Towards robust and eco-efficient reduction in aviation's climate impact by identifying climate-optimised aircraft trajectories

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Overview

The main objective of the **FlyATM4E** project is to assess **climate impact of aviation**, including its associated uncertainties, and develop methods for the optimization of aircraft trajectories in order to identify promising climate-impact mitigation options. Overall, FlyATM4E is working towards reduction the climate impact of aircraft operations.

✈**FlyATM4E** will develop a concept to identify climate-optimised aircraft trajectories which enable a robust (in the sense of behaving stable when facing uncertainties) reduction in aviation's climate impact. Climate optimization will take into account CO_2 and non-CO_2 effects, such as contrails and contrail-cirrus, water vapour, NO_x and particulate emissions.

✈ FlyATM4E will **identify those weather situations** and aircraft trajectories, which lead to a **robust climate impact reduction** despite uncertainties in atmospheric science that can be characterised by ensemble probabilistic forecasts.

✈ This will improve the **assessment of aviation's climate** impact and FlyATM4E will further identify those situations where there is a large potential to reduce the climate impact with only little or even no cost changes ("**Cherry-Picking**") and those situations where both, climate impact and costs can be reduced ("**Win-Win**").

As a synthesis, FlyATM4E will deepen in the understanding of ATM possibilities to reduce aviation's climate impact, but moreover how to implement such eco-efficient trajectories. To this end, the FlyATM4E consortium builds on its expertise covering the whole spectrum from atmospheric science and climate research to aviation operations research and aircraft trajectory optimisation.

High-Level Messages

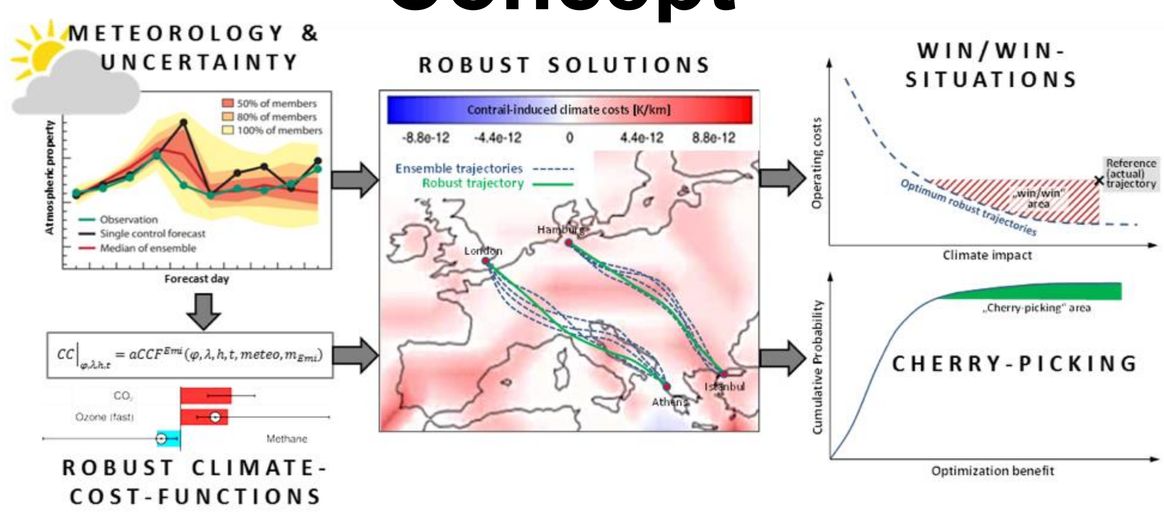
- FlyATM4E will develop advanced concepts to assess the climate impact of ATM operations.
- FlyATM4E will investigate aviation's climate impact mitigation potential.
- FlyATM4E will identify eco-efficient aircraft trajectories and related weather situations.
- FlyATM4E will provide recommendations for target stakeholders on policy actions and supporting measures to implement eco-efficient aircraft trajectories.

Objectives

The **following specific goals** arise:

1) Objective O1: advance concepts to assess the climate impact of ATM operations which integrates an adequate representation of uncertainties, including CO2, contrails, ozone, methane and water vapour climate effects, from weather forecast as well as climate science, and to provide concepts for climate information enabling ecoefficient aircraft trajectories.
2) Objective O2: investigate aviation's climate impact mitigation potential by developing robust flight planning algorithms through integration of uncertainties from the climate impact analysis and ensemble weather forecasts in ATM.
3) Objective O3: identify eco-efficient aircraft trajectories and related weather situations, which enable a reduction of both climate impact and operational costs (Win-Win) by avoiding ATM inefficiencies; or which largely reduce the climate impact of aviation at almost unchanged costs by avoiding extreme climate sensitive regions (Cherry- Picking).
4) Objective O4: provide recommendations for target stakeholders on policy actions and supporting measures to implement eco-efficient aircraft trajectories enabled by a better understanding of the climate impact of individual aircraft trajectories.

Concept

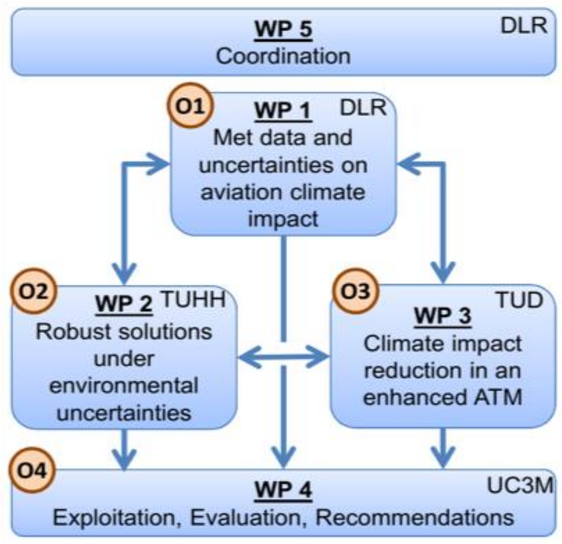


"Win-win situation" Meteorological conditions where, for a given flight connection, an adapted flight planning mechanism leads to optimised trajectories (at least one) characterised by a simultaneous reduction in both, Direct Operating Costs and the selected climate impact metric compared to the reference trajectory.

"Cherry-Picking" A procedure which applies climate-optimised flight planning to a small subset of flights identified to be causing a large fraction of the overall optimisation benefit. This enables large climate impact reduction and efficient implementation since only minor modifications of the ATM network are required.

Work Structure

FlyATM4E is organised in 5 work packages (WPs, see table 3.1a), among which, three are scientific WPs (WP 1 to WP 3), the fourth one is focused on exploitation, evaluation and recommendations, including dissemination (WP 4), and the fifth one is on coordination and management (WP 5). Each of the specific objectives (O1 to O3; see Section 1.1) is addressed in WP 1 to WP 3, respectively.



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Project Information

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