Storing carbon in rocks may help fight against climate change

October 5 2010

(PhysOrg.com) -- As climate change continues to emerge as the biggest challenge of the 21st century, the race to come up with novel ways to deal with the threat has become more urgent than ever. Carbon capture and storage – which involves removing carbon dioxide, the main contributor of greenhouse gas emissions, from the atmosphere and storing it elsewhere – is one of the leading technological solutions to mitigate global climate change.

While current methods for carbon storage exist, they involve depositing the gas into underground aquifers or depleted oil reservoirs, where it remains under high pressure. Storing the gas in this way carries with it risks, such as leaks and the acidification of the groundwater.

Now the U.S. Department of Energy has awarded Yale University $2 million to research an alternative approach to storing carbon dioxide called mineral sequestration — i.e., putting the gas in existing rock below ground. Yale geochemist Zhengrong Wang will head a large team of scientists from the Yale Department of Geology & Geophysics and the Yale Climate and Energy Institute (YCEI), which is also providing additional funding. The team will collaborate with scientists at the University of Hawaii and University of Maryland to investigate the chemistry and physics involved in the process.

“The Intergovernmental Panel on Climate Change’s special report on carbon dioxide capture and storage clearly indicates a significant role for research and development in this area,” said Rajendra Pachauri, chair of the IPCC and director of the YCEI. “This grant will provide a unique opportunity for developing a methodology and scientific solution for carbon storage that would eliminate a large number of the potential problems associated with conventional technologies.”

Mineral sequestration mimics the natural process of carbon storage in basalt rocks found at the bottom of oceans and on land, where carbon dioxide reacts naturally with minerals to form carbonate rock. The idea behind mineral sequestration is to speed up this process by, for example, pumping carbon dioxide into the porous basalt rock below ground, where carbonates such as magnesite would form as a result.

“Most of the carbon dioxide on Earth exists in carbonate rocks such as limestone at the bottom of the ocean,” said project member David Bercovici, chair of Yale’s Department of Geology & Geophysics and of the YCEI’s Steering Committee. “It’s this process that keeps our planet from experiencing a much worse global greenhouse, an extreme example being what we see on Venus,” where a carbon dioxide-rich atmosphere leads to surface temperatures of more than 800 degrees Fahrenheit.

Because the resulting carbonate rock is chemically stable and the carbon dioxide is not stored as a volatile gas, there is far less risk involved in mineral sequestration, Bercovici said. As part of the new study, a team of chemists, geologists and physicists will conduct lab experiments and field tests as well as develop theoretical models to study such questions as how quickly the rock is formed and at what pressures.

“Unlike geo-engineering methods for climate mitigation, such as adding unnatural substances to the atmosphere, we’re just trying to speed up a natural process,” Bercovici said. “At some point in the not-too-distant future we’re going to have to start treating carbon dioxide like nuclear waste, and there’s no better place to store this stuff.”

The Yale Climate and Energy Institute seeks to understand Earth's climate system, ecological and social impacts of climate change, the strengths and weaknesses of current political and economic system's ability to respond to climate change, and to provide realistic, implementable solutions to societies and communities around the world. Its mission promotes a multidisciplinary approach to learning, research, and the development of strategies that help societies contribute to solutions and adapt to the challenges of local and global climatic changes.

Provided by Yale University

Citation: Storing carbon in rocks may help fight against climate change (2010, October 5) retrieved 13 April 2024 from https://phys.org/news/2010-10-carbon-climate.html