PP09: IDENTIFYING CLIMATE OPTIMAL TRAJECTORIES IN UNDER DIFFERENT SYNOPTICAL SITUATIONS

Sigrun Matthes
German Aerospace Center (DLR)

Abstract. Mitigation of aviation climate impact is one strategic goal spelled out for a durable development of air traffic. Operational measures to identify climate-optimal aircraft trajectories by air traffic management (ATM) are one option to reduce climate impact. We present results from a comprehensive approach for weather-dependent climate-optimized flight planning applied for a case study the North Atlantic Flight corridor (NAFC) performed within the collaborative project REACT4C (Reducing Emissions from Aviation by Changing Trajectories for the benefit of Climate) funded under the European FP7 programme. Specifically, we present how climate-optimization changes routing preferences depending on the specific synoptical (meteorological) situation. Along with the distinct weather pattern, each day offers a different mitigation potential, expressed as the relation between climate impact mitigation and required investment.

Ultimate goal for climate-optimisation of aircraft trajectories is to identify maximum mitigation gain (in climate impact) for a specific investment, hence minimal marginal mitigation costs. For this purpose consecutively those flights trajectories options are selected which offer the highest mitigation potential taking into account five archetypical weather patterns in NAFC, and traffic samples in eastbound and westbound both direction. Using system approach in optimisation, which consists of identifying amongst all flights those routing options with highest mitigation potential, can result in a cost reduction of 96% of required investment or a mitigation increase by a factor of 5.

The paper presents results from a modelling chain for climate-optimisation in a flight planning tool developed within REACT4C which relies on 4-dimensional climate-cost functions applied to individual weather patterns. Traffic optimization differs between individual weather patterns, hence main characteristics are introduced in brief. Results highlight main characteristics of climate-optimization of flight trajectories, providing an estimate of individual mitigation potentials. Combining these individual optimizations, yield an estimate of the overall global potential mitigation gain of such optimized flight routing measures in terms of climate change.