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The Variety of the Relief of the Northeastern Atlantic Volcanic Seamounts

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Abstract—The structures of the volcanic seamounts of the Atlantis-Great Meteor group, as well as areas of the archipelagos of the Cape Verde Islands, the Canary Islands and the Azores are analyzed. Their simplest type is a cone-like structure with one summit (Maio seamount). A more complex type consists of two closely spaced volcanic edifices (Nola seamount). The seamounts were also formed as a result of the activity of a central-type volcano and a fissure system (The-Paps seamount). A more complex morphology is presented by the mountains that were formed as a result of the activity of an underwater volcano of the central type, which was combined with the activity of three to four radial fissure volcanic systems (the Tropic seamount). The seamounts were also formed only during fissure eruptions (the Condor seamount, the Cadamosto seamount). These are ridges, tens of kilometers long without a clearly defined summit. All above types of seamounts, with their rise above sea level, subsequent abrasion and subsidence lead to the creation of flat-topped structures (guyots) (the Senghor seamount).

Keywords: seamount, guyot, Cape Verde Islands, Canary Islands

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INTRODUCTION

On the World Ocean seafloor well-recognized isolated topographic forms of relief known as seamounts occur. They are of interest for fishing, potential extraction of cobalt and other valuable elements, and for understanding the hydrodynamics of currents, their impact on ecosystems, and the evolution of volcanic processes in the ocean. Additionally, these objects can be hazardous to human activities if they are destroyed.

The exact number of seamounts in the World Ocean is not known. According to some estimates (Iyer et al., 2012), based on the analysis of a 30" grid of global relief, there are 33 452 seamounts (height ≥1000 m) in the World Ocean. According to the analysis of satellite altimetry data, the number of seamounts with a height greater than 1000 m may exceed 100 000 (Wessel et al., 2010).

Both in the Russian- and English-language literature, there are numerous but generally similar definitions of the term "seamount." Here are a few examples: "An isolated rise in elevation of more than 500 fathoms [more than 900 m, authors]" (Heezen et al., 1962, p. 107). "An isolated seafloor rise with a relative height of more than 500 m and a well-defined conical or dome shape with one or several summits and steep slopes. A variety of seamounts are flat-topped mountains (guyots)" (*Terms*..., 1980). Under the project of the General Bathymetric Chart of the Oceans (GEBCO), the following definition of the term was recommended: "A large, isolated rise (or a group of isolated rises) with a relative height of more than 1000 m above the seabed, often conical in shape" (*Gazetteer*..., 2008, p. 2–17). It was emphasized that the definition of the term should be based solely on the geomorphological description of the shape and should not include references to its origin or composition. We note that such an approach is justified for labeling seamount names on a bathymetric map but is of limited use for understanding the origin of a particular object. The above list of definitions of the term "seamount" can be expanded, but there is no need for it in this work.

Thus, the most "significant discrepancy" in the definition of the term "seamount" is its absolute height: it exceeds 500 m or is more than 1000 m. The discussion of the application limits for the term "seamount" based on height is not the focus of this work; therefore, we reserve the right not only to use objects with heights greater than 1000 m but also to consider the objects 500–1000-m high in their geological-geomorphological analysis.

The comparison of the geological and geomorphological structure of seamounts is challenging due to the inhomogeneity of relief mapping by using modern multibeam sonar systems, sampling of bedrocks, and the determination of their age. Another difficulty is the ambiguity of the names and coordinates of objects in the articles and UNESCO recommendations (https://www.ngdc.noaa.gov/gazetteer/). For this reason, we do not provide coordinates of specific seamounts in this work with rare exceptions.

This work is based on the analysis of extensive literature supplemented by unpublished data obtained in 2019 on research vessel *Akademik Nikolaj Strakhov*.

VOLCANIC PROVINCES OF THE NORTHEASTERN ATLANTIC

Within the northeastern part of the Atlantic Ocean, there are (from south to north) (Fig. 1) archipelagos of volcanic islands of Cape Verde, Canary, Selvagens, Madeira, and Azores, as well as numerous seamounts that can be grouped into the Cape Verde Islands, Canary Islands, Atlantis-Great Meteor, and Azores volcanic provinces (Fig. 2).

THE PROVINCE OF THE CAPE VERDE ISLANDS

The province of *Cape Verde Islands* includes the eponymous archipelago, which is located 550–800 km west of the Senegal coast (Fig. 1), as well as seamounts (Figs 2, 3).

Nola seamount is situated in the northwestern part of the archipelago, 28 km west of Santo Antão (Masson et al., 2008) (Figю 1). It is a twin-peaked volcanic edifice. The seamount has a NE orientation of 55°, extends for 45 km, and is 30 km wide. It has a gentle northwestern slope and a steeper southeastern slope. The summits are table-like surfaces located at depths of 35 m. The formation of these abrasion platforms is related to a low (–126 m) sea level circa 0.64 Ma (Kwasnitschka, 2012). The lower part of the seamount is composed of altered basanite pillow lavas and volcaniclastic formations, while the upper part consists of basanite and ankaramitic lavas. On the eastern and western slopes, there are landslide cirques (Kwasnitschka, 2012).

In the southwestern part of the Cape Verde Islands archipelago are the islands of Brava and Fogo (Figs. 1, 2, 3). The *Cadamosto* seamount is located 20 km southwest of Brava Island Is. (Barker et al., 2021; Grevemeyer et al., 2010; Madeira et al., 2009; Samrock et al., 2019) (Figs. 2, 3). It extends in the northeast (NE 30°) direction and has an elliptical shape in plan (Figs. 2, 3). Its base lies deeper than 4000 m, and its summit rises to 1500 m. Cadamosto is composed of basaltsic and phonolitic pillow lavas, with the oldest lavas dating back to 1.5 Ma. The edifice structure is composed of late Pleistocene volcanic rocks, the youngest of which are about 21 ka. Earthquakes with magnitudes equal to or greater than 4 were recorded in the vicinity of the seamount in 1998 and 2004. The landslide deposits are present on the northern and southern slopes of the mountain. This underwater edifice is twice as large as Brava Island in area. It is being actively developed and can be hazardous for the island's population.

The *Tavares seamount* is located 65 km west of Brava Island (Fig. 1) (Kwasnitschka, 2012) (Figs. 2, 3). It is the highest point (500 m) of the ridge (12 × 3 km) orienting northeast at an angle of 30° and is bounded by the 4200-m isobath, displaced by NW-trending fault zones. The seamount is considered to have been produced by fissure eruptions.

The islands of Maio, Boavista, and Sal (from south to north) are located in the eastern part of the archipelago, on the flat-topped submeridional submarine ridge with depths of 100–300 m (Fig. 1) (Kwasnitschka, 2012). Several seamounts are known on its eastern slope and foothill. The *Boavista seamount* (Figs. 2, 3) is situated 65 km southeast of the eponymous island. Its base has a diameter of 24 km at a depth of 3000 m, with the summit lying at a depth of ~400 m. The slopes are complicated by five landslide cirques with diameters of 4–10 km.

The single-peaked *Maio Rise seamount* (Figs. 2, 3) (Kwasnitschka, 2012) is located 35 km southeast of Boavista Island. Its base has a diameter of 24 km at a depth of 3000 m, with the summit at a depth of ~300 m. The seamount consists of highly altered basaltic lavas and volcaniclastic breccias covered by iron-manganese crusts about 5 mm thick. The slopes are complicated by three landslide cirques. Some of these cirques have ocean floor areas with boulders and debris.

The single-peaked *Maio seamount* (Figs. 2, 3) is found 90 km southeast of the eponymous island (Fig. 1) (Kwasnitschka, 2012). Its base has a diameter of 20 km at a depth of 4000 m. The absolute height of the seamount is 2100 m. At its summit there is a landslide cirque and four volcanic cones. The seamount slopes are complicated by channels up to 500-m wide and a series of fault-line scarp. Thick iron-manganese crusts and altered volcanic rocks were recovered by dredging.

The single-peaked *Cape Verde seamount* (Figs 2, 3) is located 35 km southeast of Boavista Island (Kwasnitschka, 2012). Its base has a diameter of 35 km at a depth of 3900 m, and the summit occurs at a depth of about 511 m. The seamount is composed of basanite lavas, hyaloclastites, pillow lavas, intruded dikes, and is covered by iron-manganese crusts a few centimeters thick. On the northern and southern slopes of the seamount, there are landslide scars within more than 1 km up to 220-m high.

The *Senghor seamount* (Figs. 2, 3) is located 100 km north of Sal Island (Fig. 1) (Kwasnitschka, 2012). Its base has a diameter of 24 km at a depth of 3000 m. The subhorizontal summit surface was formed as a result of wave activity 0.64 Ma ago and lies at a depth of ~300 m. The seamount consists of altered basaltic lavas and volcaniclastic breccias covered by iron-manganese crusts up to 5-mm thick. It shows no signs of landslide

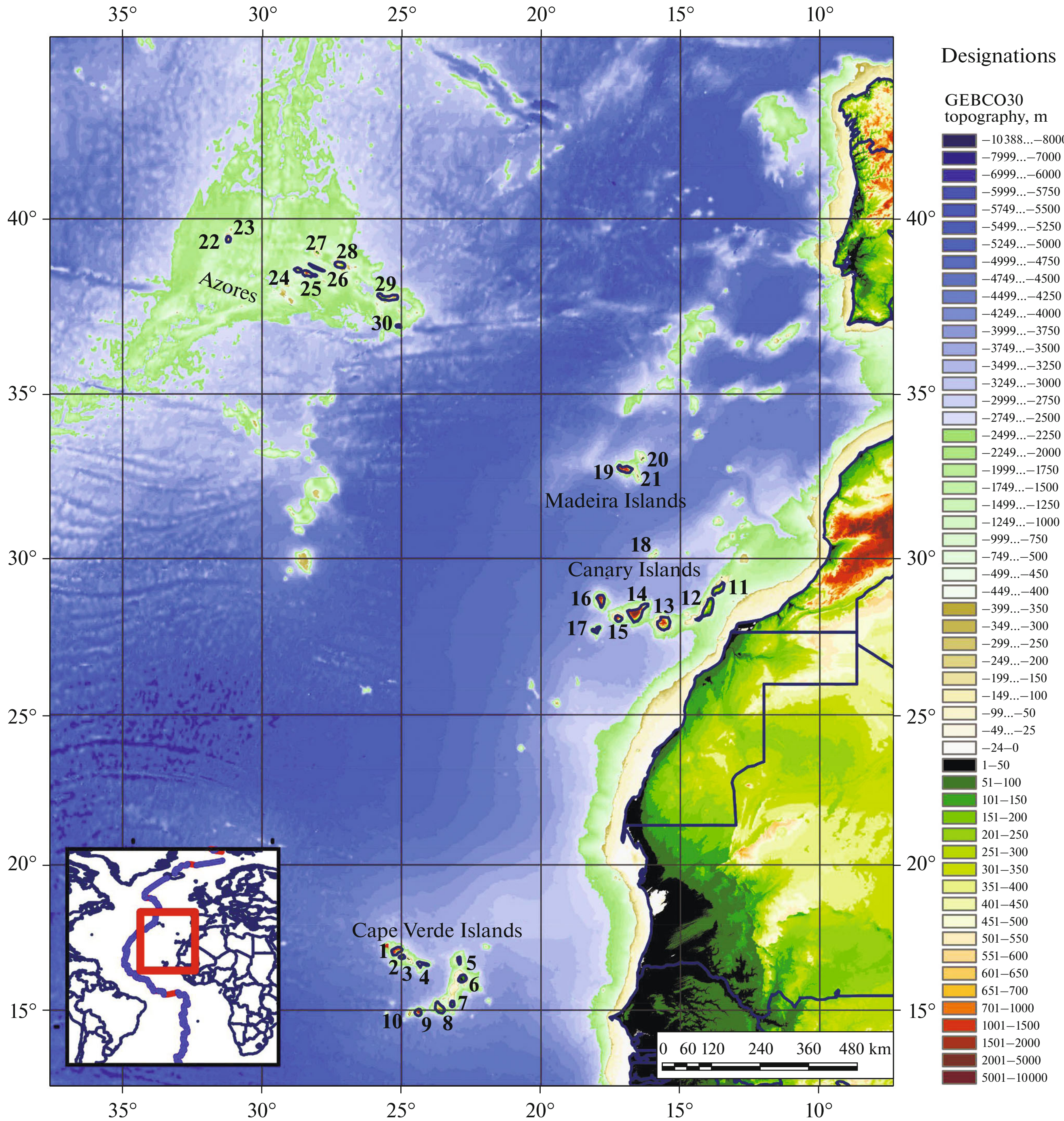

Fig. 1. The names of islands in the northeastern Atlantic mentioned in this work. (1), Santo Antão; (2), São Vicente; (3), Santa Luzia, Branco, Razu; (4), São Nicolau; (5), Sal; (6), Boavista; (7), Maio; (8), Santiago; (9), Fogo; (10), Brava; (11), Lanzarote; (12), Fuerteventura; (13), Gran Canaria; (14), Tenerife; (15), Gomera; (16), La Palma; (17), El Hierro; (18), Selvagens; (19), Madeira; (20), Porto Santo; (21), Desertas; (22), Flores; (23), Corvo; (24), Faial; (25), Pico; (26), São Jorge; (27), Graciosa; (28), Terceira; (29), São Miguel; (30), Santa Maria. Topographic base), https://www.gebco.net/data_and_products/gridded_bathymetry_data/gebco_30_second_grid/.

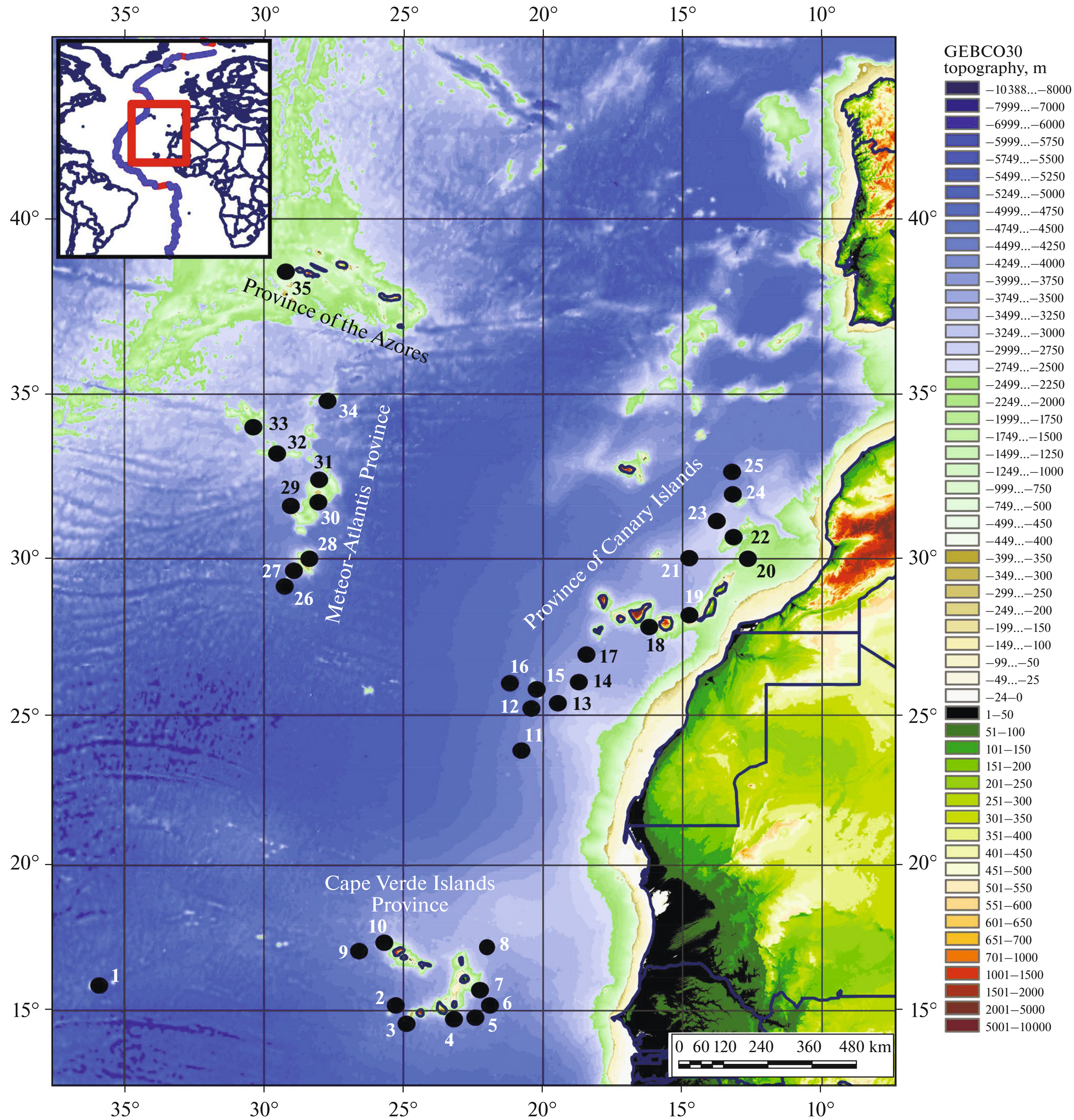

Fig. 2. Names of seamounts in the northeastern Atlantic mentioned in this work: (1) Rocket; (2) Tavares; (3) Cadamosto; (4) Maio Rise; (5) Maio; (6) Cape Verde; (7) Boavista; (8) Senghor; (9) Sodade; (10) Nola; (11) Tropic; (12) Drago; (13) Echo; (14) Bimbache; (15) The-Paps; (16) Ico; (17) Henry; (18) Ico de Tenerife; (19) Amaray; (20) Concepcion; (21) Last Minute; (22) Nico; (23) Dacia; (24) Rybin; (25) Essaouira; (26) Closs; (27) Little Meteor; (28) Great Meteor; (29) Hyeres; (30) Irving; (31) Cruiser; (32) Plato; (33) Atlantis; (34) Tyro; (35) Condor. Topographic base—https://www.gebco.net/data_and_products/gridded_bathymetry_data/gebco_30_second_grid/.

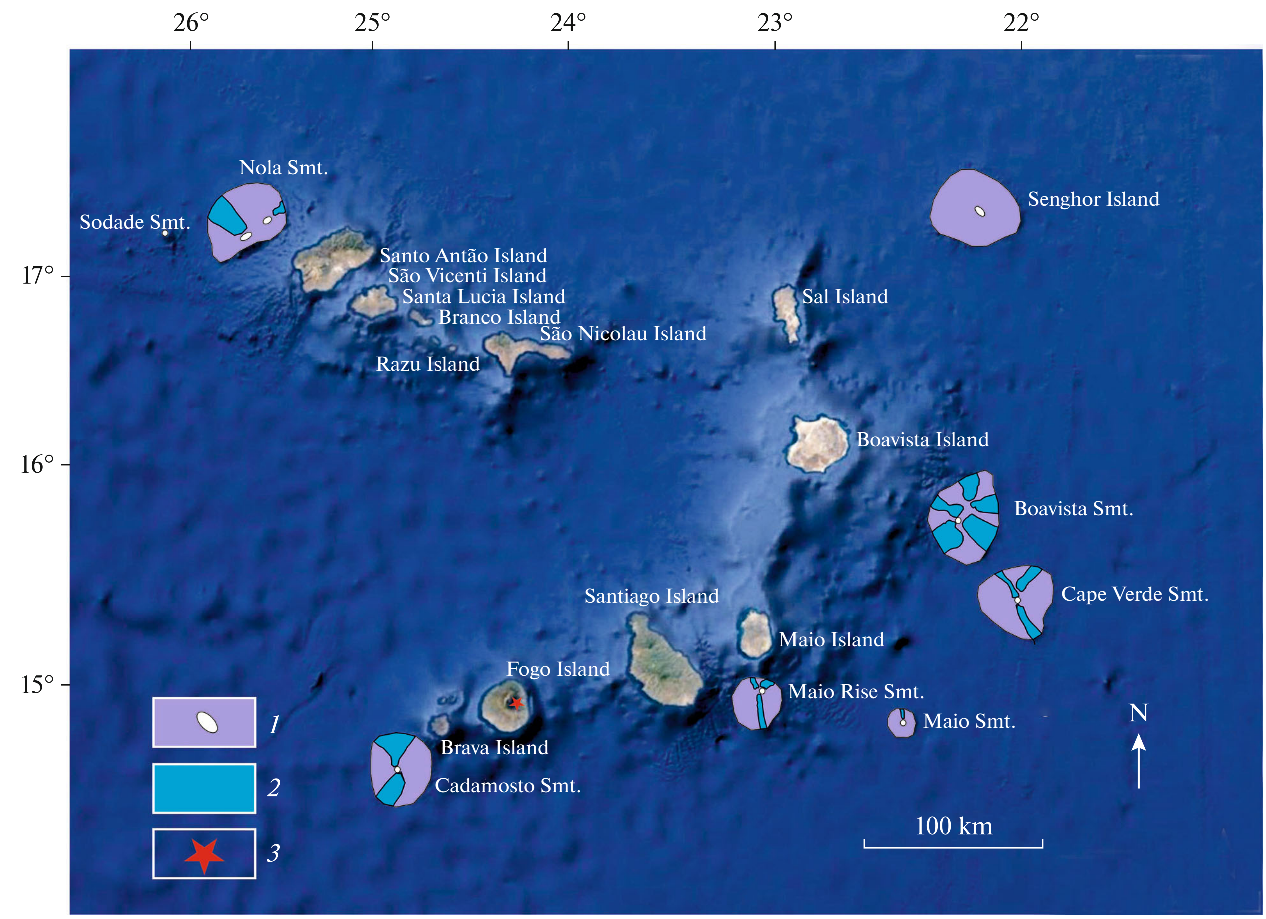

Fig. 3. The seamounts of the Cape Verde Islands Volcanic Province. Topographic base – https://earth.google.com: (*1*) seamount and summit; (*2*) landslide bodies; (*3*) Fogo active volcano.

activity, but on the western and northern slopes, at the depths of 500–1000 m, there is a complex system of grabens and horsts, associated with rockfalls.

THE PROVINCE OF THE CANARY ISLANDS

The volcanic province of the Canary Islands is located west of the West African coast and consists of seven big islands of the Canary Archipelago, Selvagens Island (Fig. 1), and several dozens of volcanic seamounts and hills. It can be conventionally divided into three parts: southwestern, central, and northeastern.

In the southwestern part of the province, 160–500 km away from El Hierro Island (Fig. 1), there are several seamounts (Figs. 2, 4), which were described extensively in (Palomino et al., 2016).

The base of the *The-Paps seamount* (Marino et al., 2018; Palomino et al., 2016) is bounded by the 4300-m isobath. It represents a twin-peaked submeridional composite volcanic edifice and a NW-trending ridge extending for almost 40 km. The minimum depth is 1600 m. The steepness of the slopes varies from 5° to 35°. The seamount is composed of alkaline basalts and felsitic lapilli covered by iron-manganese crusts. The volcanic rocks are of Turonian age (91 Ma). On the northwestern flank of the seamount, at a depth of about 3500 m, there are landslide detachment scarps. They are displaced westward for a distance of 7–8 km.

The base of the *Drago seamount* (Palomino et al., 2016) is bounded by the 4300-m isobath (Figs. 2, 4). It represents a chain of volcanic cones, extending for about 40 km and located within a NW-oriented fractured zone. The minimum depth of the peaks is 2200 m. On the northwestern slope of the seamount, at the depths of 3000–3700 m, there are detachments scarps of two landslides extending for 7–9 km.

The *Echo seamount* (Palomino et al., 2016) has its base at a depth of 3700 m (Figs. 2, 4). It has a horizontal summit surface located at a depth of ~350 m. Several volcanic cones with a minimum depth of 255 m rise above it. The absolute height of the guyot is 3400 m. The steepness of its slopes ranges from 5° to 35°. The slopes are complicated by extensive hollows. Below the summit surface, there are several landslide detachment scarps with heights up to 20 m extending for up to 12 km.

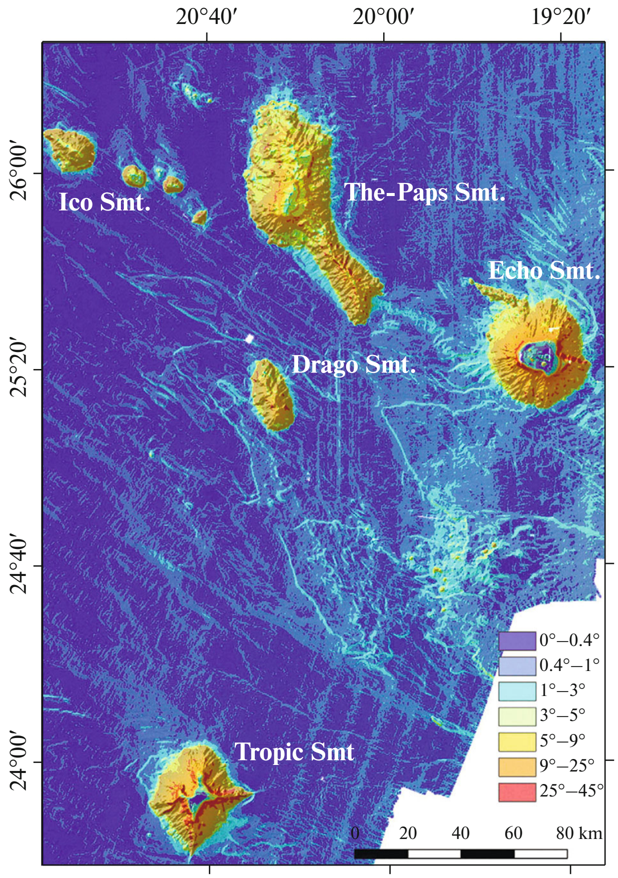

Fig. 4. The seamounts and slopes in the southwestern part of the Canary Islands Volcanic Province (Palomino et al., 2016).

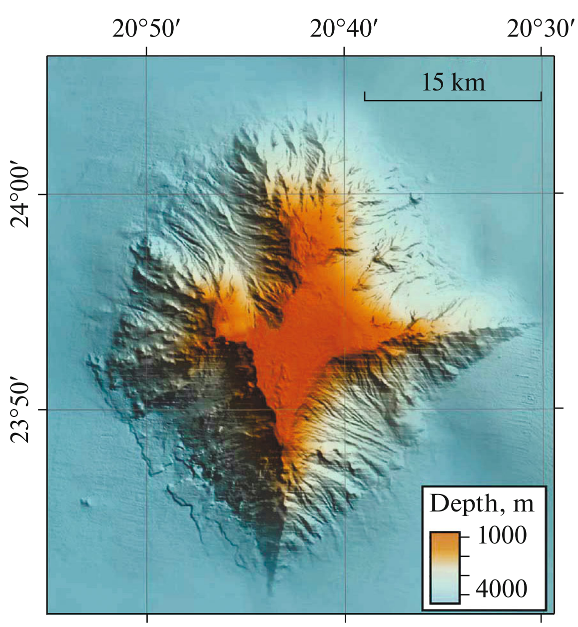

Fig. 5. The tropic guyot relief (Josso et al., 2019).

The *Tropic Guyot* has an absolute height of 3200 m (Palomino et al., 2016). In plan, it is a truncated cone with slopes complicated by four ridges extending for 10–13 km (Figs. 2, 5). The slope steepness varies from 5° to 45°. The summit surface of the guyot lies at a depth of about 1000 m, and its base is at a depth of 4300 m. It is composed of basalts, hawaiites, trachytes, mugearites, and trachybasalts with ages of 119–114 Ma and perhaps 60–80 Ma. The summit surface and slopes are covered with iron–manganese crusts with ages of 75 and 12 Ma and phosphates of 30–40 Ma. The table-like surface and the conglomerates indicate that the Tropic Guyot was an island that was eroded by wave abrasion and was submerged afterwards.

The *Ico seamount* (Palomino et al., 2016) has a height of 1400 m (Figs. 2, 4). Its base is bounded by the 4500-m isobath. In plan, it has an elliptical shape elongated in the northwestern direction (22 × 15 km), with the summit located at a depth of 3100 m. The seamount has several volcanic cones with diameters from 0.5 to 5 km. The steepness of the slopes varies from 2° to 2.7°. In the northeastern and southwestern slopes there are four scarps of landslide detachment extending for 3–6 km. The rises of the same orientation are

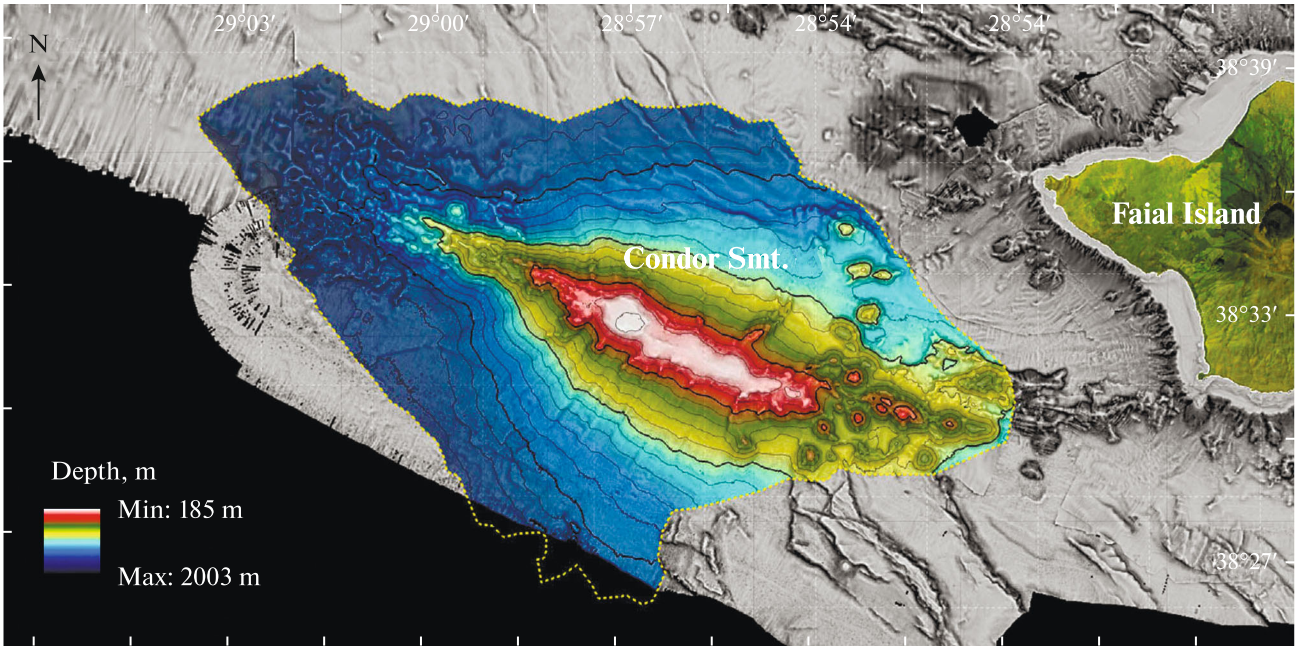

Fig. 6. The Condor seamount relief (Tempera et al., 2013).

located to the southeast of the Ico seamount, the tallest among them (Malpaso seamount) is 750-m high.

In the central part of the province, in the strait between Tenerife and Gran Canaria (Schmincke and Graf, 2000) lies the *Hijo de Tenerife seamount* (Fig. 2), with the base at a depth of 2300 m and the summit at a depth of 1700 m. It is a conical volcano built up by fresh porous felsites, their breccias and bombs, as well

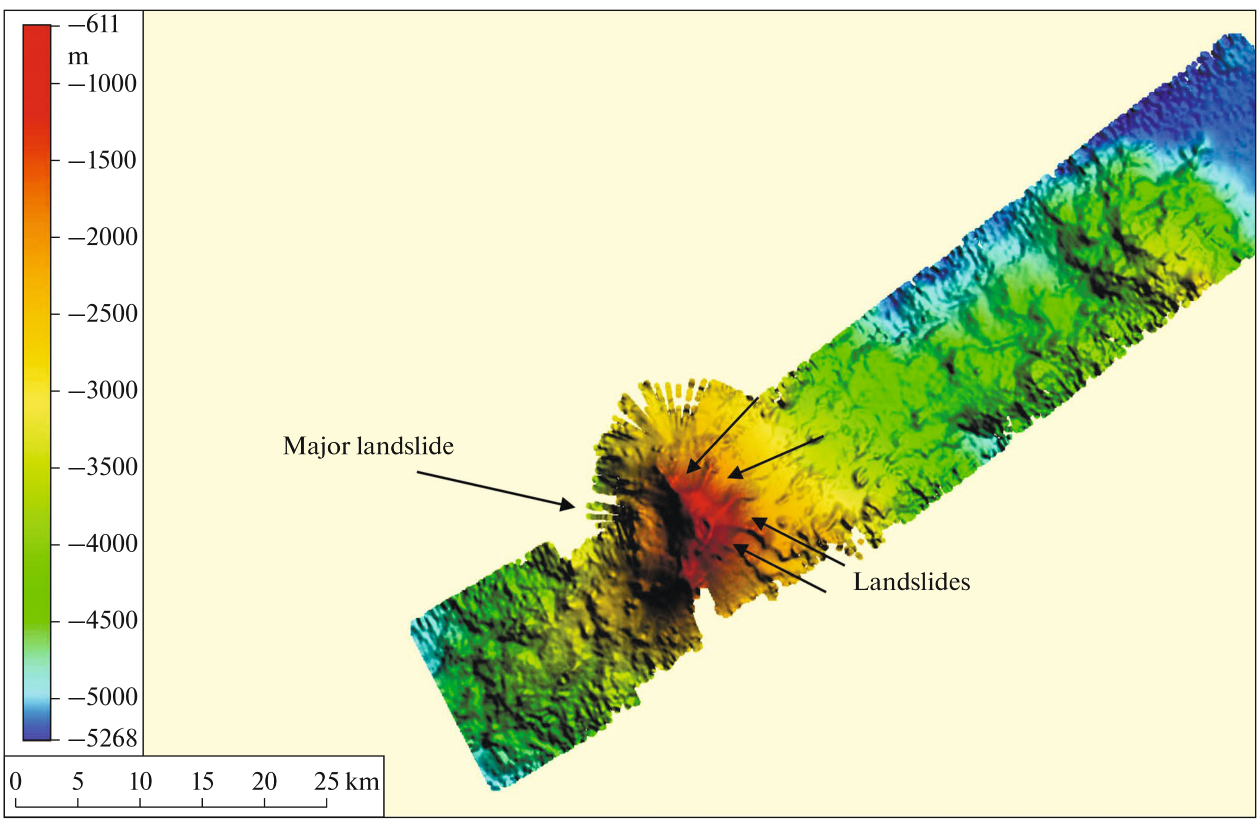

Fig. 7. The relief and landslides of the Rocket seamount (data obtained on R/V *Akademik Nikolaj Strakhov*, 2019).

as pumice rocks covered by limestones and iron–manganese crusts. The seismic hyperactivity of this area indicates volcanic activation and may lead to the increase in the edifice sizes.

The Fuerteventura and Lanzarote Islands are located on the East Canary Ridge (Vãzquez et al., 2015) trending northeast with the depth of 50–200 m (Fig. 1). North of the latter, 90 km to the northeast, is Concepcion Bank, a flat-topped seamount (Mangas et al., 2015; River et al., 2016) (Fig. 2). This is the largest seamount in the Canary volcanic province. It has a plateau-like surface (50 x 45 km) with a depth from 158 m in the east to a depth of 1485 in the west. The slopes of the bottom surface range from 0.5° to 2.7°. The plateau transits to steep slopes, which are intersected by numerous canyons, extending for up to 10 km. The highest point of Concepcion Bank is 2433 m. It is composed of gabbros, subvolcanic and volcanic (lava flows and pyroclastic formations of basalts, phonolites, and trachybasalts) rocks of alkaline series.

THE ATLANTIS-GREAT METEOR SEAMOUNT PROVINCE

South of the Azores, between 29°34′ and 35°25′ N, lies a group of seamounts stretching ~700 km in the submeridional direction (Figs 1, 2). The group appeared on the oceanic crust and is dated to 51–86 Ma (Tucholke and Smoot, 1990). In English literature, this group is called the "Seewarte Seamounts," "Seewarte Seamount Chain," "Atlantis-Great Meteor Seamount Chain," and "Atlantis-Plato-Cruiser-Great Meteor" (https://www.marineregions.org/gazetteer.php/). According to Tucholke and Smoot (1990), the group includes 18 seamounts, 5 of which (Atlantis, Cruiser, Tyro, Great Meteor, and Hyeres) have flat summits (guyots). Unfortunately, the information about the landform of the Atlantis-Great Meteor seamounts is quite scarce.

In the southern part of the province lies the *Great Meteor seamount*. Two small seamounts, Little Meteor and Closs, are located southwest of it (Fig. 2). Their bases are at a depth of 3800 m. The first seamount has a flat summit at a depth of 400 m and the second one is a seamount elongated in the northeastern direction with the summit depth of 1400 m.

The *Great Meteor Seamount* has been studied in detail (Hunt and Jarvis, 2020; Morato et al., 2012; Tucholke and Smoot, 1990) (Fig. 2). It has a plateau-like summit surface with the depths of 150–300 m (a guyot). The base of the seamount, with a diameter of approximately 110 km, is located at a depth of about 4500 m. Basalts aged 10.7 to 16.9 Ma were recovered by dredging and drilling operations. In the lower portion of the slope of the *Atlantis Seamount* (at depths down to 2340 m), limestone detritus consisting of foraminifera and nannoplankton shells in finely fragmented calcite cement was dredged (Chamov et al., 2019). The age of these limestones was dated as approximately Miocene (23–5 Ma). In the late Miocene–Pliocene (11–2 Ma), the summit surface of the seamount experienced marine abrasion and then was submerged to a depth of about 300 m (Chamov et al., 2019). The guyot is overlaid by a sedimentary cover, consisting of carbonate and pyroclastic rocks and sands, being 150–600-m thick. The study of turbidites in the Madeira Abyssal Plain (Hunt and Jarvis, 2020) showed that the volcanic edifices of the Atlantis-Great Meteor Province were destroyed by multiple landslides that might have resulted in tsunamis.

PROVINCE OF THE AZORES

The Azores volcanic province is located at the triple junction of the North American, African, and Eurasian plates (Nunes, 2014). It includes the eponymous archipelago, consisting of nine volcanic islands, seven of which are situated within the Azores Plateau (Fig. 1). This plateau is bounded by the 2000-m isobath and represents a complex combination of underwater ridges and basins trending west-northwest. The submarine volcanic edifices of the central type in the water area are not described in detail in the published literature.

The *Condor seamount* is located 17 km southwest of Faial Island and 100 km east of the Mid-Atlantic Ridge on the oceanic crust, aged 7–10.1 Ma (Morato et al., 2012; Tempera et al., 2013). It is a ridge along the 1000-m isobath, 7.4 km wide, and extending for 26 km, which rises above the surrounding seafloor by 1818 m (Fig. 6). The minimum height of the seamount is only 185 m. To the east-northeast lies a ridge with the islands of Faial and Pico of the Azores archipelago. The landform of the seamount was formed during several stages. It was built by the products of fissure eruptions, well-preserved volcanic cones with and without calderas, flows, and areas of hilly terrain. These landforms were eroded by landslide processes, the formation of channels, and "ravines." The seamount summit is a flat platform created by wave action. It exhibits iceberg gouges. The slopes of the Condor seamount are overlaid by a sedimentary cover.

ISOLATED SEAMOUNTS

Seamounts are also known beyond the mentioned provinces. For example, southwest of the Cape Verde Islands volcanic province, at a distance of 1200 km,

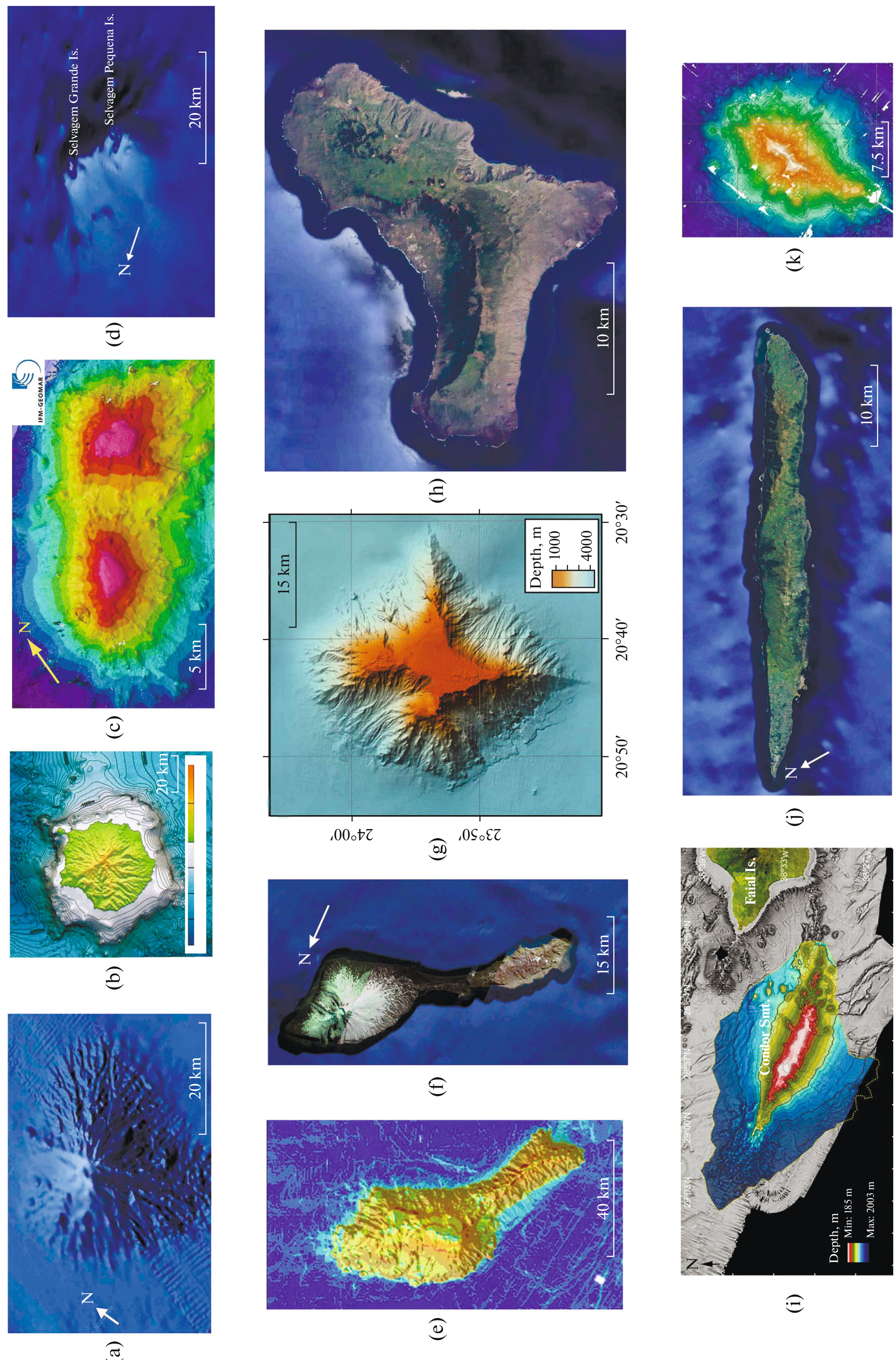
(a)
N
20 km
(b)
20 km
(c)
N
5 km
IFM-GEOMAR
(d)
Selvagem Grande Is.
Selvagem Pequena Is.
N
20 km
(e)
40 km
(f)
N
15 km
(g)
15 km
Depth, m
1000
4000
20°30′
20°40′
20°50′
24°00′
23°50′
(h)
10 km
(i)
Faial Is.
Condor Smt
Depth, m
Min: 185 m
Max: 2003 m
N
(j)
N
10 km
(k)
7.5 km

Fig. 8. Similarities in the structure of the volcanic seamounts and the islands. (a–f) seamounts: (a) Cape Verde (https://earth.google.com); (b) Nola (https://ldf.uni-hamburg.de/en/meteor/wochenberichte/expeditionsarchiv-meteor.html); (c) The-Paps (Palomino et al., 2016); (d) Tropic (Josso et al., 2019); (e) Condor (Tempera et al., 2013); (f) Vesteris (Ivarsson et al., 2017); (g–k) islands: (g) Gran Canaria (Funck, 1998); (h) Selvagens (https://earth.google.com); (i) Jan Mayen ((https://earth.google.com); (j) El Hierro (https://earth.google.com); (k) São Jorge (https://earth.google.com).

lies Rocket seamount (15°50′30″ N, 36°6′42″W) (Volcanic..., 1989; https://www.ngdc.noaa.gov/gazetteer/) (Fig. 7). It is not associated with any known hotspots. It appears probable that short-lived (ephemeral) and small-volume magma chambers formed in the oceanic crust.

The base of the Rocket seamount is located at a depth of 4500 m. The minimum depth of the summit is 640 m. The seamounts surface is covered with Middle Eocene lithified limestones. In 2019, a multibeam echosounder survey of the landform was conducted on the R/V *Akademik Nikolaj Strakhov*, which showed that the western part of the seamount was disturbed by a landslide (Fig. 7). The length of the detachment scarp exceeds 10 km, and the height is ~1000 m. Interestingly, the seamount exhibits circular landforms with lengths of detachment scarps of ~2 km, that may be interpreted as small landslides that originated before the large landslide was formed.

CONCLUSIONS

Our analysis reveals that the volcanic seamounts in the northeastern part of the Atlantic Ocean differ in topography and were formed by eruptions of central-type submarine volcanos, fissure systems, or their combinations. All these types of submarine volcanic edifices also have analogs on islands (Fig. 8).

The simplest form of seamounts is a cone-shaped structure with a single summit (“monovolcano”). Such objects are widespread in the eastern part of the Cape Verde Province, for example, the Maio and Cape Verde seamounts (Fig. 8a). In the case of active influx of igneous material, neotectonic movements, or sea level variations, the seamounts may rise above sea level and form islands like Fogo, Gran Canaria (Fig. 8b), or Gomera.

A more complicated type of seamounts has two closely spaced volcanic edifices (“a twin-peaked seamount”). Such an object may be represented by the Nola seamount (Fig. 8c). If it rises above sea level, an archipelago of islands like Selvagens may be created (Fig. 8d) (Mazarovich, 2022).

Seamounts may also appear as a result of the activity of both a central-type submarine volcano and a fissure system (“composite seamounts”). Such an object may be represented by the The-Paps seamount (Fig. 8e) (Marino et al., 2018). Similar seamounts (Warwick seamount) are also known in the Gulf of Alaska (Pacific Ocean) (Chaytor et al., 2007). If the seamounts of this type rise above sea level, islands similar to Jan Mayen (Fig. 8f) can be formed (Mazarovich and Sokolov, 2022).

Seamounts with a more complex morphology are star-shaped (“asteroids”), such as the Tropic seamount (Fig. 8g). These formed as a result of the activity of a central-type submarine volcano combined with the activity of three to four radial fissure volcanic systems. The fissure origin of the “rays” is most likely to be established when they are compared with the rift zones of the islands of Hierro (Fig. 8h) (Hoernle and Carracedo, 2009) and Tenerife, where similar objects are swarms of dikes and numerous cinder cones. The “rays” created favorable conditions for the formation of landslides between them.

In the northeastern Atlantic, the seamounts could also have been formed solely by fissure eruptions. Morphologically, these are ridges tens of kilometers long with a well-defined uplifted part. This means that they do not fit the common definition of the term “seamount,” as it was described at the beginning of this work. Nevertheless, these objects represent clearly defined forms of submarine relief. Condor seamount (Fig. 8i) can be an example (Tempera et al., 2013). If seamounts of this type rise above sea level, islands resembling São Jorge (Mazarovich, 2022) (Fig. 8i) can be formed.

Fissure submarine eruptions could also have led to the formation of elongated forms of submarine relief without a clearly defined summit. They include elliptical-shaped seamounts, such as Cadamosto and Tavares, as well as beyond the region, Vesteris seamount (Fig. 8k) located east of Greenland (Ivarsson et al., 2017).

All types of seamounts described above, when the seamounts rise above sea level, form islands that are subject to wave abrasion, which leads to the creation of subhorizontal surfaces upon their submergence (guyots). These are known in all volcanic provinces, including the Cape Verde Islands (Nola and Senghor seamounts), the Canary Islands (Tropic seamount) (Fig. 5), and Meteor islands (Atlantis, Cruiser, Tyro, Great Meteor, and Hyeres).

Most of the seamounts in the northeastern Atlantic exhibit landslide processes that complicate their structure.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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