

2.162 New constraints on budgets of oxidized volatile organic compounds in the remote troposphere.

Early Career Scientist

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Abstract:

Recent flight-based measurements of volatile organic compounds (VOCs) in the remote troposphere provide a unique opportunity to validate and improve the representation of these trace gases in global models, and to identify previously unknown or misunderstood aspects of their budgets. Here, we compare measurements of methanol, formaldehyde, acetone, and other oxidized VOCs from the Atmospheric Tomography (ATom) campaign to simulated mixing ratios of these compounds using GEOS-Chem, a global chemical transport model. Persistent model underestimates of formaldehyde and methanol in the remote marine troposphere suggest missing sources of these compounds, while acetone is typically overestimated in the model. Using a combination of tagged tracers, sensitivity studies, and correlations with additional trace gases, we identify potential factors in these model-measurement discrepancies, including air-sea exchange, biomass burning emissions, and photochemical reactions not previously included in the model, such as the reaction of the methyl peroxy radical with the hydroxyl radical. We further investigate the potential roles of these processes and others in the budgets of ubiquitous VOCs in the remote troposphere and discuss the extent to which these budgets remain unconstrained.