



Will climate change increase transatlantic aviation turbulence?

Paul Williams (1) and Manoj Joshi (2)

(1) Department of Meteorology, University of Reading, Reading, United Kingdom (p.d.williams@reading.ac.uk), (2) School of Environmental Sciences, University of East Anglia, Norwich, United Kingdom

Atmospheric turbulence causes most weather-related aircraft incidents. Commercial aircraft encounter moderate-or-greater turbulence tens of thousands of times each year world-wide, injuring probably hundreds of passengers (occasionally fatally), costing airlines tens of millions of dollars, and causing structural damage to planes. Clear-air turbulence is especially difficult to avoid, because it cannot be seen by pilots or detected by satellites or on-board radar. Clear-air turbulence is linked to atmospheric jet streams, which are projected to be strengthened by anthropogenic climate change. However, the response of clear-air turbulence to climate change has not previously been studied.

Here we show using computer simulations that clear-air turbulence changes significantly within the transatlantic flight corridor when the concentration of carbon dioxide in the atmosphere is doubled. At cruise altitudes within 50-75°N and 10-60°W in winter, most clear-air turbulence measures show a 10-40% increase in the median strength of turbulence and a 40-170% increase in the frequency of occurrence of moderate-or-greater turbulence. Our results suggest that climate change will lead to bumpier transatlantic flights by the middle of this century. Journey times may lengthen and fuel consumption and emissions may increase. Aviation is partly responsible for changing the climate, but our findings show for the first time how climate change could affect aviation.