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THE CONTRIBUTION OF AVIATION NO_x EMISSIONS TO CLIMATE CHANGE

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Abstract. The contribution of aviation to anthropogenic climate change results from CO₂ and non-CO₂ emissions. Latter comprises emissions of nitrogen oxides, water vapour, and aerosols as well as contrail and contrail-cirrus effects. A series of updates can be noted in recent studies related to the effects of NO_x-emissions; the inclusion of two physical processes and an updated radiation calculation (see below). However, in our opinion, two further published methodological shortcomings have not been fully considered which leads to a considerable underestimation of the contribution of aviation's NO_x emissions to climate change. First, methane response calculations implicitly assume steady-state instead of an adequate transient development. Second, most studies determine ozone changes caused by switching off or reducing aviation NO_x emissions, instead of calculating aviation contributions to ozone. Such methodological simplifications largely underestimate the contribution of the aviation NO_x emissions to climate change by a factor of 6 to 7 and can thereby be considered as flaws. Note that the contribution of an emission to climate change ("status report") and the contribution of a change in emissions to climate change ("mitigation option") require different calculation methods. While for calculating the contribution of emissions to atmospheric compositions (and hence climate change), to which we are referring here, a clear recommendation was made, the methodological approach for evaluating mitigation measures might still be ambiguous, but should certainly not ignore the results of contribution calculations.

REFERENCES

Grewe, V. & Matthes S. & Dahlmann K., 2008. The contribution of aviation NO_x emissions to climate change, *Environ. Res. Lett.* 14 (2019) 121003.