Climate crisis may be increasing jet stream turbulence, study finds

Potential impacts of rise in vertical shear include longer, bumpier and dearer flights

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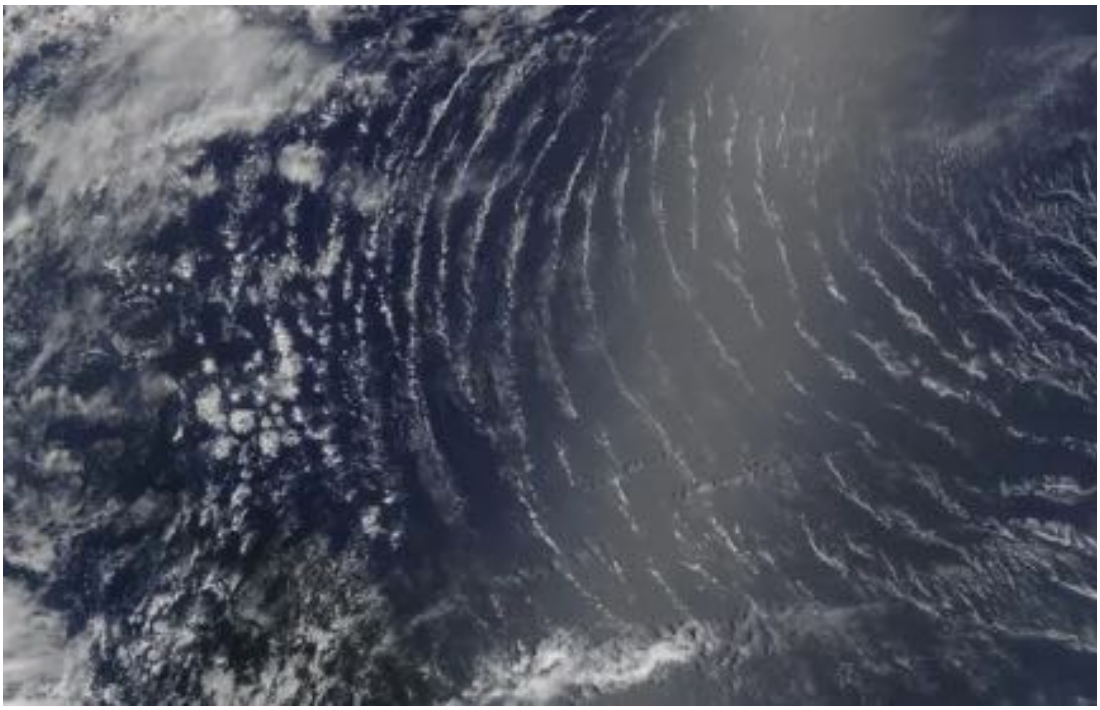

A satellite image of air turbulence over the mid-Atlantic. Photograph: MODIS/Terra/NASA

The climate crisis could be making transatlantic flights more bumpy, according to research into the impact of global heating on the jet stream.

Jet streams are powerful currents of air at the altitudes which planes fly. . They result from the air temperature gradient between the poles and the tropics, and reach speeds of up to 250mph (400kmph). They also sometimes meander.

Researchers say previous studies of the speed and location of the fastest part of the north Atlantic jet stream have found only small changes over time, although there are signs it is slowly shifting northward. Experts say the lack of dramatic alterations is because climate change produces competing effects at different altitudes.

The latest study, however, took a different approach. “Just because the speed isn’t changing, doesn’t mean the jet stream isn’t changing in other ways,” said Prof Paul Williams of the University of Reading, the lead author of the research.

His study, published in the journal Nature, (https://www.nature.com/articles/s41586-019-1465-z) looked at the change in wind speed with height, known as vertical shear. “The higher up you go, the windier it gets,” he said.

Using three different datasets based on satellite observations, the team say they identified a 15% increase in vertical shear between 1979 and 2017, consistent with what would be expected from climate change.

“The winds and the temperatures are in a certain kind of balance in the atmosphere,” said Williams. “The consequence is that it is impossible to change the temperature patterns without having an effect on the wind patterns.”

The increase in vertical shear has important consequences for aircraft. “If that wind shear effect gets too strong and moving from one layer [of air] up to the next there is a big jump in speed, that is what causes turbulence,” said Williams.

In other words, large changes in wind speeds with height can result in a breakdown, or disruption of layers of air.

The impact goes beyond passengers having to keep their seatbelts on and forgo a plastic cup of wine. More patches of turbulence are likely to mean more diversions as planes try to avoid them, which in will increase journey times, emissions and fuel costs.

Previous work by the team suggests that, assuming drastic action on the climate crisis is not taken, the amount of severe turbulence in the atmosphere could double or triple by the period 2050-2080.

The aviation industry could well be contributing to the changes Williams and his colleagues found. ,It currently accounts for about 2% of global CO2 emissions and is one of the fastest-growing polluters. This year is forecast to be another record-breaking year for air travel, with passengers expected to fly a total of 5tn miles (8.1tn km).

Recent analysis by the Guardian highlights the disproportionate carbon footprint of those who can afford to fly. Taking a long-haul flight generates more CO2 emissions than the average person in many countries produces in a whole year. Even a short-haul flight from London to Edinburgh generates more

CO_2 emissions than a person in Uganda or Somalia produces in year.

The study backs up predictions the team made several years ago that changes to vertical shear will not only be felt by those who fly. Researchers says it could also have important consequences for large-scale atmospheric thermodynamics and dynamics.

“[With] climate change, normally we are thinking of ground level because that is where we live, but of course the climate is changing right up there at 35,000ft as well,” said Williams.

“The 15% shear increase must rank as one of the largest anthropogenic changes to have occurred in the climate system since satellite observations began.

“The change has been taking place silently, high above our heads, for the past 40 years, and it has gone unnoticed until now. It makes me wonder what else we don’t yet know about how climate change is altering the global atmospheric circulation.”