Geophysical Research Abstracts
Vol. 14, EGU2012-3057, 2012
EGU General Assembly 2012

Impact of land convection on the thermal structure of the lower stratosphere as inferred from COSMIC GPS/RO temperature measurements

S. Khaykin, A. Hauchecorne, and J.-P. Pommereau
LATMOS, CNRS, Université de Versailles St Quentin, Guyancourt, 78280 France

Although the frequent injection of clean air, ice crystals and tropospheric chemicals by deep convection over land up to 20 km altitude in the tropical lower stratosphere has been unambiguously demonstrated, the importance of this process at the global scale is still debated. In agreement with Danielsen's suggestion of strong cooling of the lower stratosphere by injection of adiabatically cooled tropospheric air by convective turrets, several series of radio-soundings in Brazil and West Africa are showing, at least locally, systematic cooling well above the tropopause during the development phase of convective systems in the afternoon.
The geographic extension of the impact of deep convection on the thermal structure of the tropical UTLS has been explored using the high-resolution COSMIC GPS radio-occultation temperature measurements during 2006 - 2011 above South America, Africa, Australia and the maritime continent. The temperature above those continents during the summer season is shown to display a systematic average cooling of 2°C of the lower stratosphere up to 20 km in the late afternoon, as opposed to oceanic areas showing little or no diurnal variation. This is consistent with the diurnal cycle of Overshooting Precipitation Features (OPFs) reported by the TRMM precipitation radar and suggests that injection of adiabatically cooled air is indeed the process responsible for the diurnal temperature cycle of the lower stratosphere over land, a systematic feature as observed from the COSMIC GPS measurements.