Earth's sensitivity to climate change could be 'double' previous estimates, say geologists

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The sensitivity of the Earth's climate to CO_2 could be double what has been previously estimated, according to a statement issued by the Geological Society of London.

In an addendum to 2010's 'Climate change: Evidence from the Geological Record', the statement notes that many climate models typically look at short term, rapid factors when calculating the Earth's climate sensitivity – defined as the mean global temperature increase brought about by a doubling of atmospheric CO_2.

It is well known that a doubling of atmospheric CO_2 levels could result in temperature increases of between 1.5 and 4.5°C, due to fast changes such as snow and ice melt, and the behaviour of clouds and water vapour.

Geological evidence from studies of past climate change now suggests that if longer term factors are taken into account, such as the decay of large ice sheets and the operation of the full carbon cycle, the sensitivity of the Earth to a doubling of CO_2 could be double that predicted by most climate models.

Dr Colin Summerhayes, who led the statement's working group, says 'Geological studies of past climate change are throwing new light on how the Earth may respond to growing emissions of CO_2. The climate sensitivity suggested by modern climate models may be fine for the short term, but does not encompass the full range of change expected in the

long term as the Earth's climate moves slowly towards equilibrium.'

The statement also highlights new data showing that temperature and CO_2 levels recorded in Antarctic ice cores increase at the same time. This, says Summerhayes, 'makes the role of CO_2 in changing Ice Age climate highly significant.'

Atmospheric carbon levels are current at just below 400 parts per million – a figure last seen during the Pliocene, between 5.3 and 2.6 million years ago. At that time, global temperatures were 2-3°C higher than today, and sea levels were several metres higher, due to partial melting of the Antarctic ice sheet.

If the current rate of increase (2 ppm per year) continues, CO_2 levels could reach 600 ppm by the end of this century; levels which, says Summerhayes, 'have not been seen for 24 million years.'

The statement outlines evidence that a relatively modest rise in atmospheric CO_2 levels and temperature results in significant sea level rise, while oceans become more acidic and less oxygenated. Previous such events, such as the Paleocene-Eocene Thermal Maximum (PETM) 55 million years ago, caused marine crises and extinctions, with the Earth System taking around 100,000 years to recover.

'We now have even more confidence from the geological record' says Summerhayes, 'that the only plausible explanation for current warming is the unprecedented exponential rise in CO_2 and other greenhouse gases. Recent compilations of past climate data, along with astronomical calculations, show that changes in the Earth's orbit and axis cooled the world over the past 10,000 years. This cooling would normally be expected to continue for at least another 1,000 years.

'And yet Arctic palaeoclimate records show that the period 1950-2000

was the warmest 50 year interval for 2,000 years. We should be cool, but we're not.'

More information: For more information, see www.geolsoc.org.uk/climatechange

Provided by Geological Society of London