Foretelling a major meltdown: Rare mineral might portend return to hothouse climate of old

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By discovering the meaning of a rare mineral that can be used to track ancient climates, Binghamton University geologist Tim Lowenstein is helping climatologists and others better understand what we're probably in for over the next century or two as global warming begins to crank up the heat — and, ultimately, to change life as we know it.

"I think the earth will be a very different place in the next hundred years or so, and that many species will adapt to it and many won't," Lowenstein said. "Humans are supremely good at adapting. But, rich countries will adapt much better than poor countries and other species will have far more trouble coping with environmental change. There are going to be challenges we can't even imagine right now."

Lowenstein's concerns are rooted not in speculation about unprecedented future happenings, but in the scientific discovery and analysis of mineral samples formed during the Eocene Epoch, the warmest period on earth in the last 65 million years.

What Lowenstein and his colleague Robert Demicco at Binghamton University have discovered is that nahcolite, a rare, yellowish-green or brown carbonate mineral, only forms on earth under environmental conditions marked by very high atmospheric CO2 levels. That establishes it as both a marker and a benchmark that can be used by scientists as they consider the likely climatic implications of ever-

increasing CO2 levels in our atmosphere today. More specifically, nahcolite suggests that Eocene warming was concurrent with atmospheric CO2 levels of at least 1,125 parts per million (ppm), which is 3 times the current levels of 380 ppm, but not all that much higher than we can expect on earth in the next 100 years or so given generally accepted scientific projections based on fossil-fuel consumption.

Because CO2 is a forcing factor for climate change, increases in its levels can be directly tied to global warming. A greenhouse gas, CO2 absorbs radiation that would normally be reflected out of the atmosphere, helping to ramp up temperatures, melt glaciers and significantly alter ocean currents and weather patterns.

As for steep, projected increases in CO2 levels over the next century, Lowenstein thinks that might not be our only cause for concern.

"If we assume that you and I are both in our 50s, the change in atmospheric CO2 in our lifetime is greater than the rate of any change in at least the last half million years," said Lowenstein, who is particularly concerned about unexpected changes

"Right now, we're on a predictable pace. But there will likely be tipping points, unexpected events that could really change things, so all of a sudden we may get changes in ocean circulation that we never would have predicted, or the tundra may melt. Some unexpected event is going to occur that's going to be more dramatic than the progressive changes that occurred over the last 100 years."

As a scientist, Lowenstein has no doubt that burning oil, gas and coal are fueling global warming and creating, along with environmental degradation, an immediate threat to some species of life on the planet. His opinion is unchanged by those who would point to the earth's ancient hothouse past as proof that natural swings in climate take place with or

without human intervention.

Lowenstein said these consequences seem more and more likely without drastic change.

"The glacier on Mount Kilimanjaro has not much time left even now. Many mountain glaciers are going to disappear," he said. "It all depends on how much fossil fuel we burn. But if we keep doing what we're doing now, we will be up to the CO2 levels of the Eocene within another 100 or 200 years."

As Lowenstein points out, although it is difficult to predict how global temperatures over the coming centuries will compare to the Eocene, the "hothouse" world 50 million years ago should serve as a reminder of what global changes are possible.

Source: Binghamton University