

Extinction risk to plant biodiversity may occur at lower levels of atmospheric CO₂ than previously considered

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(PhysOrg.com) -- Scientists have traced a sudden collapse in plant biodiversity in ancient Greenland, some 200 million years ago, to a relatively small rise in atmospheric carbon dioxide which caused a rise in the Earth's temperature.

According to the findings published in the leading journal *Science*, the current estimated levels of atmospheric carbon dioxide which are thought to lead to sudden biodiversity loss may have to be revised downwards.

However, the scientists from University College Dublin, The Smithsonian Institute in Washington DC and Oxford University, have cautioned that their study findings may not have accounted for additional atmospheric gases such as sulphur dioxide which may have emerged from extensive volcanic emissions at the time to also play a role in driving the rise in the Earth's temperature.

“Examining the 200 million year old fossil leaves from East Greenland, we discovered that the ancient biodiversity crash happened at atmospheric greenhouse gas levels of approximately 900 parts per million,” said Dr Jenny McElwain from the UCD School of Biology and Environmental Science at University College Dublin, Ireland, the lead researcher on the project.

“If we continue with the current intensive use of fossil fuel energy, some estimates calculate that [carbon dioxide](#) levels in the earth’s atmosphere will reach 900 parts per million by the year 2100. This is exactly the same levels at which our study identified the mass biodiversity collapse in ancient Greenland.” But according to Dr McElwain, this is a worst case scenario.

“Clearly, our study on ancient ecosystems shows that we must take heed of the early warning signs of deterioration within modern ecosystems, as we have seen from the past that very high levels of species extinctions - as high as 80% - can take place very suddenly although preceded by long intervals of ecological change,” she explains.

Using a new technique developed by Professor Peter Wagner at The Smithsonian Institute, the team of international scientists were able to detect very early signs at which plant diversity in ancient ecosystems were in a state of steady decline before they went extinct.

The new method reveals the early warning signs that an ecosystem is in trouble in terms of extinction risk. “The differences in species abundances for the first 20 meters of the cliffs from which the fossils were collected, are of the sort you expect given imperfect sampling of the same ecosystem,” said Professor Wagner. “But the final 10 meters show dramatic losses of diversity that far exceed what can be attributed to sampling error: the ecosystems were supporting fewer and fewer species.”

"Earth's deep time climate history reveals startling discoveries that shake the foundations of our knowledge and understanding of climate change in modern times," said H. Richard Lane, program director in the National Science Foundation (NSF)'s Division of Earth Sciences, which partially funded the research.

Provided by University College Dublin

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