# Enhanced rock weathering could counter fossil-fuel emissions and protect our oceans

December 14 2015

Credit: Tiago Fioreze / Wikipedia

Scientists have discovered enhanced weathering of rock could counter man-made fossil fuel CO2 emissions and help to protect our oceans.

An international team, led by researchers from the University of Sheffield, found that speeding up the naturally occurring process of the weathering of rock to draw CO2 out of the atmosphere could help to

significantly stabilise the climate and avert ocean acidification caused by humans burning fossil fuels.

This is the first time the large-scale effects of weathering by vegetation, roots and symbiotic microbes have been investigated using a complex modelling approach to find out how to accelerate the Earth's natural CO2 removal system to counter-act anthropogenic CO2 emissions and ocean acidification.

Weathering occurs when rainwater comes into contact with rocks under warm conditions causing the rock to breakdown chemically. This process converts CO2 to bicarbonate, a natural neutraliser, which eventually drains away via rivers to the oceans. Plants enhance this further by acidifying the soil particles around their roots. It helps if the surface of the rock particles is large such as in silicate rock like volcanic rock basalt.

Dr Lyla Taylor, from the University of Sheffield's Department of Animal and Plant Sciences, said: "Phasing down fossil fuel emissions remains a top priority but we also need to better understand potential strategies for safely removing atmospheric CO2 to avert dangerous climate change."

"We have shown that, in principle, rock weathering could indeed draw down atmospheric CO2 and could benefit coral reefs in the ocean.

"The simulations we ran were idealised as they covered some of the world's most ecologically sensitive terrestrial environments, however our evidence shows that the enhanced weathering strategy is definitely worth investigating further as it could play a significant role in offsetting the damage we are doing to the environment."

Ocean acidification is caused by the uptake of CO2 from the atmosphere

which leads to an ongoing decrease in the pH of the Earth's oceans and has a range of possible harmful consequences including coral bleaching which leaves the organism vulnerable to disease.

The United Nations estimate ocean acidification could cost the global economy one trillion US dollars a year by 2100.

Lead author of the study, Professor David Beerling, also from the Department of Animal and Plant Sciences, said: "This study is important because deploying strategies for removing CO2 from the atmosphere are strongly embedded in climate stabilisation policies but don't yet exist.

"With the UN Climate Change Conference still at the forefront of everyone's mind it is vital that we investigate the safety, effectiveness and benefits of methods such as enhanced weathering so we know what our options are. Detailed theoretical modelling like this is a good place to start."

The study, which is published today (Monday 14 December 2015) in *Nature Climate Change*, was conducted by researchers at the University of Sheffield in collaboration with the University of Bristol, University of California, Columbia University, and the Goddard Institute for Space Studies.

This research is part of the University of Sheffield's revolutionary approaches to tackling climate change. Last month saw the launch of its £10 million Leverhulme Centre for Climate Change Mitigation led by Professor David Beerling, which will develop the science to safely remove CO2 from the atmosphere to cool the planet.

**More information:** Lyla L. Taylor et al. Enhanced weathering strategies for stabilizing climate and averting ocean acidification, *Nature Climate Change* (2015). DOI: 10.1038/nclimate2882

Provided by University of Sheffield