Convective impacts on trace gases in the Tropical Tropopause Layer during Boreal Winter as seen during ATTREX

Leonhard Pfister[1], Eric Jensen[1], Maria Navarro[2]

[1]*NASA Ames Research Center, Moffett Field, USA*
[2]*Rosenstiel School of Marine and Atmospheric Sciences, Miami, USA*

In the Tropical Tropopause Layer, deep convective injection competes with slow, wave forced ascent and advection from midlatitudes in determining the distribution of trace gases (CO and water vapor) and clouds. Past studies have clearly shown that such convective injection is essential to understanding TTL satellite observations. In this paper, we: (1) briefly describe a high time/spatial resolution method based on satellite observations to incorporate convective injection into trajectory models, as well as its validation; and (2) apply this method to understanding aircraft observations of trace gases made during ATTREX.

Results for ATTREX3 indicate an evolution in the origin of convectively influenced air from the early flights during February (Africa and Indian Ocean) to the later flights during March (western and southwestern Pacific). This is due to the interaction of convection with the placement of the northern hemisphere western Pacific monsoon anticyclone. During ATTREX2, aircraft observations in the eastern Pacific were further from convective sources, but showed convective origins from both the southwestern and northwester1Gn Pacific. The relationship between subseasonal variations of convective influence and TTL temperature (significant for in situ cloud formation processes) will be explored.