

Pros and contrails

Flying the redevye may help keep the planet cooler.

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Contrails could cause climate change.

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warming effect," says atmospheric scientist Gunnar Myhre.

To what degree depends on the angle of the Sun in the sky, find Myhre and his colleague Frode Stordal, at the Norwegian Institute for Air Research in Kjeller¹. Around dawn and dusk, contrails act more like reflectors, bouncing incoming sunlight back into space.

Taking a plane just after dawn or just before sunset could be better for the environment, according to a study of contrails - the lustrous lines of ice crystals that streak the sky in the wake of jets.

They may look benign, beautiful even, but by reflecting heat rising from the ground, contrails have a small but significant environmental impact. "Globally they have a

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"With a shift in air traffic towards sunrise and sunset, you could decrease this impact," Myhre says.

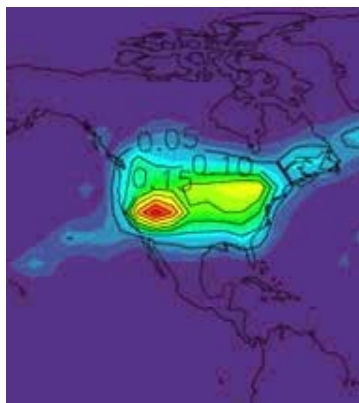
Patrick Minnis, an atmospheric scientist at NASA's Langley Research Center in Hampton, Virginia, agrees with the pair's findings, but thinks it would be "very unrealistic" to try to squeeze more air traffic into time slots around sunrise and sunset.

Even if it were possible to regulate when planes fly, "you couldn't force contrails into persisting for just a few hours a day", he cautions.

Blowing hot and cold

Contrails form when water vapour in the exhaust from jet-engines freezes high in the troposphere where airliners cruise. Being efficient at scattering light, contrail ice crystals have a greater 'greenhouse' effect than the carbon dioxide gas also produced by jet engines, says Myhre.

Measuring contrails' impact is not an exact science. Depending on a plane's altitude, and the temperature and humidity of the atmosphere, contrails can vary enormously in their thickness and duration, and therefore in their reflecting or insulating power. Most last minutes or hours, some last days.



Contrails follow the traffic.
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During the day, persistent contrails trap slightly more heat than they reflect back into space - at night they continue to trap heat. In areas with dense air traffic, such as Europe and North America, contrails could be warming the atmosphere by up to 0.1°C, Minnis

and colleagues found in 1999².

Although warming by contrails is minor - about 75 times less than man-made CO₂ - "the future climatic impact of aircraft is very important", warns Myhre - with a predicted fivefold increase in air traffic in the next 50 years.

Myhre and Stordal combined satellite images with data on the journey length and fuel consumption of air traffic. Comparing this with models of how contrails scatter light, they estimated how much heat contrails trap or reflect.

Like others before them, the duo found a net warming effect. But taking previous measurements of the reflecting properties of ice crystals in icy cirrus clouds into account, they found that when light hits contrails at low angles - like at dawn and dusk - they in fact reflect light, causing a cooling effect.

The researchers plan to keep watching contrails as jet technology and flight patterns are set to change. Although cleaner burning, next-generation jet engines are expected to cruise at higher altitudes and to make more contrails.

References

1. Myhre, G. & Stordal, F., On the tradeoff of the solar and thermal infrared radiative impact of contrails. *Geophysical Research Letters*, 28, 3119 - 3122, (2001).
2. Minnis, P., Schumann, U., Doelling, D. R., Gierrens, K. M. & Fahey, D. W., Global distribution of contrail radiative forcing. *Geophysical Research Letters*, 26, 1853 - 1856, (1999).