

Interactive
Comment

Interactive comment on “Aviation 2006 NO_x-induced effects on atmospheric ozone and HO_x in Community Earth System Model (CESM)” by A. Khodayari et al.

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It is misleading to state (in the Abstract) "Aviation NO_x emissions are associated with a change in global mean O₃ radiative forcing (RF) of 43.9 and 36.5 mW m⁻² in CAM5 and CAM4, respectively."

This O₃ RF is that due to the O₃ increase generated by adding aircraft NO_x whilst holding methane levels fixed. (It is described in Section 4.5 as the 'short-term' ozone RF, which is correct, but the phrase short-term should be explained with reference to earlier work, e.g., Wild et al., 2001; Stevenson et al., 2004.)

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As you quantify, aircraft NO_x emissions generate OH and reduce the methane lifetime. If your model experiments had not held methane levels fixed, methane concentrations would have adjusted to a new, lower, equilibrium level (over a few methane lifetimes). This methane decrease would become relatively well-mixed throughout the atmosphere. As methane is an important ozone precursor, tropospheric ozone levels would reduce. If you want to calculate the 'equilibrium' net impact of aviation NO_x on ozone RF, then you should include this effect (termed in earlier work the 'long-term' effect) - it is not negligible. You may want to argue that the relatively rapid growth of aviation NO_x emissions implies the real atmosphere is in partial disequilibrium, but I think it is probably reasonably close to equilibrium in this respect.

You also state in Section 4.5 that the O₃ RF neglects stratospheric adjustment; the qualification that the O₃ RFs are instantaneous should also feature in any reporting of O₃ RFs in the Abstract.

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