Geophysical Research Abstracts
Vol. 15, EGU2013-551-2, 2013
EGU General Assembly 2013

Impact of land convection on the water vapor and temperature variability in the TTL with an emphasis over Bauru (Brazil)

Fabien Carminati (1,2,3), Philippe Ricaud (2), Jean Pierre Pommereau (4), Serguey Khaykin (4), Emmanuel Rivière (5), Juying Warner (3), Jean-Luc Attié (1,6), David Saint-Martin (2), Martine Michou (2), and Thomas August (7)

(1) Université Toulouse III, France (fabien.carminati.01@gmail.com), (2) CNRM Météo-France, France, (3) University of Maryland, College Park, MD, USA, (4) LATMOS CNRS, Guyancourt, France, (5) GSMA CNRS, Université de Reims Champagne-Ardenne, France, (6) Laboratoire d'Aérologie, Toulouse, France, (7) EUMETSAT, Darmstadt, Germany

A highly debated issue in the troposphere-to-stratosphere transport and processes controlling the water vapor (H_2O) balance in the stratosphere is the role of deep overshooting over intense convective regions and interplay between hydration and dehydration processes in the Tropical Tropopause Layer (TTL). TRO-Pico is a 5-year project aiming to monitor the H_2O amount during the wet season. The project relies on field campaigns held in Bauru (22.3°S; 49.1°W), Brazil, and involves a combination of balloon-borne measurements, ground-based and space-borne observations and modeling. More specifically, the MetOp-IASI and Aqua-AIRS nadir sounders datasets in the Upper Troposphere (UT) and the Aura-MLS limb sounder datasets in the Lower Stratosphere (LS) are inter-compared over long time ranges and different spatial scales to the Chemistry-Climate Model CNRM-CCM and the ECMWF analysis datasets, together with the balloon-borne sensors: Vaisala RS-92GDP radiosondes, Pico-SDLA and Flash-B hygrometers. In the tropical band (30°S-30°N), during convective seasons, we show in the UT strong negative day-night variations of H_2O over Southern continents, consistent with the diurnal cycle of convective events, and, to a lesser extent, also over Northern continents. In the LS, during convective periods, the H_2O signal becomes slightly positive over Southern continents and of an opposite sign over the Northern continents. The temperature fields show positive day-night variations over land increasing with altitude, with a maximum amplitude above the Cold Point (CP) around 80 hPa. At the local scale over Bauru, we sampled the different datasets over 24 hours to highlight the shape of the diurnal cycle of H_2O. An early afternoon minimum is observed in the UT, consistent with the late afternoon maximum of convection. The diurnal cycle of temperature has a late morning minimum in the UT, shifted to the night at the CP level, also consistent with the injection of cold air by deep convection. Regarding the different H_2O datasets, between 100 and 50 hPa, we obtain a good consistency (within 10%) between MLS and the hygrometers while IASI overestimates from 2 to 3.5 ppmv (50-180%) and AIRS underestimates from 1 to 1.5 ppmv (50-60%) the H_2O content. The temperature is well reproduced by IASI and AIRS with respect to the hygrometers, within 3 K at the CP and less ($\sim$1 K) in the UT.