



The impact of climate change on persistent contrail occurrence

Emma Irvine (1), Keith Shine (1), and Marc Stringer (2)

(1) Reading University, Meteorology Department, Reading, United Kingdom (e.a.irvine@reading.ac.uk), (2) Met Office, Exeter, United Kingdom

The formation of persistent contrails by aircraft flying through cold ice-supersaturated (CISS) regions contributes to anthropogenic climate change. However, as the climate itself changes during the 21st century, the potential for the formation of persistent contrails may also change. We recently (doi: 10.5194/esd-6-555-2015) found a global-mean decrease in the frequency of CISS regions of one third (11 to 7%) by the end of the 21st century, relative to present-day conditions, using climate model data from CMIP5. This decrease is dominated by the large decrease in CISS frequency in the tropics where the models predict strong upper-tropospheric warming, to levels above the threshold temperature at which contrails can form. The situation for the northern hemisphere mid-latitudes is less clear and dependent on model, latitude and season. Actual changes to contrail cover during this period will depend also on flight routing. An example is shown for the north Atlantic, where aircraft routing is strongly wind-dependent and therefore will be affected by changes to the jet stream. Here we combine our analysis of changes in CISS with projected changes in aircraft routes (which are calculated using the climate model winds), to estimate the net impact on persistent contrail occurrence in this region. We distinguish between the effect on eastbound flights, which generally aim to exploit the jet stream, and westbound flights that aim to avoid it.