# Improving the global budget for atmospheric methanol

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New aircraft survey data show that although atmospheric chemistry above remote ocean regions is a considerable source of methanol production, the ocean's net methanol emission is minor.

Despite being the second most common organic gas behind methane, scientists are still working to understand the role and movement of methanol in regions of the atmosphere above the remote ocean. The gas interacts with a host of other important atmospheric molecules, like ozone and hydroxyl radical (OH), and serves as a precursor for carbon monoxide and formaldehyde. Globally, most atmospheric methanol comes from terrestrial plants, but it is also produced by humans, the oceans, and biomass burning. In the past decade, scientists have begun to understand that the atmosphere's natural chemistry is another major source of methanol, especially above remote ocean regions.

In a new study, Bates et al. attempt to update models of atmospheric methanol using measurements taken during NASA's Atmospheric Tomography Mission (ATom), which lasted from the summer of 2016 to the spring of 2018. The mission consisted of a suite of aircraft flights up and down the Pacific and Atlantic Oceans at various altitudes. Sensors on board the planes took measurements of methanol and other trace gases. The team then used these data to constrain the GEOS-Chem model, a global model of atmospheric chemistry, to create a more complete picture of atmospheric chemistry above the ocean.

Overall, the scientists found that the average atmospheric lifetime of methanol was 5.3 days, with about half of the gas coming from the terrestrial biosphere. Of the remaining half, the majority (~60%) of methanol in remote regions came from gas phase chemistry, specifically the reaction of methylperoxy radicals (CH3O2) with OH, themselves, and other peroxy radicals. The new numbers show that the ocean is a net sink for the gas because much of the methanol rising from the water is often rapidly deposited back to the ocean's surface. Because of the importance of methanol in atmospheric chemistry, the researchers hope the updates to the model will help give a more complete picture of how methanol influences the concentration of the various important radical species in the air above remote oceans.

**More information:** Kelvin H. Bates et al. The Global Budget of Atmospheric Methanol: New Constraints on Secondary, Oceanic, and Terrestrial Sources, *Journal of Geophysical Research: Atmospheres* (2021). DOI: 10.1029/2020JD033439

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