

Geosci. Model Dev. Discuss., referee comment RC1
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Comment on gmd-2022-220

Anonymous Referee #1

Referee comment on "Predicting the climate impact of aviation for en-route emissions: The algorithmic climate change function submodel ACCF 1.0 of EMAC 2.53" by Feijia Yin et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2022-220-RC1>, 2022

This study presents the ACCF 1.0 to describe the climate impact of aviation emissions. ACCF 1.0 takes the atmospheric conditions as input to calculate the climate impact, mainly through the average temperature response over 20 years (ATR20). The emissions include , (via and), vapour, and contrail-cirrus. The study is valuable as it provides an integrated model to assess the environmental impact of the non-CO₂ emissions. I have a few comments below:

1.The ACCF 1.0 model is based on the aCCF, which is proposed by the earlier project REACT4C2 for researching the climate change caused by emissions. ACCF works as a sub-model of the global atmospheric-chemistry model EMAC. What new features/functions are developed should be discussed.

2.The application simulation of existing trajectory is conducted to show the climatology impact. They also used the calculation model to optimize the trajectory, from which they draw the conclusion that climate-optimized trajectories considering non-CO₂ effects fly lower altitudes to reduce the impact of the total NO_x, H₂O, and contrails. The scalability of the tool for large-scale problems should be discussed.

3.However, in their scenarios, the CO₂-related environmental impact is considered to be lower than the non-CO₂ impact, which may limit the possible subsequent applications of the ACCF. Maybe discuss futural models which can provide a comprehensive assessment of climate impact caused by aviation emissions.