

# Geologist says there's no need to fight over mineral resources

October 7 2010, By Lauren Gold

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It's easy to be a pessimist in a world full of calamities. But for those worried about the continuing availability of natural resources, data from the ocean makes a good case for optimism, says economic geologist Lawrence Cathles.

In a review paper published June 23 online in the journal *Mineralium Deposita*, Cathles, Cornell professor of earth and atmospheric sciences, writes that while land-based deposits may be a dwindling source of valuable minerals, deposits on the [ocean floor](#) could power humanity for centuries.

The minerals, including sulfur, copper, zinc, iron and [precious metals](#), are contained in volcanogenic massive sulfide (VMS) deposits that form on the ocean floor where [tectonic plates](#) pull apart and allow magma ([molten rock](#)) to invade the Earth's 3.7-mile- (6 kilometer-) thick crust. The magma heats seawater to 662 degrees Fahrenheit (350 degrees Celsius) and moves it through the ocean crust via convection; and the seawater deposits the minerals where it discharges along the ridge axis.

According to [model simulations](#) by Cathles and colleagues combined with heat flow measurements from the 1980s around the [Galapagos Islands](#), the [seawater](#) convection cools the entire crust -- "like a homeowner who lights a fire in his fireplace for the express purpose of cooling his house," said Cathles.

That knowledge, along with the known thickness of the ocean crust,

allows researchers to calculate the quantity of dissolved minerals that could be transported over each square meter of ocean floor.

If just 3 percent of the dissolved minerals precipitate -- an estimate based on earlier studies -- the ocean floor would hold reserves vastly greater than those on land, Cathles said.

In the case of copper -- a key component in construction, power generation and transmission, industrial machinery, transportation, electronics, plumbing, heating and cooling systems, telecommunications and more -- calculations show that just half of the total accumulated amount could be enough to bring the world's growing population up to a modern standard of living and maintain it for centuries.

"I think there's a good chance that it's a lot more than 3 percent," Cathles said. "But even just taking 3 percent, if you calculate how long the copper on the ocean floor would last, just half of it could last humanity 50 centuries or more.

"You go back to Christ, and then you go twice as far again, and you've got that much copper," he said. "That's everyone living at a European standard of living, essentially forever." Equally large quantities of uranium, lithium, phosphate, potash and other minerals are dissolved in ocean water and could be extracted, he added.

With the necessary precautions, extracting the underwater deposits may also be a more environmentally friendly process than mining on land, Cathles said.

And it could provide other benefits, both scientific and psychological. Undersea exploration around ocean ridges could open doors to new research on the fundamental processes behind the formation of Earth's crust, he noted; and a more positive outlook on the future could lead to

fewer wars and more positive engagement.

"We are not resource limited on planet Earth. For a human on Earth to complain about resources is like a trillionaire's child complaining about his allowance or inheritance. It just doesn't have much credibility in my view," he said.

"I think there's real risk if we don't really carefully, and in a credible way, articulate that there are enough resources for everybody," he added. "We don't have to fight over these things."

Provided by Cornell University

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