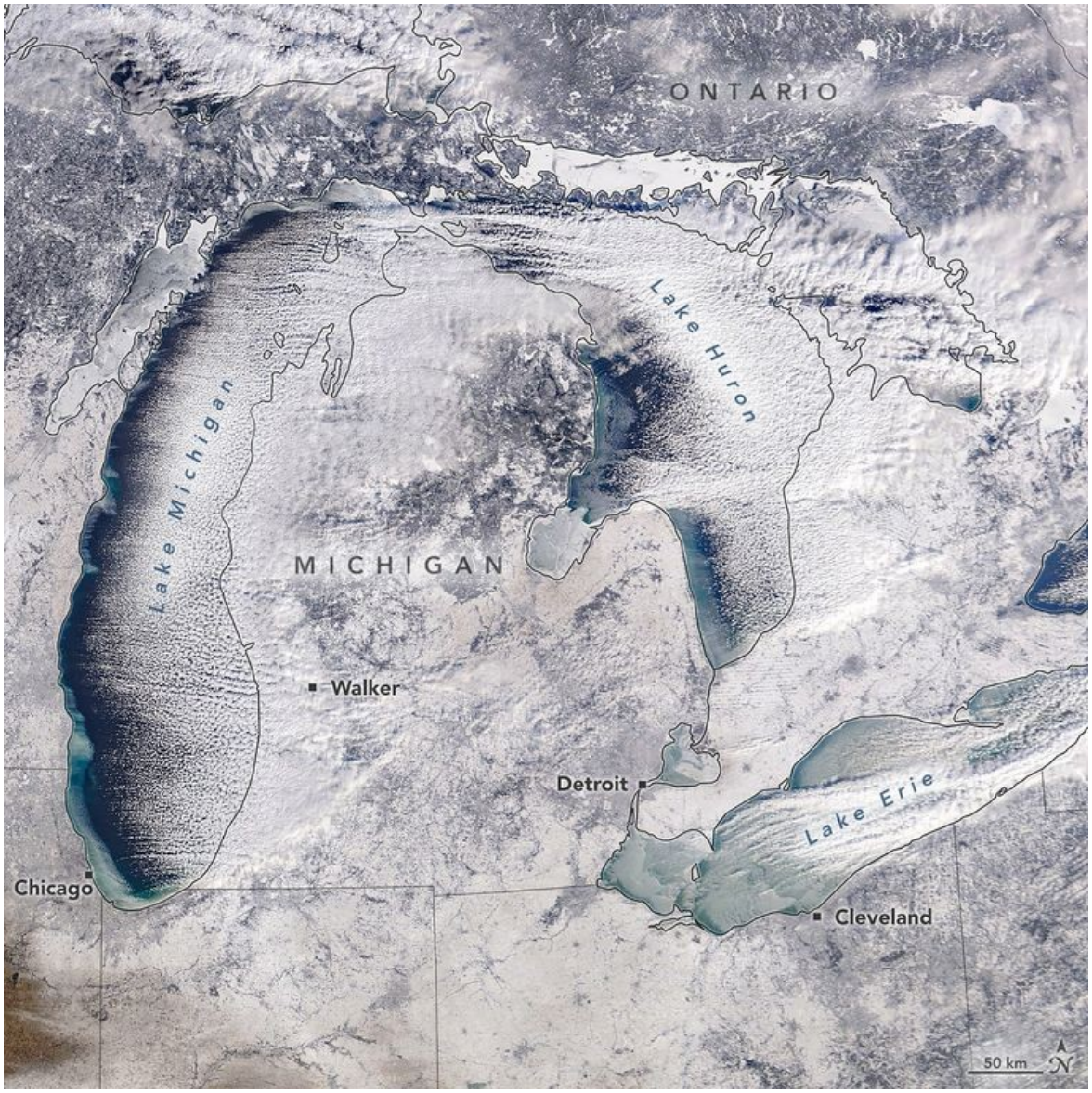
January 26, 2026

News and notes



Winter Grips the Michigan Mitten
Credit: NASA Image of the day, public domain

This week, before going on to discuss the geology and mineral resources of Namibia, we will first look at some news items I thought were interesting. The picture above was NASA's image of the day for January 23.

If you enjoy my blogs, bookmark the site and check on Mondays rather than relying on social media postings which can get lost in the shuffle. For my news items, I try to stick to open access papers.

Comments

If anyone has comments on any of my postings, please leave a comment on the Linkedin page for the posting or email me at raymondreichelt@gmail.com.

Geopolitics

- In Humiliating Retreat, Starmer Forced To Pull Chagos Bill After Trump Backlash.
- China Moves to Price LNG in Yuan.
- Trump at One Year: He's Asimov's The Mule, Breaker of Worlds.
- We ran high-level US civil war simulations. Minnesota is exactly how they start.

Research and News

- Permian mylonites in the footwall of a Miocene Cycladic core complex (Ios, Greece): Insights from (micro)structurally integrated apatite U-Pb petrochronology.
- Accumulation of remineralised carbon and nutrients in the mid-depth Atlantic during Heinrich Stadial 1 and the Younger Dryas.
- Sedimentology: Volume 73, Issue 2, Pages: 293-587, February 2026.
- CO_2 fluxing and carbon assimilation by arc melts during magma–limestone interaction.
- Age of the Acraman impact ejecta layer in the adelaide superbasin and Implications on clay-mineral provenance from the Rb–Sr systematics of middle Ediacaran shales.
- Carbonate platform evolution in response to the Mid - Pleistocene climate transition on the North-West Shelf of Australia: Insights from forward stratigraphic modelling.
- Zircon deformation features reveal sequence of transient high stress, tension and shearing during seismic faulting: A case study from the Ivrea-Verbano Zone, Italy.
- Pyrite records fluid evolution: sulfur sources controls on arsenic speciation and zonation.
- REE Geochemistry: Tracing anatexis and bottom-up crustal homogenisation with in situ Sm-Nd isotopes.
- Single-crystal elasticity of celestine at ambient conditions.
- Chemistry of Bridgmanite in the $MgO–SiO^2–Al_2O_3–Fe_2O_3–FeO$ system at 27 GPa and 1700–2300 K.
- Juxingite, Bi6Cu140Fe30S125, a new copper sulfide mineral from the Jiama porphyry-skarn Cu-polymetallic deposit, Tibet, China.
- Sediment resuspension and reductive dissolution of terrigenous Fe-Mn oxides control dissolved neodymium and hafnium inputs from the Amazon shelf.

- Inferring relationships between petrophysical data and hyperspectral-derived mineralogy using PLS-based modelling.
- Silicon isotope-based assessments of biogenic and dissolved silica content determination in marine sediments.

Geophysics

- A mantle assist for the early geodynamo and planetary shielding.
- Linking electrical anomalies in the upper mantle to petrological and geochemical heterogeneities.
- Electrical Conductivity of Carbonatite Melts to 20 GPa: Constraints on Partial Melting Atop the 410-km Discontinuity and in the Lower Mantle Transition Zone.

Plate Tectonics

- Cambrian post-collisional overprint recorded by detrital rutile: Insights into the late evolution of the Araçuaí Orogen.
- Strain-rate evolution in the European Alps due to Glacial Isostatic Adjustment since the Last Glacial Maximum.
- Plate motion drivers: Geodynamical framework and statistical appraisal for the case of the Neogene Nazca–South America convergence.
- Bilateral Loa-Kea trends of the Hawaiian Islands caused by the bottom-up splitting of plume conduit.
- From wide rifts to orogens: A new perspective for Proterozoic tectonics.
- East Meets West: The Trace of the Mesoproterozoic Kibaran Event in the Mantle Lithosphere Beneath Eastern Tanzania.
- Cenozoic cooling and exhumation history of Southern Ecuador: The role of plate-boundary reorganizations and inboard tectonic conditions.
- Cooling-Induced Rheological Weakening Along the Nascent Plate Interface-A Mechanism for Catastrophic Subduction Initiation?
- Formation of sedimentary and tectonic mélanges during seamount subduction: new insights from analog modeling.
- In situ microseismicity reveals lithospheric accretion at the ultraslow-spreading Gakkel Ridge, Arctic Ocean.

Paleontology

- Virtual endocasts of the Paleogene Ctenodactyloidea and brain evolution in ctenodactyloid rodents.

- Ammonite biostratigraphy on the platform–slope transition between the Vercors Urgonian platform and the Vocontian Trough (S–E France).
- Microscopy of Macrofossils: Techniques from Geology.
- Life's origins: How the ocean's hydrothermal systems made the first life on Earth possible.
- How microbial fossils illuminate life's origins.
- New species evolved within a few thousand years of the Chicxulub Impact; behind a paywall, Phys.org summary here.
- Dynamic redox–promoted iron and nutrient cycling drove graptolite evolution across the Ordovician-Silurian transition.
- *Prototaxites* fossils are structurally and chemically distinct from extinct and extant Fungi.
- New Middle Jurassic mammaliaform tracks from northern Shaanxi Province, China.
- Southern hemisphere ceratosaurs evolved feeding mechanics paralleling those of Northern hemisphere tyrannosaurids.
- Fossil shorebirds (Aves: Charadriiformes) reveal trends in Pleistocene wetlands at Naracoorte Caves, South Australia; Phys.org summary here.
- Scientists opened a tiny "time capsule" — and inside was a creature from 100 million years ago.
- 4 of the coolest dinosaurs that once roamed Mexico.
- A new genus of lonchidiid hybodontiform sharks from the Cretaceous of North Africa and South America.
- On the taxonomic status of *Tharrhias castellanoi* Duarte & Santos, 1962 (Gonorynchiformes, Chanidae).

Mining and Energy

- China Opens Lithium Market to Overseas Investors.
- USA Rare Earth surges on $1.6B gov't funding LOI.
- Chevron, oil execs send strong message on Venezuela.
- Trump administration to acquire 10% of USA Rare Earth in $1.6B deal: reports.
- Frigid weather stresses US electric grid.
- Critical Minerals: A Looming Crunch–is the West Ready for What's Coming?
- Saudi Arabia says it has $2.5 trillion in mineral reserves. That could make it a key player in the race for rare earths.

- Growth in global demand for natural gas is set to accelerate in 2026 as LNG wave spreads through markets.
- Extreme winter storm threat sparks historic natural gas spike.
- Only a Fraction of Venezuela's Oil Is Economically Recoverable.
- B.C. fusion company to go public after major cash injection.
- Global oil demand growth to rise in 2026, IEA says.
- Wind and solar overtook fossil fuels for EU power generation in 2025, report finds.
- Top five rare earths projects to watch in 2026.
- China drills beneath the Wangu gold field and discovers a “treasure” of more than 1,000 tons that could be hidden 3,000 meters underground.
- South Koreans join in Canadian LNG project.
- PBBM: Philippines makes major gas discovery at Malampaya East, first in over a decade.
- DRC revives $29B iron ore export plan once tied to billionaire Gertler.
- Northern Graphite to build $200M Saudi plant with partner.
- USGS releases assessment of undiscovered oil and gas resources in Woodford and Barnett shales.

Environmental Geology and Hydrogeology

- A Decadal Survey of the Near-Surface Seismic Velocity Response to Hydrological Variations in Utah, United States.
- Operational Flood Forecasting System in Denmark – Integrating Groundwater and Surface-water.
- Release of toxic-metal acid brines related to slumping of Cretaceous mudstones—Smoking Hills (Ingniryuat), Arctic Canada.

Glaciers and Climate Change

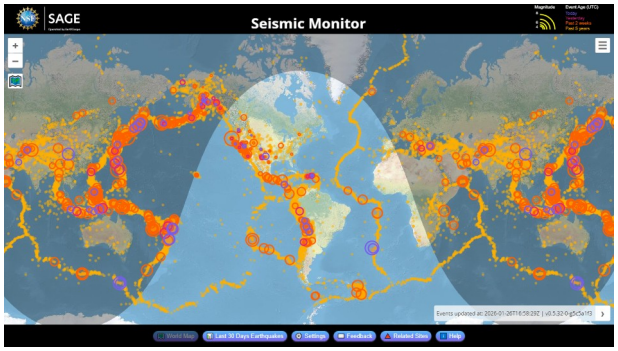
- Single particle ICP-TOFMS on previously characterised EGRIP ice core samples: new approaches, limitations, and challenges.
- Seasonal upper ocean temperatures from coccolith clumped isotopes and a proxy-model comparison for the late Early Eocene Climatic Optimum.
- Thermobarokinetics of ice: constitutive formulation for the coupled effect of temperature, stress, and strain rate in ice.
- Seasonal glacier motion variations and underlying hydro-mechanical processes at the Argentiere Glacier, French Alps.

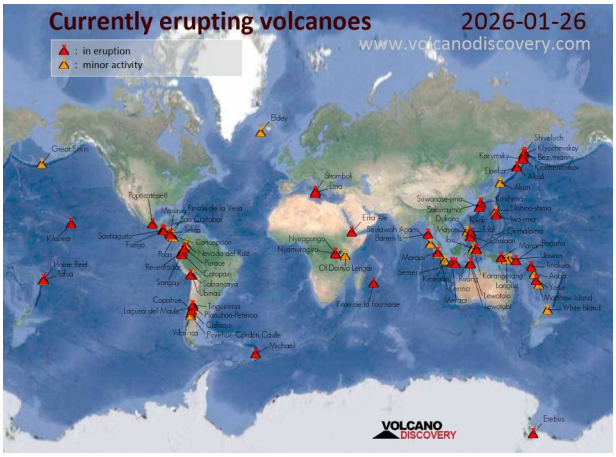
- Continued continental weathering during snowball earth mitigated greenhouse gas buildup and prolonged global glaciation.
- The domino effect of climate tipping points: a multidisciplinary perspective on global risks.
- On the accuracy of the measured and modelled surface latent and sensible heat flux in the interior of the Greenland Ice Sheet.
- Dynamics of snow and glacier cover in the Upper Karnali Basin, Nepal: an analysis of its relationship with climatic and topographic parameters.
- Relatively warm deep-water formation persisted in the Last Glacial Maximum; Phys.org summary here.
- Inferring the ice sheet sliding law from seismic observations: A Pine Island Glacier case study.
- Widespread terrestrial ecosystem disruption at the onset of the Paleocene–Eocene Thermal Maximum.

Bad Science

- RETRACTED ARTICLE: The influence of exploration activities of a potential lithium mine to the environment in Western Serbia.

Volcanoes, Earthquakes and Geohazards





Seismic Monitor **Active Volcano Map**

Volcanoes

- Smithsonian / USGS Weekly Volcanic Activity Report.
- United States Geological Survey (USGS) Volcano Observatories:
    - Yellowstone Caldera Chronicles: The largest thermal area in Yellowstone National Park: Lower Geyser Basin.

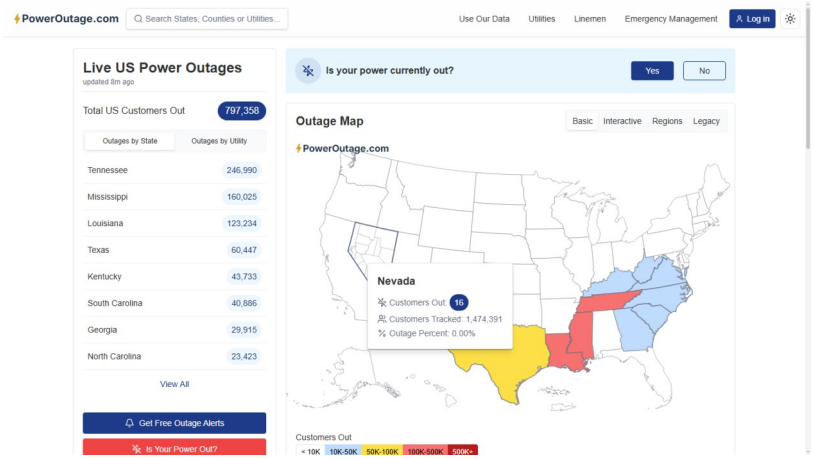
    - Cascades Volcano Observatory Weekly Update.
    - Volcano Watch – What do small earthquakes beneath Kīlauea summit mean for the ongoing eruption?

- Voluminous Inflated Lobate Flows on the Distal Rift Zones of Axial Seamount, Juan de Fuca Spreading Ridge.
- The Age and Composition of the Voyager Seamounts: Evidence for a Long-Lived Marquesas Mantle Source.
- Deep Sources of Recent Volcanism in Armenia Inferred From Ambient Noise Tomography.

Earthquakes

- Euro-Mediterranean Seismological Centre (EMSC).
- Earthquakes Monitoring Live Worldwide.
- M4.7 earthquake in Utah rattles Salt Lake City; USGS summary here.
- Magnitude 4.9 Earthquake, Western Türkiye, 2026-01-23 21:24:38.5 UTC.
- Soil Gas Investigations in Hatay-Reyhanlı (Türkiye): Implications for Buried Fault Detection and Seismic Hazard Assessment.
- M4.9 earthquake strikes inside Joshua Tree National Park, California; USGS summary here.
- The BELSHAKE Database of Earthquake Ground Motion in Belgium.
- An Intraplate Seismic Swarm in the Karoo Basin, South Africa, Highlights the Presence of Critically Stressed Faults in an Area of Proposed Shale Gas Exploration.
- M5.6 earthquake collapses buildings in Pakistan; USGS summary here.

Geohazards



Power outages – January 26, 2026

- Massive winter storm across U.S. brings snow, frigid temperatures, widespread power outages.

Free Geology Books and Other Stuff

Free geology books can be downloaded from these sites:

- OreZone Readers and Experts Telegram Channel; the Ore Zone channel also shows employment opportunities for geologists.
- The Groundwater Project has many groundwater geology books for free download together with free online courses, listed here.
- Free Groundwater Modeling Courses from the HydroGeoCenter.
- From Western Australia: Carbonatite, lamprophyre and host rocks in the northern Aileron Province.
- The Geology of Indonesia: Volume 1 and Volume 2.
- Brett Davis' book on veins in a deforming rock mass: "The Veining Bible"; also at this site.
- From the Mineralogical Society of America: Handbook of Mineralogy.
- Systematic geochemical classification of felsic igneous rocks of the Yilgarn Craton.

Upcoming Events

- Free webinar: The challenges of investigating fuel stations, 10 February 2026, 12:30 - 13:15 GMT.
- 2026 AAAS Annual Meeting, Phoenix, AZ, February 12-14.
- Feb. 16-18, 2026, Inaugural Mineralogical Society of America Annual Meeting, Tuscon AZ.
- March 15-21, 2026, Provincial Engineering and Geoscience Week, Manitoba.
- AGS Annual Conference 2026, 19th Mar 2026, One Great George Street, London, U.K.
- GAC-MAC 2026 St. John's NL, St. John's Convention Center, May 25-28, 2026.
- PEG2026: 11th International Symposium on Granitic Pegmatites; 16th–19th August 2026, in Perth, Western Australia.
- 14-18 September 2026 , IAH 2026, 53rd Congress of the International Association of Hydrogeologists; Budapest Congress Center.
- Society of Petroleum Engineers Distinguished Lecturer Schedule.
- American Geophysical Union List of Upcoming Meetings.
- The Geological Society: Events & Courses.

January 26, 2026

Geology and Mineral Resources – Namibia

Introduction

Figure 1a – Namibia
Credit: CIA World Factbook, public domain

Figure 1b – Location of Namibia
Credit: CIA World Factbook, public domain

The Republic of Namibia is a country of 2,803,660 people in Southern Africa. The country has an area of 824,292 square kilometres and borders on the Atlantic Ocean to the west, Angola and Zambia to the north, Botswana to the east and South Africa to the south; about 200 metres from the easternmost extension of the Caprivi Strip is Zimbabwe.

The people of Namibia are relatively poor with a per capita GDP (PPP) of $12,370 and a medium Human Development Index of 0.665. While most Namibians make a living from of subsistence agriculture and herding (some live by hunting and gathering), there is a well developed market economy with a large mining sector. In 2023, the top exports of Namibia were gold, diamonds, radioactive chemicals, fish fillets, and non-fillet frozen fish; the top destinations for exports were South Africa ($1.71B), China ($726M), Botswana ($503M), Belgium ($433M), and France ($336M). In 2023, the top imports of Namibia were refined petroleum, copper ore, delivery trucks, electricity, and cars; the top origins imports were from South Africa ($3.07B), China ($691M), India ($498M), United Arab Emirates ($319M), and the United States ($243M).

For more details on the country, check out the CIA World Factbook on Namibia as well as the Wikipedia and Grokipedia articles.

Geology

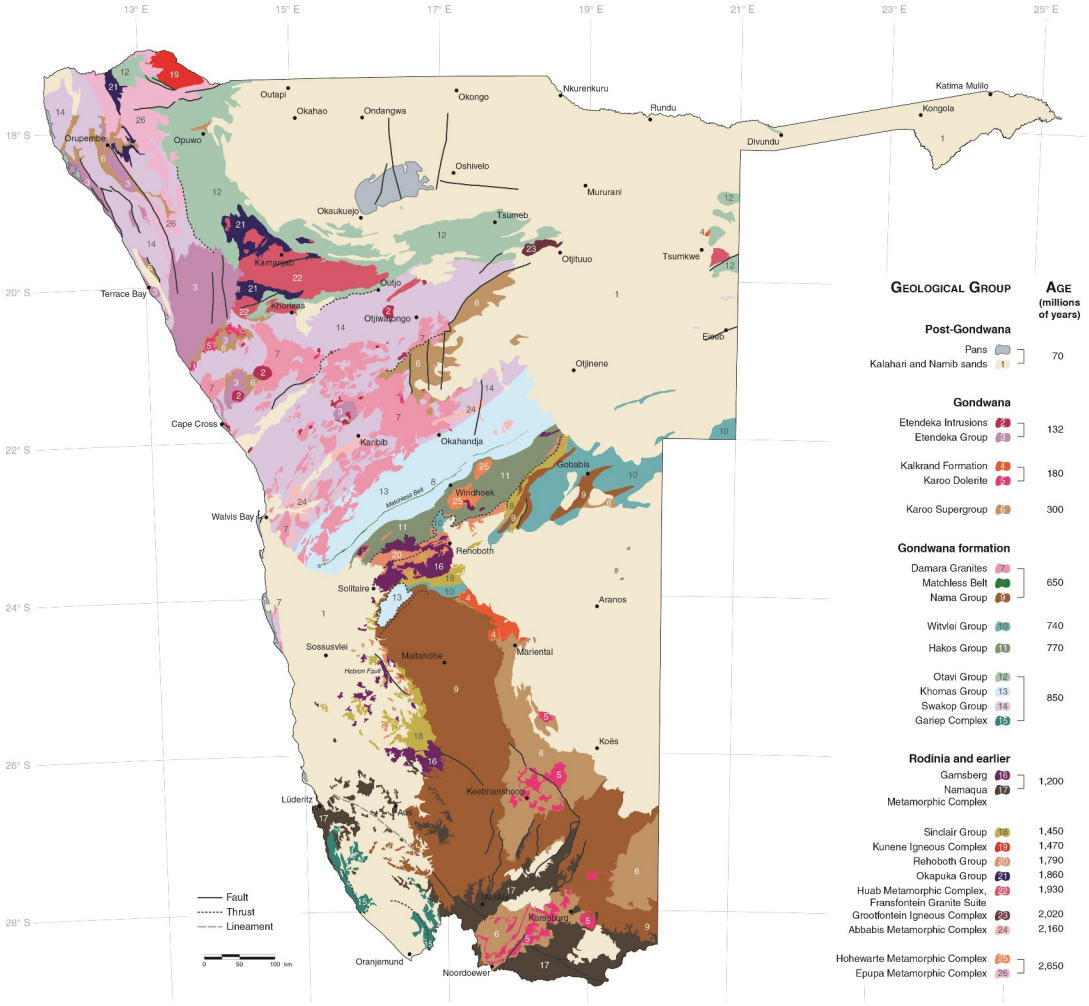


Figure 2 – Geological Map of Namibia
Credit: Atlas of Namibia, Creative Commons Attribution-Share Alike 4.0 International license

The origins of the most of the rocks in Namibia lie in the ancient supercontinents of Gondwana and Rodinia. The Rodinia complex is the oldest.

Rodinia Complex

The oldest rocks in Namibia are from the Neoarchean:

- Epupa Metamorphic Complex, predominantly granitoid gneisses that have been migmatized over large areas; and
- Hohewarte Metamorphic Complex approximately 2,650 million years (Mya) old, a wide variety of gneiss.

Next are the Paleoproterozoic aged rocks of the:

- Abbabis Metamorphic Complex (2,160 Mya): granitic gneisses, including augen gneisses, along with extensive granitic intrusions and some subordinate metasedimentary and metavolcanic rocks.
- Grootfontein Igneous Complex (2,020 Mya), mafic metavolcanic rock, gneisses and metasedimentary rocks.
- Fransfontein Granite Suite, granite.
- Huab Metamorphic Complex (1,930 Mya), amphibolites, metasedimentary and metavolcanic rocks.
- Okapuka Group (1,860 Mya), metasedimentary and metavolcanic rocks including felsic schist.
- Rehoboth Group (1,790 Mya), granites, granodiorite, and diorite.

Mesoproterozoic aged rocks include:

- Kunene Igneous Complex (1,470 Mya), anorthosite and gabbro.
- Sinclair Group (1,450 Mya).
- Namaqua Metamorphic Complex (1,200 Mya), mostly granite.
- Gamsberg Formation (1,200 Mya), also largely granite.

Gondwana Assembly

Rocks in Namibia associated with the assembly of Gondwana are Neoproterozoic in age, and are considered part of the Damara Orogen, these include:

- Ganep Complex, Swakop Group, Khomas Group and Otavi Group (all 850 Mya), siliciclastic and carbonate rocks
- Hakos Group (770 Mya), nappe complex rocks including diamictite.
- Witvlei Group (740 Mya), fine-grained siliciclastic and carbonate rocks.
- Nama Group (650 Mya), carbonate and siliciclastic foreland basin deposits.
- Matchless Group (650 Mya), schist, dolomite, quartzite, conglomerate, phyllite, and amphibolite.
- Damara Granites (650 Mya).

Gondwana Deposits and Intrusions

Geologic units deposited on or intruded into the Gondwana terrane are Phanerozoic in age and include:

- Karoo Supergroup (Carboniferous-Permian, 300 Mya), shales and sandstone.
- Karoo Dolerite (Jurassic, 180 Mya), dolerite intrusion.
- Kalkrand Formation (Jurassic,180 Mya), flood basalts.

- Etendeka Group and Etendeka Intrusions (Jurassic-Cretaceous, 132 Mya), flood basalts and alkaline intrusions.

Post Gondwana Units

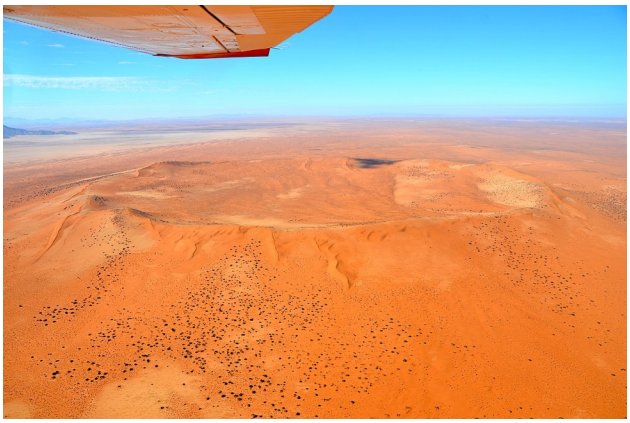


Figure 3 – Roter Kamm Crater
Credit: Olga Ernst & Hp.Baumeler, Creative Commons Attribution-Share Alike 4.0 International license

The geological units deposited after the breakup of Gondwana are mostly the Kalahari and Namib sands (Late Cretaceous to Cenozoic 70 Mya). Also deposited during the Cenozoic were the Black Crow Limestone (Eocene, Ypresian-Lutetian), the Langental Formation (Eocene, Bartonian-Priabonian), the Elisabeth Bay Formation (Miocene, Aquitaine-Burdigalian). The Roter Kamm Crater appears to have been formed by a meteorite strike 4.81 ± 0.5 Mya, during the Pliocene.

Paleontology

Figure 4 - *Pteridinium simplex* fossil from the Ediacaran Nama Group of Namibia
Credit: Ghedoghedo, Creative Commons Attribution-Share Alike 3.0 Unported license

Fossils found in Namibia range in age from the Neoproterozoic Ediacaran to the Cenozoic. A list of fossiliferous stratigraphic units in Namibia can be found here. Below is a summary of some of the fossil treasures of Namibia.

The oldest fossils in Namibia are Ediacaran Biota from the Neoproterozoic Nama Group. Species identified in the Nama Group include *Ausia fenestrata*, *Brooksella*, *Cloudina*, *Neonereites sp.*, *Diplocraterion*, *Enigmatichnus africani*, *Namacalathus hermanastes*, *Namalia villiersiensis*, *Namapoikia rietoogensis*, *Nereites*, *Protechiurus edmondsi*, *Pteridinium sp.*, *Rangea schneiderhoehni*, *Skolithos*, *Streptichnus narbonnei*, *Swartpuntia sp.*, and *Treptichnus pedum*.

Figure 5 – Reconstruction of *Moschops capensis*
Credit: Nobu Tamura, Creative Commons Attribution-Share Alike 3.0 Unported license

The next large lithological group that yields fossils is the Karoo Supergroup. A wide variety of fossils have come from the Karoo including plants (both macrofossils and pollen and spores), insects and fish, tetrapods (mostly therapsids like *Moschops*), temnospondyl amphibians, parareptiles, archosauromorphs and dinosaurs), and many types of trace fossils such as coprolites, burrows and trackways.

Figure 6 – *Pterodon dasyuroides* skull and mandible
Credit: Ghedo, Creative Commons Attribution-Share Alike 4.0 International license

Cenozoic fossils from Namibia include mammals (such as *Pterodon dasyuroides*), amphibians, reptiles, fish, and gastropods.

Mineral Resources

Figure 7 – Navachab Gold Mine
Credit: Hp.Baumeler, Creative Commons Attribution-Share Alike 4.0 International license

According to the USGS Minerals Yearbook on Namibia, the country produces a wide variety of metallic and industrial minerals. The most current production statistics from the USGS are here. The list of mining operations from the Namibian Ministry of Industries, Mines and Energy is here.

Metallic Minerals

- Copper is mined at the: Otjihase Mine, Matchless Mine, Tschudi Mine, Tsumeb West Mine, and Kombat Mine.
- Gold is mined from the Navachab Mine and Otjikoto Mine, and both gold and silver were also produced as a co-products of the Tsumeb copper smelter until June of 2025.
- Iron ore is mined at the Dordabis Mine.
- Both lead and zinc are mined at the Rosh Pinah Mine and the Namib Lead and Zinc Mine; silver is also produced at the Rosh Pinah Mine.
- Lithium production is under development at the at the Rubicon and Helikon mines, both tin and lithium are in the Uis Mine deposit.
- Manganese is produced at the Otjozondu Mine.
- Uranium is mined at the Langer Heinrich, Rössing, and Husab mines.

Industrial Minerals

- Cement is produced at two locations, near Otavi and at the Otjiwarongo cement plant.
- Diamonds are produced at both onshore and offshore operations in the Atlantic 1, Orange River Sendelingsdrif and Karas Region mines, and the Elizabeth Bay Mine. You can also take guided tours of the restricted diamond region in Luderitz Bay.
- Dimension stone, granite, marble, and slate, are quarried at numerous locations.
- Fluorspar is mined at the Okorusu Fluorspar Mine.
- Graphite is mined at the Okanjande Mine.
- There are plans for offshore phosphate mining at the Sandpiper and LL Namibia Phosphates projects.
- Picturestone, a variety of jasper, is quarried at Oa ta ra Bloukrans Quarry.
- Phonolite is produced at the Aris Quarries.
- Salt is produced in salt pans along the coastline.
- Wollastonite is produced at the Usakos Mine.

Figure 8 links to an interactive mineral deposit map of Namibia from Mindat.org.

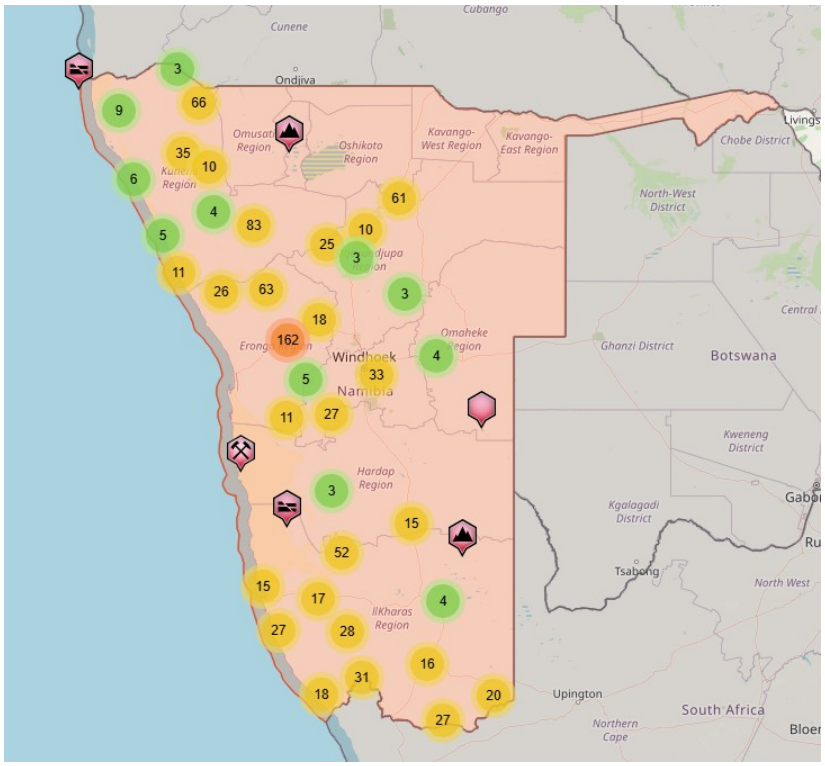


Figure 8 – Interactive Mineral Occurrence Map of Namibia
Credit: Mindat.org

Summary

Figure 9 - Fluorspar from Farm Marburg
Credit: Elena Ternovaja, Creative Commons Attribution-Share Alike 3.0 Unported license

As long as you like deserts, Namibia looks like another promising place for mineral exploration. With a relatively stable government and a rich geological landscape, Namibia looks like a good place for a geologist to explore. One new area being looked into are potential offshore oil and gas deposits.

It's a big improvement over the country's former reputation as the Skeleton Coast.

Standard Caveat

J. Robert Oppenheimer on freedom and scientific inquiry

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.