# Development of climate functions for aircraft design

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Kathrin Deck, Volker Grewe, Feijia Yin, Irene Dedoussi, Roelof Vos, Pieter-Jan Proesmans, Florian Linke, Kaushik Radhakrishnan, Malte Niklaß, Benjamin Lührs

Aviation ensures mobility for both passengers and goods. It is important as a transport sector for connections on and between continents. Nevertheless, aviation also contributes to anthropogenic climate change. The effects are usually divided in $CO_2$ and non-$CO_2$ effects and therefore not only $CO_2$ emissions but also other emissions (e.g., $NO_x$, water vapour or soot) and contrails are covered. To reduce the effects of aviation's climate impact, several mitigation options are applied. One approach are climate change functions, which will be addressed here. The concept of climate change functions was used in previous projects, e.g. REACT4C, WeCare, ATM4E. The goal of these functions was to optimize the aircraft routes regarding the calculated climate impact. Climate change functions measure the climate impact per unit emission for a specific day, which considers the current meteorological conditions. Climate change functions were previously used to optimize the aircraft routings. The concept should now be applied for the optimization of the aircraft design as well since the promising concept is currently missing for the application of aircraft design optimization.
The climate functions for aircraft design will connect the aircraft design with the climate impact of various emission in order to be able to optimize the aircraft design. For the calculation of the functions, it is necessary to define a specific application. This application results from a combination of aircraft design parameters. Aircraft design parameters can be for example flight altitude, climb rate, speed or range. Based on a resulting emission inventory, the temperature response can be calculated with the model "AirClim". This model calculates with the input, first, the radiative forcing and based on that the temperature change. The final development step is the verification of the climate functions.