

ATS/CIRA Colloquium

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The generation of turbulence around thunderstorms

Hosted by Thomas Birner

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**ATS room 101; Discussion will begin at 3:30pm
Refreshments will be served at 3:00pm in the coffee lounge**

Anyone who has flown in a commercial aircraft is familiar with turbulence. Unexpected encounters with turbulence pose a safety risk to airline passengers and crew, can occasionally damage aircraft, and indirectly increase the cost of air travel. Deep convective clouds are one of the most important sources of turbulence and cloud-induced turbulence can occur both within clouds and in the surrounding clear air. Turbulence associated with but outside of clouds, so-called near-cloud turbulence, is of particular concern because it is more difficult to discern using standard hazard identification technologies (e.g., satellite and radar) and thus is often the source of unexpected turbulence encounters. While operational guidelines for avoiding near-cloud turbulence exist, they are in many ways inadequate because they were developed before the governing dynamical processes were understood. Recently, there have been significant advances in the understanding of the dynamics of near-cloud turbulence. In this presentation, I present examples that demonstrate how these advances have stemmed from improved turbulence observing and reporting systems, the establishment of archives of turbulence encounters, detailed case studies, and high-resolution numerical simulations. Some of the important phenomena that have recently been identified as contributing to near-cloud turbulence include gravity wave breaking, unstable upper-level thunderstorm outflows, shearing instabilities, and cirrus cloud bands. The consequences of these phenomena for developing new en-route turbulence avoidance guidelines and forecasting methods are discussed, along with recent research results, and outstanding research questions.