

January 19, 2026

News and notes



Morning Visitor January 16

This week, before going on to discuss the geology and mineral resources of Mozambique, we will first look at some news items I thought were interesting. The picture above is of a pheasant that dropped by my house this last week. Pheasants (*Phasianus colchicus*) are not common in Manitoba, so this is unusual.

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

- Iran: [TWISTED REGIME Fears up to 16,500 killed in Iran under cover of Ayatollah's 'digital darkness' as desperate families search for victims.](#)
- [Trump's Arctic Ambitions: Why the U.S. Wants Canada and Greenland.](#)

Research and News

- [Increasing the Accuracy and Efficiency of Micromagnetic Tomography by Double Sided Scanning.](#)
- Breaking rocks for fun: [In Situ Microscale Shear Failure Mechanism in Hot Dry Rock Under Thermal Cycling.](#)
- [Geochemistry and structures of the exomorphic halo of the Volta Grande pegmatite, Brazil: implications for net mass change and pegmatite emplacement.](#)
- Geophysics: [Characterizing near-surface permafrost in Utqiagvik, Alaska, using Electrical Resistivity Tomography and Ground Penetrating Radar.](#)

- [Steep nested clinofolds in the mixed siliciclastic-carbonate Eocene Sobrarbe Deltaic Complex, Aínsa Basin, Spain.](#)
- [Spatial and temporal variations in the distribution of eastern Australian post-orogenic granites and related mineral deposits: metallogenic and tectonic significance.](#)
- [The Mantle \$Fe_3^+/\Sigma Fe\$ Ratio Has Doubled Since the Early Archean.](#)
- [A reversed latitudinal ocean oxygen gradient in the Proterozoic Eon.](#)
- [Paleoenvironmental analysis of the Late Cretaceous Wombat kimberlite maar sediments, subarctic Canada: implications from geochemical and microfossil data.](#)
- [The Neoproterozoic Throssell Range Group, Western Australia: A Peri-Marginal Continental Basin in Rodinia and Its Implications for the Centralian Superbasin.](#)
- [Fingerprinting W-Sn mineralization processes in the East Greenland Caledonides using scheelite and cassiterite U-Pb dating and trace element composition.](#)
- [Isotopic evidence for volatile loss driven by South Pole-Aitken basin-forming impact.](#)
- [Multiphase magmatism and crustal reworking in the Álamo Complex \(Central Iberian Zone\): evidence from geochemistry and zircon U-Pb geochronology.](#)
- [Why Middle Jurassic coal seams generally lack volcanic-ash-altered kaolinitic layers and critical metals enrichment compared to the Carboniferous-Permian in the Ordos Basin, North China?](#)
- [From fabric to process: An integrated study of deformed quartz-rich carbonates.](#)

Mineralogy

- [A single-crystal neutron diffraction study of berborite 2T, \$Be_2\(BO_3\)\(OH\)\cdot H_2O\$.](#)
- [Quantitative analyses by combined energy and wavelength dispersive spectrometry: The best of both worlds.](#)
- [Revealing the True Nature of Chrysocolla: From Macro- to Nano-Characterization and First Thermodynamic Constraints.](#)

Plate Tectonics

- [Crustal Structure Across the Okavango Rift, Botswana: The SEISORZ Wide-Angle Seismic Experiment.](#)
- New Zealand: [Seismological Characterization of Northern Hikurangi Margin Slow Slip Regions Associated With Normal Faults, Seamounts, and Seeps.](#)
- [Deep carbon cycling in subduction zones constrained by partial melting of phengite-bearing carbonated eclogite.](#)
- [Low-frequency earthquakes track the motion of a captured slab fragment](#); Phys.org summary [here](#).

- [A New High-Resolution Seismic Catalog for Southwestern Australia \(2020–2025\) and Analysis of Long-Term Clustering Behavior.](#)
- [Widespread abyssal turbidites record megathrust earthquake-triggered landslides and coseismic deformation in the Cascadia subduction zone.](#)
- [From Compression to Extension in the Eastern Pyrenees: New Insights From Low-Temperature Thermochronology.](#)
- [Rifting Evolution of the Central Campos Basin as a Hybrid Rifted Margin: Insights From Tectonic and Magmatic Structures.](#)
- [Seismic source parameters analysis in Southeastern Alps and associated tectonic implications](#)

Paleontology

- [Analysis of pseudopathologies in *Edmontosaurus annectens* bones: taphonomic implications from biogenetic and diagenetic bone alterations from a Cretaceous bonebed in the Lance Formation, Wyoming.](#)
- Evolution: [Dominant contribution of Asgard archaea to eukaryogenesis.](#)
- [Prolonged growth and extended subadult development in the *Tyrannosaurus rex* species complex revealed by expanded histological sampling and statistical modeling.](#)
- [Exploring structural integrity of coralline algae in response to the environmental changes associated with the PETM: a tale of functional resistance.](#)
- [Formation, preservation, and interpretation of dinosaur tracks.](#)
- [How did birds evolve? The answer is wilder than anyone thought.](#)
- [Evidence for diverse anaerobic metabolisms in 3.7-billion-year-old marine detrital sediments.](#)
- [The Paleogene–Neogene silcrete macrofloras of Kati Thanda-Lake Eyre and northeastern deserts, South Australia: a literature review and assessment of collections.](#)
- [A Thick-Skulled Troodontid Theropod from the Late Cretaceous of Mexico](#);SciNews summary [here](#).

Ore Geology

- [Signature of lithology and alteration in velocity and density models across the Boda–Kaiser porphyry gold–copper camp, NSW](#)
- [3D mineral prospectivity modeling using a multi-scale CNN–transformer: A case study from the Siahcheshmeh gold deposit, NW Iran.](#)
- Gold geology: [A numerical appraisal of the ‘fault-valve’ model of origin of lode-type gold deposits.](#)

- More gold: [Unveiling the metallogenic continuum of an Archean craton.](#)
- [In situ compositions and sulfur isotopes of the copper sulfides from the Jiama giant copper polymetallic deposit: implications for ore-forming material sources, gold enrichment mechanism and mineral exploration.](#)
- [Magmatic and hydrothermal superimposition in Nb-Ta-Li mineralization at the Hailuoling deposit, South China: Records from columbite-tantalite chronology and mica chemistry.](#)

Mining and Energy

- [Lithium swings from glut to scarcity on Asia demand, Traxys says.](#)
- [Hopes and fears as Guinea exports iron ore from Simandou mines.](#)
- [Chevron Greenlights Major Expansion of Israel's Leviathan Gas Field.](#)
- [Solar power generation drives electricity generation growth over the next two years.](#)
- Venezuela: [Oil Majors Tell Washington They Want PDVSA Out of the Way.](#)
- [Exxon Baton Rouge, Louisiana refinery preparing to run Venezuelan oil, sources say.](#)
- [Critical Metals soars on project upgrades, US-Greenland talks.](#)
- [Silver mining stocks jump as metal holds above \\$90 milestone.](#)
- REE: [Greenland's Buried Promise: When Geology Meets European Hesitation.](#)
- [Nuclear startups are back in vogue with small reactors, and big challenges.](#)

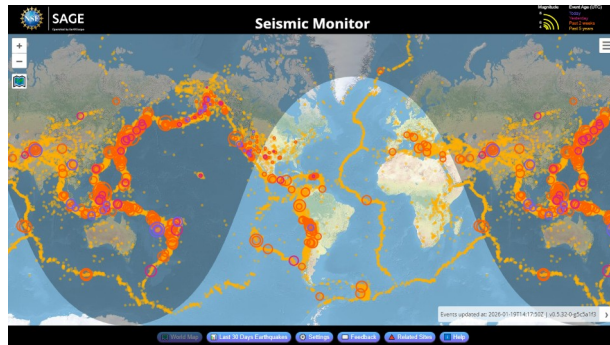
Environmental Geology and Hydrogeology

- [Ontario's proposed nuclear waste repository poses millennia-long ethical questions.](#)
- [High resolution US water table depth estimates reveal quantity of accessible groundwater; Phys.org summary \[here\]\(#\).](#)
- [How 'day zero' water shortages in Iran are fuelling protests.](#)
- [US Supreme Court wrestles with Louisiana communities' lawsuits against oil companies.](#)

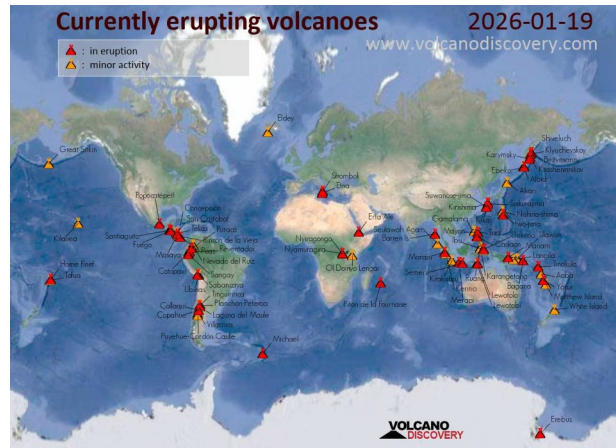
Glaciers and Climate Change

- Ancient climates: [Paleohydraulics of cyclonic storm deposits suggest that the equatorial climate of Earth in the Pennsylvanian was not cold.](#)
- [Positive feedbacks drive the Greenland ice sheet evolution in millennial-length MAR-GISM simulations under a high-end warming scenario.](#)
- Under the ice: [Complex mesoscale landscapes beneath Antarctica mapped from space; Phys.org summary \[here\]\(#\).](#)

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: [How many eruptions has Yellowstone had?](#)
 - [Cascades Volcano Observatory Weekly Update.](#)
 - Volcano Watch – [The 1969 Maunaulu eruption: 12 lava fountaining episodes.](#)
- [The Magmatic-Hydrothermal System of the Three Sisters Volcanic Cluster, Oregon, Imaged From Field Gravity Measurements.](#)

Earthquakes

- [Euro-Mediterranean Seismological Centre \(EMSC\).](#)
- [Earthquakes Monitoring Live Worldwide.](#)
- [Fluid-Induced Fault Reactivations in Strike-Slip Regimes: Temporal Constraints From GNSS and Seismological Analysis in the Peloritani Mts and Aeolian Archipelago \(Central Mediterranean\).](#)
- [Rapid Seismicity Monitoring After the March 2023 Ms 4.5 Earthquake Around the Xinfengjiang Reservoir, China.](#)
- [Ground-Motion Simulations for the 2024 Mw 4.8 Tewksbury, New Jersey, Earthquake.](#)
- [Repeated Large-Magnitude Earthquakes in the Marianna Area of East-Central Arkansas During the Middle-Early Holocene and Possibly the Late Pleistocene.](#)
- [Distributed Faulting of the Northern West Napa Fault Zone in Napa Valley, California.](#)

- [Characteristic Displacement and Paleoearthquake Activity of the Xiaojiang Fault Mapped from Historical Image Data and Tectonic Implications.](#)
- [Parkfield, San Andreas, and the hunt for a ‘crystal ball’ for predicting earthquakes earlier than they occur;](#) book reference [here.](#)
- [Paleo-earthquakes of the Dachaidan fault in western Qaidam basin, northeast of the Tibetan Plateau, China.](#)
- [AGMD: A Ground-Motion Database for the Australian Continental Crust.](#)

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.](#)

Upcoming Events

- [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](#)
- [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 19, 2026

Geology and Mineral Resources – Mozambique

Introduction



Figure 1 – Mozambique

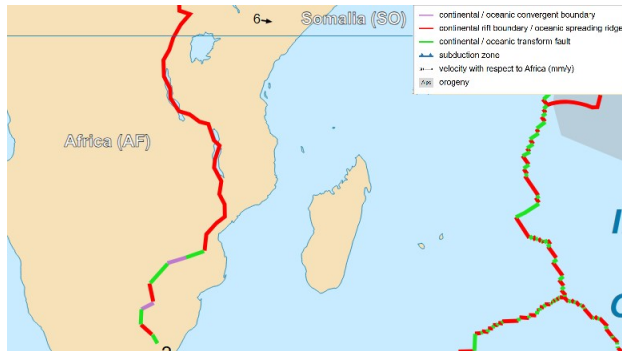
Credit: [CIA World Factbook](#), public domain

A former [Portuguese colony](#), the [Republic of Mozambique](#) is a country of 33,350,954 people in [Southeast Africa](#). The country has an area of 799,380 square kilometres and borders on the [Indian Ocean](#) and [Mozambique Channel](#), to the east; [Tanzania](#) to the north; [Malawi](#) and [Zambia](#) to the northwest; [Zimbabwe](#) to the west; and [Eswatini](#) and [South Africa](#) to the south and southwest. Across the Mozambique Channel are the [Comoros Islands](#), [Mayotte](#), and [Madagascar](#).

The people of Madagascar are generally poor. The per capita [GDP \(PPP\)](#) is \$1,730 and the [Human Development Index](#) is low at 0.493. The main economic activities are [subsistence agriculture](#) and extractive industries such as mining and forestry. In 2023, the [top exports](#) of Mozambique were coal briquettes, petroleum gas, raw aluminium, titanium ore, and gold. The top destinations were India, China, South Africa, United Arab Emirates, and Thailand. In the latest year, Mozambique was the world's largest exporter of titanium ore. Also in 2023 the top imports of Mozambique were refined petroleum, chromium ore, ferroalloys, iron ore, and fluorides. The top origins were South Africa, China, India, United Arab Emirates, and Singapore.

For more details on the country, check out the [CIA World Factbook on Mozambique](#) as well as the [Wikipedia article](#).

Geology



Most of Mozambique sits on the [Somali Tectonic Plate](#) while some of the western parts of Mozambique sit on the [African or Nubian Plate](#) in between of which is the [East African Rift](#). This location shapes the [country's topography, hydrology, and ecosystems](#).

Figure 3, below, shows the basic geology of Mozambique and Figure 4 leads to an interactive geology map of the country.

Figure 2 – Tectonic Framework of Southeast Africa
 Extracted from [Credit: Eric Gaba \(Sting\), Creative Commons Attribution-Share Alike 2.5 Generic license](#)

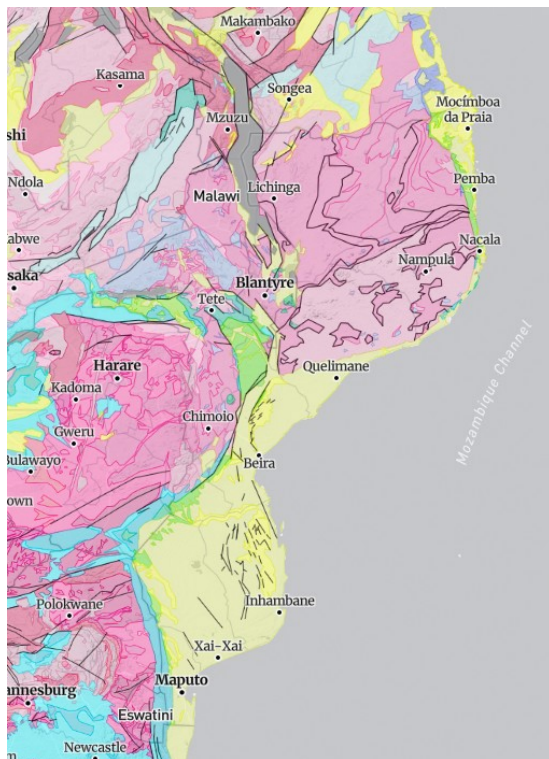


Figure 3 – Interactive Geology of Mozambique
[Credit: Macrostrat, Creative Commons Attribution-Share Alike 4.0 International license](#)

The oldest rocks in Mozambique are [Archaean](#) to [Proterozoic](#) in age. These rocks are found in [Manica](#) and the western part of [Sofala](#) provinces, in the centre of the country. This [Precambrian craton](#) includes the [Umkondo Formation](#) and the [Granite Complex](#) of the [Zimbabwe Craton](#). Archean and Proterozoic rocks in Mozambique include: [slate](#), [schist](#), [quartzite](#), [carbonate rocks](#), [gneiss](#), [greenschist](#), [serpentinite](#), [metaconglomerate](#), [greywacke](#) and [granite](#).

Next younger, is the Proterozoic aged [Precambrian Basement Complex](#) of the [Mozambique Metamorphic Belt](#). These rocks occupy almost the entire region north of the Zambezi River (a large part of the provinces of [Zambezi](#), [Nampula](#), [Cabo Delgado](#) and Niassa and the northern part of the province of [Tete](#)).

Mostly metamorphic rock, this complex includes granite, [gabbro](#), [diorite](#), [anorthosite](#), gneiss, [metasediment](#) and [charnockitic granite](#).

Intruding the basement rocks of Mozambique are [Jurassic](#) and [Early Cretaceous](#) aged igneous intrusions of the [Karoo](#) and post-Karoo complexes. The Karoo volcanic rocks include [basalt](#), [rhyolite](#), [andesite](#), [tuff](#), [ignimbrite](#) and [volcanic breccia](#). The post-Karoo intrusions include granite, [syenite](#), gabbro, [feldspar porphyry](#) and [mafic dykes](#).

The [Karoo Supergroup](#) in Mozambique also includes sedimentary basin deposits. Key formations include: the [sandstone](#) of the Zumbo Formation, Upper Karoo Group ([Triassic](#)); the red sandstone of the Lualadzi Formation, Upper Karoo Group (Jurassic); the [limestone](#) and sandstone of the Magoé Formation (Jurassic/[Cretaceous](#)).



Next, ranging in age from Jurassic to the [Paleogene](#) and [Neogene](#) periods are the following:

- Among Jurassic to Cretaceous aged formations are the [Lupata Group](#), the [conglomeratic](#) sandstone of the Monte Mazambulo Formation, and the sandstone and [conglomerate](#) of the Tchazica Formation. Formations within the Lupata Group are the main source of fossils in Mozambique.
- The Cretaceous aged Sena Formation made up of conglomerate, minor sandstone (including a [thorium](#) sandstone member), and a basal conglomerate member.
- The sandstone and limestone of the Paleogene Mangulane Formation.

**Figure 4 – *Malawisaurus* sp. from the [Lupata Group](#)
Credit: CaptMondo, [Creative Commons Attribution-Share Alike 3.0 Unported](#) license**

- The limestone and [calcarenite](#) of the Paleogene to Neogene aged Cheringoma Formation.
- The sandstone of the Neogene aged Inhaminga Formation.
- The sandstone and conglomeratic sandstone of the Neogene Jofane Formation; the Cabe Member includes calcarenite, conglomerate and quartzite and some limestone.
- The Mazamba Formation (Neogene) made up of [arkosic sandstone](#) some of which is [conglomeratic](#).

The youngest deposits in Mozambique are [Quaternary](#) aged formations. These deposits include: [sand dunes](#) (both on the coast and in the interior), [alluvium](#), [lacustrine limestones](#), [marine reef](#) and [bioclastic sediments](#), [sand](#) and [gravel](#).

Mineral Resources



Figure 5 - [Moatize Coal Mine](#), Tete Province, Mozambique

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

According to the [USGS Minerals Yearbook for Mozambique](#), the [mineral industry](#) of Mozambique includes production of metallic minerals, industrial minerals (including gemstones), and fuel minerals. The most current production statistics from the USGS can found [here](#).

Metallic Minerals

Metallic minerals are mined in Mozambique by formal industrial operations as well as by artisanal miners, the commodities extracted include:

- **Bauxite**, the primary ore of aluminium, is mined at the [Mina Alumina mine in Manica Province](#).
- **Gold** is mined by artisanal miners in [Manica Province](#) as well as the [Manica Gold Project](#) mine.
- **Niobium (columbium), tantalum, and columbite-tantalite** are mined by artisanal miners in the [Mujane Pegmatite](#), found in Zambezia Province together with the [Marropino Mine](#) operated by Noventa Group, also in the Zambezia Province.

Gemstones



Figure 6 – Garnet Gemstones from Mozambique

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

Artisanal miners dig up many of the gemstones produced in Mozambique; these include garnets, rubies, and tourmaline from various locations. Industrial mining operations for gemstones include:

- **Aquamarine** from mines in the [Mavuco Province](#).
- **Garnet** from the [Vision 2000 Lda mine in Cuamba](#).
- **Ruby** from [Montepuez ruby deposit](#) the Cabo Delgado Province.

Also of note: a copper bearing **tourmaline** has been reported in the the [Alto Ligonha pegmatite district](#).

Other Industrial Minerals

Mozambique also produces a variety of other industrial minerals:

- **Bentonite** clay is mined by [Minerais Industriais de Moçambique Lda. at Mafuiane, Maputo Province](#).
- **Beryl** is mined at the [Sominah mine, Uape, Gilé District, Zambezia Province](#).
- **Cement** is made at around [10 locations](#).
- **Diatomite** (*diatomaceous earth*) is mined at the [Diana quarry near Manica](#).
- **Graphite** at the [Ancuabe Graphite Project](#) and the [Balama Graphite Operation](#) in Cabo Delgado Province.
- Mineral concentrates of **Titanium and Zirconium** are mined at the [Moma Mine](#) in [Nampula Province](#) and by the [Haiyu Mozambique Mining, Co. Ltd.](#) at their mine in Manica Province.

Summary



Figure 8 – Guru, Mozambique

Credit: Armindo Pascoal Timóteo Culeco, [Creative Commons Attribution-Share Alike 4.0 International](#) license

A pretty tropical country with [a tragic history](#), Mozambique looks like a great place for mineral exploration. I expect there to be more offshore oil and gas exploration in the the Rovuma basin, such as the “supergiant discoveries” [announced last year](#). Industrial minerals such as graphite, niobium and tantalum are also likely to be good prospects given their status as critical minerals for electronics. If you like pretty rocks (who doesn’t?), Mozambique is likely to remain a steady source of gemstones.

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.