

Climate research breakthrough

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A long standing puzzle that has haunted climate researchers looking at the fate of carbon stored in the world's soils, has now been resolved. The research suggests that climate warming may be occurring even faster than previously recognised.

The international team of researchers, led by Bristol University and reporting in *Nature* [20 January 2005], show that an apparent biological adaptation of micro-organisms that break down carbon in soils, thereby releasing carbon dioxide into the atmosphere, can in fact be explained by the widely contrasting properties of those organic carbons.

Recent reports of laboratory experiments have stated that the micro-organisms responsible for soil carbon decomposition gradually acclimatise to an increase in heat and adjust the rate at which carbon is released into the atmosphere, such that it is effectively released at a steady rate. However, this does not agree with long-established rules of physical chemistry that predict that as the climate warms these reactions should speed up, resulting in an increase in the amount of carbon dioxide released.

The team of researchers at Bristol University and the Natural Environment Research Council's QUEST programme, the Max-Planck-Institute for Biogeochemistry in Germany, and the National Centre for Atmospheric Research in Colorado, has now managed to solve the puzzle, bringing the apparent contradictions from laboratory experiments in line with theoretical predictions.

They show that what looked liked a biological adaptation of the micro-

organisms can in fact be explained by widely contrasting properties of organic carbon present in soils.

These properties range from highly digestible (labile) sugar-like compounds to almost stable, charcoal-like compounds which the micro-organisms have difficulty breaking down. Such an extreme mixture has so far prevented theoretical interpretation of the laboratory experiments.

Dr Wolfgang Knorr of Bristol University said: "The next step will be to apply the new theory in complex climate simulations, using so-called Earth System Models. So far, these models only use properties from the labile soil carbon because they are easier to measure. But an estimated 90% of the carbon locked up in the world's soil is made up of the more stable components, which must now be built into the model."

The new results predict that since the micro-organisms are not keeping the release of carbon dioxide from the soil at a steady state, as previously thought, an increase in climate temperatures will result in an increase in the rate at which the stable components decompose. This will lead to even more carbon dioxide being released into the atmosphere and more rapid climate change.

Source: Bristol University

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