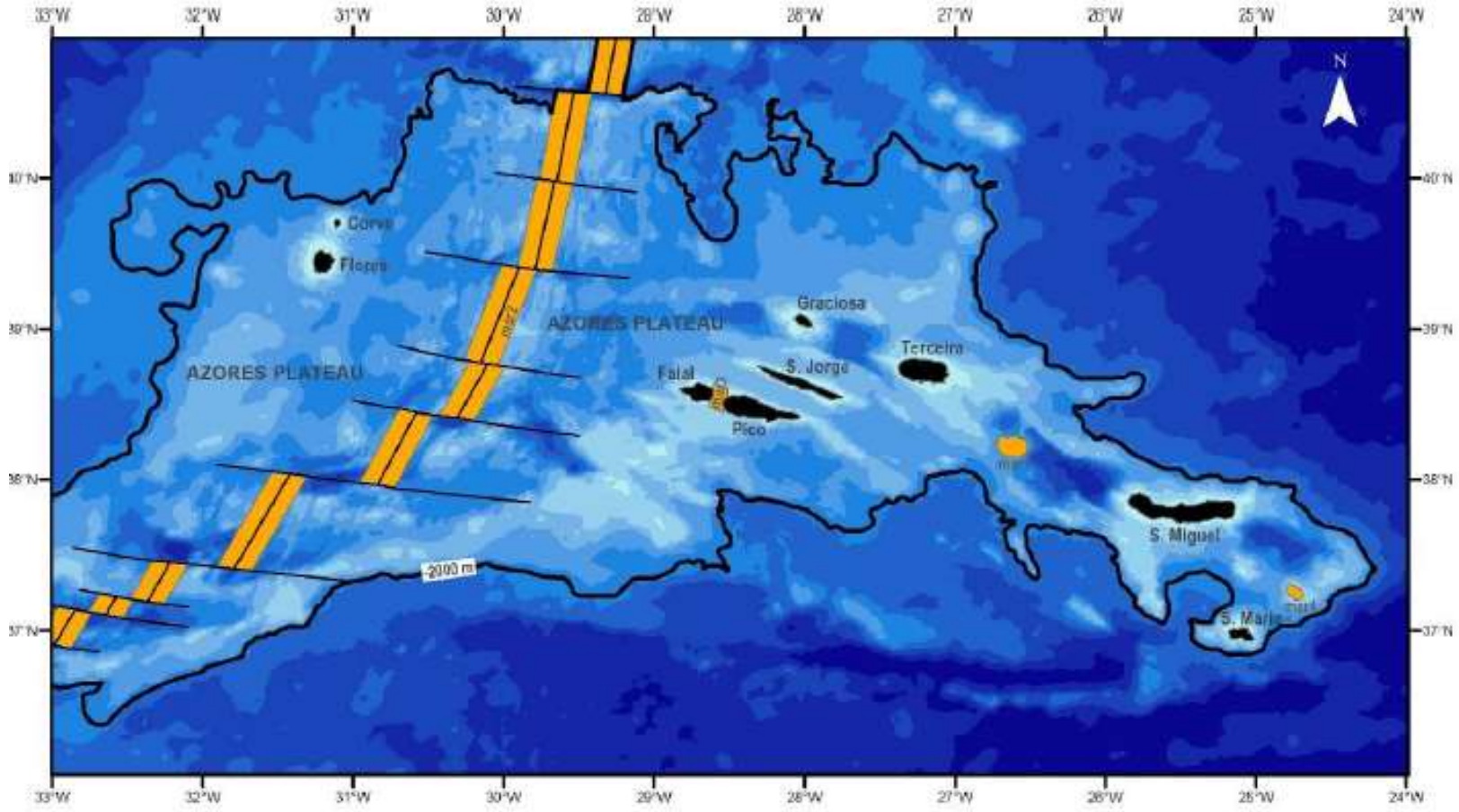
AZORES UNESCO GLOBAL GEOPARK



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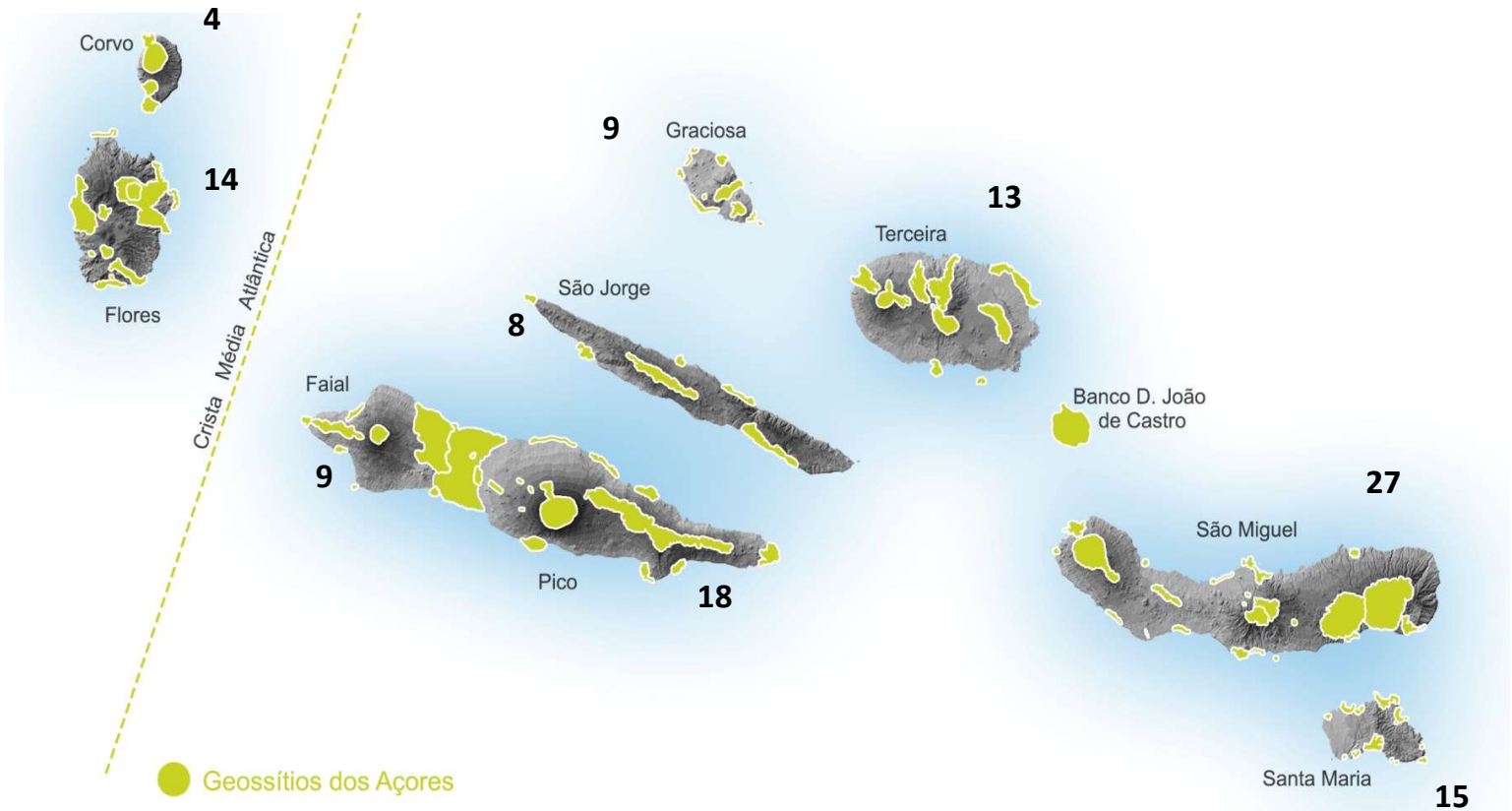
121 GEOSSITES:
6 GEOSITES OF INTERNATIONAL RELEVANCE
4 MARINE GEOSITES



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EDUCATION/CONSERVATION/SUSTAINABLE DEVELOPMENT

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celebrate the Earth's heritage; Supporting local communities

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EDUCATIONAL RESOURCES
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PRACTICAL ACTIVITY

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Volcanic rocks:

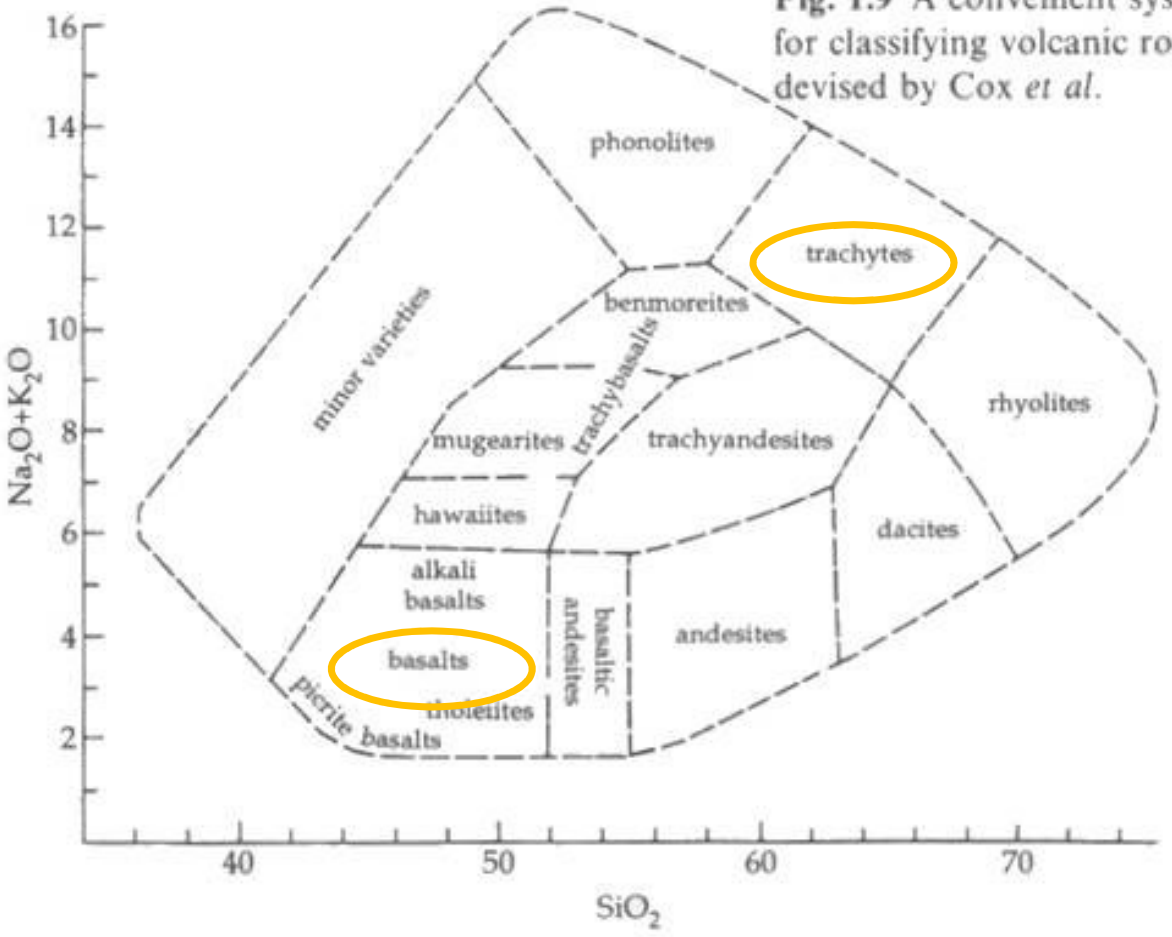

Fig. 1.9 A convenient system for classifying volcanic rocks, devised by Cox *et al.*

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NÓS SOMOS AÇORES GEOPARQUE MUNDIAL DA UNESCO

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