More oxygen -- colder climate

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Everybody talks about CO_2 and other greenhouse gases as causes of global warming and the large climate changes we are currently experiencing. But what about the atmospheric and oceanic oxygen content? Which role does oxygen content play in global warming?

This question has become extremely relevant now that Professor Robert Frei from the Department of Geography and Geology at the University of Copenhagen, in collaboration with colleagues from Uruguay, England and the University of Southern Denmark, has established that there is a historical correlation between oxygen and temperature fluctuations towards global cooling.

The team of researchers reached their conclusions via analyses of iron-rich stones, so called banded iron formations, from different locations around the globe and covering a time span of more than 3,000 million years. Their discovery was made possible by a new analytical method which the research team developed. This method is based on analysis of chrome isotopes - different chemical variants of the element chrome. It turned out that the chrome isotopes in the iron rich stones reflect the oxygen content of the atmosphere. The method is a unique tool, which makes it possible to examine historical changes in the atmospheric oxygen content and thereby possible climate changes.

"But we can simply conclude that high oxygen content in seawater enables a lot of life in the oceans "consuming" the greenhouse gas CO_2, and which subsequently leads to a cooling of the earth's surface. Throughout history our climate has been dependent on balance between

CO_2 and atmospheric oxygen. The more CO_2 and other greenhouse gases, the warmer the climate has been. But we still don't know much about the process which drives the earth from a period with a warmer climate towards an "ice age" with colder temperatures - other than that oxygen content plays an important role. It would therefore be interesting to consider atmospheric and oceanic oxygen contents much more in research aiming at understanding and tackling the causes of the current climate change," says Professor Robert Frei.

The results Professor Frei and his international research team have obtained indicate that there have been two periods in the earth's 4.5 billion year history where a significant change in the atmospheric and oceanic oxygen content has occurred. The first large increase took place in between 2.45 billion years and 2.2 billion years ago. The second "boost" occurred for only 800 to 542 million years ago and lead to an oxidisation of the deep oceans and thereby the possibility for life to exist at those depths.

"To understand the future, we have to understand the past. The two large increases in the oxygen content show, at the very least, that the temperature decreased. We hope that these results can contribute to our understanding of the complexity of climate change. I don't believe that humans have a lot of influence on the major process of oxygen formation on a large scale or on the inevitable ice ages or variations in temperature that the Earth's history is full of. But that doesn't mean that we cannot do anything to slow down the current global warming trend. For example by increased forestry and other initiatives that help to increase atmospheric and oceanic oxygen levels," explains Professor Robert Frei, who, along with his research team, has worked on the project for three years so far.

Source: University of Copenhagen