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Future Supersonic Aircraft Emissions and Impact on Chemistry and Climate

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The SCENIC project has been founded by the European commission under the EU Framework 5 RTD Program. This project regroups several European atmospheric research centers and relevant European aeronautical industry representatives.

The aim of the SCENIC project was to study the atmospheric impact of possible future fleets of supersonic aircraft using state-of-the-art atmospheric models and realistic supersonic fleet scenarios.

Several supersonic fleet scenarios have been proposed by the industry partners to be able to determine the most environmentally friendly possible fleet. The major points evaluated by the SCENIC modeling team were: role of NOx in changing ozone, influence of aerosol and contrail, change in water vapor concentration and finally change in radiative forcing of the atmosphere due to the supersonic fleet (taking into account of all the previous impacts).

First we present the different supersonic scenario proposed by Airbus: change in cruise altitude, aircraft number, emissions quantities (emission index: EI), Mach number or maximum range of the aircraft.

Then, we show their impacts on the ozone chemistry. In terms of ozone perturbation, lowering the cruise altitude and the Mach number is the best option. The reduction of altitude and speed may increase the EI(NOx) number, but the lower fuel consumption reduces the emissions and therefore their overall impact on the UTLS ozone.

Not only ozone changes are important for the impact of a supersonic fleet upon the atmosphere. We present the calculations of radiative forcing due to the change in the

ozone concentration, methane, water vapour and contrails. Within these calculations, the fleet scenario with lower cruise altitude and lower Mach number seems to be the less impacting on the radiative forcing and the climate.