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September's Science: Shutdown of airlines aided contrail studies

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Immediately after four hijacked airliners slammed into New York's World Trade Center, the Pentagon, and a field in southwestern Pennsylvania, the Federal Aviation Administration shut down all U.S. commercial air traffic for 3 days. The unprecedented grounding of airliners enabled airports to step up security measures. At the same time, scientists stepped up to a unique opportunity to study the influence of high-flying aircraft on Earth's climate.

One way that aircraft may affect climate is through their cloud like contrails, which appear behind jets flying at high altitude. Contrails are made of ice crystals that form within seconds around the small particles present in aircraft exhaust, says David J. Travis, an atmospheric scientist at the University of Wisconsin-Whitewater. Although jet fuel produces water vapor as it burns, more than 90 percent of the ice in long-lived contrails comes from water vapor already present in the air, says Travis.

Wispy cirrus clouds are the only ones that form naturally at the high altitudes where jets cruise. These thin clouds slightly cool Earth's surface by blocking some incoming sunlight, but they moderately warm the lower atmosphere by trapping a portion of Earth's outbound infrared radiation. Scientists have suspected that contrails have similar but stronger effects.

Travis and his colleagues looked at the average diurnal temperature range (DTR)-the difference between the day's high and low temperatures-reported at more than 4,000 weather stations across the continental United States. During the 3-day hiatus of air traffic last September, the average DTR was a little over 1°C wider than normal, even though the average DTRs computed for the 3-day periods immediately before and after that period were below normal.

Furthermore, says Travis, the Pacific Northwest, the Midwest, and the Northeast-areas of the country typically blanketed with aircraft contrails in mid-September-showed the largest changes in diurnal temperature range, mostly from increased daytime high temperatures. This bolsters the argument that contrails can significantly affect climate, Travis contends. He and his colleagues will report their findings next week in Portland, Ore., at a conference of the American Meteorological Society.

Travis' results are difficult to argue with, says Patrick Minnis of NASA's Langley Research Center in Hampton, Va. He and his colleagues

will report their analyses of satellite images of contrails at the same conference. In a series of photos taken Sept. 12, individual cloud trails of high-flying military aircraft stand out clearly in a nearly cloud-free region west of Washington, D.C. In just a few hours, six contrails—each of which started out a few meters wide—spread to cover more than 20,000 square kilometers. The observations of these single contrails along aerial highways normally crowded with dozens of aircraft may help scientists develop better models of how contrails spread and affect climate, says Minnis.

References and Sources

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