How to avoid severe climate change discussed at CO2 conference

September 21 2005

The kind of devastation seen on the Gulf Coast from Hurricane Katrina may be a small taste of what is to come if emissions of the greenhouse gas carbon dioxide (CO_2) are not diminished soon, warns Dr. Ken Caldeira of the Carnegie Institution's Department of Global Ecology in his opening remarks at the 7th International Carbon Dioxide Conference in Boulder, Colorado, September 26, 2005.

If current trends continue, some 5 trillion tons of carbon is expected to be spewed into the atmosphere over the next three centuries from human fossil-fuel burning. It will have serious consequences by warming the planet on average between 7 and 20 degrees Fahrenheit and turning the oceans acidic.

"These global changes would happen so fast they would overwhelm most natural processes and have devastating effects on plant and animal life on land and in the oceans. What we do this decade and the rest of this century will dramatically affect what happens to our planet for thousands of years to come," Caldeira cautions. "Although centuries seem like a long time, they aren't when you look at how long it takes organisms to adapt to new conditions. What if people a few centuries ago had knowingly damaged our long-term climate and ocean chemistry for their short-term gain; what would we think of them?" he poses.

With stronger storms like Hurricane Katrina, the causes and effects of global climate change are gaining more public attention. The National Oceanic and Atmospheric Administration (NOAA) is hosting the 7th

International Carbon Dioxide Conference in Boulder, Colorado, beginning September 26. Experts from all over the world convene to evaluate methods used to study the CO_2 cycle, describe research results, and discuss effective responses to climate change.

Caldeira's talk follows the opening address given by the Bush administration's James Mahoney, director of the U. S. Climate Change Science Program. Caldeira sets the stage for the long-term consequences of continued CO_2 emissions based on the physics and chemistry of ecological systems, analysis of Earth's history, and sophisticated climate modeling. He begins with a brief history of carbon-cycle science: In the 19th century, scientists found that the greenhouse gas CO_2 could explain why the Earth is not a frozen planet. The gas produces an insulating blanket, which acts like a greenhouse. Some scientists suspected that CO_2 played a role in the waxing and waning of the ice ages. Since that time, researchers have developed a much better understanding of the carbon cycle, but the basic science underlying the importance of CO_2 for the Earth has been established for over a century.

Caldeira addresses the carbon budget—the amount of carbon released to the atmosphere minus that which is locked-up by terrestrial plants as they use carbon for photosynthesis or is absorbed by the oceans. Some of the ocean carbon is used to make skeletons and shells. It is possible that about half of the predicted emissions could be sequestered this way. According to Caldeira, however, the net result of continuing current trends could yield an atmosphere with about five times more CO_2 than would have occurred without human-made emissions.

He states that if the planet were to warm by only 3.6 degrees F per century, as suggested by some models, the snow and ice in latitudes near the poles would melt and higher temperature bands would "march poleward" by more than 30 feet (10 meters) per day, affecting everything in the wake. If CO_2 from fossil-fuel resources is ultimately

released to the atmosphere, the Antarctic and Arctic ice sheets would be at risk of melting, which would cause a rise in sea level potentially over 230 feet (70 meters) over several thousand years.

In addition to the effects from temperature increases, Caldeira discusses how the chemistry of the oceans would be altered. Carbon dioxide dissolves in water to produce carbonic acid—a corrosive agent that would eat away shells and skeletal materials of marine organisms. This ocean acidity could kill off entire species, including those vital to the bottom of the planet's food chain.

Caldeira emphasizes that "to find comparable events in Earth history, we need to look back tens of millions of years to rare catastrophic events." He called on international governments, policy-makers, and industry "to act now to meet our responsibility to reduce emissions so we can avoid scenarios of devastation and be proud of how our civilization responded to this global challenge."

7th International Carbon Dioxide Conference Web site www.icdc7.com/

Source: Carnegie Institution