



Explore
the landscape,
the rocks and
the nature
of Nisyros.
Find out
its history and
civilisation.



NISYROS island



PROJECT: DESIGNATION
OF GEOSITES - GEOPARKS, CONTRIBUTION
TO SUSTAINABLE DEVELOPMENT

BACKGROUND ON THE AREA

Nisyros is one of the islands in the Southern Aegean Sea. It is essentially a cone, rising approximately 700 m above sea level. The cone clearly denotes the island's identity: **it is the youngest large active volcano in the Aegean**. The volcano is not just the **Stefanos crater**, which dominates the centre of the island. The whole island is a large volcanic structure. Every stone on the island is of volcanic origin, every one of the hundreds layers of rocks that form the island has been deposited by one of the numerous volcanic eruptions. The great variety in the composition and the forms of the rocks that make up the island, the extensive and easily accessible natural sections and the excellent climate

render the island of Nisyros an open-air geological museum. Furthermore, Nisyros is the only active volcano in the Aegean Sea, which boasts such low and high vegetation and, hosts a wealth of fauna. The crystal-clear blue waters allow visitors to see the beautiful, rich sea floor, underlining the continuity between land and sea. The island of Nisyros has been inhabited continuously ever since prehistoric times and is home to a really large number of great cultural monuments. It is a heaven, not just for geologists, but for every visitor who loves and respects nature, and tries to draw lessons from the eternal wisdom of its actions and to put them in use in their own infinitesimally brief existence.

HOW TO USE THE CARDS

This package contains 12 cards: the first 5 cards are general in content, with information on the geology, the rocks, the nature and the civilization of the island of Nisyros. The following 7 cards provide a brief description of the 10 most interesting geotrails of the island, based on the geological features of the area. Maps of the cards are indicative and simplified. Next to the trails marked on the map, there are numbers and letters. On the card containing the commentary for each trail, the letters correspond to the description of the trail, whereas the numbers correspond

to the description of the particular sights in the area. In order for you to hike safely, it is necessary to carry a 1:25,000 scale map of the area, with the corresponding trails. You can download the map from www.nisyrosvolcano.com. You can also download the trails in digital form, so that you can load them to your satellite compass (GPS). It's better if you carry also the geological map of the island. Before you set off on each trail, read carefully the commentary on the cards and follow the instructions in the "Code of conduct of the responsible hiker".



3rd COMMUNITY SUPPORT FRAMEWORK
PROGRAMME (2000-2006)
OPERATIONAL PROGRAMME "COMPETITIVENESS"
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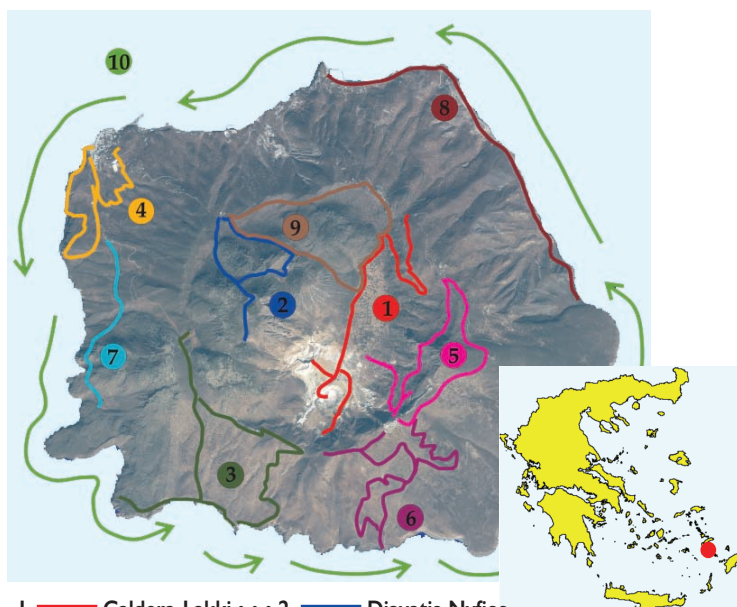
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MAP OF THE AREA OF INTEREST WITH THE SUGGESTED GEOTRAILS



1. — Caldera-Lakki ••• 2. — Diavatis-Nyfios
 3. — Argos ••• 4. — Hohlakoi-Kanoni
 5. — Nikia-Fylakio-Parletia ••• 6. — Nikia-Avlaki
 7. — Kateros ••• 8. — Paloi-Lies
 9. — Evangelistra-Emporio ••• 10. — Circum navigation*

The geotrails suggested and described here should not be considered as the most beautiful on the island. It is difficult to select this or that area, in a place where every spot is worth visiting. The choice has been made on the basis of criteria such as geological formation representativity, satisfactory visibility of the rocks and accessibility for a hiker who is adequately fit.

It is assumed that the visitor explores the island on foot, but many of the trails can be easily completed on mountain bikes or motorcycles. However, the relationship that hikers develop with nature is unique, because they can observe the landscape and the rocks, and they can also enjoy the sounds, fragrances and images of the land and the sea, the plants and the animals.

The necessary equipment for a safe walk around the island include appropriate shoes (light walking boots), hat and sunglasses: the sunlight is really harsh here. It is also necessary to carry enough

water (more than one litre per person) and light snacks (fruit, nuts, bread and cheese). One of the people in the group should carry at all times a small first aid kit in their backpack.

The ideal time for hikes is in the spring (April-June) and in the autumn (September-October). Of course, this does not mean that the hikes cannot be undertaken at other times of the year. In the summer, heat is not a serious problem because there is nearly always a pleasant breeze on the island of Nisyros. But you can also choose to hike in Nisyros in the winter, as the only month with heavy rains is December and the average daily temperature rarely falls below 10° C, even during the coldest month of the year, February.

* During the **Circum navigation**, we pass by several sites we also meet during our geotrails on the island, e.g. site 1 corresponds to site 1 of Geotrail 4. Due to this, on the **Circum navigation** card, site 1 is marked as (1)/4(1).

CODE OF CONDUCT OF THE RESPONSIBLE HIKER

When you hike along a trail, keep in mind that this is a, public or private, protected area. The environment is a source of knowledge, fitness, pleasure and recreation on condition that you treat it with care. It is, therefore, desirable to follow some basic rules.



Car in good condition, preferably 4 x 4. Park carefully, so that you do not obstruct entry to or exit from a place.



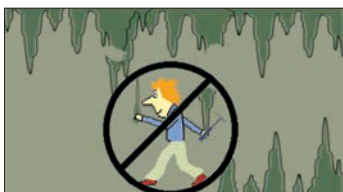
Be careful when lighting fires! If you see fire burning, call the fire brigade (199) immediately.



Do not damage fences or walls.



Do not leave any waste material behind.



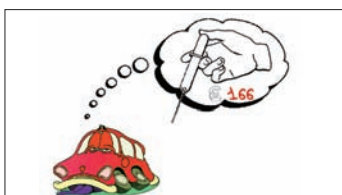
Avoid aimlessly collecting minerals or fossils. Mineral and fossils are more valuable when encountered in their natural context.



Wear clothing that is appropriately warm or cool, depending on the time of year. Use walking footwear (preferably hiking boots).



Use the geologist's hammer wisely.



If an accident occurs, notify emergency services (166) immediately.

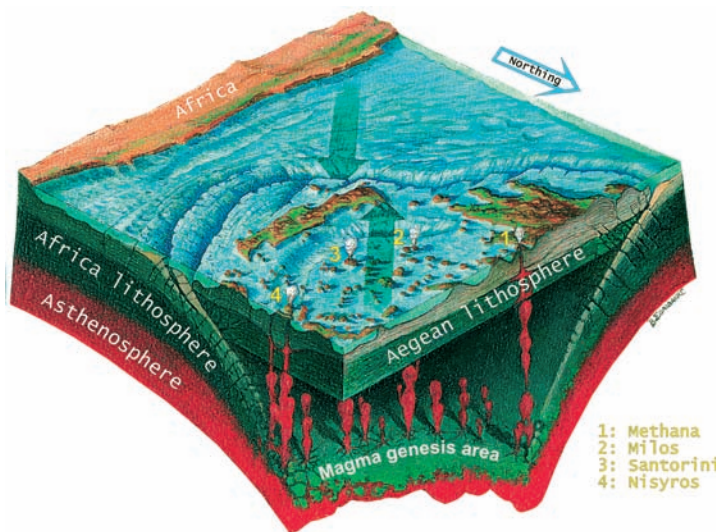
WARNING

Hikers who wish to cover the trails that we propose should know that they are doing so at their own risk. IGME will bear no responsibility for any events that might occur.

For information, publications, studies and maps on the geology of Greece or of specific Greek regions, contact INSTITUTE OF GEOLOGY AND MINERAL EXPLORATION OF GREECE.

Evaluation form of this publication is to be found at <http://www.igme.gr>
Your opinion will be very helpful for its improvement.

THE EVER-MOVING AEGEAN SEA. CREATION OF THE ACTIVE VOLCANOES AND OF NISYROS



Schematic section on the Aegean lithosphere and its active volcanoes

General information

Five million years before present, Aegeis land, an alpine mountain range located at the place of the present-day Aegean Sea, started disintegrating to fragments and sinking into the waters of the sea. The pressure of the tectonic plate of Turkey – which slides along the fault of Northern Anatolia – and the ascending warm currents created by the subducting African lithosphere wore thin and large blocks of the continental crust and made them sink into the Aegean Sea. At the same time, volcanoes also joined that battle of the land against the sea. The magma forming underneath the southern Aegean Sea, due to the subduction of the African lithosphere, found outlets at Saronikos gulf, creating Sous-saki volcano, as well as the largest part of the island of Aegina and the Methana peninsula. In the central Aegean, it created the insular groups of Milos and Santorini, and, finally, in the eastern Aegean Sea, where it created the island of Nisyros and its surrounding islets, as well as part of western Kos. At the eastern edge of the volcanic arc, the volcanic activity started

adding new volcanic land to southern Kos and creating the small islands in the South of Kos, such as Pyrgoussa and Pachia, 3.4 million years ago. An enormous eruption marked the end of volcanicity in Kos, 161,000 years ago. It was the largest eruption in the eastern Mediterranean Sea. The eruption spewed hundreds of billions tons of rock, which was spread like volcanic tephra to the whole area; at present, it covers half of the island of Kos and also occurs in Kalimnos and Tilos islands, as well as in the nearby coasts of Minor Asia. After that event, eruptions went on occurring further in the South, building up the island of Nisyros, as well as the islands of Stroggyli and Yali. Nisyros is the most recent of the large active volcanoes in Greece. The earliest rocks that appear here date back to a little later than 160,000 years ago, while the most recent rocks are almost prehistorical, dating back to approximately 20,000 years ago. We don't know exactly when the creation of the underwater foundations of Nisyros started. A few tens of thousands years of underwater volcanic activity were definitely

necessary for the first peak of the island to emerge from the waters of the Aegean Sea, approximately 150,000 years ago.

After emerging from the sea, the volcano started creating a cone of land. Over the next 100,000 years, a large volcanic cone was built above sea level, formed by successive layers of tephra and lava. Its diameter is estimated to be approximately 7 km and its maximum height 700 m. The first large destructive eruption took place on the island approximately 50,000 years ago. Within a few days, billions of ton of molten rock were spewed into the atmosphere, producing huge volumes of pumice and ash. The peak of the volcano collapsed in the void space created underneath the island, due to the spewing of the magma and the first **caldera** of the island of Nisyros was created.

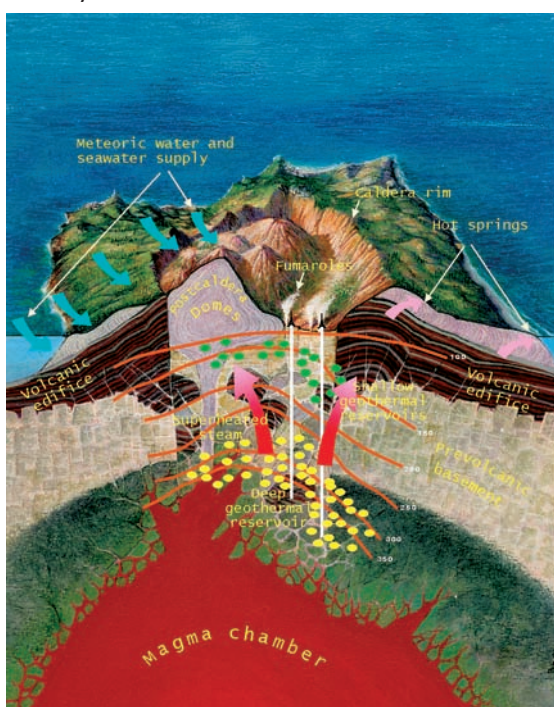
After the eruption, the highly viscous molten rock built large lava domes near the eastern rim of the first caldera and covered the south-eastern slopes of the volcano with very thick lava flows at the place where Nikia is built today.

The period of calmness that followed was interrupted after the second destructive eruption of the island of Nisyros, approximately 45,000 years ago, when new layers of pumice were added to the island and the present **caldera of Nisyros** was created. After that large eruption, magma flowed out

calmly for several thousands of years, creating the "**post-caldera domes**", the high hills that fill approximately 2/3 of the caldera, as well as the Karaviotis dome, outside the caldera.

This is how the island of Nisyros came to acquire its present form. None of the successive eruptions of the volcano, which were recorded in historical times, produced molten rock. All of them were **hydrothermal eruptions** caused by the presence of overheated vapour in the subsoil of the island. Sea water and rain water penetrate the rocks of the island, accumulate in deep horizons and are heated by magma. The water turns to overheated vapour and tremendous pressure builds up. When the pressure exceeds the weight and cohesion of the overlying rocks, it blows them in the air, causing a hydrothermal eruption.

All the eruptions recorded on the island of Nisyros in historical times belong to this type. At the southern part of the caldera floor there are traces of 20 such craters. Ten of them are well preserved and each one has its own name.



Schematic representation of Nisyros volcano interior

Mythology

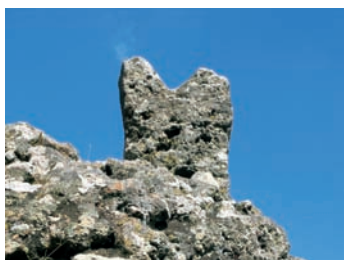
Even nowadays, we do not know precisely when the molten rock started oozing at the Nisyros area for the first time. The ancient Greeks, however, had very clear ideas both about the time and the way the island was created:

“Polybotes, hunted by Neptune in the middle of the sea, reached the island of Kos. But Neptune grabbed a piece of the island and threw it on him. It was the island of Nisyros”.

It is a wonderful myth, which reveals that our ancestors knew that the island of Nisyros is a volcano and that its rocks are similar to those of southwestern Kos. They also knew or felt that the frequent earthquakes in the area were connected with the mechanism of the island's creation. The trapped energy of the molten rock and the overheated vapour under the island of Nisyros became Polybotes, one of the Giants, who sighs and stirs because he is imprisoned beneath the island.

History and civilisation

The history of the island of Nisyros dates back to many centuries ago. There are traces of Neolithic settlements dating back to the 5th millennium B.C. and life has gone on uninterrupted on the island ever since. The island flourished in the 4th century B.C. and in the 12th-13th centuries A.D. At the end of the 19th century there were approximately 5,000 inhabitants on the island. Ever since then, the number of the inhabitants started falling. Farming, fishing and stock raising were no longer sufficient, so the inhabitants of the island started moving away from the island.



Consecration horns in the Nyfios Minoan shrine on the peak



Poseidon battle with Giant Polyvotis (Polybotes)



Nisyros silver coin

The earliest findings of human presence in the wider area date back to the Neolithic period; they consist of ruins of settlements on Giali islet and at some sites, mainly in northwestern Nisyros. There are scarce traces of the Minoan and Mycenaean presence, such as corn-shaped flakes, vase fragments and “Cyclopean” walls. The Pre-classical and Classical periods (10th-4th century B.C.) are represented mainly by the marvelous Paleokastro, a host of sculptures and fragments from ancient temples, and the settlements in the Argos area. There are some extensions and additions to classical buildings dating back to the Hellenistic period, as well as numerous “fryktories” (watchtowers), both on the island of Nisyros and on Pyrgoussa islet. As a matter of fact, the name Pyrgoussa (the Greek word for “tower is “pyrgos”) owes its name to these towers.

The Roman period left sculptures and bath ruins on the islands. Some of these can be seen at present outside Paloi. During the early



Paleokastro

Byzantine times numerous big and small churches were built; the ruins of some churches can still be seen. From the 11th to the 15th century, the island of Nisyros is under the rule of Western Europeans, the Venetians, at first, and the knights of Saint John later. It was them who built the castle at Kastro, Mandraki, as well as numerous other fortifications.

After the capture of Constantinople, the island of Nisyros became prey to incursions by pirates and the Turks.

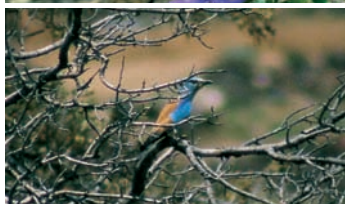
At the end of the 15th century the island was completely deserted and in 1522 it surrendered to the Ottomans, who ruled it until 1912, when the island passed under Italian rule. The Ottomans granted special status to the Dodecanese, which allowed a powerful and active local government to flourish; as a result, there was a great deal of development in Nisyros at the time. A wealth of churches dating back to that period testify to the relative prosperity and the busy social life of the island.

Flora and fauna

The island of Nisyros is on the eastern migratory corridor of Asian bird species. It is the most important route on their way to Greece and Minor Asia. Due to its fertile volcanic soil, the flora of the island is very varied.

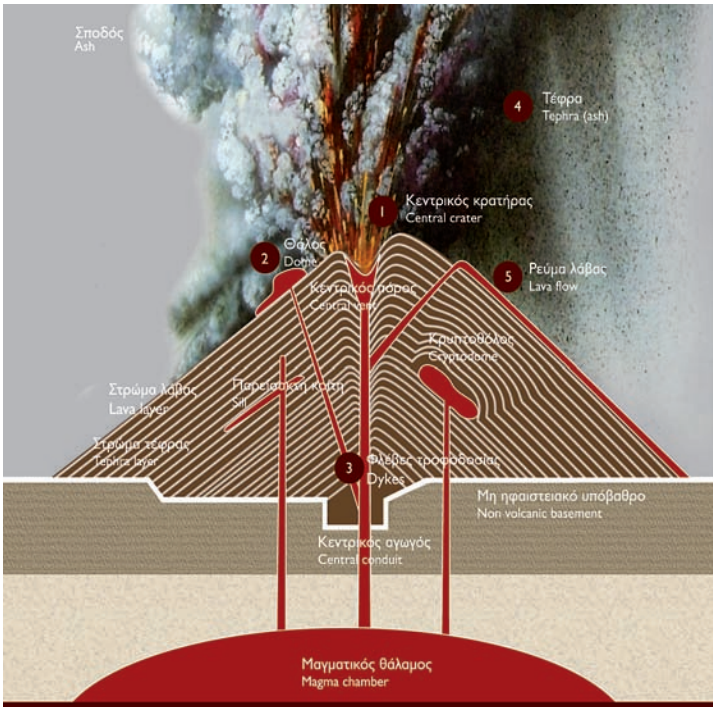
Its 450 flora recorded species, 85 bird species, 7 species of reptiles and the presence of *Monachus-Monachus* seals on its coasts designate the island of Nisyros as a site worthy of special protection and study.

The lush herbaceous vegetation is a pleasant obstacle that hikers off the marked paths are bound to encounter. Because of the abundance of trees, the island of Nisyros can be characterised as the only “green” active volcano in the Aegean Sea. The fauna of the island is just as varied and diverse as the flora. Furthermore, there are numerous free-range animals, such as goats, pigs and cows.



Nisyros flora and fauna >

VOLCANOES, LAVA AND TEPHRA



Volcanoes can be found either on land or underwater; they are natural structures and they usually have the appearance of a hill or a mountain. Volcanoes are created at places where magma, the molten rock deep inside the earth, manages to find an outlet towards the surface. When magma escapes to the surface, it cools and becomes solid lava.

The creation and escape of magma to the surface of the Earth is generally encountered in tectonically disturbed areas. Magma leaves the magma chamber, reaches the surface through volcanic conduits or dykes and ends up in the volcanic vent, which is usually a bell-shaped cavity, like a crater. In the intervals between volcanic eruptions, the only evidence of volcanic activity is the emission of fumaroles, i.e. hot gasses and vapours from cavities in the ground.

Volcanic activity can range between two extremes: in the first type, magma does not contain a great quantity of gasses; it reaches the surface slowly and flows out

of the volcanic vent, creating lava flows, when its viscosity is low, or lava domes, when it highly viscous. In the other type, gas-rich magma triggers eruptions. Then the lava is blown in fragments from the volcanic vent, in the form of tephra. Tephra is also named pyroclasts; the most fine-grained part of tephra is called volcanic ash or simply ash. Some volcanoes are in constant activity for long periods of time, such as the Stromboli volcano, in the Aeolian islands, which has been constantly active for the last 3-4,000 years.

However, most volcanoes present brief episodes of activity, which last from a few days to a few years and between, and then become dormant for tens, hundreds or thousands of years. Dormant volcanoes can present no sign of activity or emit gasses and vapours, which reveal its active status. Nowadays, active volcanoes are defined as volcanoes that have shown activity in the last 10,000 years and are located in tectonically active areas.

Rocks of the island of Nisyros

The island of Nisyros is formed exclusively by volcanic rocks.

The magma feeding the volcanic activity is initially **calc-alkaline basalt**: a fluid made up of oxides of silica, aluminium, magnesium, iron, calcium.

The mineral crystals encountered in the rocks of the island of Nisyros are:

- **Feldspars**, translucent white crystals.
- **Pyroxenes**, dark green to black crystals.
- **Hornblendes**, dark green to grey crystals.
- **Olivines**, translucent honey-coloured to green-gray crystals.

Gasses also play an important role in the final form of volcanic rocks. A fluid basaltic or andesitic magma which contains many gasses gives rocks with spongy texture and characteristic black or dark red colour, called **scoriae**.

A highly viscous dacitic or rhyolitic magma, rich in gasses, produces **pumice**, a white rock which is formed from “blown” glass with some crystals. There are very frequent occurrences of andesite **inclusions** in the dacites and the rhyolites: it is a new basaltic magma that comes into the magma chamber and mixes with the acidic magma in it.

A group of rocks that is specific to the island of Nisyros is **altered rocks**. They are encountered mainly in the Ramos area, as this is where the most intense

hydrothermal activity, which is in their origin, takes place. Finally, a special and quite rare rock, which geologists call **skarn**, is found between the fragments spewed from the bowels of the Earth by large eruptions. Its colour ranges from light green to dark olive green or from ruddy to black, depending on the crystals it is formed by (**pyroxenes, olivines, epidotes, spinels and garnets**). Skarn is formed at the contact zone, when the molten rock penetrates in limestones and marbles.

The rocks on the island of Nisyros provide its inhabitants with a wonderful material on which they can build and base their economic activity.

Paleokastro has been constructed entirely with basaltic andesite, one of the hardest rocks in the world.

The island of Nisyros has been well-known ever since ancient times for its marvelous **grindstones** and its **hand querns**, which are made mainly by basalt and andesite and are exported to the whole surrounding area.

Pumice is the rock that has been exploited the most in the area; it has been an important factor for the economy of the island in the last few decades.

The **sulphur** lodging within the altered rocks of the Ramos area (**sulphur soils**), especially near the hydrothermal craters has also been exploited at intervals.



Milestone of Classical age



Sulfur crystals

GEOTRAIL 1 • Caldera – Lakki



Distance: 6 km • Height: 90-320 m • Time: 3.5 hours

A. The trail begins at the junction of the roadway leading to Nikia with the road descending towards Lakki. At the beginning of the trail, from the northern rim of the caldera, there is a wonderful view of the **large eruptive funnel and the post-caldera domes (1)**. Then, one can observe the old formations of Nisyros, at the sections of the road lying on the slopes of the caldera. Observe the massive or laminar, due to flowing, **lava flows and the tephra layers (2)** they are intercalated by. At some points, lava flows penetrate the sediments of small ponds, lying in the craters of that time, and characteristically mix with sediments. At some other points you can see large **volcanic ejecta (bombs) (3)** which penetrate and deform the layers of ash, clearly revealing the traces of the direction of their fall and, thus, providing us with valuable info on the position of the vent they were emitted from.

B. At the second segment of the road descending to Lakki, there are **two large dykes (4)** within the first dacitic lavas on the island of Nisyros. A little further down, you will see the **fine-grained pumice (5)** originating from the last large eruption of **Yali** island deposited on the scree covering the cliffs of the caldera.

C. At the third part of the road, which is flat and leads to Lakki, you will initially encounter the **Boriatiko lavas (6)**, one of the most recent post-caldera domes of the island of Nisyros. Then, you can observe the layers of block and ash flows deposited by **collapsing parts of the Visternia dome (7)** and, a little further below, the **fu-maroles** on the eastern slopes of **Lofos dome (8)**.

D. After a refreshment at Lefteris's kiosk, follow the path to Stefanos and head down, towards the crater floor. Admire the sulphur crystals



Volcanic bomb sag (site 3)

formed at the fumaroles. Do not try to collect them: they crumble immediately and you rob visitors after you of the possibility of seeing them. Listen for the hum of the geothermal fluid as it comes up to the surface.

Beware! Do not let your clothes and equipment come into contact with the rocks and the fluids because they quickly disintegrate.

If you visit the crater during the time of the rainfalls, you will enjoy the view of the boiling mud, as the largest part of Stefanos floor turns into a mud pot.

E. Then, follow the path to **Alexandros (9), Mikros (Little) Poly-**

votis (10) and Megalos (Large) Polyvotis (11) craters, as well as to all the other craters in the Lofos area. It is worth descending into Megalos Polyvotis (taking extra care as this is meant for competent climber only), to admire the thin-layered sediments of the lake that used to be in there, before the 1871-1873 eruptions, as well as its numerous fumaroles.

Avoid descending to the bottom of Polyvotis if there is not enough wind. The accumulation of carbon dioxide, which is heavier than the air, makes this a dangerous place to be if air supply is not adequately renewed.



Stefanos crater fumaroles

GEOTRAIL 2 ◉ Diavatis – Nifios



Distance: 6.5 km • Height: 260-698 m • Time: 4 hours

A. It is probably the most interesting path and it leads to the highest peak of the island of Nisyros (altitude 698 m). Make sure you set off early in the morning and be prepared for a some climbing. There is a roadway up until Evangelistra monastery. The hiking begins at Evangelistra monastery and the time to the top is approximately one hour of normal walking without stops. At the beginning, you will walk for a few minutes on the path bordering the southern cliffs of the caldera, where you can observe the **andesitic lava flows and the scoriae of the intermediate andesitic lavas (1)**.

As soon as you reach the spot where the **Profitis Ilias dome lavas (2)** touch the caldera, turn left and start going up **on the dacites of the last volcanic eruption of the island**. Observe the rocks carefully. Within the ash rose dacites, you will see numerous rounded pieces of a darker, purple rock. It is an andesite that penetrated into the magma chamber of the dacite and they came up to the surface together. The first part of the path is easy and the path can be easily discerned, but between 450-500 m into it, you will

need to pay attention so as not to miss the path.

B. Sixty metres below the top, after you cross the kermes oaks forest which cover the northwestern slope of the dome, at a height of 638 m, you will come across **Diavatis (3)** “hanging garden”. It is an oasis of tall trees – walnut trees, fig trees, pear trees, etc. – on a flat, round surface limited by a tall stone fence. This circular structure is a **collapse crater of the Profitis Ilias dome**, a usual structure for domes, created at the final stage of the eruption, when the magma is cooling. At the entrance of Diavatis, there is a small white house with a lava cistern bearing the date 1749. The church behind the house is called Panagia Diavatiani (Galaktotrofoussa) and boasts impressive frescoes, possibly dating back to the 17th century. Across the church there is a number of small cells in a bad state; they used to host the nuns of the monastery.

C. Keep on walking on the path, towards the left, up until the easternmost site, where you will admire the entire southeast island of Nisyros and, in particular, the **caldera** and its **hydrothermal craters (4)**.



Diavatis "hanging garden" (site 3)

remnants of a settlement. **The carved caves** where the church of **Agios Ioannis Kallivitis** and a monastery with interesting frescoes, dedicated to **Nymfios Christos** (Christ Bride

D. Now, move towards the West. In a few minutes, you will reach the **peak of Profitis Ilias (5)**, with the chapel dedicated to Prophet Elias, at 698 m above sea level. **The view towards the West from here is unique.**

E. The seasoned hikers among you might want to move in the South of Profitis Ilias and admire, on the mountain saddle before Trapezina, the chapel of **Agios Pandeileimonas**.

F. We suggest you return through the impressive Nifios plateau. On the first part of the path, admire the **dome lava spines (6)** on your left.

G. On the Nyfios plateau are conserved the only indications for a Minoan shrine on the peak, with horns of consecration and the

groom) are to be found today, might have been a shrine to the Nymphs in the past (which would explain the origin of the name Nyfios).

H. You can return from Nyfios by walking 30 minutes downwards either on a path to Evangelistra or on a path to Lakki. At the junction there are impressive fronts of the lava flows fed by the **Boriatiko dome (7)**. On the way down, you will see a characteristic **neck of andesitic lava (8)** rising up on the foot of the northern cliff of the caldera. At Evangelistra, make a stop at the monastery, have some fresh water from the cistern in the yard and enjoy the cool breeze under the branches of the enormous turpentine tree.



The hydrothermal craters view from Profitis Ilias (site 4)

GEOTRAIL 3 ◉ Argos



Distance: 8.5 km • Height: 0-350 m • Time: 4 hours

A. The trail begins from a dirt road that can be travelled by car on the western slopes of the island of Nisyros, at the place where Karaviotis and Trapezina domes meet. You can also reach this spot on foot from Mandraki. The first place to visit is **Siones**. It is a small temple on the western slopes of the caldera; it is dedicated to the birth of Madonna and is richly decorated, as it was renovated by monk Ionas in 1733.

B. Leave the dirt road between Karaviotis and Trapezina domes and follow the path unravelling mainly in the archaeological site of Argos, which has not been explored. You will come across a number of **settlement remnants from the Neolithic (?) period** (1, 2) to the last century. The “tavles” (cultivating terraces), with their high retaining walls built exclusively from the remnants of **andesite**,

which was quarried for the renowned grindstones of the island of Nisyros, are a particularly impressive sight.

C. The last part of the path unfolds between impressive occurrences of **andesitic lava flows and scoriae** (3). This area is full of **galleries**, dug into the ground, which extend tens of metres in length and a few metres in depth. They were probably shelters, built by the inhabitants of the island ever since ancient years, so that they could hide in the event of pirate incursions. The path ends at Agia Irini, where you can see the ruins of **the sulphur processing plant** (4), built in 1879 by A. Rallis; the plant was operative for just 10 years.

D. A path from Argos area leads to **Drakospilo** (5), the southernmost “fryktoría” (watchtower meant to observe the sea) of the



Argos lavas

island of Nisyros. Underneath the ruins of the watchtower is conserved the cave that was probably used as living quarters by the guards. The last part of the trail is extremely difficult, as it unfolds on the sharp Karaviotis lava fragments, as there is virtually no traced path.

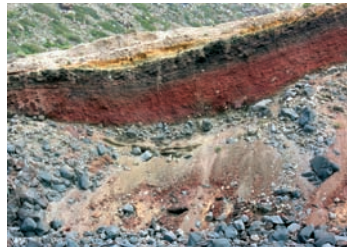
E. On the way back to Stavros monastery from Agia Irini, approximately after the first half of the dirt road, another path leads to **Piria (6)**, an area of hot vapour emissions, used ever since ancient times as a place of treatment, for vapour inhalation and as natural

sauna. Along this path there are very nice outcrops of the Lower pumice formation: they are fall horizons and pyroclastic flows of pumice, dating back to the first destructive eruption on the island. The area is ideal for the collection of beautiful skarn samples, on condition that we they lie on the ground.

F. The trail ends at Stavros monastery, which is built on the southern rim of the caldera. This is where one of the five castles of the Templar Knights of Rhodes used to stand; its few ruins are hardly visible today.

Right: Red andesitic scoriae layers on the Argos lavas (site 3)

Bellow: Andesitic lava flow at Agia Irini



GEOTRAIL 4 • Hohlakoi – Kanoni



Distance: 5.5 km • Height: 0-160 m • Time: 3 hours

A. The trail begins within Mandraki, from Tavla Gialou, under the cliffs from which the church of Panagia Spiliani hangs. This is the place where you can observe the **oldest lavas of the volcano: tens of “pillows” of greyish basaltic andesite (1)** with a diameter ranging from 0.5 to ten metres, from here to **Hohlakoi** bay, the beach of Mandraki, with impressive black pebbles, created by the marine erosion of the submarine lavas.

B. Keep moving along the coast, towards Cape Kanoni. After hopping briefly on top of large basaltic andesite lava blocks – used to build Paleokastro, which is on top of the steep coast – you will reach the second steep valley. Once you get there and climb for a while, you will come across **layers of old pebbles and sand (2), deposited on the lavas by the sea**, when the former were under the surface of the latter. Amid these layers you will see a whitish-grey sand, glittering strangely under the sun.

Do not touch it! Your hands will be filled with tiny needles, resembling the prickles of the prickly

pears. They are millions of silicon prickles, the skeletons of the sponges living in the sea at that time.

Overall, these are the deposits of Kastro conglomerate layers which show that this place used to be until recently below the surface of the sea.

C. Then, you can climb up (climbing is a little difficult, due to the presence of terraces and the fact that the path is not marked), across the slope. If you look up on your right, you will see the **fronts of andesitic lava flows (3)**.

D. When you get near the heliport, you can follow the path to Kanoni, the western cape of the island. There, you can see impressive fronts of andesitic lava and **columnar jointing lava structures (4)**.

E. From Kanoni, move eastwards, into a path, which is not very clearly traced. Walk on the mud flows covering the lower pumice tephra deposits of Nisyros, the first large destructive eruption of the volcano.



Pillow lavas at Tavla tou Gialou (site 1)

F. From here, you can either follow the path back North, or walk outside the path for a while, until you come across the dirt road and, then, visit the church of **Panagia Faneromeni**, a cruciform church with a dome.

There are remnants of frescoes on the sanctuary, possibly dating back to the 14th-15th century, while the wealth of scattered marble members testifies to an ancient temple previously built on the exact same spot.

There are more ruins of temples in the surrounding area, as well

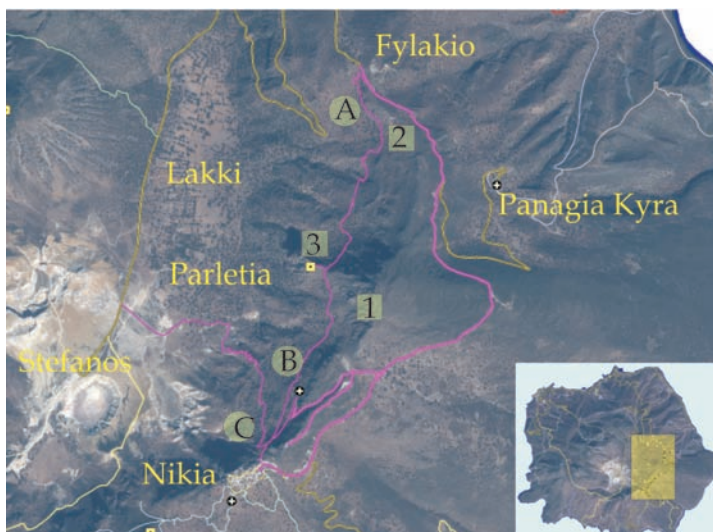
as stone buildings, possibly used as the living quarters of the monks.

G. The dirt road on the way back turns into a paved road after the heliport and leads to **Paleokastro** on the left and to Mandraki on the right. This is where the path to Mandraki begins. If you have not visited Paleokastro, don't miss it. Within the castle, apart from Classical, Hellenistic and Byzantine remnants, you will also see the **andesite mining quarries (5)**, used to build the castle.



Columnar jointing of andesitic lavas at Cape Kanoni (site 4)

GEOTRAIL 5 • Nikia – Fylakio – Parletia



Distance: 6 km • Height: 120-420 m • Time: 3.5 hours

The trail moves along the eastern slopes of the caldera, starting from Nikia and ending at Fylakio, or the other way round. The middle part of the path is not marked and not very well traced. If you don't feel like searching for the path, you can cover just the first part at Fylakio (A) and then re-enter it from Nikia to Parletia (B).

From a geological point of view, this path presents interesting **flow and ramp structures of the Nikia lava (1)**, which prevails in the first half of the trail, as well as large **flows of andesitic lava (2)**, which have built the steep slopes, near the end of the path, under Fylakio. At the beginning of the trail, you



will see the **Agios Ioannis Theologos monastery**, with a very interesting **bell tower made up from sculpted lava**. In mid-trail, the

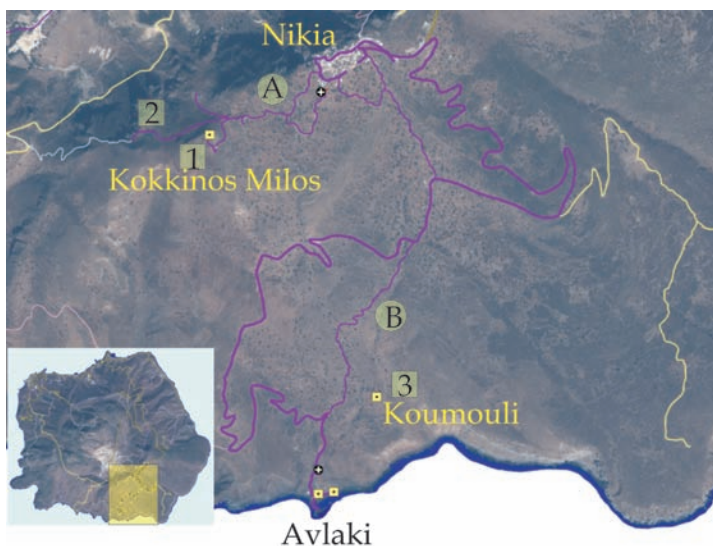


main sight is the **lava neck** which creates Parletia hill (3), one of the Medieval castles on the island of Nisyros; some ruins and basins are still visible. At Nikia, you can visit the **Volcanological Museum of Nisyros**, which is hosted in the ancient primary school of the village. The small coffee shops in the single square of Nikia offer rest and pleasure, and a walk in the alleys of the village will uncover its interesting architecture.

C. Another interesting route is the one on the old path linking Nikia to Lakki, by crossing the entire slope of the eastern caldera. The biggest part of the path has been recently renovated and it is a pleasure to cross it, walking on the old stone paved structure.

< Parletia lava neck (site 4)

GEOTRAIL 6 • Nikia – Avlaki



Distance: 9.5 km • Height: 0-420 m • Time: 4 hours

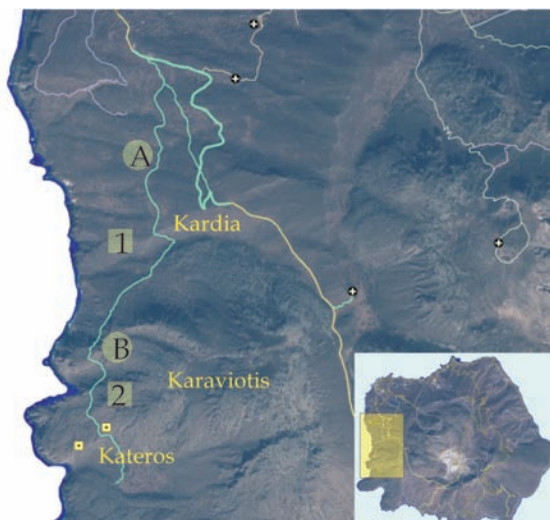
A. The trail begins from Nikia and initially crosses the southern rim of the caldera. In the first part of the wonderfully preserved cobbled path, which begins at the western edge of the village, next to the cemetery, we come across characteristic farmhouses, built with “sugar stone” (Nikia perlite lava). A small junction in the South leads to **Kokkinos Milos peak (1)**, where there is a windmill. The Kokkinos Milos hill is composed of **Argos rhyolites**, covered by layers of grey-red scoriae from the Kyra eruptions, as well as by layers of pumice from the first destructive eruption. The main path lines the inner rim of the caldera and offers a unique view of the hydrothermal craters, the **lava neck and the ramp structures of the Argos lavas (2)**. Then, it goes down, like the Kailia path, and joins the dirt road leading to Lakki, or to Mandraki, across the western slopes of the volcano.

B. Go back to Nikia and follow the path that leads to Avlaki, the southern bay of the island of Nisyros, where there used to be a village with several families and thermal spas. In the first part of the path,

we come across church ruins. After the short part which coincides with the roadway, the path moves downward once more, on the Nikia lavas, and ends up in the Agios Pandeileimonas monastery, above Avlaki. As you approach Avlaki, the path runs near a **man-made hill, Koumouli (3)**. It is unknown whether it is an ancient vaulted tomb or just an area for depositing the abrasions from quarrying and producing the grindstones. At Avlaki bay, look for the waters of the warm spring in the shallow sea, in front of the last house of the abandoned village. Observe the beautiful layers of black scoriae, which become red on top and the impressive andesitic lava flow which forms the Avlaki cape. After you get some rest in the cool yard of Agios Pandeileimonas monastery, you can set off on the return trip.



GEOTRAIL 7 • Kateros



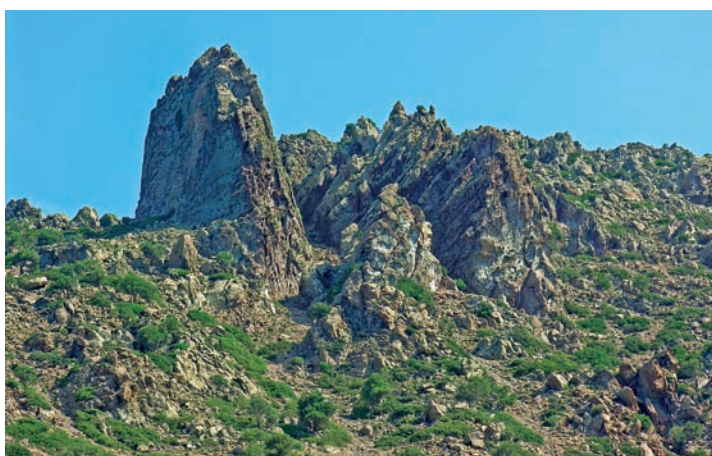
Distance: 6.5 km • Height: 50-160 m • Time: 4 hours

A. This path lines the western slopes of the volcano and leads to Kateros bay, a unique place, isolated from every recent human activity; up until the middle of the 20th century the bay was cultivated by the inhabitants of Mandraki. The trail is very interesting, as at the beginning comes across andesitic lava flows and the **oldest tephra horizons on the island of Nisyros (1)**.

B. Then, the path turns upwards, towards the more **recent lavas of the volcano, the Karaviotis dome rhyolites (2)**.

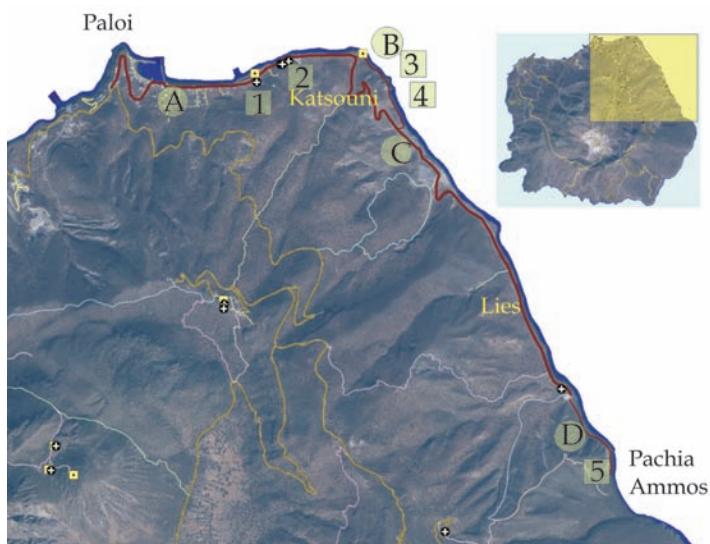
At Kateros, there are farmhouses and churches; the traces of ancient settlements are also visible.

Numerous shards of ancient vases used to transport wine testify to the intense vine cultivation and the serious production of wine, during Classical and Hellenistic times. This path is scarcely marked and its middle part is not easily discernible. Therefore, hikers who are not equipped with GPS and the corresponding file (which can be downloaded from the site www.nisyrosvolcano.com) should be extremely careful.



Lava spines at Karaviotis dome (site 2)

GEOTRAIL 8 • Paloi – Lies



Distance: 13 km • Height: 0-40 m • Time: 4 hours

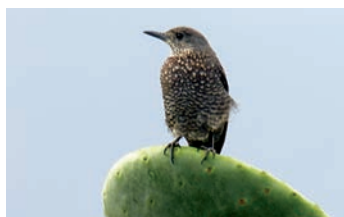
A. The trail from Paloi to Lies is extremely rich; it concentrates on the area around Katsouni, reached either through the roadway or through the path that lines the sea. At the edge of the picturesque Paloi village, you can visit **Panagia Thermiani church**, built on the ruins of the Roman baths, and the **thermal spring (1) the church is named after**. On the way to cape Katsouni, you come across the **grey and black tephra of the Kyra last eruptions and the last basaltic andesite lava flows from the first terrestrial cone (2)**.

B. Leave the roadway behind you and follow the beach towards Katsouni. The path is almost interrupted by the **ramp lava front (3)**. As soon as you go past the cape, you will see a wonderful section on the steep coast. At its base, there is **lava and tephra from the last eruptions of the terrestrial cone (4)**; they are covered by red solid soil which developed on top of them (*paleosoil*). Then, you will see the layers of pumice from the first destructive eruption, next, a second paleosoil and, finally, the layers of pumice from the second destructive eruption. The waves of

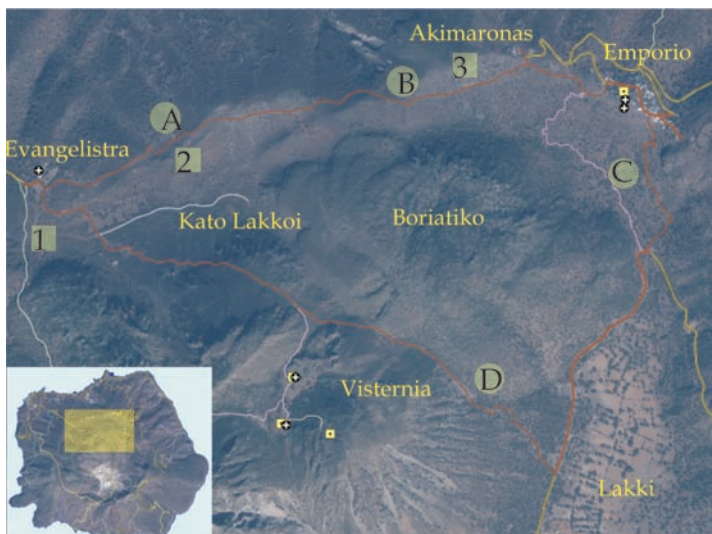
the ash layers bear the traces of the impetus of the ardent clouds, which transferred the volcanic ash here.

C. Resume your trail, walking back towards Lies. Along the coast, it is possible to come across free-range cows. Your presence will probably worry the european rollers (Kyanos).

D. At the southern edge of the large beach, the road ends. Take the path leading to the **tephra layers from the Kyra eruptions (5)**. Observe the white layers of ash, impressive traces of the fall of volcanic bombs. At the highest point of the path, you will come across layers of black andesite scoriae. Collect a few beautiful pieces of skarn – do not tear them away from the formation: the best pieces are already scattered on the ground due to the erosion – and enjoy the Pachia Ammos beach at the end of the path, before you go back.



GEOTRAIL 9 ◉ Evangelistra – Emporio



Distance: 8 km • Height: 120-340 m • Time: 4 hours

A. This path begins at Evangelistra and lines the northern rim of the caldera. The geological formation structuring the **NW (1) and the northern (2) slopes of the caldera** are interesting. The sequence of andesitic lava flows with horizons of ash-grey and red scoriae are an eloquent indication of the structure of a typical stratovolcano.

B. Then, we come across the impressive forms of Aeolian erosion of the **Akimaronas dome dacitic lavas (3)**.

C. The path ends up in Emporio, a place which deserves a visit for its particular architecture. Visit the ruins of the Medieval castle (Pandoniki), the Taxiarchis and Metamorphosis Sotira church-

es, as well as the **Volcanological Observatory**, which is hosted in the old primary school of the village.

D. From the centre of Emporio, a nice path leads to Lakki.

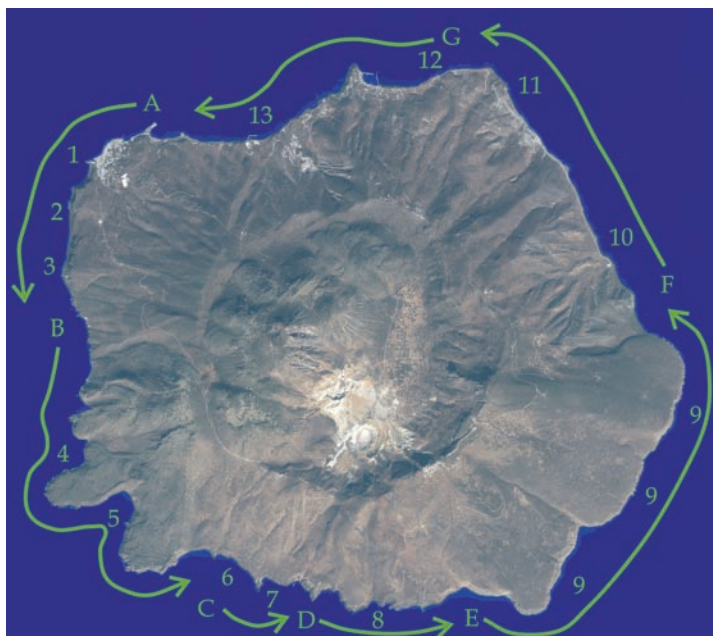
E. We suggest you return to Evangelistra through the path which links the Boriatiko and Visternia domes.

You will observe the lava flows and spines of the last volcanic activity on the island of Nisyros, as well as an **impressive lava neck in the northern slopes of the caldera**.



Left: Aeolic erosion structures at Akimaronas lavas (site 3)
Right: Lava neck at the north caldera cliffs (E)

GEOTRAIL 10 ◉ Circum navigation



Distance: 28 km • Time: 3 hours

A. The trail starts at Mandraki and heads to the South. First, you will see the **submarine lavas (1)/4(1)** and, then, the **subaerial lava flows (2)/4(3)** which cover them; the oldest rocks of the volcano which are currently found above sea level. At cape Kanoni, there are **impressive prisms of andesitic lava (3)/4(4)**.

B. After Kardia valley, the realm of Karaviotis sets in. Thick dacite flows, starting from the only post-caldera dome which developed outside the caldera, create steep coasts and unique **natural sculptures due to the erosion of the air and the sea on the lava (4)/7(2)**. If the weather is good, you have enough time and the guide is knowledgeable enough, you can make an interesting and relatively easy visit to **Drakospilo (5)/3(5)**.

C. From Lefkos bay to Agia Irini, the most important thing to see is a layer of **red scoriae (6)/3(3)** crowning the beach; the layer originates from the last Kyra eruptions. At Agia Irini bay, you can see

the skeleton of the **sulphur soil processing plant (7)/3(4)**, dating back to 1879.

D. From here to Avlaki, there are mainly thick **Argos rhyolitic lava flow fronts (8)**.

E. After Avlaki, you enter the realm of the Nikia lavas: spectacular thick frons with visible **folde of consecutive laminates of the highly-viscous magma (9)/5(1)**.

F. After Pachia Ammos and the **tephra layers from the first large eruptions of Nisyros (10)/8(5)**, the coast becomes smooth. **The geological sections and the view from the coasts of the Katsouni area (11)/8(3)** are also unique. The andesitic lava flows here are crowned by the tephra from the large destructive eruptions.

G. On the way back to Mandraki, you will see the impressive building of **Pandelides Spas (12)/8(1)**, at the edge of the picturesque Paloi village, as well as the **Public Spas (13)** at Thermia, a little before the harbour of Mandraki.