NELSON CCR Center for Climatic Research

Climate, People, and the Environment Program Seminar Series

CPEP

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Ozone and CO transport and chemistry in the tropical upper troposphere : the contribution of IASI observations

Ozone (O3) is one of the most important greenhouse gas which radiative impact is the highest for molecules located in the Upper Troposphere-Lower Stratosphere (UTLS). Due to high insulation and precursor emissions, ¾ of the production and destruction of tropospheric O3 are occuring in the tropics. During the June-September period, uplift of pollution by deep convection occurs over the Asian Summer Monsoon (ASM) region. Furthermore, lightning's produced NOx (LiNOx) result in O3 enhancement downwind of the detrainment regions. Stratosphere to Troposphere Exchanges (STE) along the subtropical jet also contribute to tropical UT O3 enhancements. Satellite observations provide a unique tool to have a global view of the composition of the troposphere. The IASI sensor was launched in 2006 aboard the Metop-A platform. Primarily aimed at measuring temperature and water vapour, it allows us to characterize the tropospheric composition. We will first introduce the retrieval and characterization of trace gas profiles from IASI with the SOFRID (SOftware for a Fast Retrieval of IASI Data). Comparisons between the IASI-SOFRID O3 and CO data with independent in-situ data (global networks, airborne IAGOS program) will be presented. I will then proceed with two case analyses of large scale transport and chemistry of CO and O3 in the tropical UT.

Over the Indian Ocean, the frequent occurrence of elevated O3 concentrations in the mid- to upper-troposphere during the winter season have been attributed to STE or to convective lofting of pollution from the Indian continental outflow. We have used IASI-SOFRID data to document a strong event of O3 transport from Africa. This afro-indian UT "O3 river" is corroborated over the north-western coast of India by measurements from the IAGOS program. A transport analysis based on the Meso-NH model link this "O3 river" to the convective outflow of air masses impacted by African LiNOx supporting the contribution of this source to tropospheric O3 enhancements over India. During the ASM, satellite (MLS, ACE-FTS, Calipso) observations have documented the accumulation of primary pollutants (CO, HCN, aerosols) into the large scale UTLS Asian Monsoon Anticyclone (AMA). This uplift of lower tropospheric air has a potentially strong impact upon the UTLS composition (O3, H2O, aerosols) and therefore on the surface radiative forcing. To document the CO and O3 distributions throughout the Asian troposphere during the ASM we have used IASI-SOFRID data. These data have also enabled us to validate simulations with the GEOS-Chem model. Finally, we have performed sensitivity simulations with the different sources (LiNOx, STE, anthropogenic pollution) switched off to establish the CO and O3 budget in the AMA. Our results show that South Asian pollution is responsible for the largest CO enhancement while Asian LiNOx is the most important source of O3 in the AMA..

Thursday, December 8, 2016 1:00 pm

AOSS Building, Room 1039 **1225 W. Dayton St.**

Please join us for coffee at 12:45 in Room 1039