

January 13, 2025

News and notes

This week I am going to follow up on a comment from Marcus S. to the effect that I should take a closer look at the [Simandou Iron Deposit](#) in Guinea; so that will be the main subject of this week's posting. But before we get on to that, here are some news items I thought were interesting.

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.

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](#).
- Free Groundwater Modeling Course – [HydroGeoCenter](#).

Geopolitics

- [China and India Stand To Lose From U.S. Sanctions on Russian Oil Trade](#).
- 01/10 [US slaps new sanctions on Venezuela officials as Maduro inaugurated](#).
- 01/09 Organized crime and geopolitics: [Japanese Crime Boss Pleads Guilty in Plot To Sell Nuclear Material To Iran](#).
- 01/09 From The Conversation: [How the U.S. could in fact make Canada an American territory](#); or as one great American said “I’ll make him an offer he can’t refuse”; related stories [here](#) and [here](#).
- 01/09 [Trump’s Greenland Stunt Leaves Brussels Speechless](#); see also Whitney Webb’s [tweet on X](#).
- 01/09 [Documenting a coastal sediment routing tract in the sedimentary record: Implications for coastal palaeogeography and sand distribution patterns](#).
- 01/09 [Features and dolomitizing mechanisms in inner platform facies across the Permian–Triassic boundary \(External Dinarides, Croatia\)](#).
- 01/08 Resource wars: [Russian Army Inches Towards Large Lithium Deposit in Ukraine](#).
- 01/07 [It Begins: China Cuts Undersea Internet Cables to Taiwan](#).
- 01/06 [Barrick to halt Mali mine amid fresh export restrictions](#).

Research and News

- Mineralogy and carbon capture: [Transition of CO₂ from Emissions to Sequestration During Chemical Weathering of Ultramafic and Mafic Mine Tailings](#).
- More mineralogy: [Anomalous thermal expansion of cordierite, Mg₂Al₄Si₅O₁₈, understood through lattice simulations](#); Phys.org summary [here](#).
- Varves: [Jurassic intercalated micrite and quartz silt lagoonal laminae: Cyclostratigraphic deposition indicative of Schwabe 11-year solar cycles](#).
- Fluvial geology: [The impact of high discharge variability on sedimentology and architecture of bar deposits in the meandering Powder River \(Montana, USA\)](#).
- [Explore forty-two years of field notes from the Loch Vale watershed, Rocky Mountain National Park](#).
- [The sedimentological signature of impact spherules and its relation to ejecta transport mechanisms during the Chicxulub asteroid impact \(Cretaceous/Paleogene boundary\)](#).
- [Channeled Scablands, Northwest U.S., and Runnable Mental Models](#).
- Geophysics: [Full-waveform inversion reveals diverse origins of lower mantle positive wave speed anomalies](#); Phys.org summary [here](#).
- Neat video: [Zanclean Flood of the Mediterranean in Sicily – computer animation](#).

Plate Tectonics

- [Subsurface structure of a foreland basin from analysis of gravity and aeromagnetic data: Revealing the basement structure of Gharb Basin, NW Morocco](#).
- [Kinematics of Active Deformation and Possible Segmentation of Seismic Slip Along the Foothills of the Western Kunlun \(China\)](#).
- [The Colorado Rocky Mountains Awaken: Understanding Topographic Rejuvenation in Postorogenic Mountain Belts](#).
- [The Neogene–Quaternary volcanism of the Carpathian–Pannonian region: from initial plate tectonic models to quantitative petrogenetic explanations](#).

Paleontology

- [A new assemblage of Lower Triassic neoselachians \(Chondrichthyes\) from the Grippia Bonebed of Spitsbergen, Norway](#).
- [Comparative analysis of cleaning techniques and their impact on *Meriones* rodent teeth from Kaldar Cave \(Iran\)](#).
- [Preservation and early evolution of scalidophoran ventral nerve cord](#); Phys.org summary [here](#).
- [A new ornithomimid theropod from the Upper Cretaceous Bissekty Formation of Uzbekistan](#).

- [First record of *Borealosuchus sternbergii* from the lower Paleocene Denver Formation \(lower Danian\), Colorado \(Denver Basin\).](#)
- Here kitty, kitty: [Functional optimality underpins the repeated evolution of the extreme “saber-tooth” morphology](#); summary in The Conversation [here](#).
- [Marine strontium isotopes preserved in fossil shark teeth calibrate Neogene land mammal evolution.](#)
- Essay: [90 Million Years Ago, Antarctica Had A Lush Rainforest And Dinosaurs.](#)
- [Rethinking dinosaur origins: oldest known equatorial dinosaur-bearing assemblage \(mid-late Carnian Popo Agie FM, Wyoming, USA\); SciNews summary \[here\]\(#\).](#)
- [Multiproxy synthesis at the Arlington Archosaur Site: New insights into Cretaceous paralic paleoenvironments and regional stratigraphy, Woodbine Group, Texas, USA.](#)
- [Adaptive responses in Cambrian predator and prey highlight the arms race during the rise of animals](#); behind a paywall, SciTechDaily summary [here](#).
- [A giant specimen of *Rhamphorhynchus muensteri* and comments on the ontogeny of rhamphorhynchines.](#)
- [Visualizing and quantifying biomineral preservation in fossil vertebrate dental remains.](#)

Ore Deposit Geology

- [Evolution of the Hydrothermal Fluids Inferred from the Occurrence and Isotope Characteristics of the Carbonate Minerals at the Pogo Gold Deposit, Alaska, USA.](#)
- [The origin of lithium in hydrothermally overprinted Li-rich strata in the Mesoproterozoic Wumishan Formation: Insights from radiogenic and stable isotopes.](#)
- [Failed genesis of a Fe-skarn deposit caused by redox states of intrusion and wall rocks \(Torre di Rio, Island of Elba, Italy\).](#)
- [Sulfide-rich continental roots at cratonic margins formed by carbonated melts](#); SciTechDaily summary [here](#).

Mining and Energy

- [Two Nuclear Microreactors Reach Milestone Westinghouse and Radiant are developing some of the world's smallest reactors.](#)
- Black market: [Congo rebels muddy minerals market with illegal Rwanda exports, says UN report.](#)
- [Canada Rare Earth signs deals to buy permitted refinery, co-develop mine project in Laos.](#)
- Papua New Guinea: [K92 Mining shares soar on record-breaking gold production.](#)
- [Alaska sues Biden administration over oil and gas leases in Arctic refuge.](#)

- [Cameco Faces Uranium Production Halt at JV Inkaï Following Regulatory Delay.](#)

Environmental Geology and Hydrogeology

- [Toxic traces of lead mining in Missouri are hard to erase.](#)
- [EPA Begins Five Chemical Risk Evaluations Under Toxic Substances Control Act.](#)
- [Unravelling groundwater–stream connections over the continental United States; Phys.org summary \[here\]\(#\).](#)
- [Japanese researchers develop method to break down PFAS 'forever chemicals'.](#)
- New topsoil geochemistry data from the [British Geological Survey](#).
- [Pan-European atmospheric lead pollution, enhanced blood lead levels, and cognitive decline from Roman-era mining and smelting; Phys.org summary \[here\]\(#\).](#)

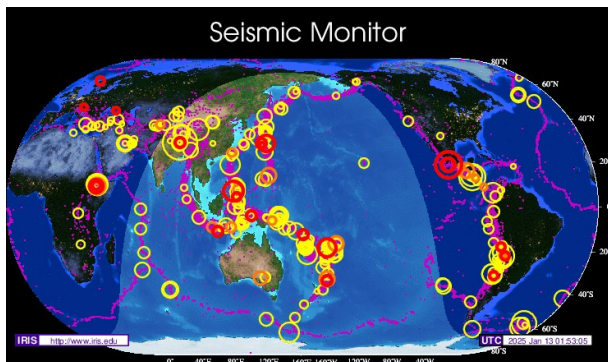
Glaciers and Climate Change

- [Media Release: Landmark Research Project Discovers more than 1.2-Million-Year-long Ice Core.](#)
- [Rapid rise in atmospheric CO2 marked the end of the Late Palaeozoic Ice Age; summary from The Conversation \[here\]\(#\).](#)

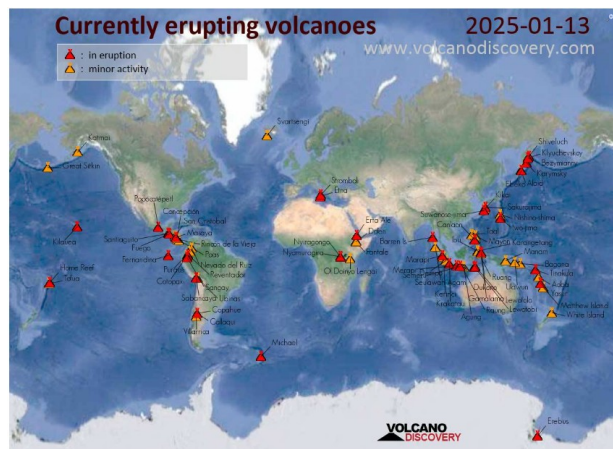
Geologists in the News

- [How a beloved geology professor's bond with a former student transcends illness.](#)

Volcanoes, Earthquakes and Geohazards



[Seismic Monitor](#)



[Active Volcano Map](#)

Volcanoes

- United States Geological Survey (USGS) Volcano Watch: [The pressure is on, within Kilauea and for volcanologists to foretell what's next](#); Also, photo from [January 3, 2025 – Kilauea Overlook within Hawai'i Volcanoes National Park](#)

- USGS Yellowstone Volcano Observatory: [Looking back on geological activity in Yellowstone during 2024](#).
- [Smithsonian / USGS Weekly Volcanic Activity Report](#).

Earthquakes

- [Euro-Mediterranean Seismological Centre \(EMSC\)](#).
- [Earthquakes Monitoring Live Worldwide](#).
- Research: [Revisiting the dip-slip rate of the North Tehran Fault \(Northern Iran\) through studying the faulted materials and geomorphic markers](#).
- More research: [How frictional ruptures and earthquakes nucleate and evolve](#); behind a paywall, Phys.org summary [here](#).
- [Deadly M7.1 earthquake strikes Tibet](#); USGS summary [here](#); update [here](#).
- Even more research: [The Energy Space Density \(ESD\) Distribution: A New Approach to Reveal the Degree of Fracturing of the Crust in the Etna Region \(Italy\)](#).

Los Angeles Wildfires

- [Live updates: Fire crews in Los Angeles brace for winds as destroyed areas not safe yet](#).
- Video: [Los Angeles Wildfires – Latest on fires burning in Southern California](#).

Upcoming Events

- The Geological Society: [Events & Courses](#).
- [Williston Basin Petroleum Conference, April 28-30, Regina Saskatchewan](#).
- European Geosciences Union: [EGU General Assembly 2025, Vienna, Austria & Online 27 April–2 May 2025](#)
- [Sedimentary Geology and the Energy Transition Conference, June 2-5, 2025 – Salt Lake City, UT USA](#).
- [Geoscience Beyond Borders, GAC-MAC-IAH-CNC 2025 Ottawa, Ontario, May 11-14, 2025](#).
- [Society for Sedimentary Geology conference, Mountjoy IV – August 10-13, 2025, in Montreal, Canada](#).
- [Copper to the World Conference, Tuesday 26 – Wednesday 27 August 2025](#), in Adelaide, Australia; report on 2024 conference [here](#).
- 2024-2025 [Society of Petroleum Engineers Distinguished Lecturer Schedule](#).
- [List of geoscience events in 2025 from the International Union of Geological Sciences](#).
- [American Geophysical Union List of Upcoming Meetings](#).

January 13, 2025

Simandou Iron Range – Guinea

Following last week's posting of the geology and geopolitics of Guinea, a reader, Marcus S. from Australia, suggested that I take a closer look at the [Simandou Iron Range](#). So, in this posting let's take a quick look at this deposit and the related story of Banded Iron Formations. I will also give a list of references at the end of this posting.

Location

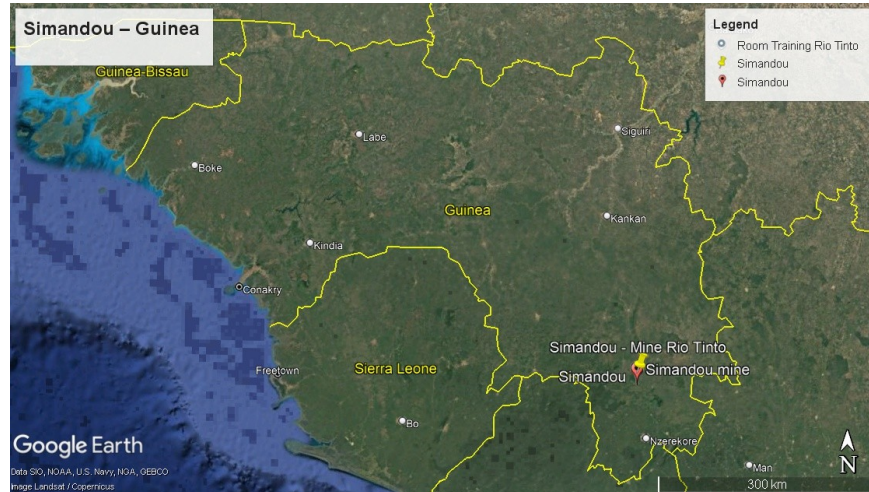


Figure 1 – Simandou, Guinea

[Credit: Google Earth](#)

The [Simandou Iron Range](#) is an 110 kilometre (km) long range of hills located in the [Guinée Forestière](#) region of southeastern [Guinea](#), about 530 km southeast of the national capital of [Conakry](#). The region is mountainous and heavily forested. At the south end of the range is the [Pic de Fon Mine](#), a high grade iron ore deposit.

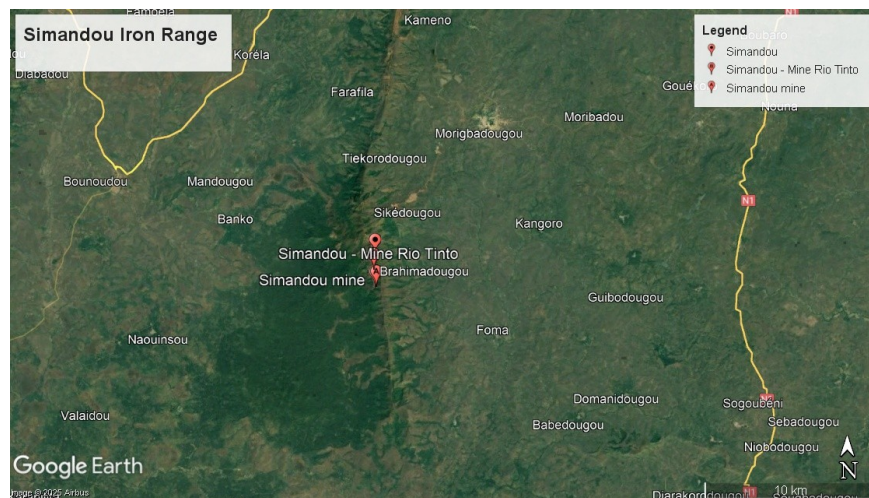


Figure 2 – Simandou Iron Range, Guinea

[Credit: Google Earth](#)

Geology

Regional Geology

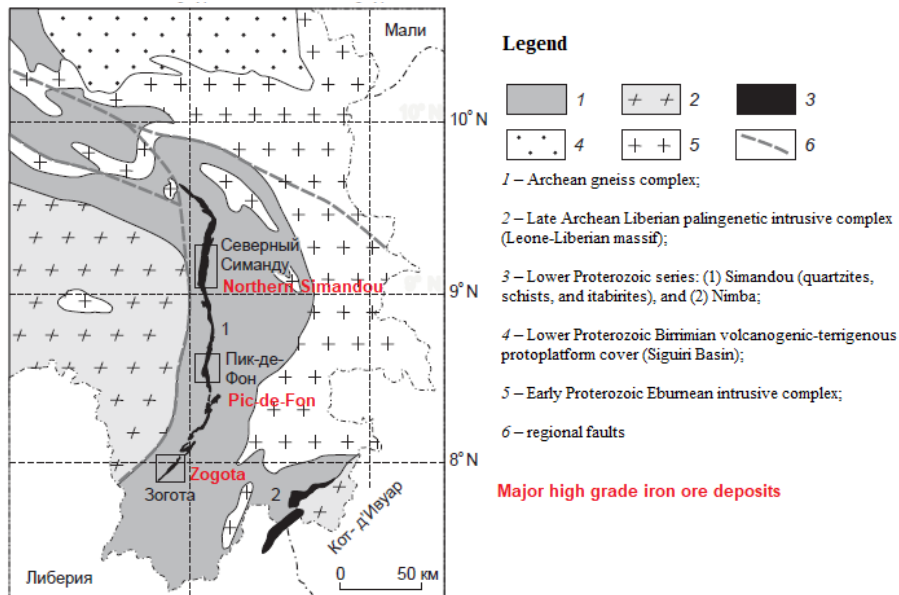


Figure 3 – Regional Geology, Simandou Iron Range

Credit: Figure 1 in Bolonin *et al*, 2023

The Simandou Iron Range sits within the [Man Shield](#) portion of the [West African Craton](#). The Range itself is a trough filled with [Banded Iron Formation](#) deposits dating from the [Lower Proterozoic Era](#). The surrounding rocks are an [Archean](#) aged [gneiss](#) complex. We will more closely examine the Range below.

The Archean gneiss complex includes [quartzites](#), [mica schists](#), [amphibolites](#) and [migmatites](#). To the west is the [Leone-Liberian Massif](#), a [Late Archean](#) intrusive igneous complex made up of [granodiorites](#), [granites](#), [tonalites](#) and [metagabbroids](#). To the east is another intrusive complex, the [Early Proterozoic](#) aged [Eburnean Complex](#) made up of [biotite granites](#) and granodiorites. Finally, to the north, is the Lower Proterozoic aged [Birrimian Complex](#) made up of [alkaline granites](#), [metavolcanics](#) and [metasediments](#).

A number of orogenies, mountain building events, have tortured the rocks in the vicinity of the Simandou Iron Range. These orogenies include the:

- The [Pre-Leonean and Leonean Orogeny](#) that occurred during the Archean 3.5 to 2.9 billion years ago (Ga);
- The [Liberian Orogeny](#) that also occurred during the Archean, 2.9 to 2.8 Ga; and
- The [Eburnean Orogeny](#) that occurred 2.15-1.8 Ga, following the deposition of the rocks of the Simandou Iron Range 2.5–2.1 Ga. Associated with the Eburnean Orogeny are [pegmatite](#) and [dolerite](#) intrusions.

Following the orogenies that affected the rocks of the Simandou Iron Range and in the vicinity, there was a long period, more than a billion years, of weathering. This weathering created [laterites](#) and [supergene](#) iron ore deposits. [Bolonin *et al*, 2023](#) identifies three main supergene iron ore deposits (Northern

Simandou, Pic de Fon, and Zogota) in the Simandou Iron Range, as in Figure 3. Rio Tinto, one of the companies interested in developing the Range, estimates that there are [2.8 billion tonnes of iron ore in the deposit](#).

Geology of the Simandou Iron Range



The [Banded Iron Formation](#) rocks that make up the Simandou Iron Range include both primary rocks and altered rocks, i.e. products of the weathering and oxidation of the primary minerals.

Primary rocks in the Range include:

- quartzites,
- [phyllites](#) and mica schists, and
- [itabirites](#).

Itabirites include: primary itabirite, which is made up of [quartz](#) and [magnetite](#); and amphibole itabirite, made up of quartz, magnetite, and [cummingtonite](#), a monoclinic [amphibole](#).

Figure 4 – Itabirite in Outcrop:

**a – unchanged (Northern Simandou);
b – oxidized (Zogota)**

[Credit: Figure 3 in Bolonin et al, 2023](#)

Altered rocks that were made as the result of the weathering of the primary rocks include:

- [illite-kaolinite](#) clay
- [martitized](#) itabirite
- quartz-[martite](#) friable ore;
- martite friable ore;
- martite-[limonite](#) friable ore; and
- [goethite-hematite](#) ore.

Figure 5, below shows cross-sections across two of the iron ore zones in the Simandou Iron Range: in the north at the Gaff prospects of Northern Simandou; and in the south Zogota.

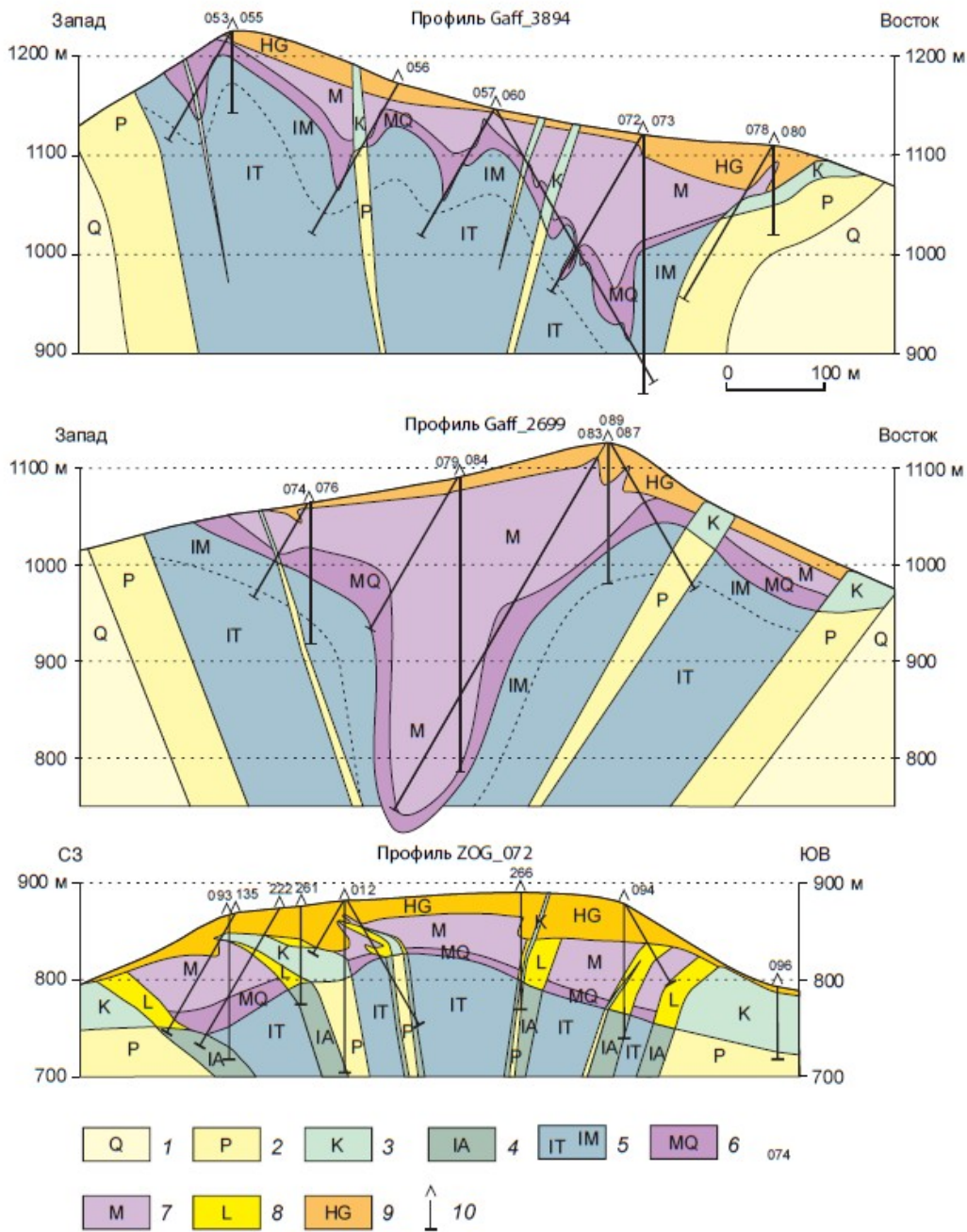


Figure 5 – Geological sections across the Northern Simandou (profiles Gaff_3894, Gaff_2699) and Zogota (profile ZOG_072) ore deposits:

1 – quartzites; 2 – phyllites and mica schists; 3 – illite-kaolinite clay; 4 – amphibole itabirite; 5 – itabirites: primary (IT) and martitized (IM); 6 – quartz-martite friable ore; 7 – martite friable ore; 8 – martite-limonite friable ore; 9 – goethite-hematite friable to solid ore; 10 – borehole and its number

[Credit: Figure 2 in Bolonin et al., 2023](#)

Banded Iron Formations

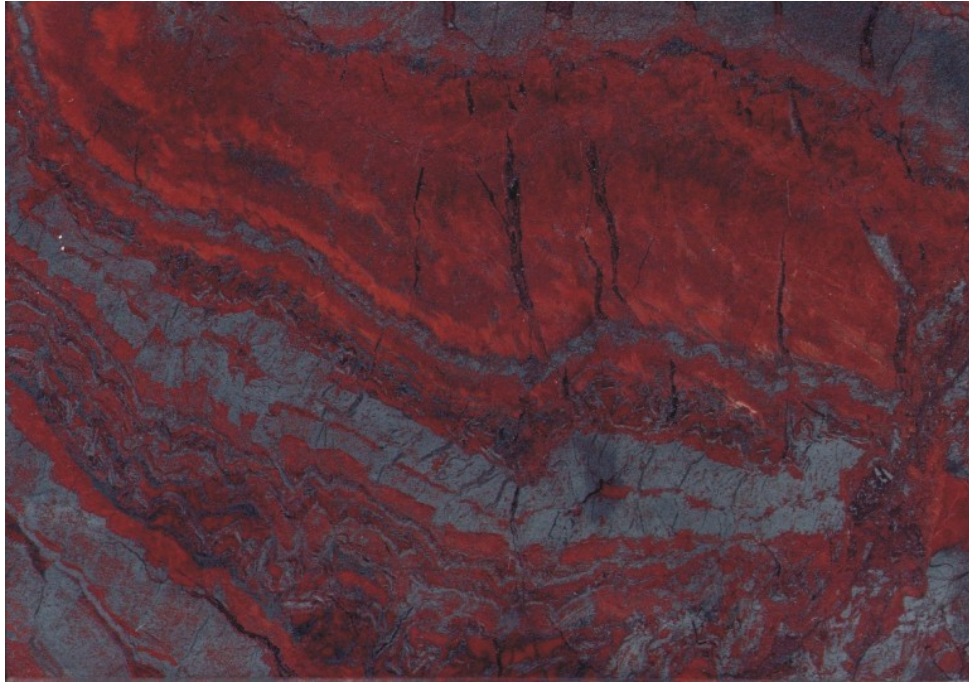


Figure 6 – Banded Iron Formation

Credit: [Lysippos](#), [Creative Commons Attribution 3.0 Unported](#) license

I discussed Banded Iron Formations (BIF) in two of my previous blog postings ([here](#) and [here](#)), but it is worthwhile to point out the basic facts about them here.

BIF are sedimentary deposits of containing alternating beds of quartz such as [chert](#) or quartzite and iron oxides. Other sediments can also be found in the BIF complex. All the BIF were formed during the [Precambrian](#) in a time period ranging from the [Mesoarchean](#) Era to the [Neoproterozoic](#). They also tend to be found in trough-like deposits. The time period of BIF deposition includes the [Great Oxidation Event](#) during the [Paleoproterozoic](#) and another [oxidation event during the Neoproterozoic](#).

The [origin of BIF](#) seems to be tied up with the radically different ocean and atmospheric chemistry of the time period in which they were deposited. Compared to today, the concentrations of oxygen in the ocean and atmosphere were very low, leading to a chemically reducing regime. Although oxygen producing organisms, such as [cyanobacteria](#), had evolved, they had not yet produced enough oxygen to change the atmosphere and oceans. Also, because of the chemically reducing conditions in the oceans, there was an abundance of dissolved iron (Fe^{+2}) in the ocean.

The combination of high concentrations of dissolved iron, say from hydrothermal vents, with cyanobacteria appears to be conducive to the deposition of BIF. The hydrothermal vents also led to the dissolution of quartz in the ocean water. The troughs in which the BIF were deposited are also likely to be associated with the tectonic activity that gave birth to the hydrothermal vents. The cyanobacteria released oxygen, which in turn combined with the dissolved iron to create a precipitate of iron oxide and quartz. When the dissolved iron oxide was used up, only quartz was precipitated.

The end of the Precambrian, and the beginning of the [Phanerozoic](#), coincides with a decrease in dissolved iron, and an increase in oxygen content, in the oceans sufficient to end the creation of BIF. However, conditions conducive to the [deposition of amorphous quartz](#), such as chert, continued after the end of the Precambrian.

BIF are the largest sources of iron ore in the world. Figure 7 shows the locations of the world's major BIF deposits.

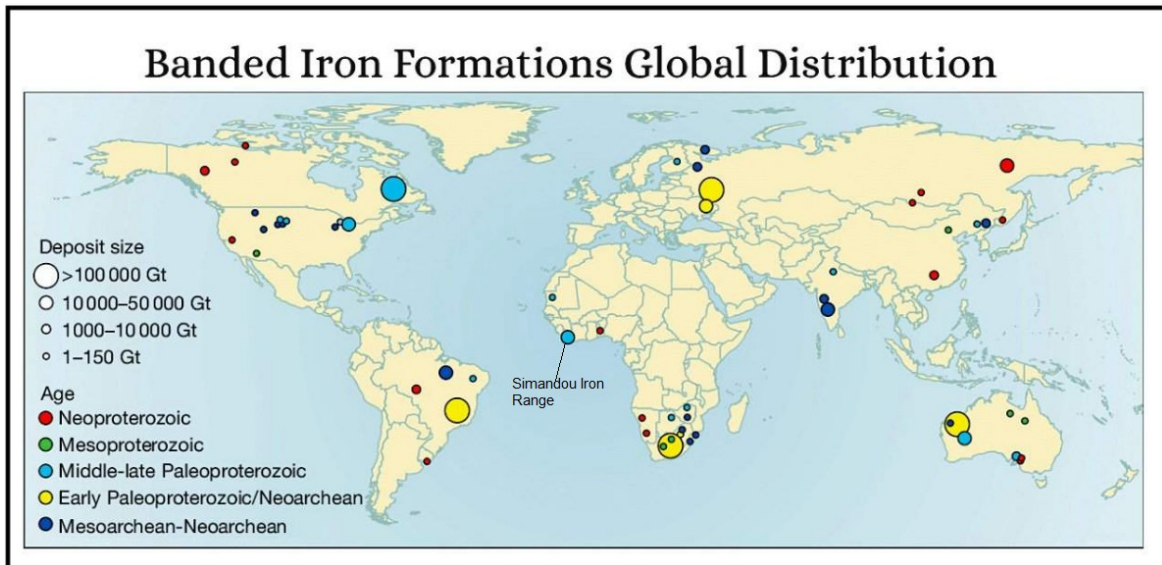


Figure 7 – Banded Iron Formations Global Distribution Map
[Credit: Geology In, 2024](#)

Further Reading and References

There is a **lot more** you can read on the subject of the Simandou Iron Range and Banded Iron Formations.

For the deposit itself, check out:

Bolonin A. V., Mamedov V. I., Myznikov I. K. Iron quartzites of the Simandou mountain (Republic of Guinea). *Ores and metals*, 2022, № 3, pp. 57–77. [DOI: 10.47765/0869-5997-2022-10017](https://doi.org/10.47765/0869-5997-2022-10017) (in Russian, I used [Google Translate](#))

Bolonin A. V., Myznikov I. K., Nigmatullina A. M. High-grade iron ores in the laterite weathering crust after the banded iron formation in the Simandou mountain range, Republic of Guinea. *Ores and metals*, 2023, № 2, pp. 44–63. [DOI: 10.47765/0869-5997-2023-10008](https://doi.org/10.47765/0869-5997-2023-10008) (in Russian)

Cope, I. L. & Wilkinson, Jamie & Herrington, R. & Harris, C. J., 2005. Geology and mineralogy of the Pic de Fon iron oxide deposit, Simandou range, Republic of Guinea, West Africa. *Australasian Institute of Mining and Metallurgy Publication Series*. 43-48. [Link](#)

Cope, I. L., J. J. Wilkinson, A. J. Boyce, J. B. Chapman, R. J. Herrington, C. J. Harris, 2008. Genesis of the Pic de Fon Iron Oxide Deposit, Simandou Range, Republic of Guinea, West Africa. *Banded Iron*

Formation-Related High-Grade Iron Ore, Steffen Hagemann, Carlos Alberto Rosière, Jens Gutzmer, Nicolas J. Beukes, <https://doi.org/10.5382/Rev.15.13>

Cope, I. L. & Wilkinson, Jamie & Boyce, Adrian & Herrington, R., 2009. Oxygen Isotope Composition of Hematite: Pic de Fon Deposit, Republic of Guinea, West Africa. [Link](#)

Porter GeoConsultancy Pty Ltd Database, accessed January 11, 2025, Simandou Range – Simandou South (Pic de Fon, Oueleba), Simandou North, Zogota. [Link](#)

J J. Wilkinson, R J. Herrington, C J. Ha, 2005, Geology and Mineralogy of the Pic de Fon Iron Oxide Deposit, Simandou Range, Republic of Guinea, West Africa. [Link](#)

For Banded Iron Formations check out:

Evans, Katharine Anne & McCuaig, T. & Leach, D. & Angerer, Thomas & Hagemann, Steffen, 2013. Banded iron formation to iron ore: A record of the evolution of Earth environments?. GEOLOGY. 41. 99-102. 10.1130/G33244.1. [DOI:10.1130/G33244.1](https://doi.org/10.1130/G33244.1)

Gumsley, Ashley & Chamberlain, Kevin & Bleeker, Wouter & Söderlund, Ulf & de Kock, Michiel & Larsson, Emilie & Bekker, Andrey, 2017. Timing and tempo of the Great Oxidation Event. Proceedings of the National Academy of Sciences of the United States of America. 114. 1811-1816. 10.1073/pnas.1608824114. [DOI:10.1073/pnas.1608824114](https://doi.org/10.1073/pnas.1608824114)

Beard, Brian & Johnson, Clark, 2015. Biologically recycled continental iron is a major component in banded iron formations. Proceedings of the National Academy of Sciences of the United States of America. 112. 10.1073/pnas.1505515112. [DOI:10.1073/pnas.1505515112](https://doi.org/10.1073/pnas.1505515112)

Harnmeijer, J. P., Mar.,2003. Banded Iron-Formation: A Continuing Enigma of Geology, University of Washington. [Link](#)

Yin, J., Li, H., & Xiao, K., 2023. Origin of Banded Iron Formations: Links with Paleoclimate, Paleoenvironment, and Major Geological Processes. Minerals, 13(4), 547. <https://doi.org/10.3390/min13040547>

Geology In (2024) summary of Banded Iron Formations [here](#).

Science Direct (2025) summary of Banded Iron Formations [here](#).

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.