Aircraft gas turbine particle emissions in cruise

Theo Rindlisbacher

Swiss Civil Aviation Authority FOCA
theo.rindlisbacher@bazl.admin.ch

The existing global regulation of aircraft gas turbine particle emissions (limits for non-volatile particle mass and number) has been mainly developed related to local air quality concerns. In recent years, the environmental role of aircraft particle emissions at cruise above 8 km of altitude has gained more interest. Particle emission measurements performed at cruise (with chase aircraft) revealed an influence of non-volatile particle number emissions on the number of ice nucleation particles and on the radiative properties of contrails and contrail-cirrus. Recent measurements indicate that volatile particles may play a role, too. Since especially persistent contrails at night can produce a significant climate warming effect, whereas during daytime they can produce a climate cooling effect, reduction of cruise particle emissions and avoiding persistent contrails at night, while not increasing fossil CO_2 emissions are considered important mitigation measures to reduce unwanted short term climate effects from aviation. The presentation summarises the state of knowledge concerning the role of particle emissions in cruise, the gaps in terms of engine dependent particle emission characteristics, the role of Sustainable Aviation Fuels in this context and the activities by aviation regulators to close the gaps.

[1] A New Approach to Estimate Particulate Matter Emissions From Ground Certification Data: The nvPM Mission Emissions Estimation Methodology, Ahrens et al. 2022, https://doi.org/10.1115/1.4055477

[2] Cleaner burning aviation fuels can reduce contrail cloudiness, Voigt et al., Nat. Comm. EE, 2021, Cleaner burning aviation fuels can reduce contrail cloudiness | Communications Earth & Environment (nature.com)