

*January 1, 2024*

## News and notes

Happy New Year everyone! Before going on to discuss the geology and geopolitics of [Cabo Verde](#), here are some news items I thought were interesting.

## Year End Reviews and Predictions

Rather than bore you with my own, not very entertaining, thoughts on this matter, here are a few writers who do it much better than me:

- [Dave Collum's 2023 Year in Review: Down Some Dark Rabbit Holes](#);
- Mr Z: [Looking Back At 2023](#).
- Mining.com: [The biggest global mining news of 2023](#).
- James H. Kunstler: [Do You Dare Even Look? — Forecast 2024](#).
- GeologyHub Video: [5 Volcanoes Which Could Erupt in 2024; 2 are in Iceland](#).

## Research

- Mineralogy: [Authigenic clay mineral constraints on spatiotemporal evolution of restricted, evaporitic conditions during deposition of the Ediacaran Doushantuo Formation](#).
- Mineralogy and petrology: [Nature and Origin of a Massive Sulfide Occurrence in the Karrat Group: Evidence for Paleoproterozoic VMS Mineralization in Central West Greenland](#).
- [Geochemical Characteristics, Zircon U-Pb Ages and Lu-Hf Isotopes of Pan-African Pegmatites from the Larsemann Hills, Prydz Bay, East Antarctica and Their Tectonic Implications](#).
- Geomorphology: [The aggradation of alluvial fans in response to monsoon variability over the last 400 ka in the Hajar Mountains, south-east Arabia](#); Phys.org summary [here](#).
- Video: [The Great Unconformity and Spectacular Geology of Wyoming's Fremont Canyon](#).

## Plate Tectonics

- [Precise tilt measurement by seafloor borehole tiltmeters at the Nankai Trough subduction zone](#).
- [Physics-informed neural network reconciles Australian displacements and tectonic stresses](#).

## Sedimentology

- [On depositional processes governing along-strike facies variations of fine-grained deposits: Unlocking the Little Ice Age subaqueous clinothems on the Adriatic shelf](#).

## Paleontology

- Video: [These Are The Coolest Fossils From 2023](#).

- Extinction research: [Age-dependent extinction and the neutral theory of biodiversity](#); behind paywall.
- More extinction research: [Coupled volcanic activity and marine anoxia in the Upper Yangtze region prior to the Capitanian mass extinction](#); Phys.org summary [here](#).
- Bad collectors: [Somerset beach damaged by 'irresponsible' fossil hunters](#).
- [Unusual ancient elephant tracks had our team of fossil experts stumped – how we solved the mystery](#).

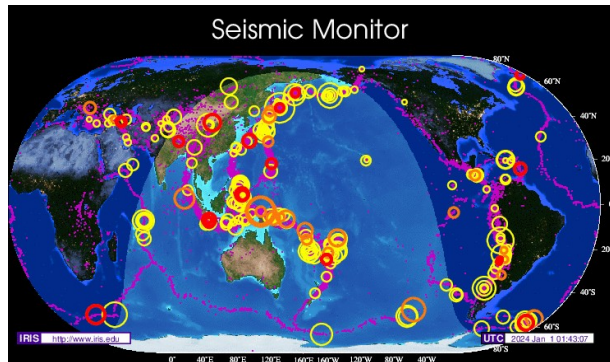
## Mining and Energy

- Ancient mines: [The first petrographic characterisation of a prehistoric rock crystal mine in the Swiss Alps](#).
- [Mining the Northwest: Ottawa went too far on regulating mining, infrastructure projects: experts](#).
- Papua New Guinea: [Why the battle over PNG's Porgera gold mine has been called 'Game of Thrones...on crack'](#).
- Ocean floor mining, India: [Potential bidders set to get three chances in offshore mineral auction](#).
- From the Lawrence Berkeley National Laboratory: [Characterizing the Geothermal Lithium Resource at the Salton Sea](#).
- [Lithium: Price Collapse Secures Green Transition, Causes Headaches](#).
- [A lawsuit filed against a bitcoin mine in Texas has shed light on a growing trend: US crypto mines backed by millions of dollars from Chinese investors](#).
- Video: [Arthur Berman: "Shale Oil and the Slurping Sound"](#).
- [More OPEC cuts, a US production boom, and a market share war: Here's what oil markets are anticipating in 2024](#).
- [India's Russian crude imports prevented price surge, 'havoc' in global oil market, says petroleum ministry](#).
- From the Western Producer: [Renewable diesel plans unrealistic: analyst](#).

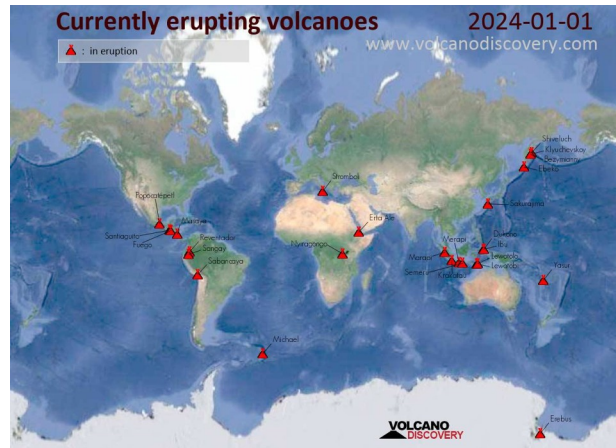
## Environmental Geology and Hydrogeology

- Air pollution and cadmium: [Particulate matter composition drives differential molecular and morphological responses in lung epithelial cells](#); News-Medical.Net summary [here](#).
- [Assessment of the estuarine shoreline microplastics and mesoplastics of the River Itchen, Southampton \(UK\) for contaminants and for their interaction with invertebrate fauna](#).
- Groundwater in a Japanese Spa: [Isotopic evolutionary track of water due to interaction with rocks and its use for tracing water cycle through the lithosphere](#); Phys.org summary [here](#).

## Volcanoes, Earthquakes and Geohazards



[Seismic Monitor](#)



[Active Volcano Map](#)

- United States Geological Survey (USGS) Volcano Watch: [New Year's Eve 1974: Kīlauea's most recent Southwest Rift Zone eruption](#).
- USGS Yellowstone Volcano Observatory: [Over a century of Yellowstone River streamflow measurements at Corwin Springs, MT](#).
- [Smithsonian / USGS Weekly Volcanic Activity Report](#).
- Iceland:
  - Live video feed: [Reykjanes multiview – Live from Iceland](#).
  - Dec. 26, [Volcano Watch 2023: The Eruption's Aftermath](#);
  - Dec. 27, [Building up to a new eruption](#), and [Just like a few days before the eruption](#);
  - Dec. 27, [Two big quakes on the Reykjanes ridge](#), USGS summary [here](#);
  - Dec. 28, [Land continues to rise in Svartsengi](#);
  - Dec 30: [New hazard assessment map issued: Increased danger of eruption](#).
- Alaska, [Frosty: A stratovolcano in the Aleutian Islands](#).
- Hunga Tonga–Hunga Haʻapai: [The magmatic system under Hunga volcano before and after the 15 January 2022 eruption](#); Phys.org summary [here](#).
- Earthquake research: [Impact of chlorite dehydration on intermediate-depth earthquakes in subducting slabs](#).
- More earthquake research: [The submarine fault scarp of the 2011 Tohoku-oki Earthquake in the Japan Trench](#).

January 1, 2024

## Geology and the Fate of Societies – Cabo Verde



Figure 1 – Map of Cabo Verde

Credit: [CIA World Factbook, Cabo Verde](#), public domain

The Republic of [Cabo Verde](#) is an archipelago in the [Atlantic Ocean](#). Also called Cape Verde, the archipelago is located around 570 kilometres (km) west of [Cap-Vert, Senegal](#), the westernmost point in [Africa](#).

According to the [American Central Intelligence Agency \(CIA\) World Factbook on Cap Verde](#), the total land area of the islands is 4,033 km<sup>2</sup> and the total coastline around the islands is 965 km. There are no land borders with any other states. The islands of the Cabo Verde archipelago consists of ten island and eight small islets. Only nine of the islands are inhabited. The archipelago is divided into two groups:

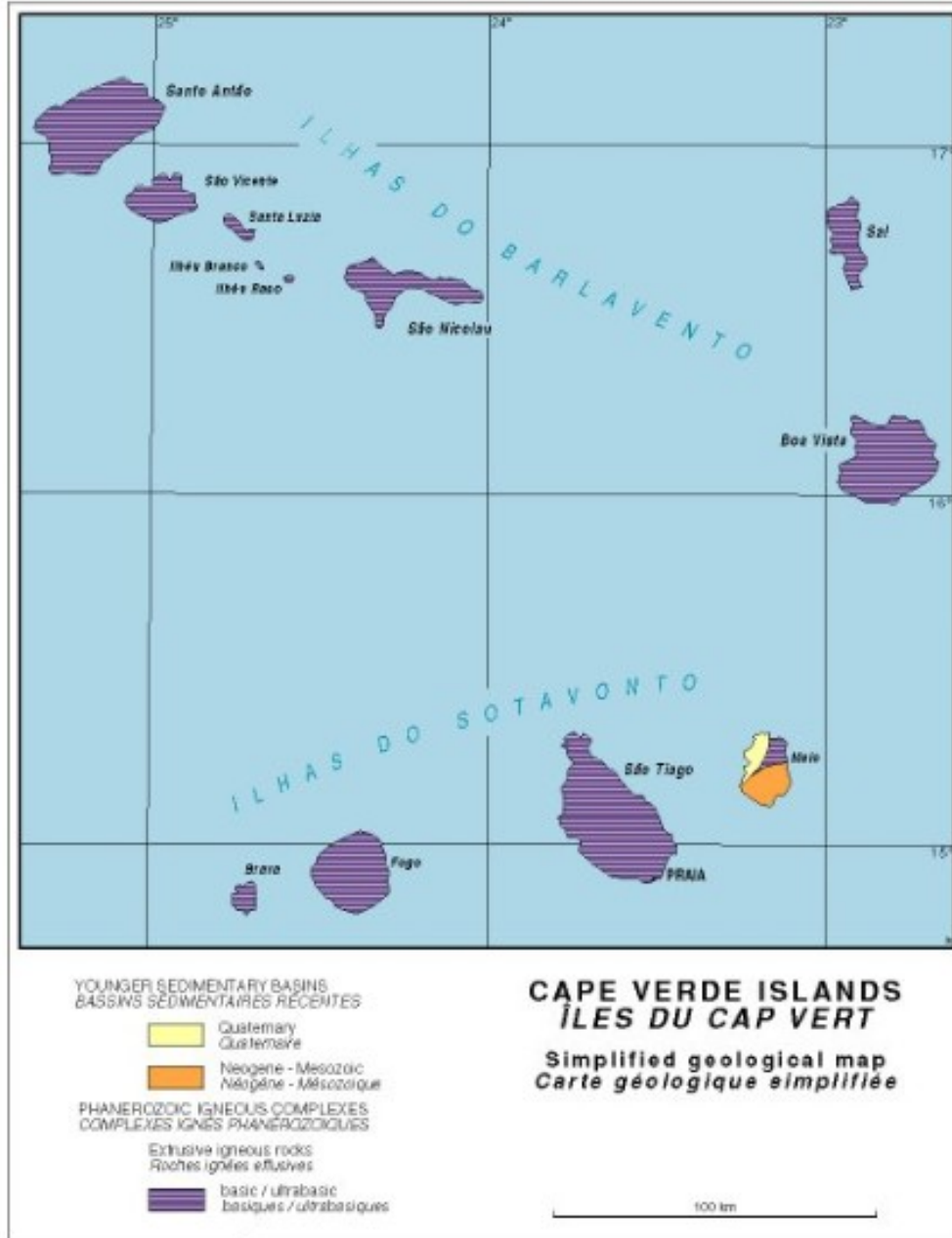
- The [Barlavento Islands](#) or windward islands of [Santo Antão](#), [São Vicente](#), [Santa Luzia](#), [São Nicolau](#), [Sal](#), and [Boa Vista](#);
- The Sotavento Islands or leeward island of [Maio](#), [Santiago](#), [Fogo](#), and [Brava](#).

Also according to the CIA World Factbook on Cap Verde, the current estimated population of the country is 603,901. The people of Cap Verde are predominately, 71%, a mixture of [Portuguese](#) and [African](#) people ([Mulatto](#)). Of the remaining, 28% are African and 1% are [European](#). The official languages of Cabo Verde are [Portuguese](#) and [Cabo Verde Creole](#).

As you might guess from the naming of the islands after [Catholic Saints](#), the main religion in Cabo Verde is [Roman Catholic](#), followed by about 77.3% of the population. Of the remaining, 4.6% are [Protestant](#) Christians, 1.8% are [Muslim](#) with 12.8% are [listed](#) as other, unspecified or having no religion.

The government of Cabo Verde is a [semi-presidential republic](#). The current President is [José Maria Neves](#) and the Prime Minister is [Ulisses Correia e Silva](#). The largest city is the Capital, [Praia](#), population 159,050.

## Geology



**Figure 2 – Geology of Cabo Verde**  
Credit: [Mindat.org](#)

The [geology of Cabo Verde](#) lies in the eruptions of volcanic eruptions that began during the [Miocene](#) as the [African Plate](#) moved over a [mantle plume](#) or “hot spot” during the [opening of the Atlantic Ocean](#) that began during the [Cretaceous](#).

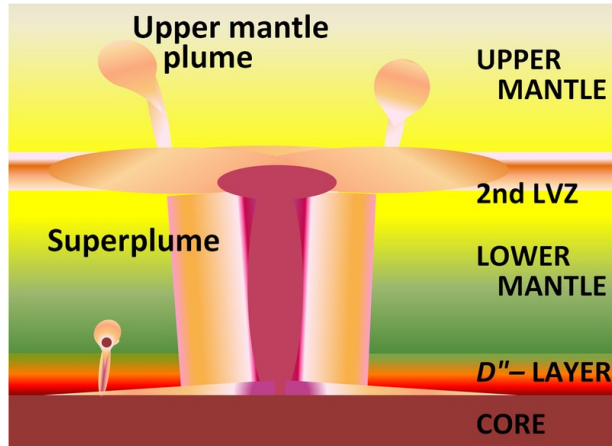


Figure 3 – Mantle Plume

Credit: Brews ohare, [Creative Commons Attribution-Share Alike 3.0 Unported](#) license

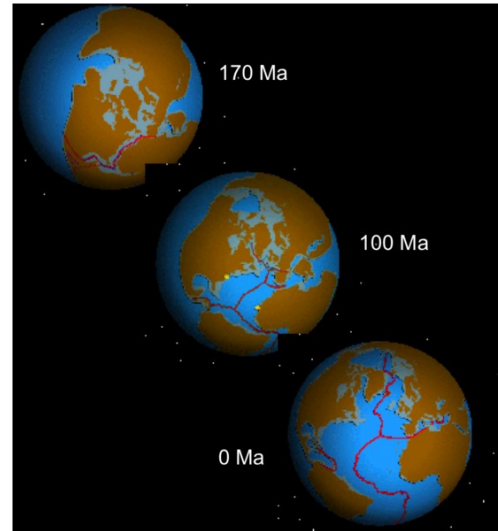


Figure 4 – Breakup of Central Atlantic

Credit: Zkelly1, [Creative Commons Attribution-Share Alike 3.0 Unported](#) license

The Cabo Verde sits on [oceanic crust](#), Cretaceous in age. The oldest igneous rocks in the archipelago are [Miocene](#) aged [syenite](#) from Boa Vista Island. Other igneous rocks on the islands include [basalts](#), basaltic [pyroclastic](#) and [breccia](#) deposits as well as other igneous rocks such as [nepheline syenite](#). Volcanism continues at the islands, with the most recent eruption in [March 1995 on Fogo Island](#).

Sedimentary rocks off shore of the Cabo Verde archipelago include marine clays, marls and siliceous limestones ranging in age from the [Upper Jurassic](#) to the [Cenozoic](#). On shore sedimentary rocks include [Neogene](#) and [Quaternary alluvial](#) deposits and [sand dunes](#). There are also extensive salt flats on Boa Vista, Sal and Maio islands.



Figure 5 - Salt Pan South of Curral Velho, Boa Vista

Credit: Horst, [Creative Commons Attribution-Share Alike 4.0 International](#) license

## Resources

### *Agricultural Resources*



**Figure 6 – Sugar Cane fields Tarrafal de Monte Trigo Santo Antão, Cabo Verde**  
**Credit:** Herbert wie, [Creative Commons Attribution-Share Alike 4.0 International](#) license

According to the United Nations [Food and Agriculture Organization](#) about 79,000 hectares (ha) of the [Cabo Verde Islands](#) are under cultivation and 45,420 ha are forest cover. Staple crops such as maize and beans are produced for subsistence. Commercial crops include sugarcane and tomatoes. Subsistence crops are dependent on rainfall whereas commercial crops are dependent on irrigation. Data on food production can be found [here](#).

Livestock production on the Cabo Verde Islands includes cattle, chickens, sheep and goats. Statistics on livestock production are also found on the FAO site, [here](#).

Another major source of food in Cabo Verde is from the fishery. [According to the FAO](#), 5,800 are employed in the fishery and about 10% of the animal protein consumed on the islands comes from seafood.

[Drought is a common problem](#) for agricultural production on the Cabo Verde Islands and about 30% to 40% of the [population experiences what the FAO calls food insecurity](#). Food insecurity has [social consequences](#).

## Mineral Resources

The main [mineral products of Cabo Verde](#) include [pozzolana](#) (a volcanic rock used in cement production), limestone for construction, and salt from evaporation pans. Official statistics indicate that about [2,621 tonnes of minerals](#) were produced in 2021.

## Climate

Surrounded by relatively cool waters, Cabo Verde has a tropical arid climate, also called [Hot Semi-arid](#). As noted above, droughts are common and are a constant threat to agricultural production. If you plan to visit Cabo Verde, you might want to visit [this site](#).

## History and Geopolitics

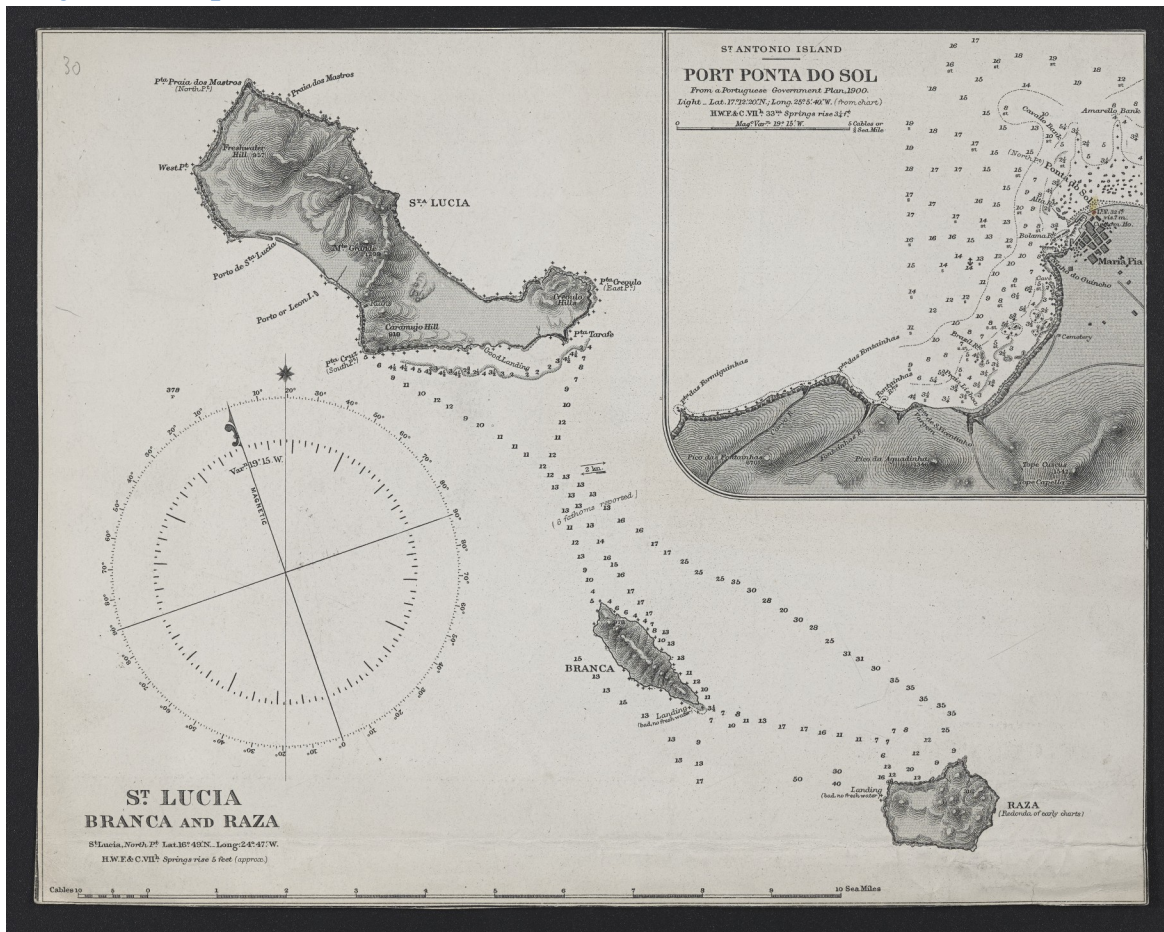


Figure 7 – Maritime Chart, ca. 1900

Credit: o. A., [Creative Commons CC0 1.0 Universal Public Domain Dedication](#)

## History

The [history of the Cabo Verde Islands](#) began with the discovery of the islands by the Portuguese in 1456. Prior to that time, the islands were uninhabited. The [Portuguese colonized the islands](#) from 1456 until the islands were granted independence in 1975.



**Figure 8 – Mother and Child in Sao Vicente, Cabo Verde, 1900**  
**Credit:** unknown author, in the [Coleção Jill Rosemary Dias](#), public domain

The most important feature of Portuguese rule in Cabo Verde was the introduction of sugar production and the subsequent [importation of African slaves](#) to work the sugar plantations. Other than that, Cabo Verde followed the ups and downs of [Portugal's overseas empire](#).

Independence from Portugal came in 1975. Since then there have been a succession of various rulers, the usual churn of democratic government.

### ***Geopolitics***

The main internal problems of Cabo Verde are related to [persistent poverty](#) and [drought](#). The good news is that they have made progress in improving the lives of the people, as the African Development Bank Group [states](#): “Real GDP is projected to grow by 5.7% in 2023 and 6.2% in 2024, supported by agriculture, energy, the digital economy, and tourism”. Having a [government](#) that acts like it is responsible to its people is a big reason for optimism in this respect.

A small island state, [Cabo Verde's position in the mid-Atlantic](#) gives it many challenges. Its main external relations are going to be with trading partners and countries interested in maritime trade. In this respect, its key external relations are with the following actors:

### ***ECOWAS***

The nearby nations of West Africa, the Economic Community of West African States ([ECOWAS](#)): [Benin](#), [Burkina Faso](#), [Cote d'Ivoire](#), [Gambia](#), [Ghana](#), [Guinea-Bissau](#), [Guinea-Conakry](#), [Liberia](#), [Mali](#), [Mauritania](#), [Niger](#), [Nigeria](#), [Senegal](#), and [Sierra Leone](#). This is a diverse group of states with varying

interests and ambitions. Cabo Verde is in the position to trade with them all and also act as a neutral party in the various disputes that arise.

Of all the ECOWAS countries, the one that will likely influence Cabo Verde, in the long run, is Nigeria. With its large, dynamic population, Nigeria may be on the cusp of a [period of long term social/economic growth](#). Inevitably, they will develop ambitions and these desires will affect nearby nations, including Cabo Verde.

### ***The European Union***

Cabo Verde's former colonial master, Portugal, is also part of the [European Union](#) (EU) and any relationship with the EU is likely to have that former colonial relationship as political baggage. It is not inconsequential, therefore, that Cabo Verde maintains a [close relationship with the EU](#). The EU and Cabo Verde have a [special partnership agreement](#) and there has been [some suggestions](#) that Cabo Verde could become part of the EU. The EU also has a number of [foreign aid projects](#) on-going in Cabo Verde. The trick for Cabo Verde will be to not fall into a new colonial relationship with its former masters.

### ***Brazil***

To the west of Cabo Verde is the growing regional power of [Brazil](#). Both countries have a lot in common, beginning with both being former Portuguese colonies. The [Brazilian Cooperation Agency](#) and Cabo Verde are part of a Cooperation Program, funded by Brazil; according to the [Cabo Verde's Foreign Affairs Ministry](#): "Cabo Verde is one of our biggest partners in projects developed with funds from the Brazilian Cooperation Agency (ABC), in areas such as health, education, agriculture and regulatory agencies". Brazil is an ambitious regional power, Cabo Verde may substantially benefit from its trade and political connections with Brazil, but Brazil will always be the senior partner.

### ***The United States***



**Figure 9 – USS America Enforcing Freedom of Navigation**  
**Credit: [U.S. Navy, public domain](#)**

The [United States](#) is the world's [preeminent naval power](#) and is likely to remain so in the near future. With this in mind, island states like Cabo Verde are likely to remain [important](#) to powers like the United States. The trick for Cabo Verde is, essentially, not to draw the unwanted attention of the United States

by allying itself with potential or actual American adversaries like [China](#) or [Russia](#). America, or rather its [navy](#), takes its [freedom of navigation](#) seriously and it would not be to wise to invite a [Carrier Battle Group](#) to make an unfriendly visit to your country, enforcing that freedom of navigation.

That kind of wraps up this brief look at the geology and geopolitics of Cabo Verde. I looks like an interesting place, one that would be [worth visiting](#). If any of this interests you, follow up on some of the links.

### **Standard Caveat**

The purpose of my weblog postings is to spark people's curiosity in geology. Don't entirely believe me until you've done your own research and checked the evidence. If I have sparked your curiosity in the subject of this posting, follow up with some of the links provided here. If you want to, go out into the field and examine some rocks on your own with the help of a good field guide. Follow the evidence and make up your own mind.

In science, the only authority is the evidence.