

Oceans may soon be more corrosive than when the dinosaurs died

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Increased carbon dioxide emissions are rapidly making the world's oceans more acidic and, if unabated, could cause a mass extinction of marine life similar to one that occurred 65 million years ago when the dinosaurs disappeared. Ken Caldeira of the Carnegie Institution's Department of Global Ecology will present this research at the AGU/ASLO Ocean Sciences meeting in Honolulu, HI on Monday, Feb 20.

Caldeira's computer models have predicted that the oceans will become far more acidic within the next century. Now, he has compared this data with ocean chemistry evidence from the fossil record, and has found some startling similarities. The new finding offers a glimpse of what the future might hold for ocean life if society does not drastically curb carbon dioxide emissions.

"The geologic record tells us the chemical effects of ocean acidification would last tens of thousands of years," Caldeira said. "But biological recovery could take millions of years. Ocean acidification has the potential to cause extinction of many marine species."

When carbon dioxide from the burning of coal, oil,

and gas dissolves in the ocean, some of it becomes carbonic acid. Over time, accumulation of this carbonic acid makes ocean water more acidic. When carbonic acid input is modest, sediments from the ocean floor can buffer the increases in acidity. But at the current rate of input--nearly 50 times the natural background from volcanoes and other sources--this buffering mechanism is overwhelmed. Previous estimates suggest that in less than 100 years, the pH of the oceans could drop by as much as half a unit from its natural value of 8.2 to about 7.7. (On the pH scale, lower numbers are more acidic and higher numbers are more basic.)

This drop in ocean pH would be especially damaging to marine animals such as corals that use calcium carbonate to make their shells. Under normal conditions the ocean is supersaturated with this mineral, making it easy for such creatures to grow. However, a more acidic ocean would more easily dissolve calcium carbonate, putting these species at particular risk.

The last time the oceans endured such a drastic change in chemistry was 65 million years ago, at about the same time the dinosaurs went extinct. Though researchers do not yet know exactly what caused this ancient acidification, it was directly related to the cataclysm that wiped out the giant beasts. The pattern of extinction in the ocean is consistent with ocean acidification--the fossil record reveals a precipitous drop in the number of species with calcium carbonate shells that live in the upper ocean--especially corals and plankton. During the same period, species with shells made from resistant silicate minerals were more likely to survive.

The world's oceans came close to an acidic catastrophe one other time about 55 million years ago, when the temperature of the Earth spiked and large amounts of methane and/or carbon dioxide flooded the atmosphere. There is no evidence,

however, that this caused a mass extinction event.

"Ultimately, if we are not careful, our energy system could make the oceans corrosive to coral reefs and many other marine organisms," Caldeira cautions.

"These results should help motivate the search for new energy sources, such as wind and solar, that can fuel economic growth without releasing dangerous carbon dioxide into the environment."

Source: Carnegie Institution

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