In hot water: lakes speed up climate change

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Lakes that warm up due to climate change give off large amounts of CO2, says Dutch PhD researcher Sarian Kosten in Global Biochemical Cycles. And those emissions speed up climate change in their turn.

Kosten researched the influence of climate on the ecosystems of shallow lakes in South America. A focal point of her study was the amount of dissolved carbon dioxide in the lakes. To her surprise, most of the lakes appeared to be over-saturated with carbon dioxide. 'This means that they are in fact carbon sinks.'

Moreover, warmer lakes turned out to be more saturated with carbon than cooler ones. According to Kosten, this is the first time that this correlation with temperature has been revealed. 'It is a new finding that the temperature has such a big influence', says Kosten. 'It is difficult to prove, because many other factors such as algae growth and influx of oxygen also influence the carbon dioxide level. But because we took samples from many lakes with a wide variety of temperatures, we managed.'

Feedback loop

This correlation could have important consequences. Kosten says that global warming will probably cause cold lakes to emit more carbon. And these emissions will in turn increase global warming: an example of what scientists call a positive feedback loop. This effect has not yet been integrated into the climate models of the IPCC.

Exactly how that over-saturation takes place is not entirely clear. Rising temperature stimulate the growth of algae and with it the absorption of CO2. At the same time, however, respiration increases, releasing more CO2. 'Apparently, the breakdown speeds up faster than the production. So CO2 builds up and the lakes emit more carbon.'

Cloudy

Kosten spent two years travelling around South America, taking samples from 82 lakes spread over different climate zones over a range of 6,000 kilometres. Her conclusions are worrying. Climate change stimulates eutrophication in lakes. 'What we are finding is that lakes get cloudier as they warm up. Climate change intensifies eutrophication and its symptoms', Kosten explains.

Changing precipitation patterns can lead to a larger supply of nutrients, and sediments break down faster in warmer water too. This dual effect immediately leads to cloudier water. 'So then you lose your aquatic plants faster and algae become dominant. What is more, the composition of the algae changes and there are more blue-green algae. And you don't want that.´

Kosten is due to get her PhD on Tuesday 6 April, when she defends her thesis 'Aquatic ecosystems in hot water'.

Provided by Wageningen University