

Methane finding baffles scientists

MUNICH

The startling discovery that terrestrial plants produce the greenhouse gas methane is sending scientists in two disciplines, not to mention a few politicians, back to the drawing board.

The newly revealed methane emissions have taken plant physiologists by surprise, because far more energy is required to create methane than, say, carbon dioxide in an oxygenated environment. Climate researchers are also amazed that they could have missed what is potentially a huge methane source — up to a third of all methane produced worldwide (see ‘How could we have missed this?’).

Until now, it was thought that plant matter produces methane only through microbial activity in oxygen-free environments such as swamps, flooded rice fields and ruminants’ guts. But on page 187 of this issue, Frank Keppler, a geochemist at the Max Planck Institute for Nuclear Physics in Heidelberg, Germany, and his colleagues report that grasses and leaves from various species release the gas under normal aerobic conditions.

The source of the methane — and why plants make it — is unknown. Some species make other volatile hydrocarbons such as isoprene, but that reaction involves a specific enzyme, and only seems to kick in when the plants need to dissipate excess energy. The methane emissions that Keppler found rise smoothly with temperature up to 70 °C, suggesting that no enzyme is involved.

“This seems to be a secondary chemical reaction with no specific function for



Methane machine? Vegetation may be a huge source of this major greenhouse gas.

plant metabolism,” says Elmar Weiler, a plant physiologist at Ruhr University in Bochum, Germany. “It’s a truly surprising finding.”

But beyond its implications for botany, the discovery could prove important for understanding and predicting climate change — and for our attempts to reduce greenhouse-gas emissions. Methane is the second most important greenhouse gas in the atmosphere after carbon dioxide, and levels have doubled over the past 200 years, mainly as a result of increased agricultural activity.

The finding doesn’t change ideas about the total amount of methane being released into

the atmosphere. But scientists had thought they knew about all the significant methane sources and how much each contributed (see page 148). Now it seems that their figures were very wrong. As a rough estimate, Keppler reckons that global vegetation may be releasing between 60 million and 240 million tonnes of methane each year — up to a third of the total amount that enters the atmosphere.

“The surprising thing to me is the amount of methane they found,” says Martin Heimann, director of the Max Planck Institute for Biogeochemistry in Jena, Germany. “It means we neglected a big driving force for the climate.”

It is too early to say exactly how the revelation might influence predictions for future climate change, but it’s unlikely to be good news. The fact that plant methane emissions rise with temperature, and that plants are likely to grow faster in a warmer climate anyway, could lead to a big rise in methane emissions from natural sources, says Johannes Lelieveld, an atmospheric researcher at the Max Planck Institute for Chemistry in Mainz, Germany.

The finding also restricts our options for reducing methane emissions, he points out, because measures such as growing rice in drier fields are likely to prove less effective than had been thought. “If natural greenhouse-gas sources are greater than we thought, the scope for climate politics becomes narrower,” he says. “You wouldn’t cut down forests just because trees release methane.”

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Additional reporting by Mark Peplow.

How could we have missed this?

The finding that plants are a major source of methane has left many scientists struggling to believe it could have been missed before — and wondering what else might have been overlooked if it is true.

Keppler points out that detecting the methane was far from easy, as the amount released by individual plants is tiny compared with levels already in the atmosphere. His team were studying chemical reactions in ageing plants, and acted on a hunch after they found hints of methane from leaves left in an incubator. To

check their finding, they carried out studies in methane-free air, and irradiated plants to rule out microbial activity as a cause.

But the discovery has made climate researchers wonder how much they really understand about greenhouse-gas sources and sinks. “I don’t think there will be many more big surprises,” says Drew Shindell, a climate researcher at NASA’s Goddard Institute for Space Studies in New York. “But I also wouldn’t bet that this is the last one.”

Others want to wait until it becomes clear exactly how the

methane is produced before they jump to any conclusions. “My feeling is that this could be very important,” says David Beerling, a palaeoclimatologist at the University of Sheffield, UK. “But inferring a methane source by incubating leaves or placing chambers over plants can mean the nature of the source is quite uncertain.”

“I don’t know what to make of it,” adds Colin Prentice, a biogeochemist at the University of Bristol, UK. “My first reaction is scepticism. I find it hard to believe that we missed this.” Q.S. & M.P.