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A first step towards assessing the Impact of Aviation NO_x Emissions on Global Surface Temperatures

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Aviation emissions of carbon dioxide (CO_2) and nitrous oxides ($NO+NO_2=NO_x$) contribute to global warming by modifying the radiative properties of the atmosphere. Improvements to engine design and combustor technology can reduce emission levels of NO_x and CO_2. However, methods that reduce NO_x levels generally produce higher CO_2 levels, and *vice versa*. Therefore, it is necessary to know which gas has the greatest impact on global temperature before making a choice on emissions trade-off in relation to combustor technology development.

Whilst CO_2 has a first order influence on the global surface temperature, the impacts of NO_x on surface temperature are much harder to quantify. Increased NO_x concentration can lead to formation of ozone (O_3) (warming effect) but also to reduction of methane (CH_4) (cooling effect).

Here, we present the first results from a study that aims to quantify the contribution to global warming by aviation NO_x. Global patterns of NO_x, O_3 and CH_4 are generated using a 3D global chemical transport model, MOZART-2 (Model for OZone And Related chemical Tracers), which includes detailed NOx-CH_4-NMHC chemistry for the troposphere, with stratospheric chemistry constrained to climatologies. The model processes aviation emissions scenarios produced within the EU-project QUANTIFY. The emissions data represent the base year 2000 and are derived by combining the OAG2000 and AERO2K air traffic movements databases in combination with an aviation emissions assessment tool (Future Aviation Scenarios Tool, FAST). The effect of the aviation NO_x emissions on the tropospheric O_3 and CH_4 distributions for the base year 2000 are quantified and discussed.