

---

---

MMM

SEMINAR

NCAR

---

---

## *Microphysics of Aerodynamic Contrail Formation Processes*

*Andrew Heymsfield<sup>1</sup> and Joachim Jansen<sup>2</sup>*

1. *National Center for Atmospheric Research, Boulder, Colorado*

2. *Utrecht University, Utrecht, The Netherlands*

In this seminar we focus on the formation of ice particles in the airflow over jet aircraft wings and the generation of iridescent aerodynamic contrails. These are different than the commonly observed contrails at aircraft cruise altitude, which are due to combustion.

Aerodynamic condensation is a result of intense adiabatic cooling in the airflow over aircraft wings, and behind propeller blades. Out-of-cloud, condensation appears as a burst-like fog (jet aircraft during takeoff and landing, propellers) or as an iridescent trail visible from the ground behind the trailing edge of the wing (jet aircraft, subsonic cruise flight), consisting of ice particles that grow to visible size in ambient humidities above ice saturation. In supercooled liquid clouds, aircraft produced ice particles may lead to inadvertent cloud seeding because ice grows preferentially relative to water.

We use a 2D compressible flow model to evaluate two likely processes considered for the initial ice particle formation: homogeneous nucleation of droplets directly from water vapor followed by their homogeneous freezing, and depositional growth and freezing of pre-existing solution droplets. We show visible aerodynamic contrails form between  $T = -20$  and  $-50$  °C and  $RH \geq 80\%$ , consistent with observations.

*This seminar will be webcast live at:*

*<http://www.fin.ucar.edu/it/mms/fl-live.htm>*

*Recorded seminar link can be viewed here:*

*<https://www.mmm.ucar.edu/events/seminars>*

**Thursday, 30 April 2015, 3:30 PM**

Refreshments 3:15 PM

NCAR-Foothills Laboratory

3450 Mitchell Lane

Bldg 2 Main Auditorium, Room 1022

MMM SEMINAR COORDINATOR

Morris Weisman, 303.497.8901, [weisman@ucar.edu](mailto:weisman@ucar.edu)

<http://www.mmm.ucar.edu/events/seminars>