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z naslovom:

Methane and the Oxidizing Capacity of the Atmosphere

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Vljudno vabljeni!

Abstract

Photo-oxidation is an effective cleaning process for the atmosphere, converting reduced gases such as carbon monoxide (CO), methane (CH_4), other volatile organic compounds (VOCs), and the oxides of nitrogen (NOx) and sulfur (SO_2) to more soluble forms that are then easily removed by wet and dry deposition processes. Measurements show that global CH_4 mixing ratios have tripled since pre-industrial times, and, after a brief pause during 2000-2005, are again increasing. Additional increases could occur if higher temperatures destabilize the large natural CH_4 reservoirs in permafrost and oceanic clathrates. Simple analyses of the tropospheric photochemical system indicate that the global oxidation is limited and becomes less effective if the species to be removed (e.g., CH_4) exceed certain thresholds. Collapse of the Earth's oxidizing capacity would likely result in strong greenhouse warming from run-away increases in atmospheric CH_4, but it is unclear if this has actually occurred over geological history. A critical role may be played by NOx, emitted in relatively small amounts by natural processes such as forest fires and lightning but in large quantities by human activities, which catalyzes the production of photo-oxidants (e.g., the hydroxyl radical, OH) that react with CH_4 and other reduced species. However, direct observations of OH suggest that natural biogenic hydrocarbons (e.g., isoprene) may be buffering global OH concentrations. Thus, the relative importance of the natural biosphere and human activities remains unclear, raising justifiable skepticism about our ability to predict the self-cleaning ability of the atmosphere, and the growth of CH_4, in the coming decades of the anthropocene.