ACOM Seminar: Troy Thornberry

ACOM SEMINAR

Title: In Situ Perspective on Water Vapor, Couds and Dehydration in the Tropical Tropopause Layer

Presenter: Troy Thornberry, NOAA/ESRL/CSD and CU CIRES

Abstract: Water vapor and cirrus clouds in the tropical tropopause layer (TTL) both play significant roles in Earth's radiative balance and climate system. The low H2O content of air entering the LS is controlled to first order by dehydration processes at the cold temperatures near the tropical tropopause. High altitude cirrus clouds are ubiquitous in the TTL, especially in the tropical western Pacific region and play a significant role in the radiative balance of the TTL. TTL cirrus can result from detrainment of ice from deep convection or form in situ due to slow vertical advection or wave-driven cooling. Convective detrainment results in deposition of water from the lower troposphere into the TTL, while in situ cloud formation produces the dehydration of air as it is transported through the TTL into the stratosphere. The balance of these processes and their interaction controls the mixing ratio of water reaching the stratosphere. Uncertainties in aspects of the nucleation and growth of cirrus cloud particles and the sparseness of in situ water vapor and cirrus cloud observations with sufficient spatial resolution to resolve these processes have limited our ability to fully characterize the final stages of dehydration before air enters the LS in the tropics.

In this presentation I will discuss results from the recent NASA ATTREX and POSIDON high-altitude airborne science missions to the tropical western Pacific that have provided extensive in situ sampling of the TTL in this important region. Accurate measurements of water vapor along with cirrus cloud properties and meteorological parameters provide the means to investigate details of the TTL dehydration processes. Combining the observations with reanalysis datasets can then be used to assess the overall effect of inefficiencies in the dehydration process on the mixing ratio of water reaching the stratosphere. Finally, since convection transports trace gases from the lower troposphere into the TTL along with water, I will look at the potential for O3 measured within clouds to differentiate between those of recent convective origin and those formed through in situ processes.

Monday, May 14, 2018, 3:30pm
Refreshments: 3;15pm
NCAR Foothills Laboratory
FL-1022, Large Auditorium
Live webcast: http://ucarconnect.ucar.edu/live

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