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Ocean acidification: Humanity and the environment in geologic time

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S46.04**Ocean acidification: humanity and the environment in geologic time**Ken Caldeira*Carnegie Institution, Department of Global Ecology, Stanford, CA, USA*

If current trends in carbon dioxide emissions are not reversed soon, we will produce chemical changes in the oceans of a magnitude that has not been seen for many tens of millions of years. A failure to cut carbon dioxide emissions deeply and soon risks widespread extinctions in the marine environment, with difficult-to-predict consequences for marine ecosystems generally. The geologic record indicates that ecosystem recovery from such an insult would likely take hundreds of thousands, if not many millions of years. True recovery is of course impossible, because extinctions are irreversible. We think in minutes, days, and months, and perhaps even years and centuries. But the next few decades is a blink of the geologic eye. Atmospheric carbon dioxide content has not been substantially higher than today's value for over 20 million years. The rate of increase in atmospheric carbon dioxide probably has not been greater than today's rate since 65 million years ago, when the dinosaurs became extinct -- and ocean chemistry is particularly vulnerable to very rapid changes in carbon dioxide content such as we are experiencing today. It is not known exactly how the consequences of this acidification will play out. If current trends in carbon dioxide emission continue, coral reefs [which have been around continuously for the past 63 million years] will likely disappear. It is not clear how many other types of ecosystems will suffer a similar fate, or what the effects might be up the food chain. What we decide to do over the next decades will produce changes that are profound when viewed from a geologic perspective. The choice to continue emitting carbon dioxide means that we will be an agent of biological change of a force and magnitude exceeded only by the causes of the great mass extinction events. We will leave a mark in the geologic record that will be visible to future geologists hundreds of millions of years into the future. If we do not cut carbon dioxide emissions deeply and soon, the consequences of ocean acidification will stand out against the broad reaches of geologic time. Those consequences will remain embedded in the geologic record as testimony from a civilization that had the wisdom to develop high technology but did not develop the wisdom to use it wisely. Cutting carbon dioxide emissions deeply and soon is compatible with economic growth and development, if we develop the wisdom to develop high technology and use it wisely.