

Breakthrough in debate on recent increase in atmospheric methane

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The amount of the greenhouse gas methane in the atmosphere is once again increasing rapidly after a period of stagnation through 2007. The cause of this recent increase is the subject of heated scientific debate. Scenarios in which the increase was due to either fossil energy mining or agriculture seemed to exclude one another as the likely cause. A new study by Dutch and American climate scientists has now brought an end to this controversy.

The results of this study by researchers from Utrecht University, SRON Netherlands Institute for Space Research and the VU Amsterdam, together with their American partners, will be published this week in the journal *Nature Communications*.

Sudhanshu Pandey (SRON/UU), postdoc researcher in the research group led by Prof. Thomas Röckmann (UU), used a computer model to study the contributions that various sources have made to the amount of methane in the [atmosphere](#) and found the explanation for the contradiction.

The increase of methane in the atmosphere is accurately registered by a global network of measurement stations. Unfortunately, it is difficult to determine exactly which sources are responsible for the increase based on their measurements. Additional information is provided by other measurements, such as the composition of the methane isotopes, or changes in other atmospheric gases, such as carbon monoxide or ethane. These measurements served as the basis for Pandey's analysis.

Contradictory scenarios solved

The observed changes in the methane isotopes indicates that agricultural activities, such as livestock and rice farming, are responsible for the increase, and rules out the use of [fossil fuels](#) as a source of the additional methane. However,

measurements of ethane in the atmosphere suggest that the increase in methane is primarily due to mining-related sources. The increased use of shale gas in the United States, which releases both ethane and methane into the atmosphere, could be responsible. The researchers found a solution to these contradictory findings in the conclusion that there have also been changes in the emission of methane from forest and savannah fires.

Burning biomass is not a major source of methane in general, but it does have a significant influence on the composition of the isotopes in the atmosphere. Recent estimates of global emissions from forest fires and savannah fires show a decreasing trend over the past few years. This trend can be explained by the conversion of African savannah into agricultural land, which is burned off less frequently, along with measures to prevent the deforestation of the Brazilian rain forest.

By including the reduction in [methane emissions](#) due to burning biomass in the calculations, the researchers were able to determine that an increase in emissions from fossil fuels is no longer in conflict with the isotope observations. This conclusion solves the controversy about the issue in the scientific community.

"After our American colleagues detected a trend in the burning of biomass, we were able to determine the effect it had on the amount of methane in the atmosphere", say Röckmann and Pandey. "In a computer model, we calculated various scenarios by changing the contributions made by the different sources of methane. We then selected the scenarios in which the isotope composition corresponds to actual observations."

Focused control

The study is an important step forward in coming to a better understanding of the influence that humans have on the global [methane](#) cycle, which is

necessary in order to focus efforts to control human-generated [greenhouse gas emissions](#). Future research will be geared towards quantifying these emissions further, and reducing them where possible.

More information: Reduced biomass burning emissions reconcile conflicting estimates of the post-2006 atmospheric methane budget, John R. Worden, A. Anthony Bloom, Sudhanshu Pandey, Zhe Jiang, Helen Worden, Thomas Walker, Sander Houweling, and Thomas Röckmann, *Nature Communications*, 20 December 2017.

Provided by Utrecht University Faculty of Science

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