including satellite and ground-based precipitation measurements, tree-ring records of moisture over the last millennium, model-simulated atmospheric conditions from 1856 to 2007 and climate change projections from the fourth assessment report of the Intergovernmental Panel on Climate Change. They found that the recent event was typical for the region, where long and severe droughts have occurred in earlier centuries. Climate models differ considerably in their estimates of how climate change will affect the hydrology of the southeastern US, on average predicting a modest increase in precipitation and evaporation, with the overall outcome highly uncertain.

They authors warn that climate change should not be relied upon to solve the region's water woes and that it could make matters worse rather than better.

Olive Heffernan

PALEOCLIMATE

All creatures small

PNAS

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A rapid warming about 55.5 million years ago led to the brief proliferation of smaller-bodied insects and earthworms, say scientists, who predict that the same phenomenon may be underway today. During the Palaeocene-Eocene thermal maximum, temperatures soared for a period of about 100,000 years, as did atmospheric carbon dioxide concentrations.

Jon Smith of the Kansas Geological Survey and colleagues analyzed trace fossils left behind by burrowing insects in the Bighorn Basin, Wyoming, before, during and after this ancient warming episode. During the period of peak warmth, the average body size of burrowing creatures was significantly smaller than during cooler periods. The authors infer that the hot, dry climate brought — on by the spike in atmospheric carbon dioxide levels — suppressed adult body size, probably by shortening lifespans and altering patterns of juvenile development. In addition, say the authors, high CO_2 levels may have lowered the nutritional value of plants favoured by insects for feeding, thereby limiting growth.

The team points out that if modern insects respond similarly to climate change, body size could already be decreasing. Living organisms could be compared with museum collections and archaeological specimens to monitor such changes, they say.

Alicia Newton

EARTH SCIENCE

Refining the future

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Global climate simulations have traditionally assumed that limitless nutrients are available for new plant growth, which can temper warming by absorbing CO_2 from the atmosphere. New research now questions that assumption and suggests that warming over the next century could be higher than anticipated.

The new study, by Peter Thornton of Oak Ridge National Laboratory, Tennessee, and colleagues, is the first to successfully incorporate the nitrogen cycle and its interactions with the carbon cycle into a fully coupled global climate — model that is, one that includes the ocean and the atmosphere. Simulating the climate over 230 years, the researchers found that, compared with a regular simulation, carbon taken up by terrestrial plants was two to three times lower in a high-CO_2 world owing to ni trogen-imposed restrictions on plant growth. But warmer temperatures also encouraged decomposition, freeing up nitrogen in the soil and increasing carbon uptake. This latter effect was insufficient to offset nutrient limitations on plant growth, however, resulting in an overall reduction in new vegetation.

The authors suggest that inclusion of the nitrogen cycle in other climate models would narrow the uncertainty in estimates of future carbon dioxide concentrations.

Anna Armstrong