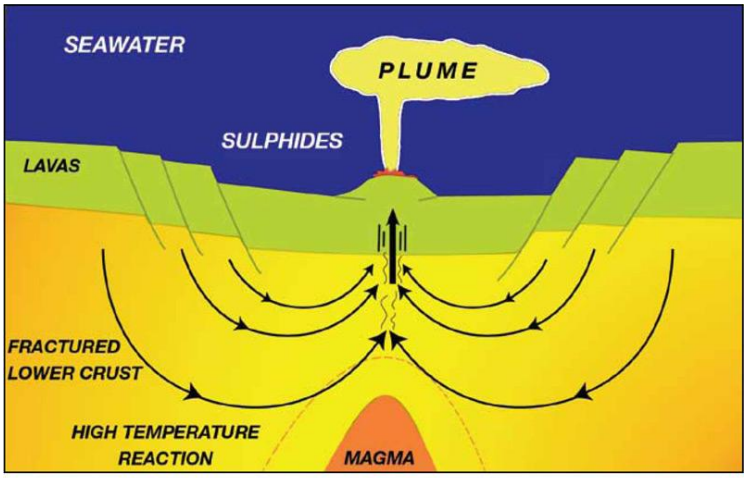
Copper Rush

By Vetle Sivertsen

Many metals, such as gold and copper, are currently at or near their nominal all-time high prices. The technology for seafloor mineral extraction, or subsea mining, is developing rapidly with projects off the coasts of Papua New Guinea and New Zealand. Some scientists believe that subsea mining is actually less damaging to the environment than terrestrial mining. The seafloor of the Arctic Ocean contains huge deposits of mineral resources including gold, copper, coal, diamonds, iron, lead, zinc and nickel. Will this lead to a mineral rush in the North Polar Region?

The minerals are found in Seafloor Massive Sulphide deposits or SMS, found on the ocean floor where new ocean crust is forming. The hot hydrothermal acidic fluids that seawater is transformed into when in contact with magma carry dissolved metals and sulphur to the seafloor. Here the sudden cooling causes the metals and sulphur to precipitate out of solution as metal-rich sulphide, forming an accumulation of sulphide material on the seafloor. SMS deposits where first recognized in the 1960s during exploration of the mid ocean ridge. In the Arctic, the Gakkel Ridge which goes from Siberia to Greenland is the tectonic plate boundary between the North American Plate and the Eurasian Plate.



Formation of seafloor sulphides. (Herzig et al. Proceedings. Minerals other than polymetallic nodules of the international seabed area, Kingston, Jamaica: International Seabed Authority, 2000, pp. 109-161.)

Subsea mining is done in a similar way as offshore oil and gas production. A rig, often referred to as a Production Support Vessel (PSV) is connected to an unmanned mining machine on the seafloor. There's a lift between the rig and the mining machine which carry the SMS to the ship. The PSVs developed so far is not suitable for the ice and stormy weathers of the Arctic Ocean. But only a decade or so ago, Arctic oil and gas production was looked upon as wishful dreams by oil executives. With the rapidly improving icebreaker technology and positioning systems together with a melting icecap, the possibilities of mining the Arctic Ocean is technologically realistic.

SMS deposits are estimated to range in size from 250,000 tonnes to almost 20 million tonnes (Logachev field). Gold content is ranging from 2 – 20 grams per ton, while copper ranges from 5 to 15% of the SMS deposits. In addition the SMS will contain silver, zinc and lead. With current commodity prices the value of the metals would range between USD 600 and USD 4,000 per ton of SMS depending on the metal content. No cost estimates for Arctic Ocean subsea mining has been done yet, but based on subsea mining elsewhere and the assumed cost disadvantage due to ice and storms, the costs for exploration, mining, lifting and transporting the SMS deposit would range between USD 500 and USD 800 per tonne.

Any environmental threat that subsea mining has to Arctic marine ecosystems has yet to be studied, but particularly the live volcanoes along the Gakkel Ridge is believed to contain yet discovered fragile marine life that would be impacted by subsea mining. On the other hand there is little evidence of plentiful marine life around inactive volcanoes except for sea stars and sea urchins. Subsea mining do not dig deep and it leaves very little waste and infrastructure behind. Naturally the sea stars and sea urchins living at the SMS deposits excavated will be impacted. Terrestrial mining has a pollution problem due to acid mine drainage (basically fresh water polluted with metal corrosion). This would not be a problem for subsea mining as the alkaline sea water would neutralize the acids. Subsea mining will have environmental problems like all other industrial ventures, but the combination of a lack of studies of Arctic seafloor habitats and an unproven technology might give Arctic subsea mining environmental headaches.

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Currently the United States is the only Arctic country that is not a full member of the International Seabed Authority (ISA). The ISA organize and control, particularly when it comes to resources, the ocean floor area of UN's Law of the Seas. This would govern the international waters that are over parts of the Gakkel Ridge. The rest is governed by the different Arctic countries. Russian legislation on seabed mining is unclear, and with a fast growing mining industry and recent comments from political leaders to focus on Arctic resources it would come as no surprise that Arctic subsea mining will first occur in Russian waters.

There is no doubt that sooner or later there will be subsea mining in the Arctic Ocean. The technology is realistic and the current commodity prices give mining companies a motive to start doing this sooner rather than later. But we do not know enough about what impact such mining will have on Arctic undersea marine life as we do not know to a full extent what marine life there is. New technology has a tendency of yielding nasty surprises. The responsibility of conducting studies of these uncertainties lays with the Arctic countries and to some extent the ISA. For these authorities to simply say no to subsea mining would also be wrong as it could prove to be a more environmental friendly than terrestrial mining. Subsea mining of the Arctic could be a blessing to the world or a tragedy. We will only be able to know that if more research is done. And that must be done soon as the mining will start in the near future.

The writer is Senior Partner with Polaris Project Partners