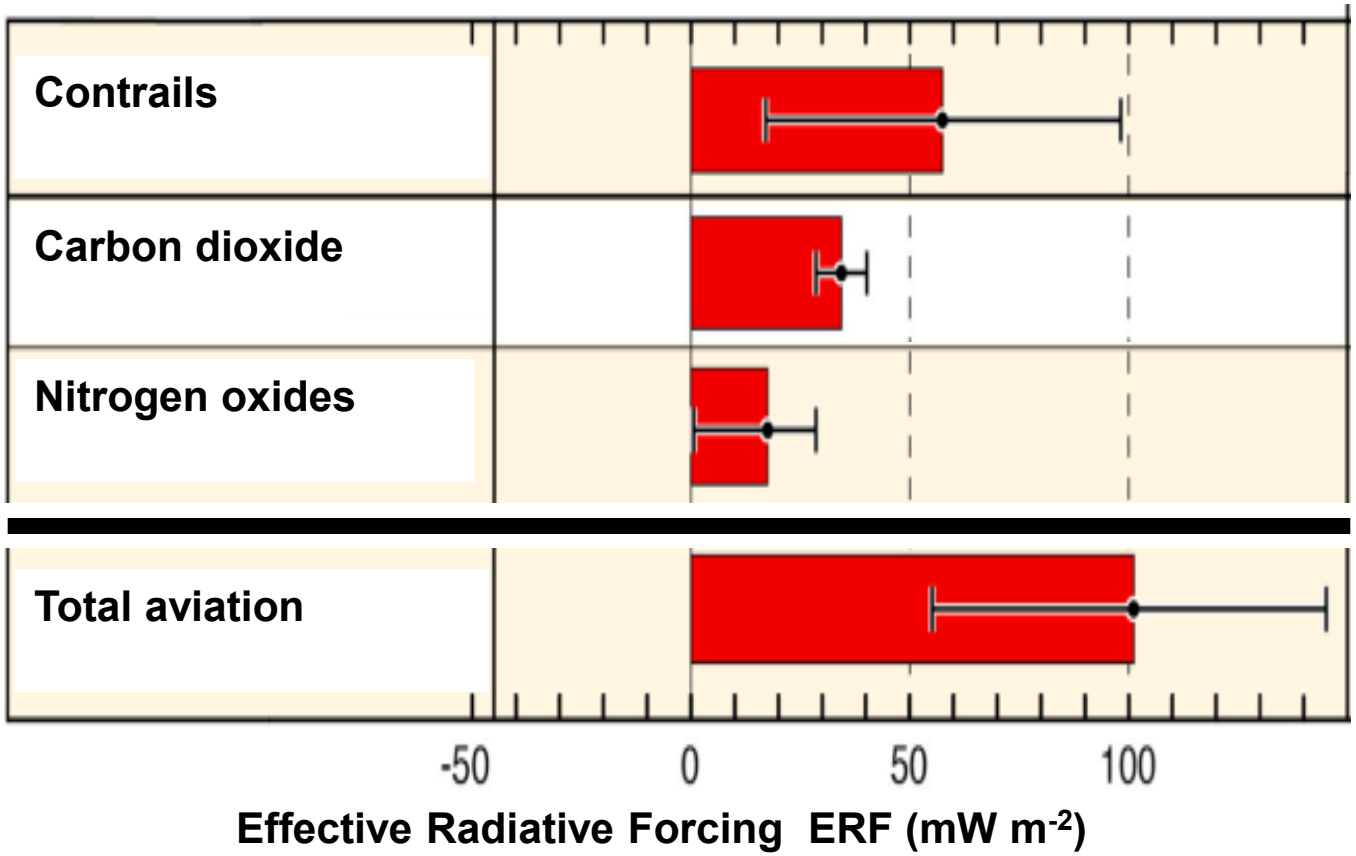
Christiane Voigt

DLR, Head of Department &
Professor, University Mainz

ICAO

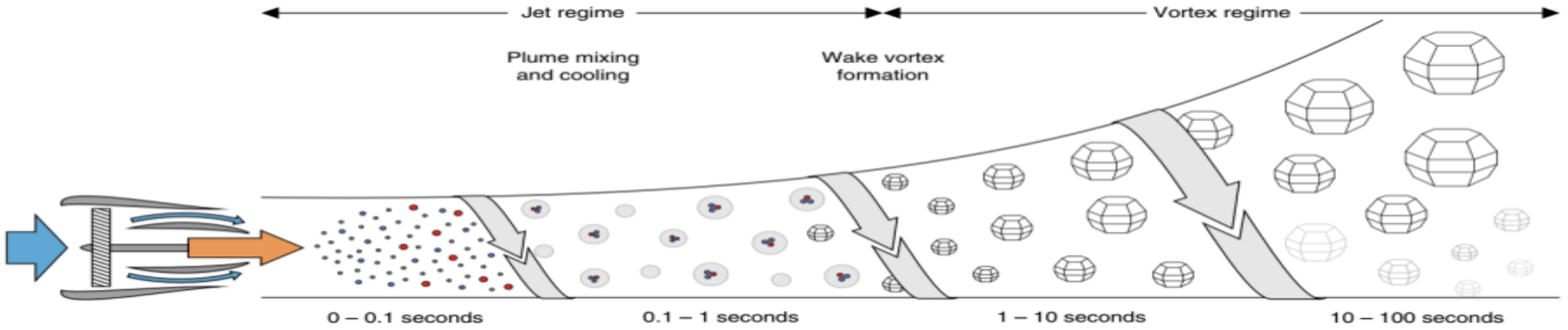
Effective radiative forcing from aviation (1940 – 2018)

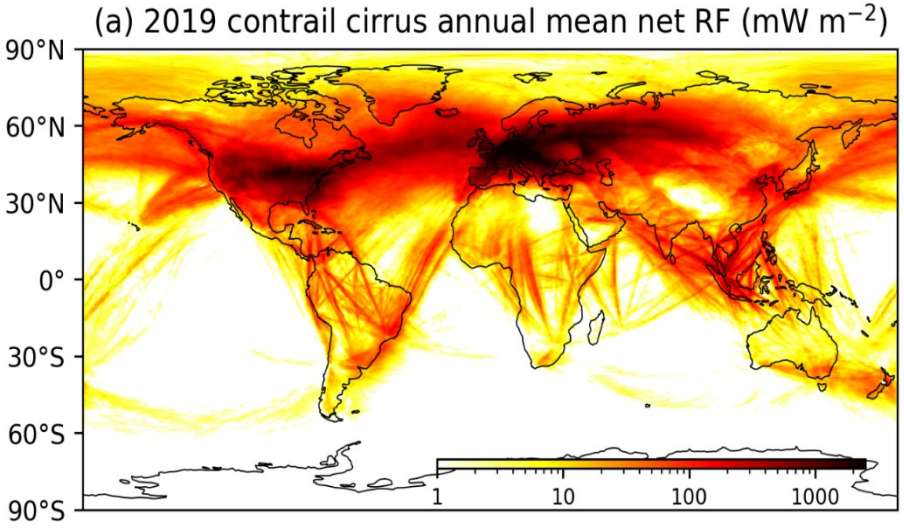


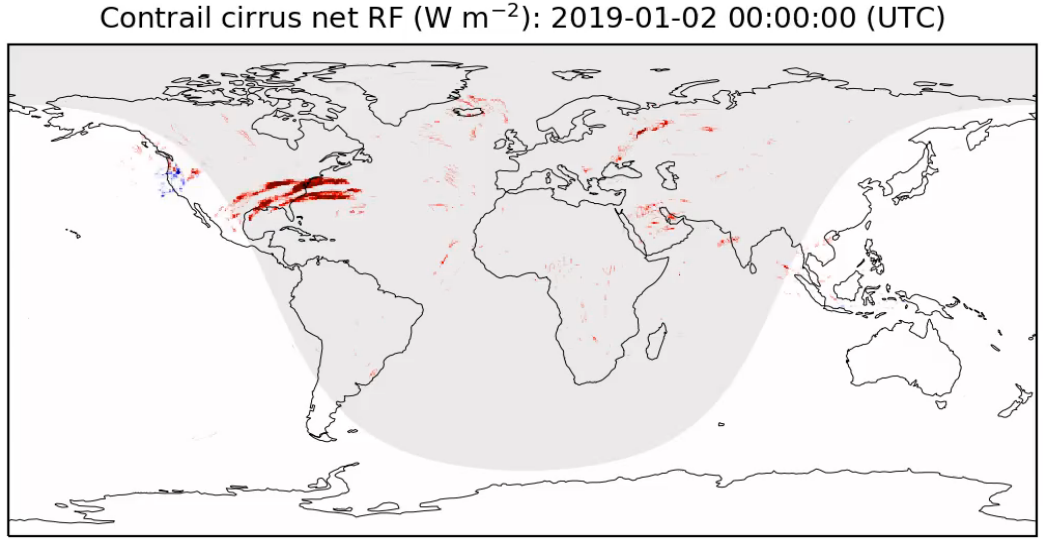
ICAO

Lee et al., Atmos. Env. 2021

Contrail formation and climate effect



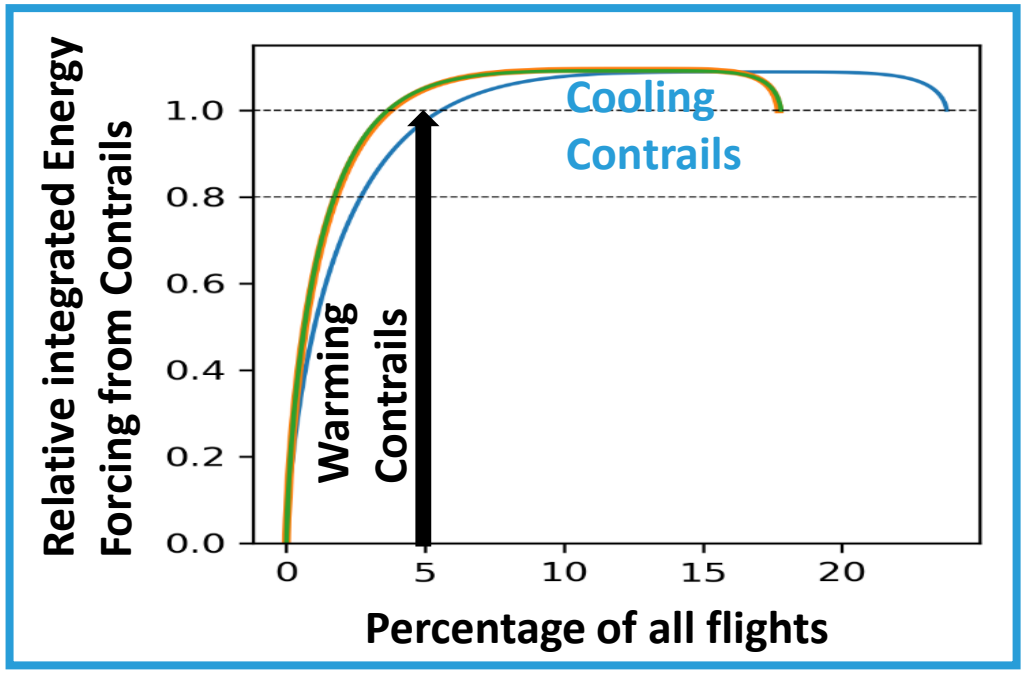


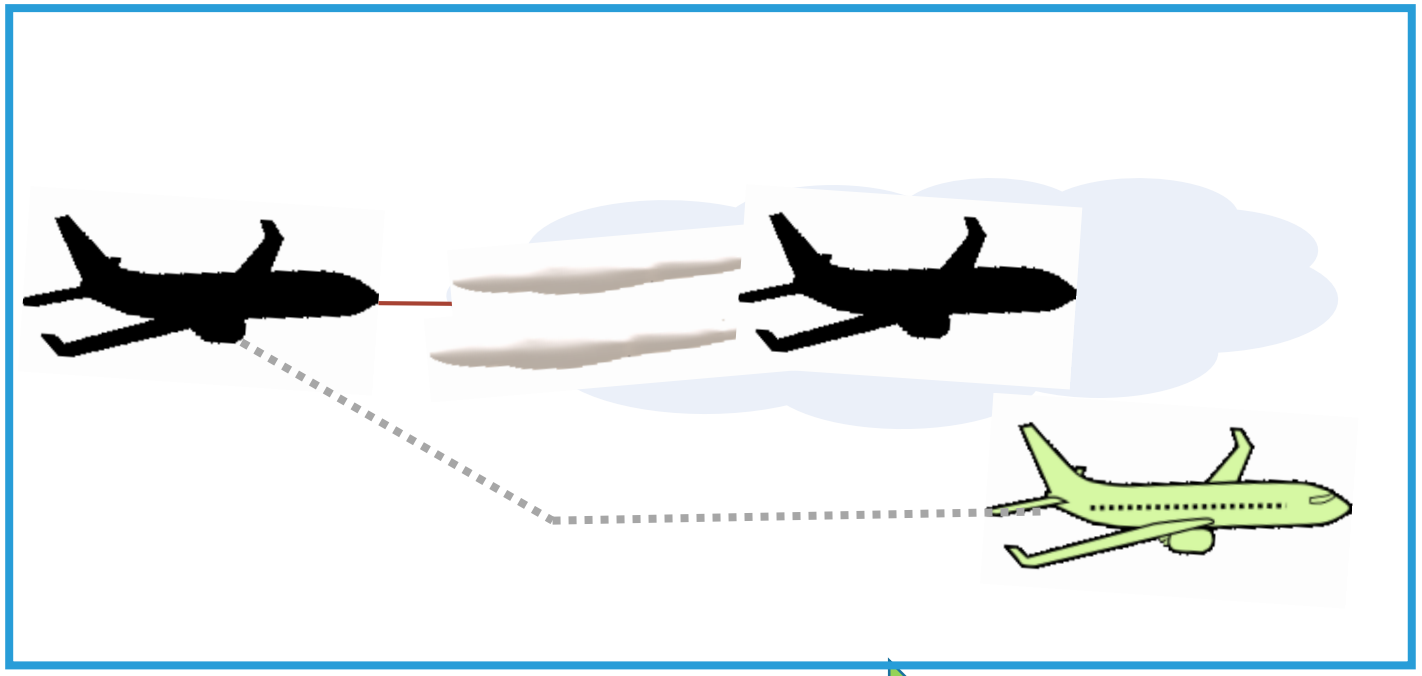


Kärcher et al., Nat Comm, 2018; Teoh et al., ACP, 2024

Potential for contrail reduction

(1) Short to mid term: Climate optimized flight routes to avoid contrails



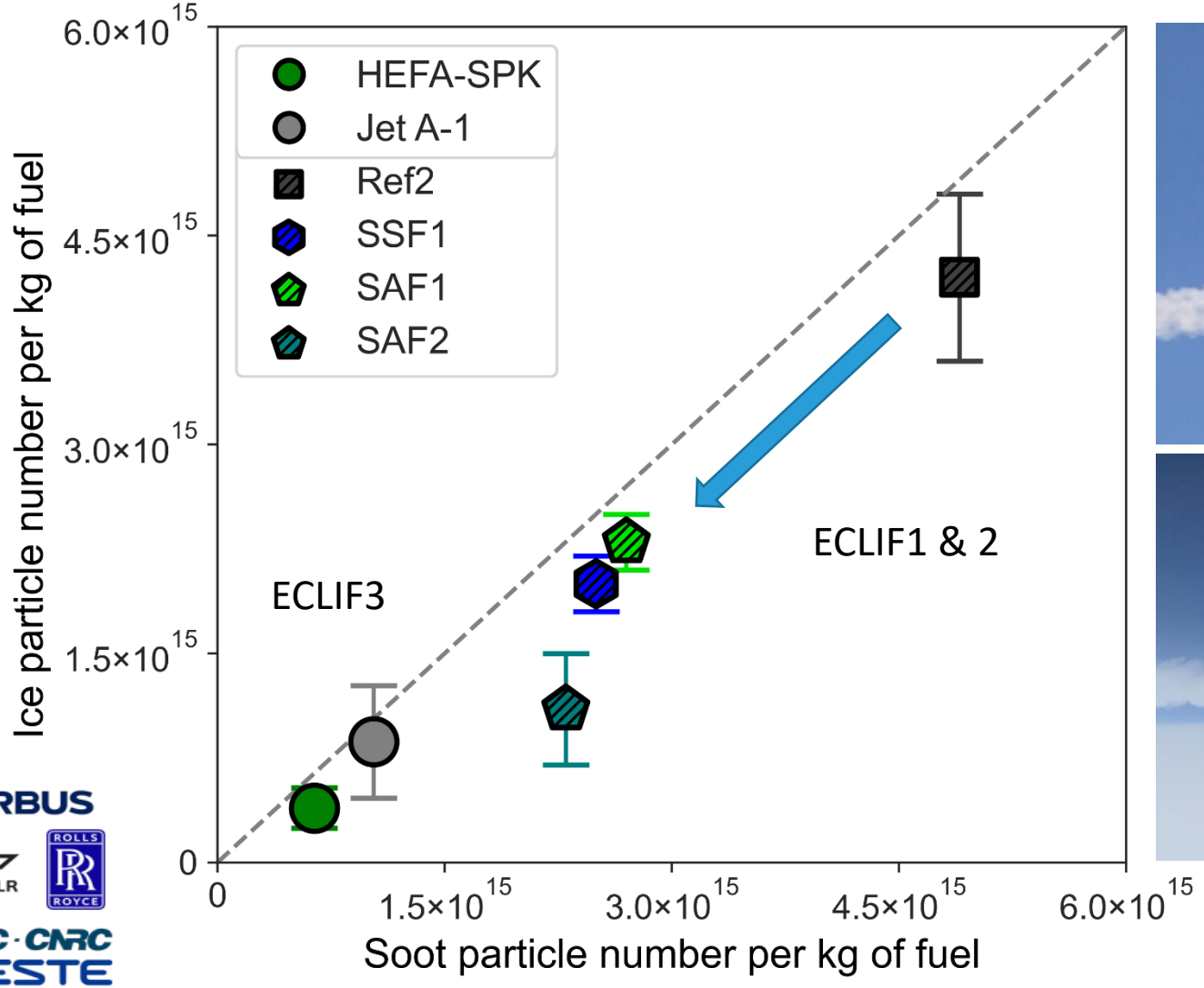


More demonstration trails, weather and contrail model developments needed, satellite evaluation, CO2 offset needs to be calculated requires support from ATM, Airlines, stakeholders

Teoh et al., ACP, 2022; 2023; 2024; Martin-Frias et al., 2024; Bourassa et al., 2024; Niklass et al., 2023; Grewe et al., 2019

(2) SAF and engine technologies reduce CO_2 footprint and contrails

Low aromatic, high H fuels reduce soot and ice particles and the radiative forcing from contrails



AIRBUS DLR ROLLS ROYCE NRC·CNRC NESTE MANCHESTER 1824 The University of Manchester

Moore et al., Nat., 2017; Voigt et al., Comm EE, 2021; Märkl et al., ACP, 2024, Dischl et al., Harlass et al., acc. ACP, 2024

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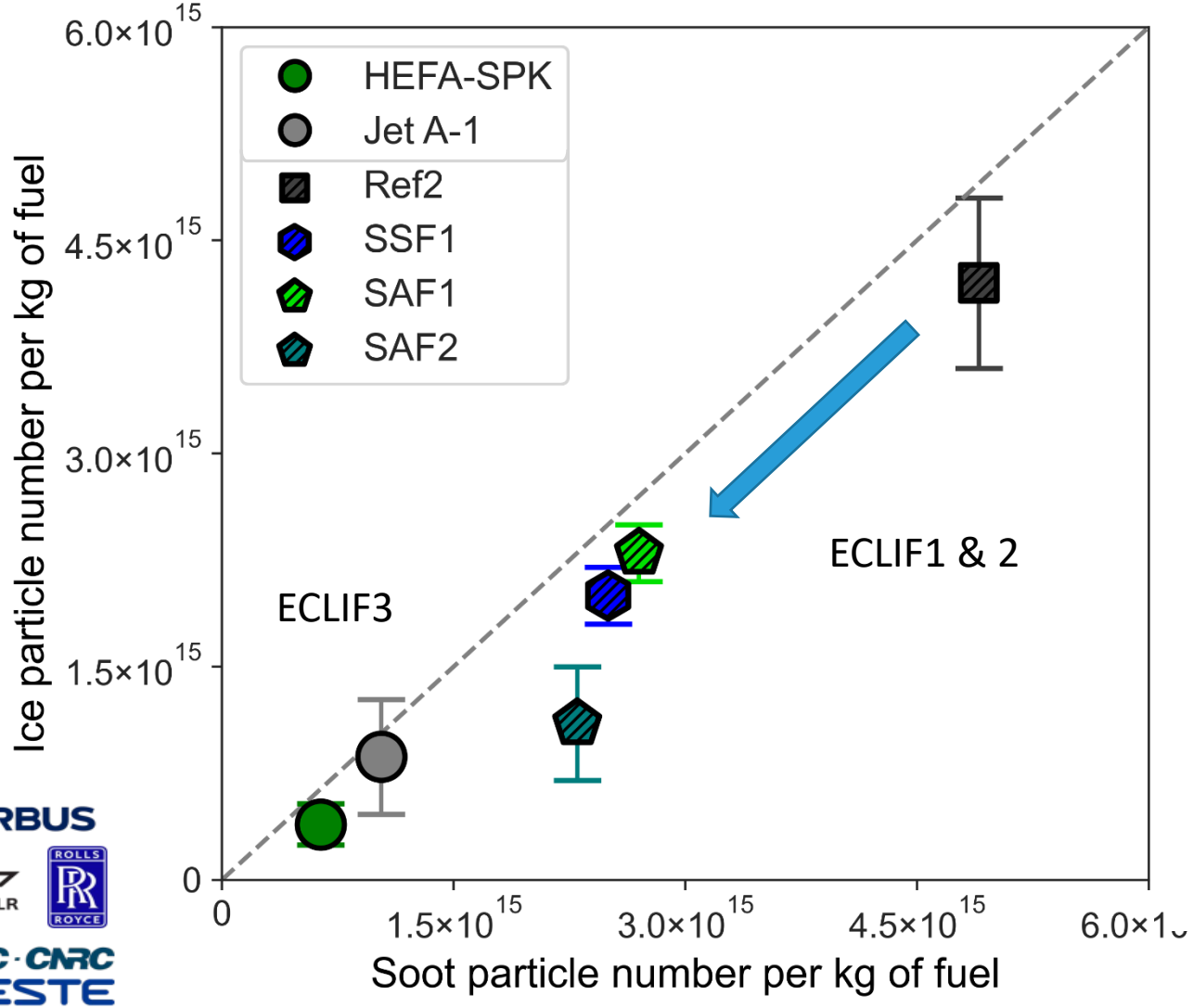
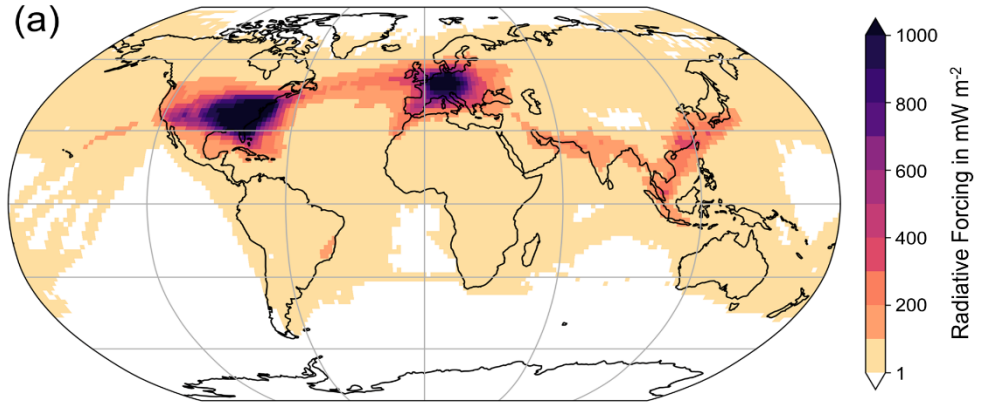
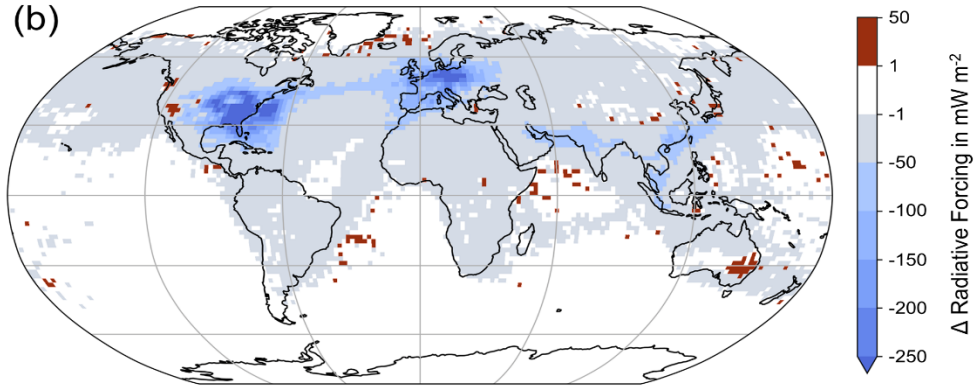


Global annual mean RF contrails in 2018 (72mW/m²)



Reduction in contrail RF by 100%SAF



Moore et al., Nat., 2017; Voigt et al., Comm EE, 2021; Märkl et al., ACP, 2024, Dischl et al., Harlass et al., acc. ACP, 2024

(3) Novel engine and hydrogen technologies need in-flight demonstration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