



## Transatlantic flight times and climate change

Paul Williams

University of Reading, Department of Meteorology, Reading, United Kingdom (p.d.williams@reading.ac.uk)

Aircraft do not fly through a vacuum, but through an atmosphere whose meteorological characteristics are changing because of global warming. The impacts of aviation on climate change have long been recognised, but the impacts of climate change on aviation have only recently begun to emerge. These impacts include intensified turbulence (Williams and Joshi 2013) and increased take-off weight restrictions.

A forthcoming study (Williams 2016) investigates the influence of climate change on flight routes and journey times. This is achieved by feeding synthetic atmospheric wind fields generated from climate model simulations into a routing algorithm of the type used operationally by flight planners. The focus is on transatlantic flights between London and New York, and how they change when the atmospheric concentration of carbon dioxide is doubled.

It is found that a strengthening of the prevailing jet-stream winds causes eastbound flights to significantly shorten and westbound flights to significantly lengthen in all seasons, causing round-trip journey times to increase. Eastbound and westbound crossings in winter become approximately twice as likely to take under 5h 20m and over 7h 00m, respectively. The early stages of this effect perhaps contributed to a well-publicised British Airways flight from New York to London on 8 January 2015, which took a record time of only 5h 16m because of a strong tailwind from an unusually fast jet stream.

Even assuming no future growth in aviation, extrapolation of our results to all transatlantic traffic suggests that aircraft may collectively be airborne for an extra 2,000 hours each year, burning an extra 7.2 million gallons of jet fuel at a cost of US\$ 22 million, and emitting an extra 70 million kg of carbon dioxide. These findings provide further evidence of the two-way interaction between aviation and climate change.

### References

- Williams PD (2016) Transatlantic flight times and climate change. *Environmental Research Letters*, in press.
- Williams PD and Joshi MM (2013) Intensification of winter transatlantic aviation turbulence in response to climate change. *Nature Climate Change*, **3**(7), pp 644-648. doi:10.1038/nclimate1866