



Reply to Yang et al.: Biomass burning is an important tropospheric source of ozone in remote regions of the globe

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Bourgeois et al. (1) show that measurements of elevated ozone above baseline values were often correlated with tracers of biomass burning emissions throughout the remote atmosphere and that these enhancements often exceeded the enhancements of ozone correlated with urban emission tracers. The analysis was performed after filtering out stratospheric influence in order to determine the effect that tropospheric sources have on remote ozone. Conversely, Yang et al. (2) do not exclude stratospherically influenced air in order to isolate tropospheric sources, and Yang et al. (2) do not consider the influence of anthropogenic or urban sources. Their isotopic analysis points to a large influence from the stratosphere to surface ozone in Tibet, a finding not at all in contrast to Bourgeois et al. (1), who intentionally excluded stratospheric air. A major finding of Bourgeois et al. (1) is that biomass burning has a larger effect on remote ozone within the troposphere than otherwise thought or modeled, not that biomass burning is more important to ozone than urban emissions or stratospheric sources in all regions of the world. Thus, the finding of Yang et al. (2) that stratospheric air has a large influence in specific locations, particularly at high altitude, is entirely plausible. Another major finding of Bourgeois et al. (1) is that multiple global climate–chemistry transport models both 1) misattributed tropospheric ozone to urban emissions rather than biomass burning and 2) overpredicted stratospheric air mixing contribution to tropospheric ozone.

That Yang et al. (2) also have a model that shows little influence of biomass burning but a significant influence of stratospheric air mixing on ozone in the Tibetan Plateau is, therefore, not a surprise.

Therefore, we suggest that the analysis by Yang et al. (2) in no way contradicts the conclusions of Bourgeois et al. (1) that biomass burning is a larger source of tropospheric ozone than previously understood and that the findings by Yang et al. (2) are not particularly relevant to those of Bourgeois et al. (1).

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The authors declare no competing interest.

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1. I. Bourgeois *et al.*, Large contribution of biomass burning emissions to ozone throughout the global remote troposphere. *Proc. Natl. Acad. Sci. U.S.A.* **118**, e2109628118 (2021).
2. J. Yang *et al.*, Not biomass burning but stratospheric intrusion dominating tropospheric ozone over the Tibetan Plateau. *Proc. Natl. Acad. Sci. U.S.A.* **119**, 10.1073/pnas.2211002119 (2022).