Global sea surface temperature data provides new measure of climate sensitivity

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Scientists have developed important new insight into the sensitivity of global temperature to changes in the Earth's radiation balance over the last half million years.

The sensitivity of global temperature to changes in the Earth's radiation balance (climate sensitivity) is a key parameter for understanding past natural climate changes as well as potential future climate change.

In a study in *Journal of Climate*, researchers from the Universities of Southampton and Bristol for the first time reconstructed climate sensitivity over five ice-age cycles based on a global suite of records of sea surface and polar temperature change. These are compared with a new reconstruction of changes in the Earth's radiation balance caused by changes in greenhouse gas concentrations, in surface reflectivity, and in insolation due to slow changes in the Earth-Sun orbital configuration. The study calculates global mean climate sensitivity, but ¬also considers its relationship with latitude. This is important because many of the past radiative changes were not equally distributed over the planet, in contrast to the more uniform distribution of the modern radiative changes due to rising greenhouse gas levels.

The researchers infer that Earth's climate sensitivity over the last half million years most likely amounted to a 3.1 to 3.9 °C temperature increase for the radiative equivalent of a modern doubling of atmospheric carbon-dioxide concentrations (with a total range of 1.7 to 5.7 °C).

Lead researcher Eelco Rohling, Professor of Ocean and Climate Change at the University of Southampton, says: "We use long time-series of data that are each obtained using a single method. This reduces uncertainty in the estimates of temperature change, relative to previous work that contrasts reconstructions of a single past climate state with modern instrumental data. Our method can be especially improved by extending the global network of long records."

He continues: "Because our climate sensitivity values are based on real-world data from a substantial interval of time in the recent geological past, our results provide strong observational support to the climate sensitivities used in IPCC-class climate models. If anything, our results suggest slightly stronger sensitivity."

Dr Mark Siddall, from the Department of Earth Science at the University of Bristol, adds: "This study shows the increasing importance of using geological data to understand the climate system and how it responds as a whole to changes in greenhouse gasses."

The current study, which is funded by the Natural Environment Research Council (NERC), is based on marine results, but terrestrial information is also being sought in order to progress the study further. In addition, Professor Rohling is joint coordinator of the international Palaeosens effort that aims to establish a common approach for the reporting and comparison of climate sensitivity estimates from geological data, which started at the Royal Netherlands Academy of Arts and Sciences in March 2011.

Provided by University of Southampton

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