

July 24, 2023

News and notes

Before going on to discuss how geology has affected the fate of [Belarus](#), here are some news items I thought were interesting.

Research



Centre Block, Canadian Parliament Buildings – Built with Tyndall Limestone
Credit: [Ken Lund](#), [Creative Commons Attribution-Share Alike 2.0 Generic](#) license

- My friend, Graham Young, is co-author of a paper on the Tyndall Limestone: [Tyndall Stone, Canada's First Global Heritage Stone Resource: Geology, Paleontology, Ichnology and Architecture](#).
- Geological history: [Precise date for the Laacher See eruption synchronizes the Younger Dryas](#).
- [Decoupled Oligocene mylonitic shearing and Miocene detachment faulting in the East Humboldt Range metamorphic core complex, northeast Nevada, USA](#).
- [Grooving in the midcontinent: A tectonic origin for the mysterious striations of L'Anse Bay, Michigan, USA](#).
- [Basin record of a Miocene lithosphere drip beneath the Colorado Plateau](#).
- [Early Neoproterozoic tectonics in the Marwar Crustal Block, NW India, the relevance of the Phulad Shear Zone, and implications for Rodinia reconstruction](#).
- [The Rise and Fall of Laramide Topography and the Sediment Evacuation From Wyoming](#).
- [Spectral Library of European Pegmatites, Pegmatite Minerals and Pegmatite Host-Rocks – the GREENPEG project database](#).

- [IESDB – the Iberian Evaporite Structure Database](#).
- Coastal geology: [Measurements and modeling of water levels, currents, density, and wave climate on a semi-enclosed tidal bay, Cádiz \(southwest Spain\)](#).
- Turbidite deposition: [How Bed Composition Affects Erosion by Debris Flows—An Experimental Assessment](#).

Paleontology

- Evolution of chordates: [Cardiopharyngeal deconstruction and ancestral tunicate sessility](#); Live Science summary [here](#).
- [Coastal raptors and raiders: New bird tracks in the Pleistocene of SW Iberian Peninsula](#); behind a paywall, Phys.org summary [here](#).
- [An exceptionally well-preserved monodominant fossil forest of *Wataria* from the lower Miocene of Japan](#); Phys.org summary [here](#).
- [Filling in the missing links on Australia's fossil record](#).
- [The true origins of the world's smallest and weirdest whale](#).
- [Life in maars: why it's worth protecting a spectacular fossil site NZ almost lost to commercial mining interests](#).
- Here kitty kitty: [Langebaanweg's sabertooth guild reveals an African Pliocene evolutionary hotspot for sabertooths \(Carnivora; Felidae\)](#); Eureka Alert summary [here](#).
- New fossils from a lagerstätte: [A new Solnhofen pterosaur](#); Eureka Alert summary [here](#).
- Disease processes shown in fossils: [Subchondral defects resembling osteochondrosis dissecans in joint surfaces of the extinct saber-toothed cat *Smilodon fatalis* and dire wolf *Aenocyon dirus*](#); Eureka Alert summary [here](#).
- [A new Gondwanan mayfly family from the Lower Cretaceous Crato Formation, Brazil \(Ephemeroptera: Siphonuroidea: Astraeopteridae fam. nov.\)](#)

Glaciers and Climate Change

- From the Max Planck Society: [The role of ice sheets for the climate](#).
- One man's opinion: [Geologist, Professor Ian Plimer, rips apart the apocalyptic, human-induced "climate change" narrative, in just two minutes](#).
- [Deglaciation of northwestern Greenland during Marine Isotope Stage 11](#); behind a paywall, Phys.org summary [here](#).
- More on Greenland: [When Greenland was green: Ancient soil from beneath a mile of ice offers warnings for the future](#).

- [Tailored Forecasts Can Predict Extreme Climate Informing Proactive Interventions in East Africa](#); Phys.org summary [here](#).

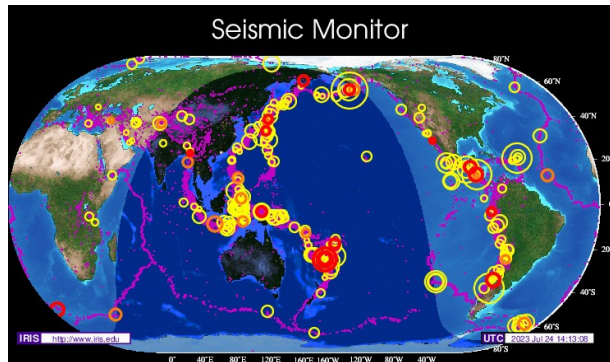
Energy and Mining

- From the United States Energy Information Administration: [Almost all U.S. renewable diesel is consumed in California; most isn't made there](#).
- [Ten GWh of sodium-ion batteries expected to be installed by 2025 – report](#).
- Opinion: [The human cost of Net Zero](#).
- [ENGO's Misrepresent and Abuse Indigenous Communities to Interfere in Resource Development – Chris Sankey](#).
- [Canada's Oil and Gas Sector Barrels Ahead with Record Annual Exports](#).
- Using green fuel: [Effect of green fuel and green lubricant with metallic nanoparticles on emissions of HC, CO, NOx, and smoke for a compression ignition engine](#).
- Deep natural gas exploration: [China is drilling some of the world's deepest holes in hunt for natural resources](#); related story [here](#).
- [Cobalt and the sacrifice of African children on the green altar](#).
- Mining and geopolitics: [Australia blocks acquisition of lithium mine by China-linked firm](#).
- [Nickel set to flood the LME, turning metal squeeze into glut](#); from earlier this year: [A nickel-trading scam targeting JP Morgan is raising fresh questions about the London Metal Exchange](#).
- Silver: [Mexico hit by trade arbitration proceedings from Canadian, US firms](#).
- If it has to be subsidized, it's not real recycling, it's just “make work”: [Dead EV batteries turn to gold with US incentives](#).

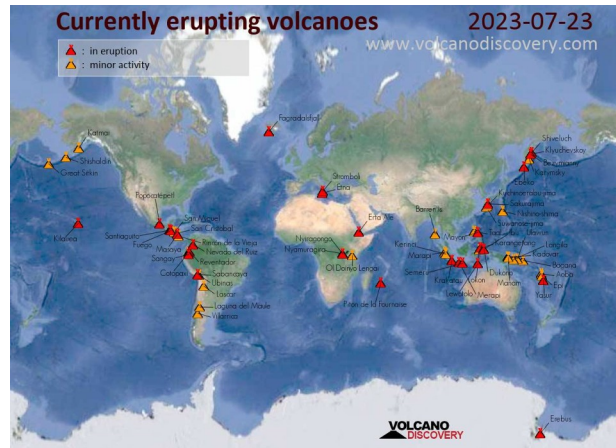
Environmental Geology and Hydrogeology

- [Researchers Gather in Saskatchewan to Study World-Leading Carbon Capture and Storage Facility](#).
- Remediation technology: [The combined rhizoremediation by a triad: plant-microorganism-functional materials](#).
- Water pollution: [15 billion gallons of sewage-polluted water flows annually into Philly's rivers and streams, report says](#).
- I find this a fascinating subject, arsenic in groundwater: [Exogenous-organic-matter-driven mobilization of groundwater arsenic](#); Phys.org summary [here](#).
- [Elevated sediment radionuclide concentrations downstream of facilities treating leachate from landfills accepting oil and gas waste](#); Phys.org summary [here](#).

Volcanoes, Earthquakes and Geohazards



[Seismic Monitor](#)



[Active Volcano Map](#)

- From the United States Geological Survey (USGS) [Volcano Watch — Halema'uma'u's 1967-68 eruption: another crater-filler](#).
- From the USGS Alaska Volcano Observatory: [Renewed Activity at Shishaldin Volcano \(Aleutians\)](#).
- Volcano research: [Seismic structure and its implication on the hydrothermal system beneath Mt. Ontake, central Japan](#).
- From the Geophysical Journal International: [Hunga Volcano Special Issue](#).
- Earthquake research: [Using GPS as a possible earthquake predictor](#), scientific papers [here](#) and [here](#).
- More earthquake research: [Three-Dimensional Electrical Structure Beneath the Epicenter Zone and Seismogenic Setting of the 1976 Ms7.8 Tangshan Earthquake, China](#).
- Earthquake in Central America: [Shaking across Central America caused by M6.5 quake in sinking slab](#); USGS report [here](#).
- Earthquake in Argentina: [M6.6 earthquake strikes deep below Argentina](#); USGS report [here](#).
- Geohazard mapping: [Satellites map aftermath of Emilia-Romagna floods](#).

General Science

- Prior restraint in scientific publishing: ["Think of the Implications of Publishing"](#).
- The importance of reproducible results: [18-Year-Old's Science Reporting Leads Stanford President to Quit](#).
- [Peter Turchin](#), using a mathematical model to predict the outcome of the Ukraine War: [Part 1](#), [Part 2](#), [Part 3](#), and [Part 4](#).

July 24, 2023

Geology and the Fate of Societies – Belarus



Figure 1 – Map of Belarus

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

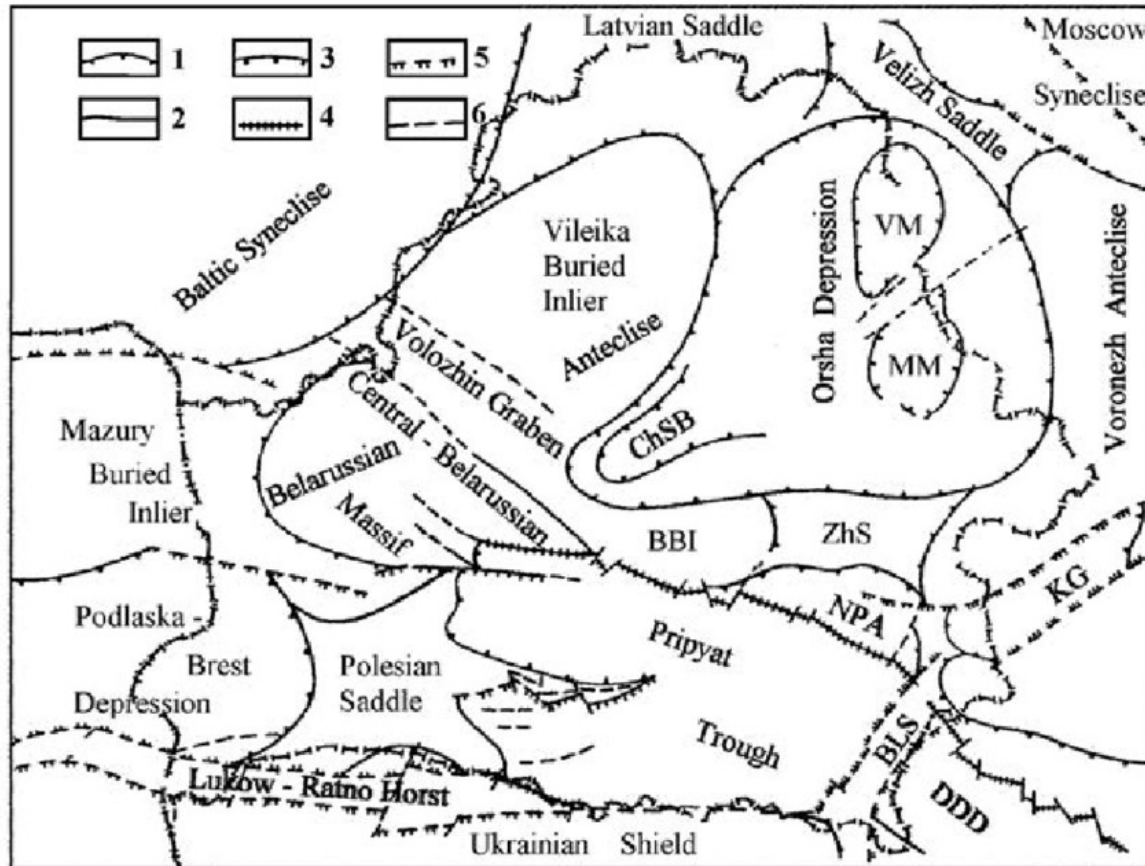
The [Republic of Belarus](#) is located in Eastern Europe. To the east is the [Russian Federation](#), to the south is [Ukraine](#), to the west is [Poland](#), and to the north are [Lithuania](#) and [Latvia](#). Belarus has been in the news a lot lately due to the [Russian-Ukrainian War](#) underway since February 2022. The latest twist in the War has Belarus hosting [Yevgeny Prigozhin](#) and members of his [Wagner Private Military Company](#) following an [abortive mutiny](#). So, Belarus is a timely topic for our examination of the geology and geopolitics of nations.

[Belorussians](#) are one of the [East Slavic](#) peoples, the others include the [Russians](#) and the [Ukrainians](#) as well as smaller groups such as the [Cossacks](#), [Rusyns](#), [Podlshuks](#) and [Poleshuks](#). The term Belorussian translates as White Russian, not to be confused with [anticommunist Russian exiles](#) or the [cocktail](#).

According to the United States Central Intelligence Agency (CIA) [World Factbook on Belarus](#), the country has a total area of 207,600 square kilometres (km²) of which 202,900 km² is land and 4,700 km² of water. Belarus has a population of 9,383,853 (2023 estimate). The population's ethnic make up is 83.7% Belarusian, 8.3% Russian, 3.1% Polish, 1.7% Ukrainian, 2.4% other, and 0.9% unspecified (2009 estimate). Both [Russian](#) and [Belarusian](#) are official languages.

The capital of Belarus and largest city in Belarus is [Minsk](#). Besides the [City of Minsk](#), the country is divided into six administrative divisions or [oblasts](#): [Brest](#), [Gomel](#), [Grodno](#), [Mogilev](#), [Minsk](#), and [Vitebsk](#).

Geology



Main geologic units within the territory of Belarus. 1-the largest; 2-large; 3-medium-size platform faults; 4-super regional; 5-regional; 6-sub-regional and local faults; DDD-Dnieper-Donets Depression; KGKlintsy Graben; BLS-Bragin-Loev Saddle; NPA-North Pripjat Arch; BBI-Bobruisk Buried Inlier; ZhS-Zhlobin Saddle; ChSB-Cherven Structural Bay; VM, MM-Vitebsk and Mogilev muldes, respectively.

Figure 2 – Main Geologic Units in Belarus
Credit: Figure 2 in [Goldstein et al, 2011](#)

The [geology of Belarus](#) is fairly complex. The [basement rock](#) in Belarus is part of the [Precambrian](#) aged [East European Craton](#). This basement is further subdivided into the [Fennoscandian Shield](#) in the north, the [Sarmatian Craton](#) in the south and the distinct [Volgo-Uralia segment](#) of the Sarmatian Craton in the east. The Precambrian rocks range in age from [Archean](#) and [Lower Proterozoic](#) to [Upper Proterozoic](#). The Archean rock include [amphibolite](#), crystalline [schist](#), [granulite](#), and [gneiss](#). Rocks deposited from the Late Archean to the Lower Proterozoic rocks include [flysch](#), [banded iron formations](#) and greywacke sequences that were later metamorphosed into schist and [amphibolite gneiss](#). Upper Proterozoic deposits include [basalts](#), [dacites](#), [trachyandesite](#), [quartz rhyolites](#), [quartzites](#), schists, [sandstones](#), and [conglomerates](#).

Siting on top of the cratonic basement rocks are three [Phanerozoic](#) sedimentary basins ([synclines](#)): the [Podlaska-Brest Depression](#), the [Pripjat Trough](#), and the [Orsha Depression](#). Sedimentary rocks in these

basins include [clastic](#) sediments and thick evaporite ([salt](#) and [potash](#)) deposits. [Anticline](#) features in Belarus include the [Belarusian Anticline](#) and the [Central Belarusian Massif](#) together with other features shown on Figure 2, above. Figure 3, below, is a [Soviet era](#) geological map of Belarus showing the bedrock geology by age. I translated the legend myself, using Google Translate, I hope I didn't screw it up too much.

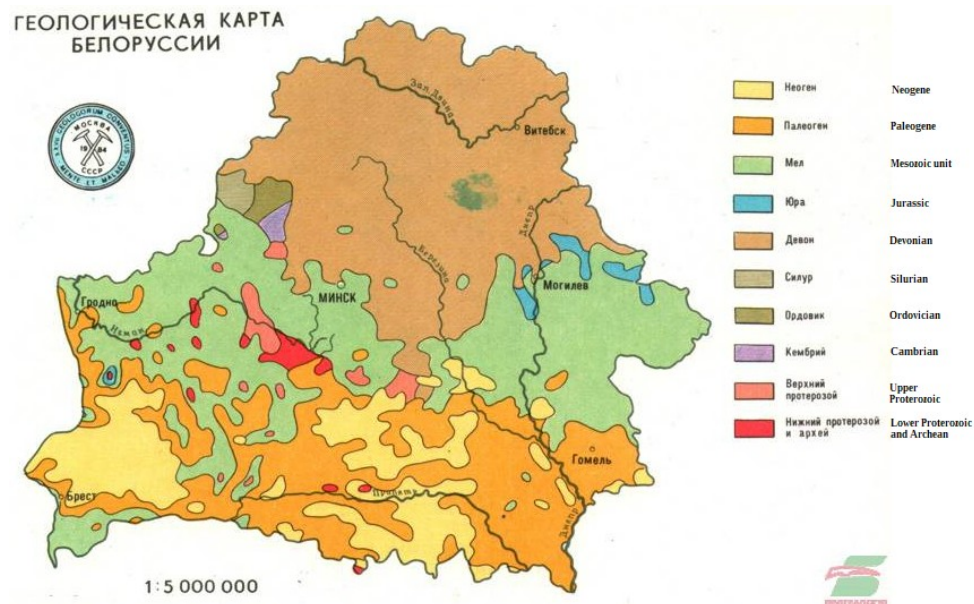


Figure 3 – Geology Map of Belarus, 1984
Credit: [Soviet Ministry of Geology](#), public domain

Resources

Agricultural Resources



Figure 4 – Belarus Tractor
Credit: [Szajci](#), [Creative Commons Attribution-Share Alike 4.0 International](#) license

You can divide agricultural production in Belarus into two sectors: plant crops and livestock.

Among plant crops, [in 2018](#) Belarus produced:

- 5.8 million tons of potato (11th largest producer in the world);
- 4.8 million tonnes of sugar beet, which serves to produce sugar and ethanol;
- 1.8 million tons of wheat;
- 1.1 million tons of maize;
- 1 million tons of [triticale](#) (3rd largest producer in the world, only behind Poland and [Germany](#));
- 944 thousand tons of barley;
- 700 thousand tons of apples (19th largest producer in the world);
- 502 thousand tons of rye (5th largest producer in the world);
- 456 thousand tons of rapeseed;
- 360 thousand tons of cabbage;
- 346 thousand tons of vegetable;
- 341 thousand tons of oats (18th largest producer in the world)
- 290 thousand tons of carrot;
- 284 thousand tons of tomato;
- 240 thousand tons of beans;
- 226 thousand tons of cucumber;
- 215 thousand tons of onion;

As well as smaller productions of other agricultural products.

The main livestock production in Belarus is for pork, beef, and poultry. Belarus has about 1.5 million dairy cows.

One of the issues in Belarus has been managing agriculture production following the obvious [failures of Soviet era agricultural organization](#). Since the [fall of the Soviet Union](#) in 1991, [agriculture in Belarus has been re-organized](#) with an aim to increase production. This re-organization necessitated actually giving control of the farm land to the farmers who actually worked the land, something that the [Bolsheviks promised](#) in 1917.

Mineral Resources

The USGS summarized the [Mineral Industry of Belarus](#) in 2018. The mineral production in 2018 included:

- 7,346,000 tonnes of Potash, K₂O content
- 3,347,300 tonnes of Salt
- 2,236,000 tonnes of crushed stone, dolomite
- 852,000 tonnes of Sulphur compounds, sulphuric acid
- 211 million cubic metres of natural gas
- 2,354,000 tonnes of peat for fuel and 270,000 tonnes for horticultural use
- 12,200 barrels of crude oil.

Belarus does not produce enough petroleum and natural gas to meet their needs and imports most of the natural gas and petroleum that they need from the Russian Federation. Figure 5, below, shows the location of mineral deposits in Belarus.

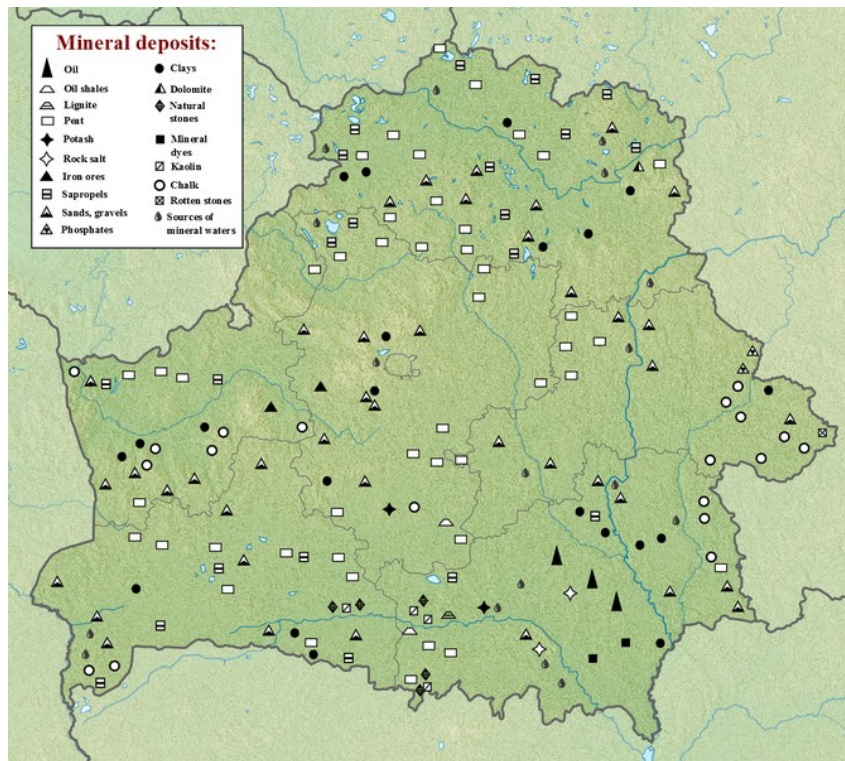


Figure 5 – Map of the Mineral Deposits of Belarus

Credit: NordNordWest, Creative Commons Attribution-Share Alike 4.0 International license

Climate

Köppen–Geiger climate classification map for Belarus (2071–2100)



Source: Beck et al.: Present and future Köppen-Geiger climate classification maps at 1-km resolution, *Scientific Data* 5:180214, doi:10.1038/sdata.2018.214 (2018)

Figure 6 – Köppen–Geiger Climate Classification Map for Belarus

Credit: Beck et al, 2018, Creative Commons Attribution-Share Alike 4.0 International license

Climate in Belarus is continental, with cold winters and relatively warm summers, and two short intermediate seasons. The degree of continental-type climate increases from northwest to southeast, that is, as you move away from the sea and enter the great plains of Eastern Europe.

During the year the country is exposed to different air masses from Russia or the Arctic, the Atlantic or the Mediterranean. Consequently there are plenty of sudden changes in temperature and weather.

History and Geopolitics



Figure 7 – Hamlet in Rural Landscape, Belarus, May 2019

Credit: Rakoon, Creative Commons CC0 1.0 Universal Public Domain Dedication

Although Belarus has been an independent state only since the fall of the [Soviet Union](#) in 1991, the region has a long history and the territory of Belarus has been part of many state level [polities](#).

Humans have lived in what is now Belarus since the [Paleolithic](#) and [archaeological studies](#) in Belarus include sites that range from prehistoric to early medieval times. The Belorussians are descended from early Slavic tribes that include the [Veneti](#) first mentioned by the Roman writers [Pliny the Elder](#) and [Tacitus](#). In early medieval times, polities ruling parts of Belarus included many different principalities, such as [Polotsk](#), [Turov](#), [Vitebsk](#), and the [Kievan Rus](#). It was also during early medieval times that missionaries [converted the eastern Slav](#) tribes to [Orthodox Christianity](#).

Following the [destruction of the Kievan Rus by the Mongol Horde](#) in 1240, the territories of modern Belarus gradually came under the rule of the [Polish-Lithuanian Commonwealth](#) – a polity made up of various Polish and Lithuanian principalities that coalesced in 1386 and formally formed by the [Union of Lublin](#) in 1569. Many [wars between the Commonwealth](#) and their neighbours, Russia, [Austria](#) and [Prussia](#) resulted in the final partition of the Commonwealth between the three neighbours in 1795. The territory that is now Belarus then became part of the [Russian Empire](#).

From 1795 till 1917 Belarus was part of the Russian Empire. Among their many troubles, Belarus bore the brunt of [Napoleon's invasion of Russia](#). Later, during the [First World War](#), German troops occupied

Minsk in 1918 while the [Bolshevik](#) government that took power in Russia was attempting to settle with Germany. The Bolsheviks made peace with the Germans in the Treaty of [Brest-Litovsk](#) and, eventually, [Belarus became one of the constituent republics](#) of the Soviet Union in 1920.

Life under the Soviet Union was not easy. [Under the rule of Josef Stalin](#), about 600,000 Belorussians were arrested by the [state security organizations](#) of whom 358,686 people died in custody. More information on Soviet rule (misrule?) in Belarus can be found at the [Virtual Museum of Soviet Repression in Belarus](#).

As if the [Communists](#) weren't bad enough, the [National Socialist](#) rulers of Germany made war upon the Soviet Union. Between the German [Operation Barbarossa](#) and the Soviet [Operation Bagration](#) and Belarus was one of the main battlefields of the war. Millions of people died, often gratuitously as in the [German genocide of Jewish people](#) living in the territories they conquered.

Post World War II, Belarus was rebuilt and many new industrial enterprises were built including the [Mink Tractor Works](#) whose product is shown in Figure 4. While far from ideal, the Communist rulers of Belarus in those years were dedicated to industrial development, however inefficiently. Unless you were one of the unfortunates caught by the state security agencies for real or imagined crimes, the Communist system actually tried to improve the lives of working people and made some progress in that direction. Even brutal, closed minded ideologues can only stay in power if they can produce something of value for the people they rule.

Since the end of the Soviet Union in 1991, Belarus has been a nominally independent although in fact they have been closely aligned to the Russian Federation. Some of this is due to practical considerations. The infrastructure and organization of the Belarus economy is based upon that which was built during Soviet times and the costs of disentangling Belarus from Russia are probably too great to be justified by whatever benefits more independence would actually bring. It helps that the current rulers of Belarus appear to be in [close alliance](#) with the rulers of Russia. Finally, Belarus has the close example of the Ukrainian War to instruct them in the [costs of getting into a dust-up with Russia](#). Consequently, the geopolitics of Belarus suggest that it will remain closely tied to its big neighbour Russia and it is even conceivable that its independence will become a useful fiction.

That kind of wraps up our look at Belarus. If any of this interests you, start by following up on the links provided.

Standard Caveat

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.