FEASIBILITY OF CLIMATE-OPTIMIZED AIR TRAFFIC ROUTING FOR TRANS-ATLANTIC FLIGHTS

Volker Grewe
German Aerospace Center (DLR)

Abstract. Current air traffic routing is motivated by minimizing economic costs. Fuel use is a major part of those costs. In addition to the climate effect of CO_2 emissions from this fuel use, aviation contributes to climate change through non-CO_2 effects, such as changes in atmospheric ozone and methane concentrations and formation of contrail-cirrus. These non-CO_2 effects depend significantly on where and when the aviation emissions occur. For example, persistent contrail-cirrus only forms in atmospheric regions which are ice supersaturated. Similarly, depending where they are emitted, nitrogen oxides might be rapidly rained-out or transported over long distances and hence leading to either little or substantial ozone production, respectively. The climate impact of aviation could potentially be reduced if flights were re-routed to avoid regions where emissions have the largest impact. We present the first results where such a strategy is simulated for all frequently occurring winter and summer weather patterns in the North Atlantic. We find that even small changes in routing, which increase the operating costs (mainly fuel) by 1% lead to considerable reductions in climate impact of 10%. The cost increase could be compensated by market based measures, if costs for non-CO_2 effects were included. Our methodology is a starting point for climate-friendly flight planning, which could also be applied globally. Although there are challenges to implementing such a system, we present a road map with the steps to overcome these.