

October 13, 2025

News and notes



Thanksgiving is Pumpkin Season in Canada

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This is [Thanksgiving](#) weekend in Canada and October 13th is [Columbus Day in the United States](#). Also it's the beginning of [Earth Science Week in Australia!!!](#)

This week, before going on to discuss the geology and mineral resources of the [Marshall Islands](#), 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

- [Pentagon moves to build \\$1 billion critical minerals stockpile to counter China - report.](#)
- REE: [Anduril Founder Urges Rapid Reindustrialization As U.S. Defense Supply Chain Remains Alarmingly Reliant On China.](#)
- [Ray Dalio says the U.S. is headed for civil war, with either side exerting 'tests of power' on their rivals.](#)
- [The world's chip supply chain is bracing for fallout from China's rare earth curbs.](#)

- [‘Conflict of interest’: Experts share concerns of U.S. stakes in Canadian miners.](#)
- Preparing for war? [Expanding strategic oil stocks in China support crude oil prices.](#)
- Related to today’s pot; [Beneath the Surface: The Geopolitical Implications of Shifting Deep Sea Mining Regulation](#)
- [Chinese companies are changing the way they operate in Africa: here’s how.](#)
- Greenland: [US government pours cold water on Critical Metals deal.](#)

Research and News

- Mineral-chemical stratigraphy and provenance analysis: [Sand Injection or Deposition: A Perspective From Mineral-Chemical Stratigraphy.](#)
- [Geothermal Heat Flow Mapping of Germany Integrating Multi-Geophysical and Geological Constraints With Uncertainty Quantification.](#)
- [Electrical and thermal conductivity of Earth’s iron-enriched basal magma ocean.](#)
- [A quantitative definition of accommodation: Implications for understanding and prediction of strata.](#)
- [Integrated remote sensing and petrological study of garnet-bearing rocks in the Arabian-Nubian shield: a case study from Wadi Shait-Wadi Gemal area, South Eastern Desert, Egypt.](#)
- [Halogens in proto-Iceland plume basalts.](#)
- New edition of [New Mexico Earth Matters.](#)
- [2025 Nobel Prize Winners.](#)
- Mars: [Recent aqueous alteration associated to sedimentary volcanism on Mars.](#)
- [A Silurian asymmetric compound delta system in south central Wales, UK.](#)
- [Constraints on Magma Pressure Distribution During Long Range Lateral Propagation of Giant Radial Dyke Swarms.](#)
- Lunar geology: [Southward impact excavated magma ocean at the lunar South Pole–Aitken basin.](#)
- [Wenqingite, \$Pb_5\(AsS_3\)_2\(Ge_2S_6\)\$, the first thiogermanate and thioarsenite mineral with edge-sharing \$GeS_4\$ tetrahedra, from the Wusihe Pb–Zn deposit, Sichuan Province, SW China.](#)
- [Reconstructing Early Cenozoic Paleodrainage and Tectonic Evolution in the Southeastern Tibetan Plateau: Evidence From Detrital Zircon and Tourmaline Provenance.](#)
- [Multiple machine learning algorithms for lithofacies prediction in the deltaic depositional system of the lower Goru Formation, Lower Indus Basin, Pakistan.](#)

- [Extended seabed geology map of the Bristol Channel published.](#)
- [Facies mosaic distribution and stratigraphic disorder of a mixed carbonate–siliciclastic tidal succession.](#)

Plate Tectonics

- [Unveiling Cenozoic Volcanism in the Takab-Shahindezh Area Induced by Slab-Mantle Interaction in the Zagros Orogen, NW Iran.](#)
- [Seismic Waveform Inversion for 3-D S- and P-Wave Velocity Structure in D' Beneath Central America and the Caribbean: Evidence for Chemical Heterogeneity Due To MORB Accumulation.](#)
- [Quantifying Serpentinization-Driven Remagnetization From Ridge Axis to Subduction Zone Using Quantum Diamond Microscopy.](#)
- [Archean rifts and triple-junctions revealed by gravity modeling of the southern Superior Craton.](#)

Paleontology

- [Critical reappraisal of a putative dicraeosaurid sauropod dinosaur from the Middle Jurassic of Gondwana and a revised view of diplodocoid evolutionary relationships and biogeography.](#)
- [Evolution of the rostral vasculature in turtles.](#)
- [Metabolic Potential and Microbial Diversity of Late Archean to Early Proterozoic Ocean Analog Hot Springs of Japan; Science Daily summary \[here\]\(#\).](#)
- [A new saurolophine hadrosaurid \(Ornithischia: Hadrosauridae\) from the Upper Cretaceous \(Campanian\) Hunter Wash Member, Kirtland Formation, San Juan Basin, New Mexico; SciNews summary \[here\]\(#\).](#)

Mining and Energy

- [It's official—Australia's Western Green Energy Hub will produce more electricity than the entire country generated in 2023.](#)
- [Teck Resources in talks to supply key defence minerals to Canada and US.](#)
- Queensland: [Australia's Coal State Ditches Plan to Shut Coal Power Plants.](#)
- [It's official – the largest reactor ever built will begin final assembly led by U.S. technology giants.](#)
- [RANKED: Top 20 biggest copper mines 2025.](#)
- [BP Launches Sixth Oil and Gas Project in 2025 at North Sea Field.](#)
- [Europe's first full design of commercial fusion power plant unveiled by German firm.](#)
- [Geothermal project sues federal agencies, says there's no evidence it will drive toad to extinction.](#)

- [Global renewable capacity is set to grow strongly, driven by solar PV.](#)
- Ore deposit geology: [Mineralogy, geochemistry and genesis of alkaline igneous rock-related gold-silver telluride deposits of central Montana.](#)
- REE recovery from mine wastewater: [Bioderived element resource separation technology for waste processing](#); Phys.org summary [here](#).

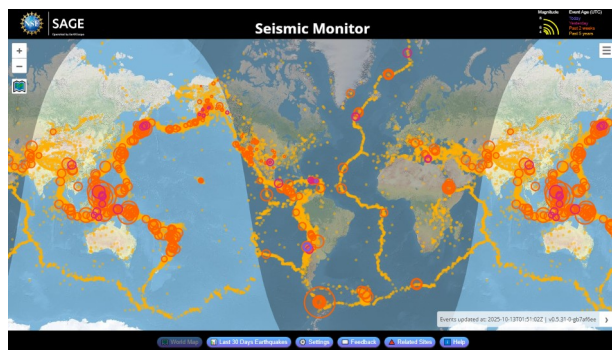
Environmental Geology and Hydrogeology

- France: [Groundwater tables as of October 1, 2025.](#)
- [Malaysia – Groundwater Should Be Tapped As Strategic Water Source.](#)
- [New Global Map Reveals 426 Shared Aquifers Crossing Borders.](#)

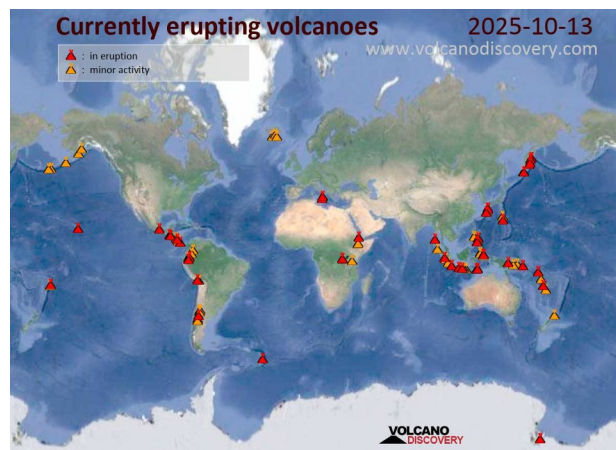
Glaciers and Climate Change

- [Mountain glaciers recouple to atmospheric warming over the twenty-first century](#); Phys.org summary [here](#).
- [Enhanced deep Southern Ocean stratification during the lukewarm interglacials](#); Phys.org summary [here](#).
- [Extremely poleward shift of Antarctic Circumpolar Current by eccentricity during the Last Interglacial](#); Phys.org summary [here](#).

Volcanoes, Earthquakes and Geohazards



[Seismic Monitor](#)



[Active Volcano Map](#)

Volcanoes

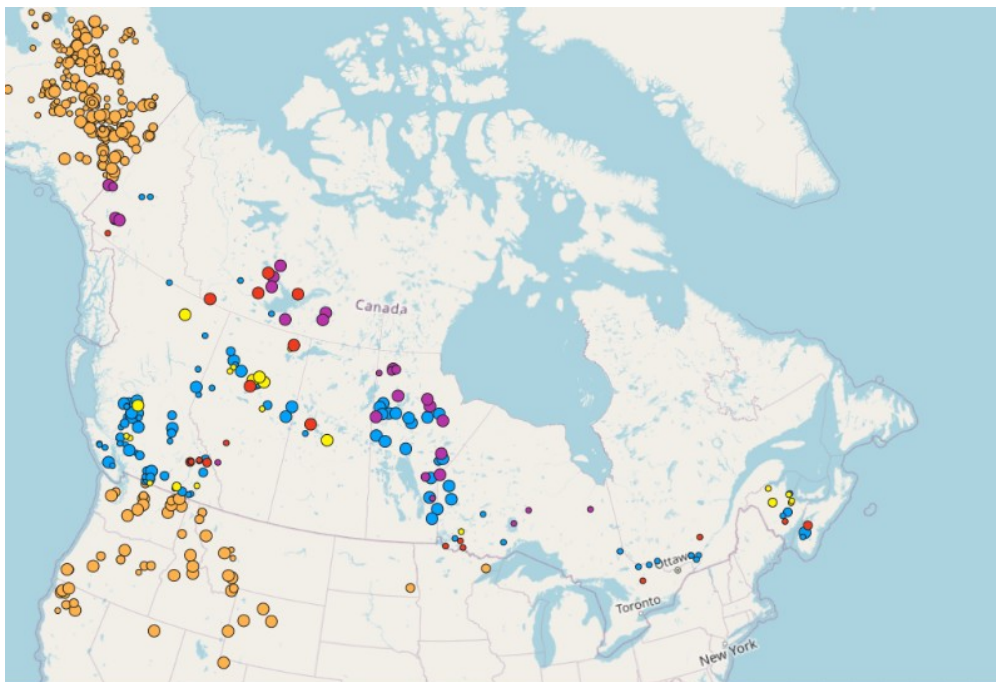
- [Smithsonian / USGS Weekly Volcanic Activity Report.](#)
- The United States Geological Survey (USGS), many of the Volcano Observatories are not reporting because of the [US Government shutdown](#).

- [Cascades Volcano Observatory Weekly Update](#).
- [Validation of Near Real-Time Retrieval of Plume Mass Eruption Rates: The Case of the 2021 Eruption of La Soufrière, St Vincent](#).
- [High vs. low pressure magma chambers at Ventotene volcano \(Tyrrhenian Sea, central Italy\): implication for pure Plinian vs. caldera-forming eruptions](#).

Earthquakes

- [Euro-Mediterranean Seismological Centre \(EMSC\)](#).
- [Earthquakes Monitoring Live Worldwide](#).
- Philippines: [Cebu shaken by M5.7 earthquake: aftershock of earlier M6.9](#); USGS summary [here](#).
- [Preparatory Phase of Major Earthquakes During Campi Flegrei Unrest \(2020–2024\)](#).
- [Another mid-M7 earthquake in the Drake Passage](#); USGS summary [here](#).
- [Damaging M7.4 subduction earthquake shakes Mindanao, Philippines](#); USGS summary [here](#).
- [Probing the Nature of Low-Frequency Earthquakes Through the Deconvolution of Tectonic Tremor](#).

Wildfires and Other Geohazards



Interactive Wildfire Map - October 12, 2025
Credit: ©[Canadian Wildland Fire Information System](#)

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

- November 3 – 4, 2025 [Central Canada Mineral Exploration Convention 2025](#) Victoria Inn Hotel & Convention Centre, 1808 Wellington Avenue, Winnipeg, Manitoba R3H 0G3, Canada.
- [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](#).
- [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](#).
- [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](#).

Geology

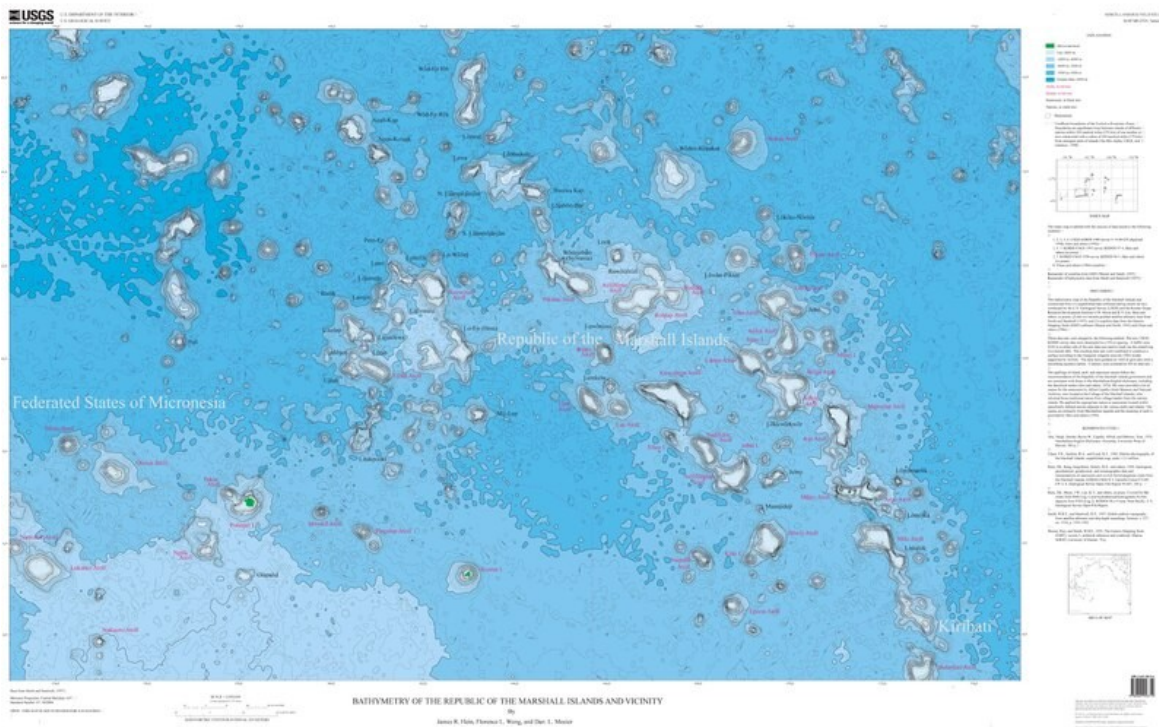


Figure 2 - Bathymetry of the Republic of the Marshall Islands and Vicinity
Credit: [Hein et al., 1999](#), USGS Miscellaneous Field Studies Map MF-2324, [public domain](#)

The Marshall Islands are a series of [atolls](#) forming [carbonate platforms](#) sitting on [volcanic seamounts](#). I've discussed carbonate platforms before in my discussions of the [Bahamas](#) and [Kiribati](#), so I won't repeat it here. The [surficial geology](#) of the Marshall Islands shows predominately [Quaternary](#) aged [limestones](#) derived from [coral](#).

The [Marshall Islands seamounts](#) form two main chains: the [Ralik Chain](#), and the [Ratak Chain](#). In addition to the two chains, there are some other seamounts around [Anewetak](#) Island. The volcanic rock [underlying the seamounts](#) appears to be [Early and Late Cretaceous](#) in age. The rock is [predominantly](#) differentiated [alkali basalt](#) and [hawaiite](#) together with alkali [melilitite](#).

The USGS has [many papers](#) on the geology of the Marshall Islands, here are links to a few of them:

- January 1, 1985, [Ages of subsurface stratigraphic intervals in the Quaternary of Enewetak Atoll, Marshall Islands](#).
- January 1, 1986, [Geochemistry and petrology of basaltic rocks from the Marshall Islands](#).
- January 1, 1989 [Petrology and age of alkalic lava from the Ratak Chain of the Marshall Islands](#).
- January 1, 1993, [Early and Late Cretaceous volcanism and reef-building in the Marshall Islands](#).

Mineral Resources

Polymetallic Deposits

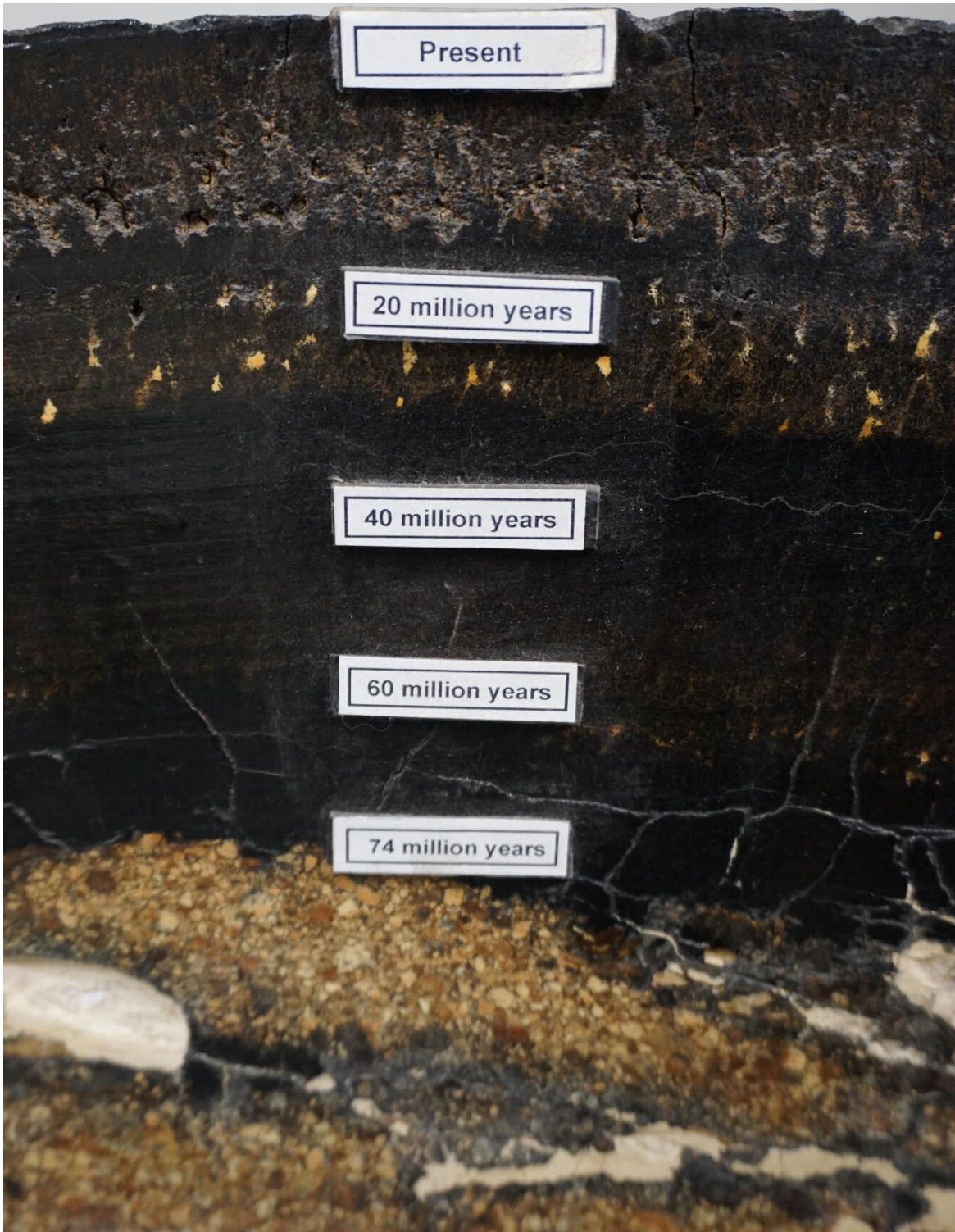


Figure 3 - Cross-section of Ferromanganese or Cobalt-rich Crusts from the Marshall Islands
[Credit: USGS, public domain](#)

The [mineral resources of the Marshall Islands are fairly limited](#) and include coral limestone and [minor phosphate deposits](#). Then there is the major possible resource that exists on the ocean floor: polymetallic nodules, sometimes called ferromanganese deposits, manganese nodules, and pelagites. These deposits are concretions composed of various minerals containing manganese, iron, copper, nickel, cobalt, and rare earth elements (REE). The deposits exist as nodules or crusts on the deep ocean floor, generally between 4,000 to 6,000 below surface.

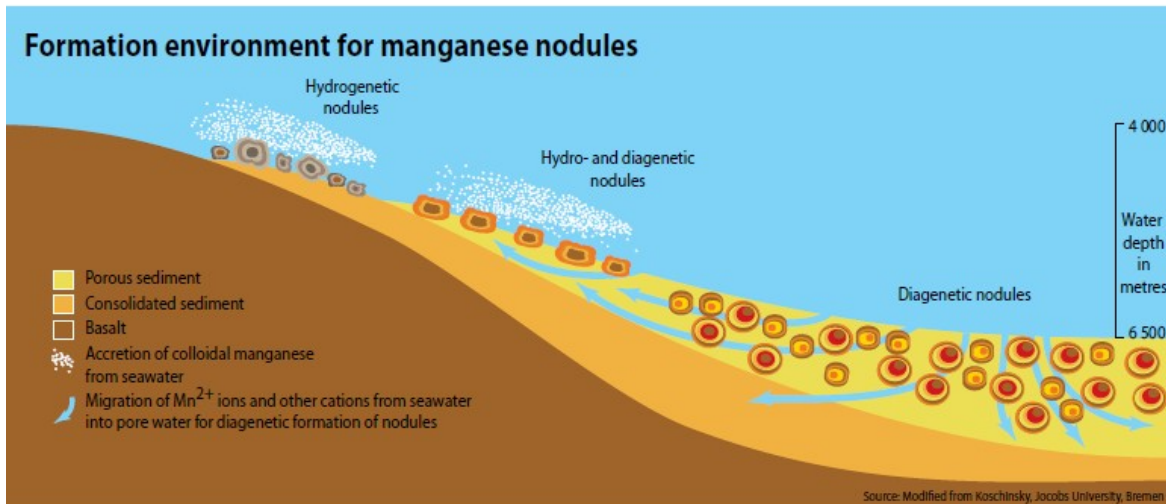


Figure 4 – Formation Environment for Manganese Nodules

Credit: Figure 3 in [Hein & Petersen, 2013](#), ©Copyright Secretariat of the Pacific Community (SPC)

Manganese nodules [form as precipitates](#) from either the surrounding seawater (hydrogenetically) or from chemical reactions within the pore water in the underlying sediment (diagenetically). These precipitates form around a nucleus, often a piece of shell or sharks tooth. The three main minerals in the concretions are: [vernadite](#) ((Mn⁴⁺,Fe³⁺,Ca,Na)(O,OH)₂ · nH₂O), [todorokite](#) ((Na,Ca,K,Ba,Sr)_{1-x}(Mn,Mg,Al)₆O₁₂ · 3-4H₂O), and [birnessite](#) ((Na,Ca)_{0.5}(Mn⁴⁺,Mn³⁺)₂O₄ · 1.5H₂O).

These nodules form very slowly, hydrogenetic nodules grow at a rate of about 1 to 10 mm per million years, while diagenetic nodules grow at rates of several hundred mm per million years. Most nodules are made up of both hydrogenetic and diagenetic material, so the growth rates will vary. [Bacteria](#) also seem to be very important in the formation of polymetallic nodules.

The Marshall Islands are within the [Clarion-Clipperton Zone \(CCZ\)](#), a seabed management zone. Deposits of manganese nodules in the CCZ are considered to be among the richest, containing abundant high grade nodules. The [International Seabed Authority \(ISA\)](#) [estimates](#) that the total amount of nodules in the CCZ exceeds 21 billion tons (Bt), containing about 5.95 Bt of manganese, 0.27 Bt of nickel, 0.23 Bt of copper and 0.05 Bt of cobalt. A study on the mineralogy of the polymetallic nodules in the CCZ can be found [here](#).

Recovery of these polymetallic nodules will involve [deep-sea mining](#), a controversial [practice](#). There may be a lot of money to be made [answering the growing demand for the metals](#). There are also concerns for the [environmental effects of the mining](#). These are the kind of trade-offs that the inhabitants of the Marshall Islands will have to ponder. There is also the very real possibility that powerful nations will simply [take the nodules](#) without reference to the [countries claiming ownership](#) of the seabed resources.

For further readings, follow up on the links noted above. Also, you might want to check out the USGS papers on ferromanganese deposits on the seabed near the Marshall Islands:

- January 1, 1984, [Geologic reconnaissance and geochemical analysis of ferromanganese crusts of the Ratak Chain, Marshall Islands.](#)
- January 1, 1986, [Geological and geochemical data for seamounts and associated ferromanganese crusts in the Ratak Chain, Marshall Islands.](#)
- December 31, 1986, [Cobalt-rich ferromanganese crusts from the Central Pacific.](#)
- January 1, 1988, [Cobalt- and platinum-rich ferromanganese crusts and associated substrate rocks from the Marshall Islands.](#)
- January 1, 1990, [Geological, geochemical, geophysical, and oceanographic data and interpretations of seamounts and co-rich ferromanganese crusts from the Marshall Islands, KORDI-USGS R.V. Farnella cruise F10-89-CP.](#)
- January 1, 1994, [Composition and origin of hydrothermal ironstones from central Pacific seamounts.](#)
- February 1, 1995, [\$^{238}\text{U}\$ - \$^{234}\text{U}\$ - \$^{230}\text{Th}\$ chronometry of Fe-Mn crusts: Growth processes and recovery of thorium isotopic ratios of seawater.](#)
- January 1, 1997, [Composition of Co-rich ferromanganese crusts and substrate rocks from the NW Marshall Islands and international waters to the north, Tunes 6 cruise.](#)
- January 1, 1998, [Composition of Co-rich ferromanganese crusts and substrate rocks from the Marshall Islands, cruise KODOS 97-4](#)
- January 1, 1999, [Co-rich Fe-Mn crusts from the Marshall Islands \(Leg 1\) and hydrothermal and hydrogenetic Fe-Mn deposits from Micronesia \(Leg 2\), KODOS 98-3 cruise, West Pacific.](#)
- January 1, 2000, [Formation of ferromanganese crusts on northwest intertropical Pacific seamounts: Electron photomicrography and microprobe chemistry.](#)

Groundwater Resources

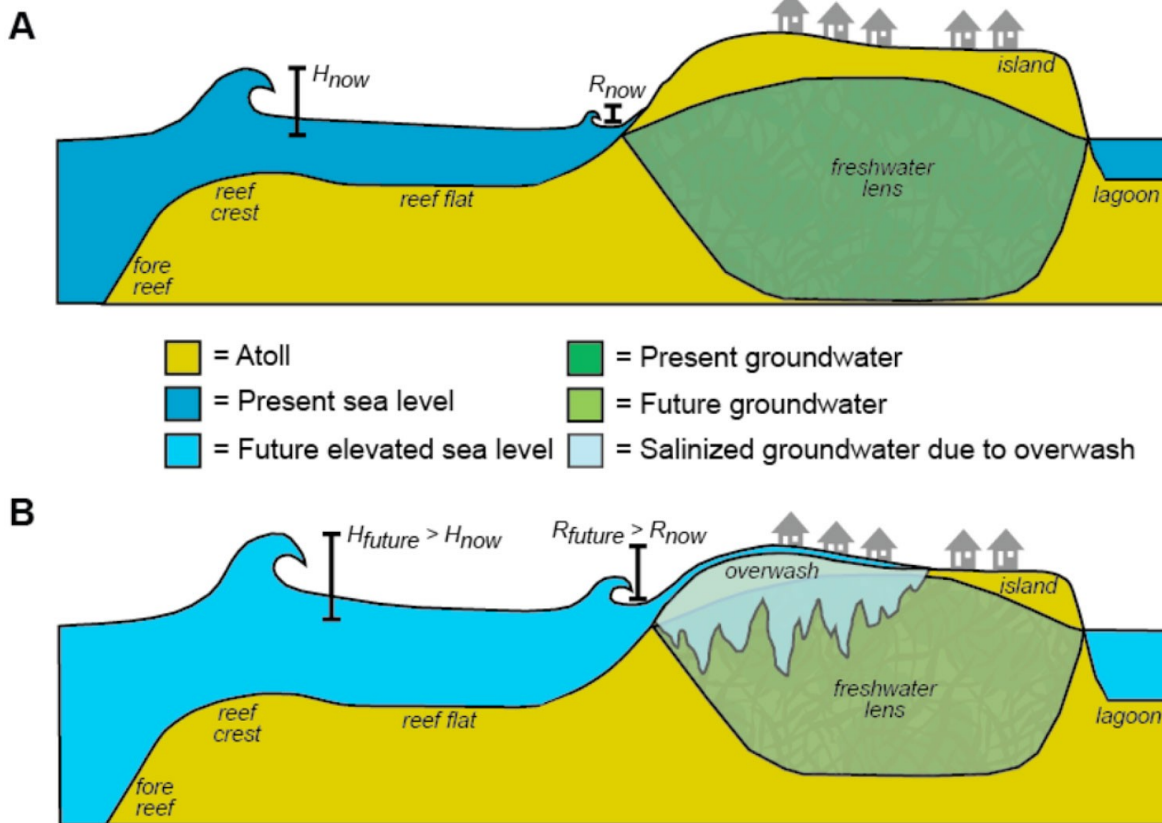


Figure 5 – Groundwater in an Atoll

Credit: USGS, public domain

Groundwater resources are also critical to day-by-day life in the Marshall Islands. Basically, the available potable groundwater is found within [perched aquifers](#) that precariously sit on top of salt water aquifers which can easily [contaminates the fresh water aquifer](#). For more reading on the groundwater resources of the Marshall Islands, check out these USGS publications:

- January 1, 1987, [Description of a fresh water lens at Laura Island, Majuro Atoll, Republic of the Marshall Islands, using electromagnetic profiling.](#)
- January 1, 1987, [Ground-water resources of the Laura area, Majuro Atoll, Marshall Islands.](#)
- January 1, 1989, [Geohydrology of the Laura fresh-water lens, Majuro atoll: A hydrogeochemical approach.](#)
- January 1, 1996, [Ground-water resources and contamination at Kwajalein Island, Republic of the Marshall Islands, 1990-91.](#)
- September 1, 1996, [Ground-water resources and contamination at Roi-Namur Island, Kwajalein Atoll, Republic of the Marshall Islands, 1990-91.](#)

- January 1, 1997, [Ground-water geochemistry of Kwajalein Island, Republic of the Marshall Islands, 1991](#).
- January 1, 2005, [Effects of the 1998 Drought on the Freshwater Lens in the Laura Area, Majuro Atoll, Republic of the Marshall Islands](#).
- January 1, 2008, [Ground water on tropical Pacific Islands - Understanding a vital resource](#).
- March 1, 2017, [Land-use change and managed aquifer recharge effects on the hydrogeochemistry of two contrasting atoll island aquifers, Roi-Namur Island, Republic of the Marshall Islands](#).
- April 28, 2017, [Seawater-flooding events and impact on freshwater lenses of low-lying islands: Controlling factors, basic management and mitigation](#).
- September 13, 2017, [Atoll groundwater movement and its response to climatic and sea-level fluctuations](#).

Summary



Figure 6 - Waves Breaking over Offshore Reefs on Kwajalein Atoll
[Credit: USGS, public domain](#)

The Marshall Islands are in an interesting predicament. They would probably like to improve their standard of living, and offshore mining might be one way to do that. However, the mining of polymetallic nodules and crusts might have unexpected effects on their existing fishing industry. Also, there is no guarantee that the people exploiting the polymetallic deposits on the seabed would in any way respect Marshall Islanders claims to that seabed. Piracy is easy to justify if there's money to be made.

For geologists, the Marshall Islands might be a pleasant place to work and there will probably be opportunities to study and exploit the offshore polymetallic deposits.

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.