4.240 Cloud resolving simulations of the UTLS chemistry during the Asian Summer Monsoon.

Presenting Author:
Brice Barret, Laboratoire d'Aérologie, CNRS, Université de Toulouse, UPS, Toulouse, France, barp@aero.obs-mip.fr

Co-Authors:
Alma Hodzic, Laboratoire d'Aérologie, CNRS, Université de Toulouse, UPS, Toulouse, France
Maud Leriche, Laboratoire d'Aérologie, CNRS, Université de Toulouse, UPS, Toulouse, France
Eric Le Flochmoën, Laboratoire d'Aérologie, CNRS, Université de Toulouse, UPS, Toulouse, France
Pierre Tulet, LaCy, Université de La Réunion, CNRS, Météo-France, Saint-DEnis de La Réunion, France

Abstract:

During the Asian Summer Monsoon, the circulation of the UTLS is characterized by the large scale Asian Monsoon Anticyclone (AMA) extending from the Mediterranean sea to the Pacific Ocean. Monsoon convection is impacting the composition of the UTLS through the accumulation of pollutants within the AMA and the formation of the Asian Tropopause Aerosol Layer (ATAL). The Stratoclim airborne campaign took place in July-August 2017 in order to document the composition of the AMA, the chemical processes responsible of the formation of the ATAL and the transport of water vapor to the stratosphere during the monsoon.
High resolution simulations with the Meso-NH cloud resolving model in the Asian monsoon region will be performed to represent convective clouds and associated processes (scavenging of particles, aerosol-cloud interactions and in-cloud chemistry). Analyses of the distributions of long-lived tracers (such as CO) will provide information about the transport processes (fast convective uplift versus slow diabatic heating) and the origin of the pollutants. The simulations will include detailed aerosol chemistry to discriminate between the different types of aerosols (black carbon, primary and secondary organic aerosols, sulfates and nitrates) and determine their formation pathways (convective uplift of boundary layer particles, taking into account scavenging and chemical processing, vs. nucleation of small particles from convectively uplifted gases oxidized within the cloud).
The Meso-NH simulations will be performed for case studies corresponding to observations from the StratoClim campaign. Airborne observations from StratoClim provide detailed and unprecedented information about the properties of the ATAL. In particular, mass spectrometer data that have documented the chemical speciation of the particles and size distributions from particle counters will be used to discriminate the formation pathways. The simulated CO distributions will be evaluated with satellite observations from the IASI sensor.