

September 29, 2025

News and notes



Beefsteak tomato in my Garden, September 23, 2025

This week, before going on to discuss the geology and mineral resources of [Mali](#), we will first look at some news items I thought were interesting. If you enjoy my blogs, bookmark the site and check Monday mornings rather than relying on social media postings which can get lost in the shuffle.

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

- [Leaked Files Show Russia Agreed to Train Chinese Paratroops for Taiwan Invasion, Analysts Say](#); the [red horse](#) rides.
- [Trump has Maduro in his sights. Will it mean war in the Caribbean?](#) For reference: [Venezuela Oil: Oil Reserves 299,953,000,000 Barrels, Global Rank #1 in the world](#).
- USA: [Prelude To A Second Civil War?](#)
- [U.S. Presses India: Cut Russian Oil Imports or Watch Trade Deal Slip Away](#).
- [Why Saudi Arabia signed a defense pact with Pakistan](#).
- Global trade: [Drying of the Panama Canal in a Warming Climate](#); Phys.org summary [here](#).

Research and News

- Carbonate mineralogy: [Stable carbon isotope fractionation during the transformation of amorphous CaCO₃ at low water–solid ratios: impact of humidity and temperature.](#)
- [The First Three-Dimensional Electrical Resistivity Model of the Lithosphere Beneath Britain.](#)
- Zircon mineralogy: [Interpreting Europium Anomalies in Zircon: The Importance of Source Redox.](#)
- 09/26 Behind a paywall: [Insights into a synorogenic origin for REE-bearing carbonatites in the Central Metasedimentary Belt Boundary Zone of the Grenville Province.](#)
- Rock deformation: [Kink strengthening and rank-1 connection of crustal rocks.](#)
- [An improved criterion for the threshold of motion of sand to gravel-sized bioclastic carbonate sediments under steady unidirectional flow: Insights from coral skeletal grain experiments.](#)
- [Review of Oxfordian \(Upper Jurassic\) sequence stratigraphy of England \(Yorkshire to Dorset\) and a comparison with the North Sea Basin.](#)
- [A night at the opera: the prestigious fate of green fluorite from the Voltennes mine, la Petite-Verrière, France.](#)
- [Genesis of cookeite, the primary lithium mineral in the Late Carboniferous strata of the North China Craton.](#)
- [Contrasting Seismic Velocity and Compaction of Marine Calcareous Oozes and Volcaniclastic Deposits on the South Aegean Volcanic Arc.](#)
- [Formation of low-Ti and high-V magnetite in iron oxide-apatite mineralization by fluid-aided alteration: insights from Baixiangshan deposit, Eastern China.](#)
- History of geology: [Goldschmidt's geochemical classification of the elements: The evolution of a nuanced hypothesis](#); also listen to [Episode 45 of Bedrock: A Podcast on Earth's Earliest History.](#)
- Oxide mineral: [Framework response to local order in hollandite.](#)
- Dendrochronology: [Sycamore Gap: Recovery and initial analysis of a wood slice from the Sycamore Gap Tree](#); Smithsonian Magazine summary [here](#).

Diamonds on the Soles of Her Shoes

- Artificial diamonds; [Earth needs a billion years, China needs a week - More than 20,000,000 roll off the line.](#)
- Mantle processes: [Diamonds at the redox frontier](#); behind a paywall
- [Redox state of the deep upper mantle recorded by nickel-rich diamond inclusions](#); Science Daily summary [here](#).

- Musical reference [here](#).

Plate Tectonics

- [Permeability of the Pāpaku Fault Within the Hikurangi Subduction Zone Determined From the Thermal Response to a Free Flowing Well Test.](#)
- [Permo-Carboniferous crustal structure and state of strain in the New England Appalachians, USA.](#)
- [Presence of continental slivers in oceanic transform faults determined by rift inheritance.](#)
- [Mode of Continental Thinning and Breakup Along the North Iberian-Armorican Conjugate Margins in the Bay of Biscay.](#)
- 09/24 [Understanding Sub-Lithospheric Small-Scale Convection by Linking Models of Grain Size Evolution, Mantle Convection, and Seismic Tomography.](#)
- [Slab tearing and segmented subduction termination driven by transform tectonics.](#)
- [Authigenic titanite constraints on fast Mesoproterozoic basin formation in hot Antarctic crust.](#)
- [Early Emperor seamount evolution and geotectonics of the northwestern Pacific plate.](#)

Paleontology

- [Cairo Fossil Forest: The oldest forest in North America with 385 million-year-old trees; video tour \[here\]\(#\) since the site is not open to the public.](#)
- [A new *Eurhinosaurus* \(Ichthyosauria\) species from the Lower Jurassic \(Toarcian\) of Mistelgau \(Bavaria, Southern Germany\); SciNews summary \[here\]\(#\).](#)
- [A new multituberculate \(Mammalia, Allotheria\) from the Lulworth Formation \(Cretaceous, Berriasian\) of Dorset, England.](#)
- [On a coal specimen possibly associated with the classical Mio-Pleistocene São Jorge leaf bed site, Madeira Island, Portugal.](#)
- [Fecal Biomarkers in Soils Record Landscape-Scale Wild Herbivore Abundance.](#)
- [After the \[earth shattering kaboom\]\(#\): A Review of Onychophoran Phylogenetic Studies Reveals Resilience of Soil Ecosystems to the Chicxulub Impact Event.](#)
- [New U-Pb zircon dates reveal a late Norian age for the upper part of the Red Cliff Coal Measures, New South Wales, Australia—implications for biostratigraphy.](#)
- [New specimens of the arthrodire *Bullerichthys fascidens* Dennis and Miles 1980 show incipient site-specific osteichthyan-like tooth addition and resorption.](#)

- [A new, diminutive, heterodont neosuchian from the Vaughn Member of the Blackleaf Formation \(Cenomanian\), southwest Montana, and implications for the paleoecology of heterodont neosuchians.](#)
- [Oldest winged insects: first Megasecoptera from the early Carboniferous \(Serpukhovian\) of Argentina.](#)
- [The braincase anatomy of *Simosaurus gaillardoti* \(Diapsida: Sauropterygia\) revealed with X-ray micro-computed tomography.](#)

Mining and Energy

- Petroleum geology: [Prediction method of vertical sealing evolution form and distribution position of oil source faults.](#)
- [Exxon Confirms Significant Reserves at Cyprus Gas Discovery.](#)
- Mergers and acquisitions: [B.C. mining group, experts support Teck-Anglo American merger.](#)
- Gold in California: [Five people caught for illegal suction dredge mining in Siskiyou County.](#)
- [‘Never lived up to its promises’: \\$3.3 billion solar plant in California scheduled to be turned off after years of wasted money.](#)
- Whereas in Brazil: [Distributed solar generating capacity is the fastest-growing power source in Brazil.](#)
- Nuclear energy: [Twenty-year renewal sees Darlington become longest-licensed Canadian plant.](#)
- Things that go boom: [New detonator plant for miners opens near Sudbury.](#)
- Geological hydrogen research: [Magnetotellurics Point to Serpentinization as a Potential Source of Hydrogen in the Bulqizë Ophiolite.](#)
- More geological hydrogen research: [CH₄-He-H₂-Rich Fluids Associated With the Intrusive Rocks of the Mid-Continent Rift System in Minnesota \(USA\).](#)
- [Fracking](#) research: [Seismic Modelling of Sandstone Intrusions With Unresolvable Geometry.](#)
- [Coal Ash to Criticals: How Close Is Hydromet to Prime Time?](#)
- Bauxite processing improvements: [American researchers have removed a major thorn in humanity’s side with a discovery that could eradicate “red mud”.](#)
- [Billions in gold beneath Timmins, says Discovery CEO.](#)
- [Lithium Americas soars 95% as Trump administration seeks equity stake in Canadian miner.](#)
- Namibia: [Why Africa’s Largest Untapped Oil Field Has Yet to Flow.](#)
- [US agency wants to buy scandium oxide from Rio Tinto for defence stockpile.](#)

- [North Sea 'has three times more oil and gas' than Government claims.](#)

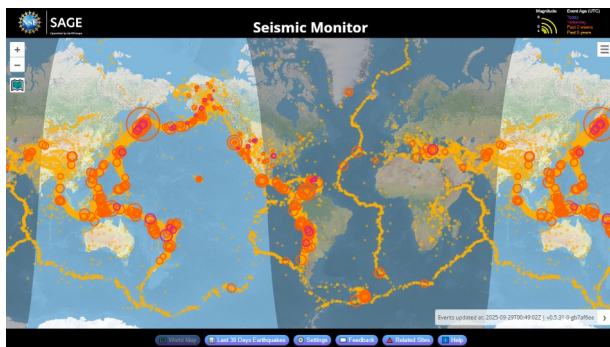
Environmental Geology and Hydrogeology

- [Different scales of electron transfer processes in the subsurface](#); Phys.org summary [here](#).
- [Quantifying the Impact of Groundwater on Ice Formation in the Great Lakes](#); Phys.org summary [here](#).

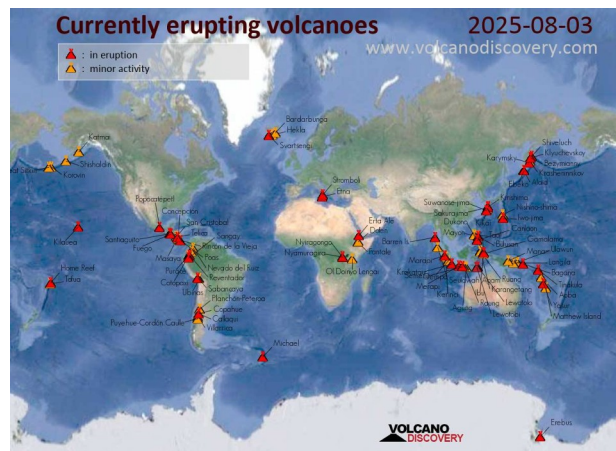
Glaciers and Climate Change

- [Rift-Related Sedimentary Basin and Deeper-Seated Mafic Intrusions Modeled Beneath Thwaites Glacier, West Antarctica: Influence on Glacier Dynamics.](#)
- [Limited warming of middle Miocene arid low-latitude climates: Application of clumped isotopes in sabkha environments.](#)
- Glacial geology: [Eskers formed in the soft-bed region – a comprehensive study of Late Saalian strata from Poland](#); Saalian glaciation summary [here](#).

Volcanoes, Earthquakes and Geohazards



[Seismic Monitor](#)



[Active Volcano Map](#)

Volcanoes

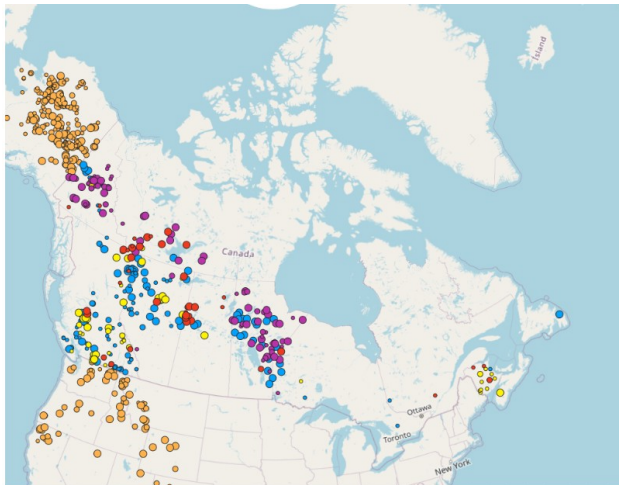
- [Smithsonian / USGS Weekly Volcanic Activity Report.](#)
- United States Geological Survey (USGS) Volcano Observatories:
 - [Cascades Volcano Observatory Weekly Update.](#)
 - Volcano Watch – [Lava, Logs, and Loose Cows: The Wild Job of HVO's Technicians.](#)
 - Yellowstone Caldera Chronicles: [Some like it hot! Studying thermophiles in Yellowstone National Park.](#)

- [Geodynamic controls on slab window volcanism: Insights from the spatiotemporal evolution of the Coast Range Volcanics, California, USA.](#)
- Axial Seamount: [Underwater Volcano Will Erupt off the Oregon Coast by the End of 2025](#)".
- [Volcanic crisis reveals coupled magma system at Santorini and Kolumbo](#); Phys.org summary [here](#).
- [Supercritical fluid flow through permeable window and phase transitions at volcanic brittle–ductile transition zone](#); Phys.org summary [here](#).

Earthquakes

- [Euro-Mediterranean Seismological Centre \(EMSC\)](#).
- [Earthquakes Monitoring Live Worldwide](#).
- Glacial rebound earthquakes: [Influence of Glacial Isostatic Adjustment on Intraplate Stress and Seismicity in Eastern North America in the Presence of Pre-Existing Weak Zones](#).
- [Several large earthquakes strike northwestern Venezuela](#); USGS summaries [here](#), [here](#), [here](#), [here](#), and [here](#).
- [M4.3 earthquake rattles Berkeley, CA](#); USGS summary [here](#).
- [Identifying obscured faults in urban areas: insights from Tāmaki Makaurau Auckland, Aotearoa New Zealand](#); Eos summary [here](#).

Wildfires and Other Geohazards



Interactive Wildfire Map September 27, 2025
Credit: ©Canadian Wildland Fire Information System

- [Artificial intelligence helps scientists identify 3000 moving slopes potentially at risk of landslide.](#)
- [NASA satellites track Pacific tsunami in real time after massive Russian earthquake.](#)

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; also they now have a [Free Online Learning Module: Pumping Test Analysis](#).
- Free Groundwater Modeling Course – [HydroGeoCenter](#).
- From Western Australia: [Carbonatite, lamprophyre and host rocks in the northern Aileron Province](#).
- Two volumes of Geology of Indonesia now can be accessed for [FREE/GRATIS](#). The books can be accessed from: vol 1 <https://lnkd.in/eH6Gcka4>; vol 2 <https://lnkd.in/egTYmpjk>.
- 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

- Beginning today: [29 September – 1 October 2025, Stuttgart, Germany, Nature Conference on Advancing Perovskite-Based Photovoltaics](#).
- [Thursday 2nd October 2025, Early Career Hydrogeology Conference 2025, Leeds U.K.](#)
- Australia: [12–18 October 2025, Earth Science Week](#).
- November 3 – 4, 2025 [Central Canada Mineral Exploration Convention 2025](#) Victoria Inn Hotel & Convention Centre, 1808 Wellington Avenue, Winnipeg, Manitoba R3H 0G3, Canada, Early Bird pricing is in effect until midnight October 1.
- [5th International Professional Geology Conference \(IPGC\), November 5 to 7, 2025, Zaragoza, Spain](#).
- [Saskatchewan Geological Open House, December 1 to 3, 2025, Delta Bessborough Hotel, Saskatoon](#); Registration for the 2025 Conference now open.
- [Groundwater Week 2025, December 9-11, 2025 in New Orleans](#).
- [GAC-MAC 2026 St. John's NL, St. John's Convention Center, May 25-28, 2026](#).
- [Society of Petroleum Engineers Distinguished Lecturer Schedule](#).
- [American Geophysical Union List of Upcoming Meetings](#).
- The Geological Society: [Events & Courses](#).
- [International Union of Geological Sciences calendar of geoscience events](#).
- [“Geology Hour” Online](#), evenings on the 3rd Monday of the Month from the Geological Society of the Oregon Country.
- [Canadian Energy Geoscience Association Upcoming Events](#).

September 29, 2025

Geology and Mineral Resources – Mali

Introduction



Figure 1a – Mali

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



Figure 1b – Location of Mali

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

A former [French](#) colony, [Mali](#) is a landlocked country of 21,990,607 people in [West Africa](#), much of which is within the [Sahel](#) region and the [Sahara Desert](#). The country has an area of 1,240,192 square kilometres and borders on: to the north by [Algeria](#); to the northwest by [Mauritania](#); to the west by [Guinea](#) and [Senegal](#); to the south by [Burkina Faso](#) and [Côte d'Ivoire](#); and to the east by [Niger](#). Mali is a relatively poor country with a per capita [GDP \(PPP\)](#) of \$2,930 and a low [Human Development Index](#) of 0.419. For more details on the country, check out the [CIA World Factbook on Mali](#) as well as the [Wikipedia](#) article on the country.

Geology

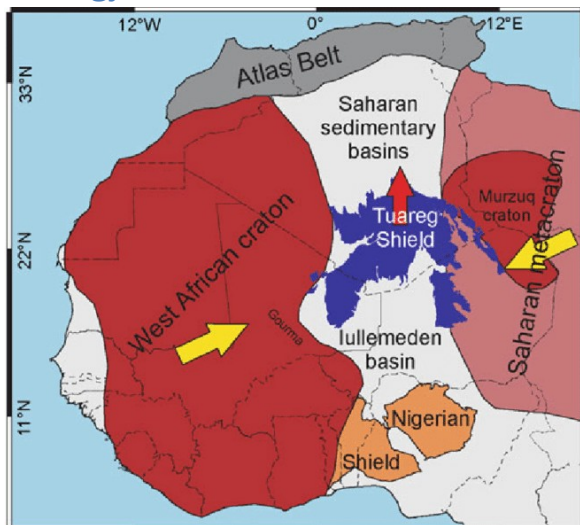


Figure 2 – Tectonic Map of West Africa

Credit: Figure 1 in [Liégeois, 2019](#)

Mali sits on the [African Plate](#). Much of the country sits on a subset of the African plate, the [West African Craton](#). The eastern part of Mali sits on the [Iullemeden Basin](#) and the [Tuareg Shield](#).

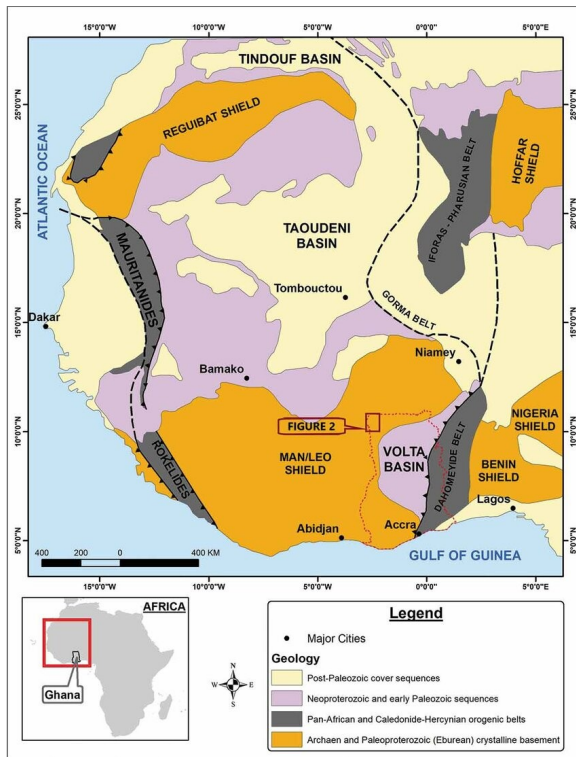


Figure 3 – Components of the West African Craton
Credit: Figure 1 in Asiedu et al, 2019

The [West African Craton](#) in Mali ranges in age from [Archean](#) to [Neoproterozoic](#). The core of the West African Craton are three Archean aged cratons: [Leo-Man-Ghana Craton](#), [Taoudeni Basin](#), and [Reguibat Shield](#). These cratons were brought together by a series of orogenies, including the [Paleoproterozoic](#) aged [Eburnean Orogeny](#) and the Neoproterozoic aged [Pan African Orogeny](#). The Leo-Man-Ghana Craton includes primarily granitic and metamorphic rocks that are part of the [Birimian terranes](#). In Mali the Birimian terrane includes [significant gold deposits](#). The [Taoudeni Basin](#) is a [major sedimentary basin](#) that formed during the [Mesoproterozoic](#) to Neoproterozoic and includes younger [Mesozoic](#) and [Paleozoic](#) deposits. The rocks of the Reguibat Shield are found northwest of the Taoudeni Basin and are mostly [granitic](#) rocks.

The [Tuareg Shield](#) is mainly composed of Archean and [Proterozoic](#) terranes that amalgamated during the Pan African orogeny. In Mali, the [Tilemsi Belt](#) is a [magmatic arc](#) that formed along a suture zone during the Pan African Orogeny.

The [Iullemeden Basin](#) is an [intracratonic basin](#) located in Mali, Niger, Benin, and Nigeria. The basin consists of [Cretaceous](#) to [Paleocene](#) sediments overlying older basement rocks. The deposits of the Iullemeden Basin may have [potential petroleum deposits](#).

Figure 4, below, summarizes the surficial geology of Mali.

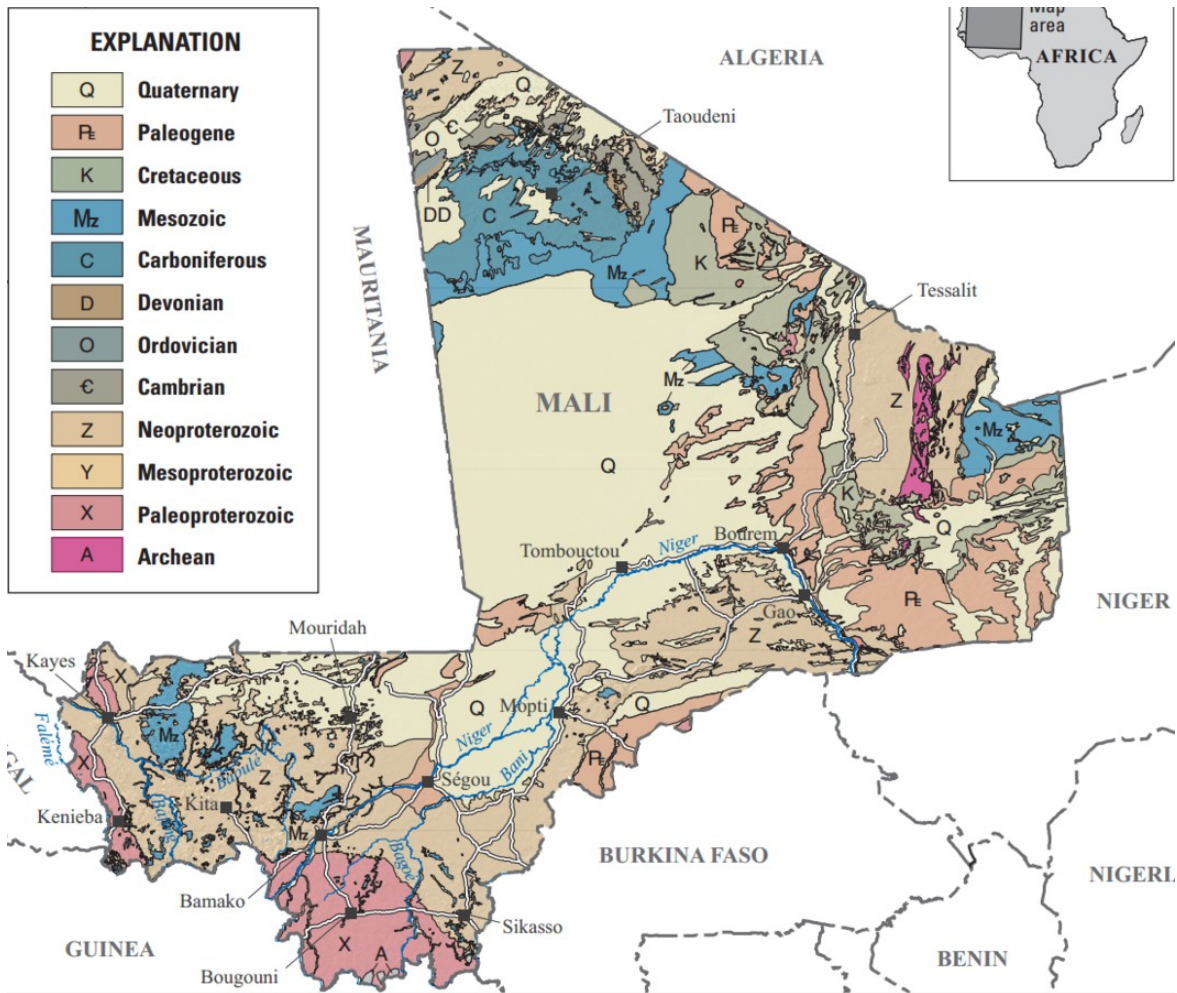


Figure 4 – General Surficial Geology of Mali

Credit: [Chirico et al, 2010](#), public domain

Digging (pun implied) further into the geology of Mali, the various lithologies in the country are as follows:

- Among the oldest Archean and Paleoproterozoic rocks are metamorphic [gneiss](#), [mica schist](#), and [quartzite](#) that were originally [shale](#), [arkose](#), [greywacke](#) and [conglomerate](#). Interbedded with these metasedimentary rocks are [greenstone](#) belts: metamorphosed [basalt](#), [gabbro](#), [dolerite](#), [rhyolite](#) and [tuff](#). Interspersed among these metamorphic rocks are granitic [intrusions](#) including [pegmatites](#).
- Next in age, among the younger [Proterozoic](#) aged rocks are metamorphosed [sandstones](#), with varying amounts of [mudstone](#) and [limestone](#).
- Paleozoic aged sedimentary rocks, ranging in age from [Cambrian](#) to [Carboniferous](#), include sandstone, limestone and shale.
- Dolerites intrusion date from the [Permian](#) to the [Triassic](#) Period.

- [Lower Cretaceous](#) aged continental sediments include sandstone, conglomerate and arkose with some [clay](#).
- [Upper Cretaceous](#) marine sediments include limestone, containing varying amounts of [marl](#), predominates at the base of the sequence together with sandstone and clay towards the top of the sequence.
- [Neogene](#) marine sediments consist of sandstone and [unconsolidated](#) sand, sometimes called the [Continental Terminal](#) formations.
- The most recent deposits are are [Quaternary](#) aged surficial [desert deposits](#) and [alluvial deposits](#) associated with the Niger River.

There are plenty of research papers on the geology of Mali. If this interests you, follow the links for a start.

Mineral Resources



Figure 5 - Work at the [Sadiola Gold Mine](#) in Mali
Credit: [Iamgold](#), [Creative Commons Attribution-Share Alike 3.0 Unported](#) license

[Historically](#), Mali was known for its gold deposits, and gold remains important today; accounting for 80% of mineral production in Mali. This [site](#) discusses the locations, discoveries, viability, export potential, and economic impact of Mali's natural resources.

According to the most recent [USGS Minerals Yearbook](#), the mineral industry of Mali consists of three main commodities: gold, cement, and phosphate rock.

Gold producers in Mali include:

- Artisanal production in the [Kéniéba Valley](#), artisanal gold production is often [dangerous](#) in this area;
- The [Tabakoto-Segala Mine](#), also in the Kéniéba Valley;
- The [Morila Mine](#), 180 km southeast of [Bamako](#);
- The [Sadiola Hill Mine](#), in the [Kayes](#) region;
- The [Kalana Mine](#), 250 km south of Bamako;
- The [Loulo-Gounkoto Mine](#), in [western Mali](#); and
- The [Syama Mine](#), 300 km southeast of Bamako.

[Phosphorite](#) is found in the [Tilemsi Valley](#) of eastern Mali and is currently under development. Cement production is also under development at [Natién, Sikasso region, in southeastern Mali](#). Other mineral resources known to occur in Mali, but not currently developed include: bauxite, diamonds, gypsum, lithium, and uranium. The most recent USGS statistics on mineral production in Mali are [here](#).

Another important mineral resource in Mali, not discussed in the USGS reports but vital in a desert and semi-desert country like Mali is groundwater. According to the [British Geological Survey's report on the hydrogeology of Mali](#), the total groundwater resource in Mali is estimated at 2.7 trillion m³ while groundwater exploitation, primarily for drinking water supply, is estimated to be 66 billion m³.

Figure 6 links to an interactive mineral occurrence map of Mali.

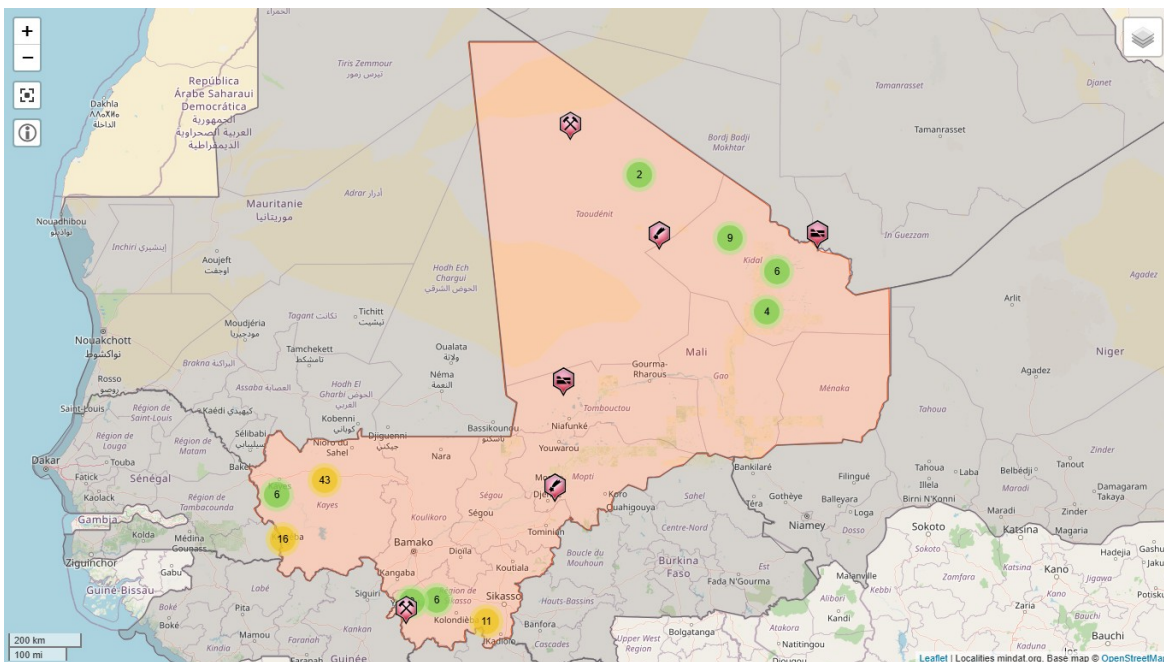


Figure 6 – Interactive Mineral Occurrence Map of Mali

Credit: ©Mindat.org

Summary



Figure 7 – Shore of the River Niger in Mali

Credit: [Jeanne Menjoulet, Creative Commons Attribution 2.0 Generic license](#)

Mali looks like an interesting place for a geologist. There are plenty of opportunities to find new deposits and the government recently [approved seven new projects](#) for [gold and lithium](#).

There have been problems, however.

For one, the country is in a [civil war](#) between members of [various rebel groups](#) (about 24) and the central government. Until 2023, the central government was aided this struggle by [United Nations peacekeepers](#), who left that year. Beginning in 2022, the Russian [Wagner Group](#) was contracted to help the government. This past June, a new Russian mercenary organization, calling itself [Africa Corps](#) (a name of [evil repute](#)), took over Wagner's mission for the central government. Wagner's time in Mali was marked by [numerous human rights abuses](#). Africa Corp is unlikely to be any different since they absorbed a lot of the former Wagner employees into their organization. Three Canadian mining companies, [Barrick Gold, B2Gold Corp, and Allied Gold Corp together with Australian company Resolute Mining](#) were accused of being in league with the Wagner Group in 2023.

Not like it did [Barrick Gold](#) any good. Last November, Barrick's [executives in Mali were jailed](#). Currently, the government is [appealing their release](#) on bail. The Mali government also seized gold produced by Barrick's mine at Loulo-Goukoto, some [three tonnes in January 2025](#) and, more recently, about a [tonne in July](#). Barrick suspended their operations in Mali in [January 2025](#) and the Mali government [seized Barrick's offices in April](#). You can peruse the timeline of their dispute [here](#).

The [ruling junta of Mali](#) and their mercenaries aren't the only bad actors within the gold business in Mali. When [geologist James C. Snell](#) finished his [fieldwork for Iamgold](#) in 1981, his report laid out the basis for the [Sadiola Gold Mine](#). Instead of rewarding Snell for his work, the President of [Iamgold, Mark Nathanson](#), took personal credit for the discovery and proceeded to develop the property. Snell was subject to [murder attempts](#) and never received payment for his work. Driven mad by the abuse and frustration with legal processes that never ended, Snell took his own his life in 2008.

That's it for this quick look at Mali. If you plan to work in Mali, you've been warned. If any of this interests you, check up on the links above.

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.